Monetary Development and Transmission in the Eurosystem

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7 October 2015

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An Evaluation of European Monetary Policy

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7.10.2015

We cannot solve our problems with the same thinking that created them.

The only real valuable thing is intuition.

Everything that can be counted doesn't necessarily count;

Everything that counts can not necessarily be counted.

Albert Einstein

Banking Institutions are more dangerous to our liberty than standing armies.[…]The modern theory of the perpetuation of debt has drenched the earth with blood, and crushed its inhabitants under burdens ever accumulating.

Thomas Jefferson

(Author of the Declaration of Independence, 3. US President)

It is well enough that people of the nation do not understand out banking and money system, for if they did, I believe there would be a revolution before tomorrow morning.

Henry Ford

(Founder of the Ford motor company, pioneer of industry production)

The Government should create, issue, and circulate all the currency and credits needed to satisfy the spending power of the Government and the buying power of consumers [and businesses]. By the adoption of these principles, the taxpayer will be saved immense sums of interest. Money will cease to be the master and become the servant of humanity.

Abraham Lincoln

(16. President of the US, modernizer who fought slavery)

I have unwittingly ruined my country [with the Fed's fractional banking system].

Woodrow Willson

(Signee of the Federal Reserve Act, US President)

Abstract

Since the launch of the European Economic and Monetary Union (EMU) in January 1999 till today in 2015, the Euro has ascended to become the second largest reference currency in the world. With about €1.6 trillion of currency in circulation it is at present even positioned above the US dollar with €1.3 trillion. The Eurosystem now comprises 19 EU countries with about 340 million people and inherits an outstanding role for the economy of the EMU, world trade, and international finance. Despite its importance, a recent independent empirical review that conclusively analyzes all key factors and efficiencies remains much obsolete. Thus, this research and review sets out to empirically-theoretically compile the last 16 years of the EMU with a focus on monetary developments, functioning of monetary transmission channels (MTCs) and mechanisms, as well as the performance of the Eurosystem and its ECB governed monetary policies (MP). For the first time it reviews a complete set of 16 MTCs and systematically evaluates the functioning of the Eurosystem and its role for the real economy and its people. It finds a high efficiency loss in all MTCs related to fractional reserve banking, excessive EU indebtedness, or legal frameworks such as MFI, financial, or equity law. Scientifically, based on all data and results, there is no way to reach a different conclusion and reminder that stresses the need, exigency and must to replace an old-fashioned reserve banking system by digital full-reserve banking via monetary reform at the earliest feasible date possible.

SEARCH TERMS

Monetary policy, monetary theory, EMU, European economic and monetary union, research review, monetary developments, monetary transmission, ECB, Eurosystem, central bank, EU, finance, inflation, HICP, correlation, VAR, forecast, empirical, reserve banking

Monetary Developments and Transmission in the Euro Area

Monetary System and Policy, Money Supply, and Real Economy in the Euro Area

— An Appraisal of Research and Efficiency of the Monetary Transmission Process —

NOTE: Figures, Tables, and Chapters are cross referenced throughout the work, so that the reader can jump to the respective reference with a 'mouse click' on the link (the chapter number). The pdf document structure provides links to all main chapters. The appendix begins with links to references and supplementary material.

Abstract (German Translation)

Seit der Einführung der Europäischen Wirtschafts- und Währungsunion (EWWU), im Januar 1999 bis heute im Jahre 2015 ist der Euro zur zweitstärksten Basiswährung der Welt aufgestiegen. Mit einem Bargeldumlauf von über 1.6 Billionen Euro erreicht der Euro derzeit sogar ein höheres Geldvolumen als der US-Dollar mit einem Gegenwert von 1.34 Billionen Euro. Das Eurosystem umfasst mittlerweile 19 EU-Mitgliedsstaaten mit einer Bevölkerung von über 340 Millionen und spielt eine bedeutende Rolle für die Wirtschaft der EWWU, den globalen Welthandel und für die internationalen Finanzströme. Trotz dieser großen Bedeutung fehlen weiterhin umfassendere und unabhängigere empirische Studien und Übersichtsartikel, die alle Schlüsselfaktoren, aber auch die Effizienz des Eurosystems, beweiskräftig analysieren. Dieser Forschungs-Review versucht daher die letzten 16 Jahre der EWWU empirisch, theoretisch und mit Hinblick auf die monetären Entwicklungen als auch auf das Funktionieren Monetärer Transmissions-Kanäle (MTKs) und Mechanismen, sowie der Geldpolitik (GP) der EZB aufzuklären. Zum ersten Mal werden alle 16 MTKs rezensiert und die Performance des Eurosystems und der EZB nachhaltig und systematisch überprüft. Ein hohes Maß an Ineffizienz konnte in jenen MTKs nachgewiesen werden, die mit dem partiellen Mindestreserve-System in Verbindung stehen, sowie mit dem hohen EU-Überschuldungsgrad, als auch anderen legalen Rahmenbedingungen, wie dem Bank-, Aktien- und Finanzrecht. Daher erlauben alle Daten und Ergebnisse nur eine wissenschaftliche Schlussfolgerung, dass eine vollständige Monetäre Reform benötig wird, um das partielle Mindestreserve-System durch eine digitale Voll-Reserve zu ersetzen - so bald wie möglich.

SUCHBEGRIFFE (German Translation)

Geldpolitik, Monetäre, Theorie, Europäische Wirtschafts- und Währungsunion, EWWU, wissenschaftlicher Review, monetäre Entwicklungen, Transmission, EZB, Eurosystem, Zentralbank, EU, Finanzen, Inflation, Korrelation, VAR, empirische, Minimumreserve

Monetäre Entwicklung und Transmission im Euro-Gebiet

Geld-System und Geld-Politik, Geldmengen-Angebot und Real-Wirtschaft in der EWWU

— Eine Begutachtung der Forschung und Effizienz der Monetären Transmission —

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List of Abbreviations

AAR *Annual Agreed Rate*

ABSPP *Asset Backed Purchase Program*

ADAS *Aggregate Demand - Aggregate Supply*

APRC *Annual Percentage Rate of Charge*

BIS *Bank of International Settlement*

bn *Billion*

BoC *Bank of China*

BoE *Bank of England*

c.p. ceteris paribus

CAPM *Capital Asset Pricing Model*

CBPP *Covered Bond Purchase Program*

CBs *Commercial Banks*

CD *Certificates of Deposit*

CET *Commopn Equity Tier*

CHIPS *Clearing House Interbank Payment Systems*

CM *Crisis Management*

CRD *Capital Requirements Directive*

CRR *Capital Requirements Regulation*

DB *Deutsche Bundesbank*

DSGE *Dynamic Stochastic General Equilibrium Model*

DST *Dual System Theory*

DT *Deprivation Theory*

EC *European Sovereign Debt Crisis*

ECB *European Central Bank*

ECSC *European Coal and Steel Community*

ECU *European Currency Unit*

EEC *European Economic Community*

EIB *European Investment Bank*

EMU *Economic and Monetary Union*

EONIA *Euro OverNight Index Average, Euro OverNight Index Average*

ESCB *European System of Central Banks*

ESI *Economic Sentiment Indicator*

ESM *European Stability Mechanism*

EU *European Union*

Euratom *European Atomic Energy Community*

FC *Financial Crisis*

FDIC *Federal Deposit Insurance Corporation*

Fed *Federal Reserve System*

FFR *Federal Funds Rate*

FOMC *Federal Open Market Committee*

FSCS *Financial Service Compensation Scheme*

GDP *Gross Domestic Product*

GLF *Greek Loan Facility*

HICP *Harmonized Index of Consumer Prices*

IFR *Initial fixed rate*

IMF *International Monetary Fund, International Monetary Fund*

IS-LM *Investment-Saving, Liquidity Preference-Money Supply*

IT *Information Technology*

LOLR *Lender of Last Resort (Provider of Liquidity)*

LTROs *Long Term Refinancing Operations*

m *Million*

M_0 *Monetary Base, Base Money*

M_1 *Narrow Money*

M_2 *Broader Money*

M_3 *Broad Money*

MBS *Mortgage Backed Securities*

MCI *Monetary Condition Index*

M_{ECB} *Central Banks Money (e.g. Legal Tender of the ECB)*

MEI *Monthly Monetary and Financial Statisitics*

MFI *Monetary Financial Institution*

MLF *Marginal Lending Facility*

MMF *Money Market Fund*

MNC *Multinational Corporation*

MRO *Main Refinancing Operations*

MS *Monetary System*

MTTs *Monetary Transmission Theories*

NCBs *National Central Banks*

NDER *Narrowly Defined Effective Rate*

NIIP *Net International Investment Position*

non-MFIs *all non-bank firms, institutions, and the general public*

NPV *Net Present Value*

OCT *Optimal Control Theory*

OMO *Open Market Operation*

OPPs *Optimal Policy Projections*

PA *Principal Agent*

PP *Purchasing Power*

PPP *Purchasing Power Parity*

PSPP *Public Sector Purchase Program (of ECB)*

PT *Prospect Theory*

Q *Quarter (Yearly Quater, 3 Seasonal Month)*

ROE

Return On Invest 89

RQFII

Renminbi-denominated Foreign Institutional Investor Program 99

RWA *Risk Weighted Asset Ratio*

SEPA *Single European Payments Area*

SIPS *Systematically Important Payment Systems*

SME *Small and Medium Size Enterprise*

SMP *Securities Markets Programme*

TA *Transaction*

TMC *Total Market Capitalization*, *Total Market Capitalization*

tn *Trillion*

ULC Unit Labor Cost

v *Velocity of Money, also V*

VAR *Vector Autoregression*

WACC *Weighted Average Cost of Capital*

ZLB *Zero Lower Bound*

ZNLB *Zero Nominal Lower Bound*

1 Preface of the Research Study

1.1 Preamble

Money is at the very core of the economy as its most fundamental element. If the financial markets are compared with the heart money is the liquidity that supplies all economic organs, firms and households. Its supply also has to be tightly regulated to achieve optimal conditions - like the right blood pressure and circulation - to maintain the body and many more analogies can be found within 'bionics of economics'. Too much money in the system leads to inflation, too less makes prices fall: and both always impact the business cycle and economic growth: deciding about many millions of job that are created or not in the EMU. Finding the best trade-off or equilibrium is the purpose and objective of many monetary policies (MPs), and every decision, and every lack of a decision, as well as the legal structure of the entire monetary system (MS) always has tremendous effects on new money's monetary transmission into all branches of the economy. This imperative makes MP, monetary developments, and monetary transmission very important for policy makers, the economy and all of its producing and consuming actors, and every other stakeholder who is affected by it world-wide. The MS and its MP structure the financial and business sector and have a more powerful and renewing impact on the economy than is usually believed today.

Since the formal introduction of the Euro in 1999, and its launch as daily legal tender in 2002, the European Economic and Monetary Union (EMU) and the European Union (EU) both have benefited much from related economic, monetary, financial, and political mechanisms of integration, standardization and centralization. Billions of costs (up to €75bn p.a., estimate base on ECB data) are saved every year that now indirectly contribute to a higher output potential (ca. 0.2-0.4% of GDP growth, p.a., estimate based on ECB data).

But the novelty of a common currency of a nationally diverse group of countries, which has almost reached eye level as international exchange media with the world's top valuta, with €1.0 trillion Euro compared to €1.24 trillion US dollar, also poses some risks and challenges. Heterogeneities persist and a political fiscal union is still far-off while a sovereign debt crisis (EC) has recently depreciated the Euro and delays a recovery from the financial crisis (FC).

Hence, an understanding of the EMU's monetary and economic developments is crucial for opinion building and informed rational decision making, for all economic participants: including corporations, banks - in this study further referred to as commercial banks (CBs) and other monetary financial institutions (MFIs) - and also private persons and households.

Basic facts and circumstances are among the most important and relevant ones to understand the macroeconomic effects in the EMU. But they must cover all monetary transmission channel (MTCs) in play, and thus need to be systematic, comprehensive and scientific.

Scientifically - from a basic research perspective - it is already interesting to research the multi-national Eurosystem, since it is a unique MS of a still new and first 'supranational monetary entity' in the world. Integration and convergence in the EMU assessed from an applied research perspective is also insightful and must aim at improving the macroeconomic conditions, advancing MP operations and options to benefit the real (EU) economy.

In the last decades, Globalization has further interconnected the world, and the FC and EC have revealed a high, and further ascending, level of international interdependency. Antecedents of the Eurosystem have much connected it with the rest of the world (RoW), and form the rudiment of the EMUs monetary, fiscal and economic aggregate researched here.

Europe's monetary and political convergence and integration has significantly improved price stability throughout the Euro area with its 19 member, and also in the EU of 28 members. Even beyond, the Eurosystem has also contributed to a lower global inflation rate.

During this time period, from 1999 on until today in 2015, the Eurosystem, managed by the European Central Bank (ECB) and the European System of Central Banks (ESCB), had to get through a number of serious financial shocks with stark economic impact, which originated domestically and internationally, while price stability had to remain the ECB's top priority.

After 16 years of this unique monetary union it is high time to scientifically understand how well the EMU's MS and the ECB's MP are functioning and benefiting all European members and its people. How appropriate or successful has been the ECB's MP and the legal frameworks of the fractional reserve based Eurosystem, and its monetary transmission? Questions - that have been neglected by far for too long by MP research, reviews, or journalism.

To answer these questions the performance of the Eurosystem has to be truly assessed. Hereby a vast extent of forms and functions of monetary transmission to be covered and the question must always be 'how efficient and effective' is any MP deal for the economy. Hence, a broadly-analytical 'research and review' approach is chosen here. It shall provide all-encompassing, valid, and graspable answers to the basic key questions that are fundaments to a conclusive and true understanding, and to see the big picture, in an unbiased all-embracing, independent research review, which is still very scarcely found today, in 2015.

1.2 Research Objective

An independent scientific description of the Eurosystem and an assessment of its performance must fulfill several criteria: it has to be comprehensive, systematic, illuminative, conclusive, revealing, evaluative, but at once also must provide key facts in a graspable way. In consideration of the extensive topic of 'monetary developments and monetary transmission in the EMU' a new hybrid form of a research thesis is developed here that follows a 'chimera-strategy' including a 'long' overview providing review to cover and update all key topics, which is evenhandedly combined with newly conducted analytical research that sheds more light into all key topics and estimates of MP and MS performance.

To achieve this mission the subordinate goals aim to illustrate, analyze and also to 'reality check' still prevailing macroeconomic theories of today. Empirical research has to challenge the 'general economic believes' that persist and dominate recent views. It has to reconcile and verify facts and theory to yield a correct and updated interpretation, in a businesslike and scientific manner. Hence, several chapters are going to deal with the question of how well existing models and theories explain monetary and economic data of the EMU, and how well these data fit into our understanding of accepted stylized facts and coherencies?

Preparation, processing, comparing and compiling of basic-but-key time series records like the monetary aggregates, lending activity, interest rates, economic growth as gross domestic product (GDP) in real and nominal terms, and many more shall provide the basis to uncover the underlying power behind monetary approaches, to help advance their usage, and to better predict macroeconomic conditions like markets, Fx, Nx, interests, or consumption.

This research aims to unveil financial and economic interdependencies in a qualitative and quantitative manner, partly also in a spatio-temporal fashion to reveal dynamical states of EU heterogeneities. Analytical frameworks and basic-but-key statistical procedures are employed to advance monetary theory (MT) and empirical research shall sharpen our view to uncover the real coherencies and primary causes of a complete set of MTC effects. Finally, the performance of the ECB's MP and the MS of the Eurosystem is going to be assessed.

The highest culmination of relevant and impactful monetary research articles lies before and around the introduction of the Euro, when consolidated data was still lacking. This research objective makes the review unique and provides it with a special focus that seems to be much more relevant, as compared to the conventional focus of the few other reviews.

1.3 Scientific Proceeding and Guide to the Research

The functioning of the monetary system impacts all of us, which is conspicuous for a supposedly 'dry subject' most of us, even business experts, have not so much notice of, nor sustained interest in. Nevertheless, this study is going to convey that the MS and its MP is in fact one of the most relevant topics of our economy, culture, and political system. Its legal settings still determine non-descript how property is distributed and re-distributed EMU wide, even world-wide, as all fractional reserve banking system show high similarity.

Hence, it 'should be' really interesting and relevant for everybody, as all of our lives, politics, and 'our countries', and the EU, depend on it and are determined by it, in many ways. Centuries have been strongly influenced by the monetary system and its transmission mechanisms - involving CBs and other MFIs, which are still the main beneficiaries of fractional reserve banking. The MS also sways the future of the EU, its economy and people.

MP research is an applied research and includes basic research, theory and empirical research. To make the entire result content informative and graspable for a broader group of readers the Introduction (see chapter 2) already 'reviews' a broad content of prevailing and canonical MTs and macroeconomic theories, and comprises background information about the MS and its money. It introduces the history and major structures of the EMU, its procedures, fractional reserve banking, its legal instances, the ECB's purpose and objectives. The monetary aggregates are introduced, the two ways of money creation by the ECB and MFIs, types and mechanisms of inflation and monetary transmission, as well as recent models. The 'Materials and Methods' (see chapter 3) describe the statistical methods, universal standard formulas, and software tools used. The 'References' are given in section 6.2, and a fully detailed complete documentation of all results for all figures is found in section 6.3. The main body of the 'Analytical Research Review' (see chapter 4) begins with a retrospective interpretation of time series analysis and correlations of the last 16 years. It analyzes inflation, GDP, monetary aggregates, the velocity of money and its impact on output, money multipliers and real money balances, as well as debt generation in the Eurosystem, including the special cases of Luxembourg and Greece, and the financial crisis (FC) and EU sovereign debt crisis (EC). The Eurosystem's time-dynamic balance sheet and ECB instruments are reviewed and the euro area's monetary transmission is newly categorized in 16 MTCs and systematically researched and modeled. The 'Conclusions' (see chapter 5) summarizes and integrates all findings and gives key recommendations towards a full-reserve.

2 Introduction, Background, and Monetary Policy Review

2.1 The ECB, the Eurozone and Eurosystem

2.1.1 Background on the Eurosystem and its Convergence Criteria

The history of the European Union (EU), the Eurozone and its single currency - involving a common monetary policy (MP) governed by the European Central Bank (ECB) - is globally unique and outstanding. Its origin dates back to the European Economic Community (EEC) founded 1957 by the Treaty of Rome, which amended to previous pillars the EEC, the European Atomic Energy Community (Euratom) and the early European Coal and Steel Community (ECSC) of 1952. Already in 1962 the Commission of the EEC announced anew its intentions, and common objectives, to establish the European Economic and Monetary Union (EMU). It started its realization in 1989 (Scheller 2004) by applying a three stage strategy on the basis of the Werner (1971) and the Delors report (1989). Interim hurdles to implementation of the EEC and the EMU were the delays caused by the collapse of the Bretton-Woods Monetary Management System (1973), against the background of the oil crisis, and the lack of defining consistent Europe-wide standards towards a sound fiscal and monetary policy, also known as stabilization policy (Görgens et al. 2014). Then, the following German reunification in 1989 and the disappearing political bisection in Europe re-catalyzed the formation of the EMU again by allowing for the Treaty of the EU, known as the Maastricht treaty of 1993 (EC 2012; Görgens et al. 2014). It still represents one of the most important EU achievements that formally established the EU and EMU with a single common currency (Görgens et al. 2014). The three capital stages to implement the EMU have been as follows:

(I) completion of the domestic market, common control and liberalization of economic and financial policy (in 1990),

(II) a ban on (directly) financing public budgets with central bank's money (in 1994), and the establishment of a central bank precursor institution, the EMI (European Monetary Institute), to prepare for the Eurozone and the ECB system, and stage

(III) the final introduction of the Euro, the ECB, and the EMU (in 1999). Of the 28 EMU member countries 19 have already successfully joined the Eurozone, sometimes also referred to as the '19 EMU stage-III members'.

The euro convergence criteria, also known as Maastricht criteria (ex-Art. 121 of the EC treaty; now Art. 140 of The Treaty), were passed as the main prerequisite and tasks for EU-

countries to be fulfilled and maintained, to technically qualify to join the EU monetary union. The criteria intent to support monetary and fiscal stability in five cardinal standards:

(1) A low level of inflation as measured by the harmonized index of consumer prices (HICP), and in comparison to the unweighted arithmetic mean of similar HICP inflation rates in those top three EU member states (that are not significantly below the Eurozone average, p.a.) with the lowest HICP inflation plus a 1.5% tolerance margin (first indent of Art. 140(1) prot. 13). (The Balassa-Samuelson-Effect is part of a rethinking of pre-union criteria for a more practicable 'EMU-reference corridor').
(2) Acceptable fiscal budgeting: annual deficit spending per Gross Domestic Product (GDP) must not exceed 3% (second indent of Art. 140(1), 126).
(3) Gross domestic debt must not exceed 60% of GDP per fiscal year (Art. 140(1), 126).
(4) Applicant countries are obliged to maintain exchange rate stability by not devaluating the central rate of their Euro-pegged currency, and they must also adhere to sound practices such as avoidance of any severe currency tension within the two years of the respective convergence tests (EC 2012; third indent of Art. 140(1)).
(5) Low long-term interest rates: the unweighted arithmetic mean yield of 10 year government bonds (of three members with lowest HICP) may not be exceeded by 2%. (Fourth indent Art. 140(1) of the Treaty, EC 2012, prot. 13).

Additionally, there are some other qualitative criteria that are not fully defined legally or standardized in a quantitative manner. Together these measures shall achieve a higher homogeneity in the community, in fiscal and monetary matters, and a sustainable convergence, stability and monetary capacity. 'Nominal convergence' refers to the formal Maastricht criteria and 'real convergence' refers to real economic structure (Görgens et al. 2014). At least once every two years but usually annually the ECB Council reports to the Commission on the annual progress in its Convergence Report, as is specified by the Treaty (European Commission 2012; Art. 140). Although the criteria are still authoritative some have been slightly melted as members were facing difficulties to adhere during crises.

After four decades of setting the goal of a common currency the Euro was introduced on January 1, 1999 in agreement with the cutting-edge Maastricht Treaty. The exchange rates of the 11 first countries were fixed one day earlier and a European Currency Unit (ECU) currency basket was calculated in US$ to accommodate the varying quantitative contribution of each member currency, respectively (Görgens et al. 2014; ECB 2015b; Ehrig et al. 2011).

The exchange rates of all members were fixed from 1999-2002 and operations to change the legal tender, Euro coins and banknotes were launched three years later in January 2002. Some stage III euro members have also launched it months later (ECB 2015b).

Since its introduction the Euro has grown to become the world's second largest reference currency next to the US dollar with about one trillion of currency in circulation (US dollar ca. €1.24tn). In subsequent years, eight additional EU-member countries have joined the euro area, the monetary union's Eurosystem, the Eurozone, which now comprises a total of 19 countries with a 340 m people economy. It also plays an important role for stage I and stage II members and in many EU overseas countries with EU-pegged currencies. Most other EU countries, especially the new members, also peg their currencies in one way or the other to the Euro and have improved their monetary stability ever since (ECB 2015b).

The EMU is still the most far reaching commitment strategy to European integration and the common Euro with its reputation of secure prices became one of its key symbols.

2.1.2 The Benefits, Functions and Policies of the Monetary Eurosystem

The establishment of the monetary union with 19 culturally diverse European countries, i.e. third EMU stage member states, is being viewed as a unique and outstanding achievement in world history. Key drivers of European cooperation and monetary unification have been the improving economical competitive advantages of its national economies' local factors:

(1) Significantly lower transactional costs (currency management, exchange and hedging costs) that can account for up to 1.5% of Eurozone-GDP (e.g. 150 billion p.a., 2014, own calculation o.c. (ECB 2015a based)), termed frictional transactional costs.
(2) Less currency based distortion and volatility, as well as less risk in nominal exchange rates and related uncertainty in planning, and less need for rescheduling and managerial efforts (totaling 0.4%-0.5% of GDP, derived from EMU trade (ECB 2015b)).
(3) Higher transparency and convergence of prices in the euro area, improved intra- and extra-EMU competition and economizing, better utilization of resources and processes and supply chain optimization (0.25% of GDP p.a., o.c., ECB 2015a based).
(4) Improvement in EMU-wide maintenance of price stability, monetary performance and global monetary leverage based on political-legal commitment and ECB policy.
(5) Guaranteed long-term commitment to sound fiscal and MP in the euro area and stability assured by the European Stability Mechanism (ESM) and euro rescue funds.

(6) Lower interest rates with the exception of the FC linked EC (EMU bond yield have improved again to initial lows of ca. 2%, post 'euro bailout fund' of the International Monetary Fund (IMF), the Commission, the EMS, and the ECB in addition to its low interest MP) (ECB 2015a). Low interest rates intent to foster investment decisions.

(7) More tourism (ca. 6% o.c.) and cross border business, cluster formation, and so on.

All these benefits come at the cost of monetary autonomy and some limit to fiscal home rule of the member countries - a political long-term commitment that provides internal stability. To estimate the real costs of the monetary union the underlying risk portfolios are to be considered that may account for potential occurrences of asymmetric shocks to demand and supply, prices, debt, or interest rates of the individual member countries. If these historically grown asymmetries (Cornelius et al. 2000) don't converge they could provoke shocks that unfold new costs and lower economic growth in the EU. Thus, ongoing economic, monetary, fiscal and political leadership are needed anew. The EMU is still new political multi-national monetary entity. Its common destiny fuels the EU's integration convergence.

Most MPs of the ECB are implemented by the European System of Central Banks (ESCB). The ECB heads and governs the ESCB and serves as its umbrella organization (European Commission 2012; Art. 8). Together they are the only legal provider of currency that serve MFIs and safeguard the constancy of the Euro's purchasing power, inside and outside of the Eurozone (e.g. adjustments to the depreciation of foreign currencies). The stability of the Euro is favorable to business in the euro area but also for world trade and world prices.

2.1.3 The Primary Objective of the ECB and the ESCB

The primary goal of the ECB and ESCB is to maintain price stability in the euro area. Without prejudice to this goal, it shall support the 'general economic policies' in accordance with Article 3 and 128 of the Treaty of the Union. Hereby it shall contribute to economic stability, growth and development, e.g. via its MP operations, or by evaluating and reporting the fulfillment of Maastricht criteria of the members states (Art. 127; European Commission, 2012). All of these MPs actions have to be in accordance with a free market economy (Art. 119, 127 of The EU Treaty) and intend to promote business growth and sustainable economic development and stable prices to improve the competitiveness of the EU's local factors (Porter 2008). The ECB must be consulted, or invited, on any proposed union act in the field of competence (Chapter II MP; European Commission, 2012) and shall foster and pro-

mote suitable coordination of all member's economic policies. The meaning of 'supporting general economic policies' comprises to achieve low interest rates, high employment, economic growth, stability of the financial markets and sector, and exchange rate stability, in an independent way, while keeping price stability unaffected. Although not explicitly specified legally, the official objective of price stability is to achieve an annual HICP price stability of below but close to 2% (ECB 2015b). As money supply serves as nominal anchor of medium term inflation and prices, the ECB has also set a M_3 reference growth rate to 4.5% p.a. (based on the expected inflation targets and a GDP growth of 2-2.5% p.a., as well as a 'medium-term' decline in the velocity of 'M_3 money' per year of 0.5-1% (Council 1999).

2.1.4 Functions of Price Stability in the Euro Area

It is widely accepted in the field of MP research, and thus also part of the ECB policy, that stronger increases in the aggregate price level can become problematic at a transition point when inflation or deflation exceeds ca. 2-3% per year. Although some MP theories claim, if wages rise in tandem and proportional with price index increases, including nominal interest rates, and keeping purchasing power (PP) hardly affected, inflation would theoretically be less problematic. This might be the case for some of the new European stage III member countries due to a consequence of the Balassa-Samuelson-Effect. But in general, the real economy has to bear a cost if the PP of the Euro decreases. This is sometimes called frictional 'costs of inflation' (Mankiw 2014; Walsh 2010; Friedman & Woodford 2010; Görgens et al. 2014). Price stability, as maintained by the ECB (0-2% of HICP, and close to 2%), has several fundamental advantages, which are widely accepted in economics (Mathews et al. 2013; Mankiw 2014; Illing 1997). They arise due to the absence of frictional disadvantages of expected and real PP changes and comprise economic welfare and employment effects, as well as fostering prosperity and growth potential by improving: (1) the transparency of relative prices, (2) by economizing resource allocation and better informed consumption and investment, (3) more cost-effective supply-chains, by advancing the conditions of competition and by increasing the common market efficiency, (4) by stabilizing the welfare of households, and (5) the robustness of domestic demand. In addition, (6) optimizing the productive potential of the economy by lowering transactional costs, (7) reducing the risk premiums of interest rates that are linked to expected inflation and thus investment and consumption costs, and (8) by preventing relative distortions in nominally fixed contracts and laws like taxes, social security, fringe benefits, insurances or the welfare system, (9) by

avoiding 'shoe leather' and (10) 'menu costs', and (11) by preventing casual emergence of potential disincentives for economic decision making and behavior, as well as (12) by abolishing non-performance based relative redistribution of PP of the respective currency, (13) causing delays and distortion in Fx rates, and (14) reducing uncertainty and planning reliability that is divesting general monetary convenience (ECB 2004; Mankiw 2014; Mathews et al. 2013), and (15) less the different rigidities in prices and wages. Several mechanisms exist to minimize the costs of inflation like index coupled wages, taxes, prices and rates.

Especially in the Eurozone sound macroeconomic conditions and low inflation helps to save more translational costs then elsewhere, due to the ongoing need of convergence and integration of variant economies to from one attractive market, also for inflow investment.

The history of inflation in euro area countries shows a strong trend towards equalization with low and very low inflation rates, also prevailing cumulatively. PP stability has much improved from 1999 when the Euro was introduced till today (Eurostat 2015). Price stability has ameliorated since also due to the deep-seated objective to meet the convergence criteria (see 2.1.1). This was further underpinned by the subsequent introduction of the Single European Payments Area (SEPA) in 2008/2010/2014 with its 28 national members (including also nearly all pre-euro stage I and II members), the global price level trends, and the common currency exchange rate (Fx) effects. The SEPA, for instance, betters the cost relation and cumulatively lowers or maintains prices stability. This might also help balance the HICP index in the EU, including stage I and II countries that catch up to meeting the Maastricht criteria due to economic incentives. The HICP standard is a Laspeyres type price index and weighted by the relative aggregate of expenditures of households for covered products per country, but doesn't include business investment and governmental spending. Notwithstanding, GDP deflators similarly depict a trend towards price stability (Eurostat 2015).

Nevertheless, if we look at the relative cost of living, the price levels and its annual changes in euro area countries several asymmetries and differences persist. Again, the Balassa-Samuelson effect helps explain why arbitrage mediated purchasing power parity (PPP) is not directly and immediately reached in the EMU: The Euro area consist of richer and poorer countries, because of the variable productivities, respective PPPs and price divergences of mainly 'non-tradable goods and services'. Heterogeneous inflation can be a result of diverging productivity kinetics (Görgens et al. 2014; Balassa 1964; Samuelson 1964). These asymmetries decline when relative productivity adopts, and prices slightly increase, due the

fact that tradable goods orient towards the world prices and global price standards of world trade. Increased international price competition and a bigger total pool of traded products and intermediates, and intensified global supply chains, also keeps EU prices constant. The effect also predicts, that prices of 'non-tradable good and services' will increase faster. This leads to a slightly higher inflation in those catching-up EU countries that today still exhibit a lower GDP per capita (Görgens et al. 2014; Balassa 1964; Samuelson 1964).

2.1.5 The Structural and Operational Framework of the Eurosystem

The Eurosystem, with the ECB and the national central banks (NCBs) that together form the European System of Central Banks (ESCB), is unique in the world but its architecture, processes, and structure resemble the U.S. Federal Reserve System (Fed), the Bank of England (BoE), and also the Deutsche Bundesbank (DB), among all other central banking system that seem to have served as a standard. This similarity facilitates a high level of comparability.

The headquarters (HQs) and Executive Board of the European Central Bank being located in Frankfurt (a. M.), in southwest Germany, is headed and led by the ECB's 'Governing Council', which is made up of six members: the president, the vice president, four council members, and the directors of all national central banks (NCBs). The ECB's Council is the supreme decision-making body of the Eurosystem (Scheller 2004; ECB 2015b). Its decision-making is based on the majority principle built on an intra-Eurozone currency-weighted representative 'rotation system' (ECB 2015b; EC 2013). The Council governs the MP in the EU together with the NCB as the heart piece of the Eurosystem (Scheller 2004; ECB 2015b). Its legal framework is given in Art. 127 of the EC Treaty and the Statute of the European ESCB and ECB (EC 2012; EC 2003; EC 2013). This has led to the world's highest independence index (CBI: ECB 0.83 > Fed 0.51) for the ECB in 2003 (Crowe & Meade 2008; Mathews et al. 2013) and is a very significant improvement of the mean CBIs of euro area members. Admittedly, so called independence of central banks doesn't mean it is not led by private and political interest groups: e.g. the Fed is even officially semi-private and the ECB is also very likely to be influenced by politics and MFIs, but final prove is often missing for this widely found assumption. Additionally, independence of central banks can be, and is found to be, harshly criticized as undemocratic (Mathews et al. 2013), and to asymmetrically privilege only CBs and other MFIs at the expense of all economic actors, a lacking mandate for its economic policy, and a lack of performance control of MP in monetary transmission.

Still, central bank's independence is widely thought to benefit price stability and this hypothesis can be much supported by correlations that are widely found (Mathews et al. 2013; Mankiw 2014; Friedman & Woodford 2010). Following this theory, the ECB's and ESCB's independence is much conductive to maintain price stability and includes: institutional, personnel, financial (e.g. separated from the EU budget), and functional autonomy. Only specific and even negligible earnings (e.g. a surplus on interests paid, and earnings that may arise from coining money, etc.) are paid to the European government. From a business point of view the ECB is not very profitable for that it may print money. Theories that suggest profitability as indicator of functionality would judge it as clearly dysfunctional.

Albeit some underlying links to the government may remain, these are still customary to all central banking systems in the world (Mathews et al. 2013). For example, the members of the ECB Executive Board are appointed by the European Council for a maximum of eight years. They are selected by the political Heads of State of the 28 EU member countries in accordance with the euro-area related political principles of occupation. However, the legal framework of the ECB and its Executive Board, backed by the European Court of Justice, shall still assure their independence in general and legal terms: for instance no governmental body in the EU or elsewhere may instruct or direct the ECB/ESCBs MP decisions (Article 130 of The Treaty) to not adhere to its general tasks specified in Art. 127, 133, and 138 (EC 2012). Or, exchange rate MP is headed by the Council of Finance Ministers (Svensson 1999).

The ECB has several means and tools to regulate the money supply, interest rates, price stability, and to also indirectly enable GDP growth (ECB 2013b; Neyer 2007). Most operations and instruments involve the sector of the commercial banks (CBs) and other MFIs (Neyer 2007). Money creation is a two step procedure: the primary money creation by the ECB is subsequently amplified by the MFIs in a privately owned and of course much more powerful secondary (book) money creation network strategy (DB 2015). The CBs and other MFIs thus represent the only relevant interface and instance of the ECB with the real economy and is also often privately managed and much 'out of ECB control'. Most new money is released into the economy in the form of new debt that has to be repaid to MFIs that are allowed to retain the principal on top of the interests as earnings, while only a 1% fraction of reserves has to be temporarily deposited with the NCB's accounts (DB 2015). Thus, MFIs are the main part of the money creating sector, which poses many risks and principal agent problems (PAPs) (Ross 1973), as MFIs are often at least partially privately owned, incorpo-

rated (privately owned by majority stake), or led. This money creation is often referred to as 'private money creation out of nothing', or 'out of thin air', or in the scientific literature 'check, book, MFI's (DB 2015), or virtual money creation'.

This way the secondary 'MFI and CB money creating sector' almost solely regulates the total supply of new money that is released into the economy and also the money stocks (with the exception of outright transactions and QE introduced later in this chapter). The behaviors of CBs and MFIs is thought to be only influenced by the economic incentives given by the market and the ECB's key European rates and MP operations (DB 2015; ECB 2015b; Neyer 2007). However, how much market forces are really at work remains to be measured and proven and is elusive until today. The ECB is intended to only adjusts MP operations to indirectly influences the behavior of MFIs and CBs with respect to their lending activity, setting of effective interest rates, managing the currency in circulation, reserve accounts, market and repurchase agreements, and alike. Noteworthy, CBs and other MFIs are often a private decision-making instance that also sets the pace and intensity of transmitting the ECB's MP actions. Thus, MP actions are only as efficient and effective as the banking market - a much forgotten scientific topic that is evaluated in this analytical review.

A professionally-effective legal overview of the ECB's instruments and operational framework are given by the 'guidelines of the ECB' (ECB 2013b; EC 2013) and the 'Statute of the ESCB' (EC 2003), according to Article 8 of The Treaty (EC 2012) and is reviewed (Neyer 2007). They precisely define the legal MP instruments, tools, approaches and operations that the Eurosystem has at its disposal - most of which are factually in practical use. The following list summarizes in detail the full scope of ECB MP actions at hand to meet its operational targets, such as the quantity of money in circulation and development of monetary aggregates, and to set and signal the bank call rate, and long term rates (ECB 2013b):

(1) *Open market operations (OMO):* the purpose of MP actions comprising OMOs are initiated by the ECB is to steer interest rates, to manage liquidity in the market, and for communication policy to 'single the MP stance'. Its five instruments are specified as:

(1.1) Reverse transaction (repurchase agreements, collateralized loans, liquidity means)

(1.2) Outright transactions (open market transactions for eligible assets, structural)

(1.3) Issuance of ECB debt certificates (to create liquidity shortage, via ECB obligations)

(1.4) Foreign exchange swaps (Art.127+219, intervention, ERM2/ECOFIN, spot/forward)

(1.5) Collection of fixed-term deposits (NCBs remunerated deposits, to absorb liquidity)

They are executed as standard tenders, quick tenders or bilateral procedures. With regard to the type of their procedures they can be categorized as follows (ECB 2013b):

(a) Main refinancing operations (MRO, these include reverse transaction with a one week maturity and frequency, and the NCB standard tenders).

(b) Long-term refinancing operations (including reverse transaction with a three-month maturity and a monthly frequency, and the NCB standard tenders).

(c) Fine tuning operations (these are *ad hoc* measures at the end of the two week reserve maintenance period, reverse transactions, foreign exchange swaps, collection of fixed-term deposits, NCB quick tenders, and bilateral procedures, by the ECB council).

(d) Structural ESCB operations (reverse open market operations, standard tenders that are non-regular and not standardized *a priori*, NCB vis-à-vis the financial sector type).

(2) *Standing facilities:* overnight liquidity management with NCBs, pre-specified interest rate against eligible assets, EMU wide terms, (and: bilateral standing Swap Fx lines).

(3) *Minimum reserves:* a legal requirement for credit institutions to hold minimum deposits on accounts with NCBs (European Commission 2003; Art. 19), which is to be uniform throughout the euro area and in the respective NCBs. It can be used as a link-up and stabilization tool in MP to influence borrowing, interest rate, check money creation and the overall money supply. Currently, the MFI's minimum reserve base rate is only 1% (1999-2011: 2%) and includes overnight deposits, deposits of up to two years, and maturity of also up to two years, and money market papers. Minimum reserves are based on the CB's monthly balance sheet's 'liabilities with reserve requirements' (ECB 2015b).

The 'central rates' are the pivot regulators and parameters of many of these MP instruments of the ECB. They are referred to as 'the rate of marginal lending facility (MLF)' (this is the rate for overnight liquidity from the central bank), the 'main refinancing operations (MRO)' (fixed rate; one-week liquidity providing MROs, LTRO rates orient on the MROs but can deviate), and the 'deposit facility' (the rate of overnight deposits with the central bank).

Although financing of national budgets is prohibited, quantitative easing (QE) in the form of buying long-term government bonds is not explicitly forbidden in the treaties, e.g. if they are not bought directly from a member country but from an 'investor' of the secondary market, which are often mainly MFIs and other central banks, and to a lesser extent other private investors. QE is often an outright transaction (see point 1.2). Such transactions represent an ongoing controversial subject, and politically discussed topic also by EU members.

The ECB officially may only carry out its tasks under the provision of all previous Treaties of the Union and the Statute of the ECB (EC 2012; EC 2013). These prohibit financing of government budgets, also e.g. via Government bonds, later referred to as G-bonds. Thus, all examples of covered bond purchase programs (CBPP) (1-3, 2015), and the asset backed securities purchase programs (ABSPP) are designed to intent to only buy from secondary markets. Regularization or a normative QE-MP with fair economic incentives is still elusive.

As its main function and core business, only the Eurosystem (the ECB and ESCB) is allowed to authorize and issue Euros (Art. 128 of the Treaty): banknotes and coins - defined as the only legal tender within the EMU. Annually, the ESCB assures the right amount of physical money (operational and managerial ECB function: planning of production, distribution, and replacement of legal tender, coins and bills) (EC 2012; Art. 16; 128). Through all of its instruments the ECB regulates and controls the monetary base M_0 (for definitions see chapter 2.2.3) that is highly profitable 'supplied' by MFIs later on. As a result it also indirectly regulates M_1-M_3 with instruments 1-3 that are mentioned above (ECB 2015b; Neyer 2007).

2.2 The Money of the Eurosystem

2.2.1 Characteristics, Dimensions and Types of Money

Since Aristotle's Politics in the 4th century BC of ancient Greece, discerning 'Oeconomics' (housekeeping) and 'Chrematistics' (wealth acquisition) there are three defined functions of money (things that buy), highlighted in table 1 (Mankiw 2014; Mathews et al. 2013).

Table 1 The Three Functions and Dimensions of Money

(1) Medium of exchange: portable, liquid, concentrated form of interchangeable value.
(2) Unit of account: terms that makes things commensurable and negotiable.
(3) Store of value: freezing of purchasing power including the concept of price stability.

These three dimensions of money are given in all marketable securities at varying degrees. Money traits of liquidity, commensurability, and store of value are newly decomposed here into: (I) freely transferable, (II) assignable, (III) divisible, (IV) negotiable, and (V) storable.

Money has evolved: from direct barter, to standard trade goods, to standard coins of precious metal, to fiat coins of less precious metal, to paper promises of precious metal, to fiat money without a standard, to digital promises of fiat money including digital promises to pay digital promises, and totally unbacked securitization of money for non-MFIs. The devel-

opment was driven by previous limitations and caused by the basic needs to better the utility of money by making payments more convenient and secure. The very old idea that a central bank system with fiat money offers benefits over the gold standard is actually already found in Adam's Smith seminal work The Wealth of Nations (Smith 1776). Although it was implemented only lately, e.g. in 1971 by the Federal Reserve System after the collapse of the Bretton-Woods System, but monetary reform was only conducted 50% and thereby stopped midway: a designated full-reserve was impeded (Douglas et al. 1939), and legal propositions (MM 2015) are still 'on hold'. The Eurosystem has directly started midway in 1999 with Fiat money, only backed by the government's monopoly and a fractional reserve.

Table 2 The Three Types of Money in the Eurozone

(1) Legal tender: official cash coins and paper money, the 'only government backed fiat money'.

(2) Reserves: in electronic deposit or as legal tender (exclusively for MFIs): it includes the minimal reserve (legal requirement), excess reserves, and other temporary MFI deposits. These central bank accounts are also used for 'netting' purposes of interbank settlements in a time period that is often minimized to 'real-time' (e.g. multilateral net settlement systems, TARGET2 real time gross settlement system RTGS, Euro 1, Bankers Automated Clearing System BACS in the UK, and many more). Today, a bank without reserves can source liquidity on the 'ECB fostered' interbank lending market.

(3) Demand deposits: only an accounting number for non-MFIs, a theoretical-legal promise to 'pay'.

Due to historical, political and, psychological, and 'market stewarding' reasons the ESCB still has many commodities like gold reserves in their possession: e.g. due to the previous gold standard (and other reasons) the ESCB still deposits 505 tonnes and the Fed 8.133 tonnes of gold, in the first quarter of 2015. Other assets are foreign currencies stored, from NCBs of former times, some date back to the Bretton-Woods System and other Fx treaties.

In times of a gold standard Gossen's laws of diminishing utility with quantity was in effect. This led to higher prices if money was scarce, which drove gold mining. Gossen's second law amplifies the effect on GDP, as the diminished utility of money divided by a higher price shrinks the consumption twice (Anderegg 2007). It remains elusive how Gossen's law are still in effect in the modern monetary theory (MMT) and neo-Chartalism's fiat money system. Marginal transaction (TA) utility of money diminishes with holding cash but different to a gold standard system. The EMU's TA power of money is discussed in the result section.

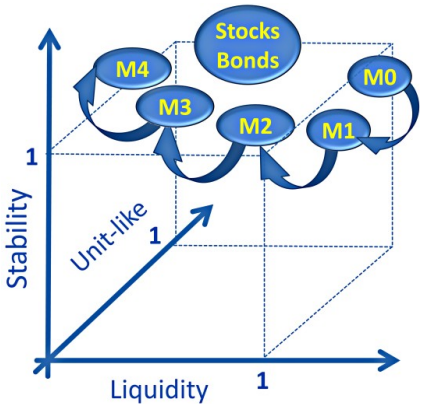


Figure 1 Schematic Representation of the Three Dimensions of Money

Monetary aggregates (M_0-M_3) (see 2.2.3) are defined by the ECB based on their respective liquidity (M_0 having the highest and M_3 the lowest) and schematically slope in a 3D vector space of money dimensions (Figure 1). Monetary aggregates are introduced in Figure 2.

2.2.2 The Types of Depreciation of Money's Purchasing Power

There are seven types of inflation categorized here by causation as newly completed list:

(1) Cost push inflation (e.g. of diverse asset types: like rising wages, taxes or oil prices, mainly due to imported factors of production, domestic factors of production, etc.)
(2) Demand pull inflation (e.g. increase in employment and improving consumer index, consumer expenditures, private investments, government spending, export driven inflation, imported inflation, price responsiveness, etc.)
(3) Profit push inflation (mark-up pricing, monopolization, price agreements, etc.)
(4) Money inflation (e.g. a higher increase in base or book money then demanded, etc.)
(5) Exchange rate inflation: (e.g. depreciated Fx rate makes imports expensive, etc.)
(6) GDP driven inflation (e.g. stagnation, a fall in real GDP in a recession, etc.)
(7) Behavioral-informational inflation (e.g. expected inflation drives prices, etc.)

All seven causations work in opposite direction for deflation (14 points in sum):

For example growth deflation (e.g. a rise in real GDP in a boom phase), etc.

Inflation can be also categorized according to its intensity and speed of price increases, as:

(1) Mild inflation (>2% p.a.)
(2) Moderate inflation (>2-10% p.a.)
(3) Strong inflation (10-100% p.a.)
(4) Hyperinflation (>100% p.a.)
(5) Deflation (<0% p.a.), etc. [until hyper-deflation (<-50% p.a.)]

2.2.3 Money Creation and Monetary Aggregates in the Eurosystem

Only the ESCB and ECB is entitle for cash generation of central bank money, legal tender in the Eurosystem, and it has several monetary instruments available (see chapter 2.1.5). They organize to pass the lawful money (coins and bills), to the private commercial banks (CBs) that serve the demand of all non-banks (Non-MFIs). Four traditional hypothetical theories exist on money creation of MFIs (Werner 2014), which tells it own tale of a deep deception:

(1) Financial Intermediation: banks are like any other economic actor, they gather resource and re-allocate them in a full-reserve like system in which banks act as intermediaries.
(2) Fractional Reserve Theory: CBs are intermediaries and only create money in systemic interaction, also known as the 'money multiplier' model, reserve based.
(3) Credit Creation Theory: a fractional reserve system with money creation loopholes also for individual banks, and in their systemic interaction; money creation by extending credit without the need of immediate reserves, e.g. capital and minimum reserves are only met at particular reporting intervals and only punctually managed including interbank lending.
(4) Liquidity and Property Deprivation Theory (DT): Theory 1-3 is amended by fractional reserve MFIs creating a vicious cycle for the real economy by soaking out its liquidity. This creates growing debt and other liability dependencies; book money is created out of nothing and the principal must be paid back in real money, while non-MFI positive money is kept too scarce. Inevitable defaults and sellouts drive deprivation of the real economy. Liquidity always ends up in MFIs again where it illegitimately re-leverages PP via (2+3). MFIs use external money for purchases, while MFIs and MP keeps the EMU debt level constant.

(1) is the traditionally naive public view, (2) a professionally accepted view of the 20th century that forgets about the principal repayment and network, and (3) a revitalized theory that 'banks can create money out of nothing', empirical evidence backed (Werner 2014), (4) a summarized updated view and theory shared by a growing number of researchers.

The ECB's and the German NCB's (Deutsche Bundesbank) only official statement is that the Eurosystem would be 'a fractional reserve system' that is 'secured by the central bank': if a MFI obtains another asset-backed demand deposit at its NCB it is referred to as 'central bank's book money creation', which is a promise to instantaneously obtain legal tender payout (currency creation) (DB 2015). This can be either an active (monetization of MFI assets) or passive (credit, repurchase agreement) way of central bank's money creation. This 'stand-by pledge' of the NCB to furnish currency for CB and other MFI reserve deposits

is the reason to group both types of money, cash and reserve securities, as real central bank's money (Figure 2, left). It includes both currency of banks and non-banks as well as all central bank reserves. Virtual money is later created as MFI checkbook money (e.g. retail banks book money creation) by multiplication in MFI accounts (Figure 2, right). This can be either passive (no change in total amount of non-MFI money [demand deposits and cash] for an increase in book money, e.g. via depositing cash with a bank; but this also allows for more active book money creation) or active book money creation (this is an increase in the total amount of non-MFIs money and an increase in CB book money, e.g. via a new credit, or if the CB/MFI buys assets) (DB 2015, Geld und Geldpolitik). This procedure is also known as 'credit extension' or 'balance sheet extension' and it is a serious debate about the slack, minimal, or even lack of real limitations for this procedure to 'create money out of nothing'.

The only explicit limits are: (1) minimum reserve requirements of 1%, (2) Target 2 operational buffers (which are also relatively very low) and (3) customer's cash (also relatively low in comparison to higher monetary aggregates). Thus, there is no effective control over the book money creation by law or ECB: the fractional reserve system is thus not 'ECB secured' as is claimed - at best it is influenced, which is also non-rhetorical: a big difference. Book money creation leads to several different forms of money with different degrees of liquidity, money dimensions, and specifications. A systematic and schematic overview of all European monetary aggregate definitions of the Eurosystem- that are in regular use in MP science and publications as they are a statistical ECB standard - is provided in Figure 2.

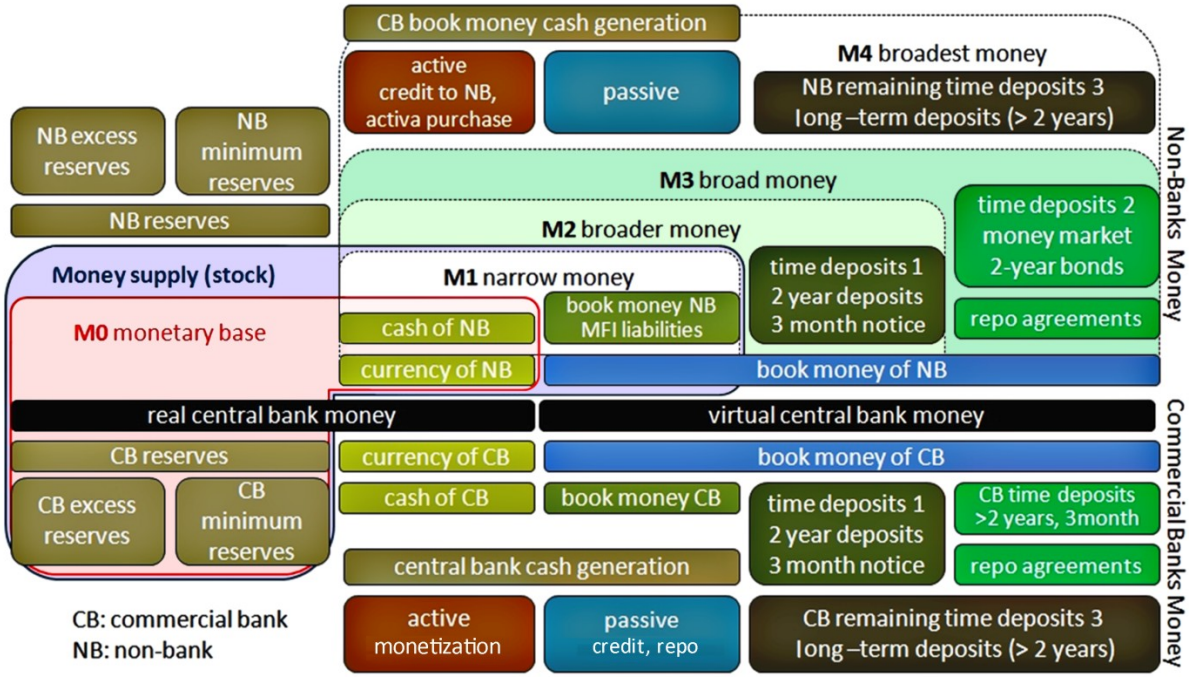


Figure 2 Schematic Overview of Central Bank's Definition of Monetary Aggregates

In economic theory, MFIs hold as much currency as needed. At the profitable equilibrium they take loans (ECB money creation) or pay them back (ECB money destruction) depending on the financial market conditions and the specific liquidity demands, e.g. of customers.

They can create checkbook money via book keeping entry at the reciprocal fraction of minimum reserve rate requirement (i.e. 1%, reserve base, see 2.1.5) and under the provisions of the Basel Accords also known as Basel I, II, and III (BIS 2011). These require 'capital adequacy ratios': a bank's non-risk based leverage capital ratio that determines the maximum amount of loans (EU: CRD IV, CRR); this is generally 4.5% (common equity tier 1 (CET)/risk weighted assets ratio (RWAs) $\geq$ 0.045) of common equity since 2015; still providing for a leverage of 22.22 fold. However, these measures don't legally limit the amount of lending. There is also no *de facto* limit on lending in the UK (Ryan-Collins et al. 2014), Canada, and only minimal limits on lending in most of the other central banking systems of today (2015).

The central bank ultimately also acts as lender of last resort (LOLR) by mechanisms to back the fractional reserve with guarantees: the Financial Service Compensation Scheme (FSCS) in the UK (£85.000), or also the Federal Deposit Insurance Corporation (FDIC) in the U.S. ($250.000), and the ECB Eurosystem assures a 90% of €50.000 (Demand Deposit Insurance Guarantee Scheme; in its EU Directive 94/19/EC). This guarantee was recently advanced to 100% of €100.000. As was seen in the crisis, all systems seem to be also secured with 'tax payer's funds' or prices in the end. The ECB has also acted as LOLR to the entire financial sector after the FC in 2008, although this is not a true legal part of its mandate (ECB 2013b).

All monetary aggregates are derived from the consolidated (or also unconsolidated) monetary financial institution (MFI) balance sheet (inter-MFI positions canceled out) of the euro area. They also take account of some central government monetary assets and liabilities (ECB 2015b; EC 2013). All aggregates contain only positions of residents from the euro area which are held locally by resident MFIs (ECB 2015b). Monetary aggregates also include liquid asset denominated in foreign currency but not bank's cash and currency (EC 2013).

The first monetary aggregate is the monetary base (M_0), also known as base money, or high powered money. It represents the central banks released, security accounted and authorized, 'legal tender' made out of the currency of non-MFIs plus the CBs reserves (that are interchangeable) at the central bank. It doesn't include MFI cash point money, and if all is included one speaks of total central banks money (or currency) and not of base money.

The narrow money aggregate (M_1) is defined as the cash of non-MFIs (all non-banks), plus all of their demand deposits. These are MFI liabilities to non-MFIs. Another way to define it is: M_0 plus demand deposits of non-MFIs minus all reserves of MFIs. It also includes balances that can immediately be turned into currency (called overnight deposits in the EU). Broader, or rather 'intermediate money' (the official ECB nomenclature), (M_2) is defined as M_1 plus all of the official MFI reported 2-year time deposits, and those deposits with a 3-month notice period (see Figure 2)(EC 2013; ECB 2015b). [MFIs are the reporting sector.] Broad money (M_3) is referred to as M_2 plus marketable instruments issued by the MFI sector: all money market fund (MMF) shares and units, 2-year-maturity bonds and repurchase agreements (repos) of non-MFIs. A high degree of price certainty and liquidity makes these instruments close substitutes of deposits (in M_2). Noteworthy, all aggregates exclude MFI owned cash and book money (EC 2013; ECB 2015b) that is to be assessed differently.

Seldom, money in the broadest sense (M_4) is used to find a way to describe money aggregates beyond the previous definitions (not an ECB definition). Liquidity decreases from M_0 to M_3. M_4 represents M_3 plus long-term deposits that bear lower money-dimension values (see 2.2.1). Long-term instruments (>2 year maturity) are considered portfolio instruments rather than means of carrying out transactions (EC 2013; ECB 2015b) (see Figure 2).

Admittedly, a dynamic real-time assessment of money is not fully possible for the monetary aggregates, only for 'cleared stacks of stocks', not flows (and flow information), a drawback of statistics (ECB 2012). Today, it is also not possible to obtain information of how much money and property is privately distributed from MFI accounts, which is of course definitely needed in a fractional reserve banking system: inevitably precipitating a future public scandal. Also, when redemptions come closer to maturity e.g. of M_2, M_3, or M_4, they become substitutes of a more liquid and more narrowly defined aggregate but are still grouped into the traditional and originally defined classes. These hidden MFI dynamics, and M_4, remain a steady uncertainty factors in the canonical assessment of money aggregates. To give a statistical example: there might be heterogeneously dispersed 'long-term portfolio' liabilities coming closer to redemption; and high volume transactions between the periodically reoccurring reporting dates. M_4 may substitute M_3 when close to redemption, but isn't considered in the aggregate M_3 making it a 'hidden liquidity factor', especially if unevenly distributed. Additionally, everything that happens in between the reporting dates escapes the stock data view reported by MFIs (balance sheets) and averts a full statistical assessment.

The first-order lever of MPs, to regulate the quantity of money, is the supply of legal tender (M_{ECB}) affecting the checkbook money, interest rates, prices, and all lending. It is defined as:

$$Central\ Bank\ Money = Legal\ Tender + Reserves = M_{ECB} = C + R_{MR} + R_{ER}$$

Formula 1 Central Bank's Money: Definition of Total European Legal Money

Entry: M_{ECB}: ECB money, C: circulating currency of non-MFIs (non-Banks, customers) including convertible currencies denominated in foreign currency, R_{MR}: minimum reserves, R_{ER}: excessive reserves

$$Monetary\ Base = M_0 = M_{ECB} - C_{MFI} = C_{nonMFI} + R_{MR} + R_{ER} = C_{NB} + R_{MR+ER}$$

Formula 2 Monetary Base (M_0): Definition of High Powered Money

Entry: M_{ECB}: ECB money, C_{MFI}: currency in hand of CBs and other MFIs, $C_{Non\text{-}MFI}$: currency in hand of non-MFIs (non-banks, firms and all others), R_{MR}: minimum reserve, R_{ER}: excessive reserve

The monetary base can be also subdivided into the two following elements: (1) a tightly controlled non-borrowed monetary base (i.e. from market operations) and (2) a less tightly controlled borrowed reserve (ECB loans) (Mathews et al. 2013), see Formula 3. Formula 4 defines the ECB's monetary aggregate definitions (M_1-M_3) (ECB 2015c; ECB 2012), and (M_4).

$$M_0 = M_0^{BR} + M_0^{NB}$$

Formula 3 Mishkin's Division of M_0 in Borrowed and Non-Borrowed M_0 (Base Money)

Entry: M_0: Monetary Base, M_{BR}: Borrowed Monetary Base, M_{NB}: Non-Borrowed Monetary Base

$$Narrow\ Money = M_1 = M_0 - R + D$$

$$Intermediate\ Money = M_2 = M_1 + TD_1$$

$$Broad\ Money = M_3 = M_2 + TD_2$$

$$Broadest\ Money = M_4 = M_3 + TD_3$$

Formula 4 ECB Definition of the EU Monetary Aggregates

Entry: TD: time deposits (1: 2-year deposits, or 3-month maturity), (2: MFI marketable instrument 2-year maturity, additional conditions, 2-year bonds, MMF money market fund, repurchase agreement), (3: long-term deposits > 2-year maturity independent of redemption date), R: total reserves (excess reserves + minimal reserves), D: demand deposits (overnight deposits, checkbook money)

The monetary base - the legal tender or M_0 - is multiplied by a factor to arrive at the monetary aggregates of banks money. The higher monetary aggregates are, as discussed above,

the result of fictional CB and MFIs book money creation that only has the base money (M_0) as its base at a 1% minimum reserve ratio (liquidity ratio): 1 % of the real money must be available to MFIs customers, but absurdly it is not truly available - as it already has to be fixed as minimum reserve: uncovering another erroneous banking principle and deep flaw. The Phillips 'money multiplier' (Phillip 1920) is considered as an important parameter of fractional reserve lending and is introduced later in chapter 2.3.7 - but is used misleadingly.

2.3 Research Theories of Monetary Policy and Monetary Transmission

The intrinsic strategy and real objective of monetary theories (MT) is to disclose and enable an understanding that should help to optimize monetary policy (MPs) to benefit the quality and quantity of output of the real economy - and hereby should not interfere with business evolution. It deals with a limited set of resources, potentials, and economic-financial capacities. There are three conventional ways of putting MP to the test (Sperber & Sprink 1990):

Table 3 Key Performance Measures of MP

(1) Ability to plan and control the money supply: target accuracy, operational goals
(2) Stringency of operations on transmission in the real economy: output parameters
(3) Decomposition of MP transmission on output and price: real, relative parameters

The ECB has implemented a two pillar approach for its empirical MT-based MPs including (I) economic and (II) monetary appraisal, assessment, and empirical analysis (ECB 2015b). The ECB's decisions are declaredly based on MT and models but remain empirical and incremental (ECB 2015b). MTs are predicated on the interrelation and interaction of economic and monetary factors, and the interrelationship of real and nominal values. Ultimately, this applied MT science aims to improve the effect of MP on the real economy. This process is known as monetary transmission that always takes place in response to MP (introduced in 2.3.8). A simple overview of MT is absent in most textbooks (Friedman & Woodford 2010; Mankiw 2014; Walsh 2010; Mathews et al. 2013; Giddy 1994; Levinson 2005; ECB 2004). Hence, a novel list of categorized MTs is given here as basic overview (see Table 4):

Table 4 A New General Categorization of Relevant Monetary Theories

(1) Currency System Theories

(1.1) Digital Money Theories : noncash full-reserve, digital, serial, trackable money
(1.2) Modern Monetary Theory (MTT): the sole use of fiat money (Chartalism)
(1.3) Commodity Money Theories (commodity standards like gold-standard)

(1.4) Barter Money Theories (barter exchange based systems)

(2) Money Creation Theories

(2.1) Bank Intermediary Theory (banking as regular business theories)

(2.2) Full-Reserve Banking Theory (fully allocatable money theories)

(2.3) Fractional Reserve Banking Theory (based on minimum reserves)

(2.4) Credit Creation Theory (fractional reserve banking loophole theories)

(2.5) Money and Property Deprivation Theory (CBs reuse liquidity for enrichment)

(3) Macroeconomic Monetary Theories

(3.1) Classical Theory (loanable funds, classical dichotomy, neutrality of money)

(3.2) Theory of the Keynesian Economic Framework, IS-LM, and related MTs

(3.3) ADAS Theory: Aggregate Demand-Aggregate Supply (Keynesian Economics)

(3.4) Liquidity Preference Theory (Keynesian Economics, Friedman's QTM, etc.)

(3.5) Quantity Theory of Money (QTM): diverse QTM theories, e.g. Fisher's QTM

(3.6) Inflation Theory (e.g. pricing theories, price push and demand pull theories)

(3.7) Employment Theory (e.g. Phillip Curve Theory: unemployment vs. inflation)

(3.8) Interest Rate Theory (e.g. Fisher's equation, and all related MTs)

(3.9) Monetary Aggregation Theory (money and property accumulation theories)

(3.10) Monetary Transmission Theory (MTTs): (channel focused MTs, see 4.3.8)

(3.11) Empirical Monetary Theory (monetary and fiscal real world data based)

(3.12) Monetary Game Theory (e.g. Nash equilibrium, dilemma-creation strategy)

(3.13) Monetary Econometrics: static and dynamic modeling (monetary-economic)

(3.14) Monetary Economics: relationships between real and nominal variables

(3.15) Asset Price Theories: the action and reaction of asset prices, and related MTs

(3.16) Financial Accounting based theories: cash flows and balance sheets functions

(3.17) Other MTs

(4) Monetary Policy Theories

(4.1) Theoretical Research (technical Neo-Monetarism and Post-Keynesianism)

(4.2) Empirical Research (analysis, models, rules and recommendation of MP)

(4.3) Behavioral Research (expectations, Barro-Gordon, asymmetric information)

(4.4) Crisis Management MP Theory: e.g. shock-stabilization management theory

(4.5) Politico-Economic Research (business cycle, growth, macro incentives)

(5) Monetary System Design Theory

(5.1) Systems Design Theories (Revolutionary Theories)

(5.2) Optimization Design Theories (Evolutionary Theories)

(6) Holistic Monetary Theories (combining all above MTs)

MT can be further categorically structured as money demand and supply theories, or via time in retrospective, current, and future MTs, including forecasts. A key focus is given to MTTs and MTCs (see 3.10) - since all MP decisions always result in monetary transmission.

2.3.1 The Classical Supply Side Theory, and Loanable Funds Model

'Money is neutral' in the classical model and doesn't affect the real economy in the long-run due to flexible prices. In these 'supply oriented models' output is a function of a given production capacity. Eventually, the real interest rate (r) adjusts to equilibrate supply and demand for an economy's output of products and services. On the supply side, monetary expansion improves capital accumulation (and potentially technology) but increases in output are offset by inflation. In Wicksell-Ohlin-Robertson's loanable funds model this results in investment equaling savings (I=S)(Keynes 1936). A fall in savings or an increase in investment raises the real interest rate (r). An increase in demand for real investment drives investment only to the extent at which higher interest rates enable more savings (Mankiw 2014). Theoretically, but in full-reserve banking, a natural economic equilibrium could form.

2.3.2 The Neo-Classical Quantity Theory of Money (QTM)

The initial core of the neoclassical QTM is a direct proportional relationship of money supplied and the economy's level of prices. Additionally, the velocity of money and output (real GDP, rGDP) also balance the formula. The here provided link of inflation coupled to excess money supply is in fact a very old one. It is a traditional and well known observation since maybe even ancient times. It was reclaimed later by Fisher, and then by Friedman and Schwarz the alter two received a noble price for their work. The scientific central tenet of classical QTM dates back to Nicolaus Copernicus in the 15th century (Volckart 1997), and Jean Bodin who introduced the velocity concept of money in the 16th century. Then, John Locke revived and advanced it in the 17th, and David Hume in the 18th century, and Simon Newcomb who developed its modern transactions form in the 19th century. Classical QTM was later enhanced by Irving Fisher (1911), who also discerns between currency and book money and velocity. He yielded today's Neo-QTM formula that was simplified by Keynes and Friedman's use of national income - however Fisher's TA-based QTM is more accurate.

$$M^D V = \sum_i p_i q_i = PT = PY^D = M_C^D V_C + M_B^D V_B \; ; \quad V = \frac{1}{k} = \frac{PY^D}{M^D}$$

$$Fisher's\ equation\ of\ exchange\colon \ MV = YP$$

Formula 5 Quantity Theory of Money (QTM) Equation and Fisher's Amendment

Entry: M^D: money demanded (C: currency, B: book money), Y^D: aggregate demand, q: quantity of goods and services purchased V: income or transactions velocity of money, P: price level (index, or GDP deflator), Y: (net) output (as rGDP) = gross output - intermediate consumption, k: money affinity coefficient per income, ideally M_D=M_S; T: transactions (TA), Fisher's QTM uses T instead of Y

In equilibrium, money demanded for TAs equals money supplied (M^D=M^S=M) yielding:

$$M = kPY \quad ; \quad v_{AD} = \frac{1}{k_{AD}} = \frac{PT}{M} \equiv \frac{PY}{M} = V_{all} = \frac{1}{k_{all}}$$

Formula 6 Transactions QTM Equation and Velocity of Income at Equilibrium Level

Entry: k: a variable or constant of how much money people want to hold (money affinity coefficient per income), AD: aggregate demand of the total of all transactions, all: aggregate demand for all transaction of Y (GDP, income) only, T: transaction (TA) volume, PY: nGDP, Y: rGDP, P: price level

It is important to discern here between two major types of velocity: (1) the income velocity of money is the smaller one. It represents the frequency at which money changes hands for all GDP relevant goods and services. And (2) Fisher's transactions velocity of money that represents a broader, and also a more complex, definition of the frequency at which money changes hands in all domestic transactions of residents, also including financial portfolio investment, and all TAs that take place whenever property changes hands (=all deals in the economy). TAs multiplied by the price level represents the nominal output. If interest rates rises velocity rises as demand for the TA-component of money declines, as also noted by Baumol and Tobin (Mathews et al. 2013). Rearranging the QTM for M and P finally yields:

$$M_{D,S} = \frac{YP}{v} = YPk \quad ; \quad P = \frac{M_{D,S} v}{Y}$$

Formula 7 QTM Formula Integrating the Income Dependent Money Affinity Coefficient

Entry: M: quantity of money, Y: net output, P: price level, v: velocity of money, D: demand, S: supply

Monetary demand mounts from the need of all functions of money listed in chapter 2.2.1: for instance, the transactional component (medium of exchange dimension) finds equilibrium with the function of liquidity preference, the convenience component (storage dimen-

sion) finds balance with the function of property's opportunity costs, and a durability component (stability dimension) equilibrates with the function of all opportunity costs of inflation and interest rates; divisibility and assignability given (see Figure 1 and Table 1).

Traditionally, there are two traditional schools of thinking about the quantity of real money balance demanded: Keynes Liquidity Preference and Friedman's Modern QTM proposition, predicated on which most other theories are based on, or generally relate to. To introduce these major concepts about the demand for money and to provide an understanding for all related concepts, these two MTs are introduced and reviewed in the following sections.

2.3.3 Keynesian Economics and Liquidity Preference Theories

In Keynesian economics, opposite to the classical view, also the demand side can be influenced by MP operations (e.g. via expansion of base money, I, i and r) effectuating output in the short to long-run. Investment depends on the interest rate, but demand linked to output is also stimulated by MP that lowers the real interest rate, or grows the base money.

According to Keynes, short-run demand for real money balances (M/P) is proportional to real income (Y) and k (a money affinity coefficient per income or transactions). In equilibrium real money balance demanded equals balances supplied. Output as supply is constant in the short-run and can be exogenously altered by MPs (e.g. via r). This in turn also affects the demand for real money balances (Keynes 1936; Mankiw 2014; Mathews et al. 2013):

$$\left(\frac{M}{P}\right)^{D} = L([i]^{-}, [Y]^{+}, [k]^{+}) = L([r]^{-}, [E\pi]^{+}, [Y]^{+}, [k]^{+}); \ \left(\frac{M}{P}\right)^{S} = const.\,(short\ run)$$

Formula 8 Keynesian Liquidity Preference and Advanced Money Demand Function

Entry: M/P= real money balance, M: quantity of money, L: liquidity preference, r: real interest rate, Y: income, D: demand, S: supply, k: money affinity coefficient, Eπ: expected inflation, P: prices, i: nominal interest rate, r: real interest rate, +/-: having a positive or negative influence, respectively

The QTM balance form integrates money balance supply and demand at equilibrium level:

$$\left(\frac{M}{P}\right)^{D} = kY = \left(\frac{M}{P}\right)^{S} = \frac{M}{P} = kY = \frac{Y}{V}$$

Formula 9 Equilibrated Real Money Balance Formula

Entry: M/P= real money balance, real purchasing power of the stock of money, D: demand, S: supply, k: money affinity coefficient per income, Y: net output (e.g. rGDP), P: price level

If people want to hold more money k grows or rather the velocity of money (V) falls: the frequency of money changing hands decreases (Mankiw 2014; Mathews et al. 2013). This shifts the TA-function of money (medium of exchange) towards a convenience function (liquidity and storage of value). A higher preference of holding cash or checkbook/demand deposits increases the average meantime between all money transactions, hereby increasing k. Hence, and with respect to Fisher's amendment in Formula 5, there are different k and V coefficients for the monetary aggregates: there is a different affinity for coins, notes, overnight deposits (checkbook or demand deposits), loans, marketable securities, and all other monetary assets. Different forms of real money balances can be used to describe money demanded and supplied in an economy to tackle different research questions.

2.3.4 Friedman's Modern Quantitative Theory of Money

Friedman tried to further the basic QTM formula and as a result he restated his own Modern Quantitative Theory of Money (Friedman 1956). Here, he tried to include a main focus on asset yields integrated in the concept of Keynes Liquidity Preference. He allowed for a more comprehensive view that includes asset demand factors like expected real returns in the money preference function, permanent income also as the net present value (NPV) of future incomes, and a variety of real asset return variables that 'make' money being invested or divested: Δr, Y and π^e affect the real money balance demanded, while money and goods or assets are substitutes and their demand is 'return driven' (Mathews et al. 2013).

$$\left(\frac{M}{P}\right)^{D} = f([Y_P]^{+}, [r_b - r_m]^{-}, [r_e - r_m]^{-}, [\pi^e - r_m]^{-})$$

Formula 10 Friedman's Restatement of a Modern QTM Equation

Entry: $(M/P)^D$: Demand for real money balances, Y_P: permanent income (present discounted value), r_b: expected return on bonds, r_m: expected return on money, r_e: expected return on equity, π^e: expected inflation rate (=expected return on goods without depreciation), +/-: positively or negatively related to demand for money balances, respectively

While Keynes' liquidity preference theory argues that income is positively and nominal interest rates i are negatively related with real money balances demanded, Friedman's Modern QTM comes to a new conclusion by subdividing the demand of holding money into four categories: cash, bonds and equity preference, and preference for goods and houses. The opportunity costs for holding money are given in the difference to returns on other assets.

2.3.5 The Keynesian IS-LM Model and the AD-AS Model

Aggregate demand (AD) is a function of quantity demanded at any given price level - the same holds true for aggregate supply (AS) (Mankiw 2014). It can be derived from QTM (Formula 5) as (M/P) depends on kY - if VM is fixed Y must go down if P rises. AD declines if prices rise during inflation and the real wealth of economic actors (private households, firms) falls in the short term. The AD-AS function also delineates the dependency on output or income, in the short-run when prices are sticky, and in the long run when they become flexible (Mankiw 2014). It can be also effectively integrated into the IS-LM model, which is compatible with regard to dimensions, for closed and open economies (see 6 Figure S7-12).

The generic IS-LM model (investment-saving, liquidity preference-money supply) is a holistic integration of the Keynesian Economics Framework giving rise to a graphical model (Keynes 1936; Samuelson 1947; Hicks 1939). It serves as an econometrics tool for micro-economically grounded structural model evidence. The Hicksian IS-LM model combines the Keynesian cross (Samuelson 1948) and liquidity preference model (Formula 11) and hereby identifies the point that satisfies the equilibrium of the goods market, where the LM curve simultaneously meets the equilibrium in the real money market. Hence, it can be also used as macro model to identify suitable MPs in a semi-quantitative way (Poole 1970). The ISLM-ADAS model established here is a graphical-arithmetical advancement (see 6 Figure S7-12).

$$IS: \quad Y = C(Y - T) + I(r) + G \qquad LM: \left(\frac{M}{P}\right) = L(r, Y)$$

Formula 11 The Basic IS-LM Formula: Income and Liquidity Preference Function

Entry: M: money, i: nominal interest rate, I: investment, D: demand, Y: net output/income, T: tax, C: consumption, G: government spending, (M/P): money balance, adjusting variables: r, Y

The generic IS-LM structural model predicts in the short-run, when prices are sticky, that an increase in the money supply (e.g. QE) benefits output and income (Y) of the real economy by lowering the real interest rate (r). This shifts the LM curve to the right and increases aggregate demand and Y (Mathews et al. 2013). The effect can be dissociated and simplified:

$$simplified\ effect: \quad M \uparrow \Rightarrow r \downarrow \Rightarrow I \uparrow \Rightarrow D \uparrow \Rightarrow Y \uparrow$$

$$I: \ r \downarrow \rightarrow I \uparrow \rightarrow Y \uparrow \qquad S: \ Y \uparrow \rightarrow S \uparrow \rightarrow r \downarrow$$

$$L: \ Y \uparrow \rightarrow L^{D} \uparrow \rightarrow r \uparrow \qquad M: \ M \uparrow \rightarrow Y \uparrow \rightarrow r \downarrow$$

Neutrality is given if in the long term prices adjust and rGDP equilibrates to its initial level.

2.3.6 The Fisher Effect on Liquidity Preference and the Cagan Model

According to QTM, if money supply grows *ceteris paribus (c.p.)* price levels will mount in the long run. The 'Fisher Effect' additionally states that an estimated increase in expected inflation also affects nominally bound contracts with future interest payments, as it heightens the mean nominal interest rates (i) by adding up to the real interest rate (r) (Formula 12), or again more precise: r is the difference of interests and inflation in real terms (Fisher 1930).

$$r = \frac{1+i}{1+\pi} - 1 = \frac{i-\pi}{1+\pi} \cong i - \pi \cong r_{ex\ post} \ ; \ r_{ex\ ante} = i - \pi_E$$

$$\left(\frac{M}{P}\right)^D = L([Y]^+, [i]^-) = L([Y]^+, [r]^- + [\pi_E]^-)$$

Formula 12 Fisher Equation and Liquidity Preference Effect

Entry: I: nominal interest rate, r: real interest rate, π: inflation, E: expected, L: liquidity demanded, Y: income, r: real interest rate, +/- indicate a positive or negative influence, respectively; note: expected inflation can drive nominal interest rate, which in turn can also (slightly) drive inflation

The Cagan model further exemplifies the role of expected inflation on real money balances:

$$\left(\frac{M}{P}\right) = -\mu(\pi_E - \pi)$$

$$P_t = \frac{1}{1+\mu} M_{t1} + \frac{\mu}{(1+\mu)^2} M_{t2} + \frac{\mu^2}{(1+\mu)^3} M_{t3} \ldots$$

Formula 13 Cagan Model of Expected Inflation and Money Supply on Prices

Entry: P_t: price level at point t of interval, M: quantity of money, t_n: time point of interval, μ: sensitivity of future money supplies and expected inflation, π_E: expected inflation, π: current inflation

The price level (P) is determined by the weighted average of all future money supplies (Mankiw 2014; Cagan & Friedman 1956). μ defines the sensitivity of future money supplies (and expected inflation) and is used as parameter to adjust and fit its impact: a high level of μ (max: 1) models a strong and long term impact, while a low level of μ resembles only a short-term weak impact on today's price level, inflation and the real money balances demanded (assuming that V and Y is constant) (Mankiw 2014; Cagan & Friedman 1956). With this model Cagan could fundamentally support the views of Monetarism that a link exists between the growth and expected growth of money and prices in hyperinflation. He also tested exceptional international datasets by fitting the model to the monetary dynamics observed (Cagan & Friedman 1956) and could match this empirically data to the model.

Furthermore, Cagan also asserted that the demand for real money balances declines during intermittent and high inflation, confirming both the 'Fisher Liquidity' and the 'Cagan Effect' (Cagan & Friedman 1956). Both, Fisher and Cagan have revealed an important monetary feedback loop that amends the original QTM formula by the factor of expected inflation and money supply in the future that influences demand of real money balances. Only if the sensitivity μ equals 0 the original QTM equation is obtained (Mankiw 2014). Thus, it represents an important option to extend the QTM and IS-LM-ADAS or New-Keynesian models (Friedman & Woodford 2010) with a non-linear parameter. It also illustrates an auto-dynamic expectations-threat of a 'viscous cycle of hyperinflation' for MP, together with the Fisher Effect (expected inflation drives nominal interest rate that may also drive future prices, or expected prices). Both explicatory effects feed forward into more inflation.

2.3.7 The Money Creation Multiplier

The money creation multiplier (m) effect, or Phillip's money multiplier effect (Phillip 1920), describes a semi-furtive virtual amplification of central banks money by MFIs and CBs using demand and time deposit accounts in fractional reserve banking, and via 'credit extension'.

The multiplier can be integrated into the aggregate money demand based QTM formula:

$$M_0 m = M_D = M_S = \frac{YP}{v}; \qquad m = \frac{M_{D,S}}{M_0} = \frac{YP}{vM_0} = \frac{1+\frac{C}{D}}{\frac{R}{D}+\frac{C}{D}}$$

Formula 14 Money Multiplier Integrated into the QTM Formula

Entry: m: money multiplier, M_0: monetary base, M_D: money demanded, M_S: money supplied, Y: real income or rather net output (real GDP), P: price Level, v: income velocity of money, C: currency in circulation (banknotes), D: demand deposits, R: reserves (current accounts and deposit facility)

The money multiplier describes both: (a) *ex ante*, the maximal amount of money that could purportedly be created from all available central bank money (M_0; but importantly: as stock value at time t that never tracks intermittent flows), and (b) *ex post*, how much money was factually created in the monetary aggregates at the periodically reoccurring (SNA 2008/ESA 95-based 'end-of-month' ECB/2008/32) reporting points in time (ECB 2012). A big technical security vulnerability is the reporting of only monthly stock and not flow data owing to recent ESA-95 'transaction method' reporting standards, which makes all inter-month flows, no matter how big they are, completely invisible to reporting: a clear security vulnerability.

The monetary base (M_0) and key interest rates have the main MP influence on money supply but MFIs are also much in play led by profitability aimed codetermination. If we assume that banks (MFIs) compete to maximize profits, they actually should not have any excess reserves, according to all recent theories (Görgens et al. 2014; Illing 1997; Anderegg 2007). Later chapters reveal recent excessive reserves of MFI and a lack of competition (4.2.2.3).

Accordingly, the reserve and currency coefficients could be simplified in Formula 15:

$$\alpha = \frac{R}{D_{NB}} = r_{MR} + r_{ER} = r_{MR} \quad ; \quad as \;\; r_{ER} = 0$$

$$R = \alpha D_{NB} \quad ; \quad C = \beta D_{NB} \; ; \quad \beta = \frac{C}{D_{NB}}$$

Formula 15 Reserve and Currency Coefficient

Entry: R: total reserves, C: currency in circulation (excluding MFIs), α: reserve coefficient (reserve deposit ratio), β: currency coefficient (currency ratio, the affinity real legal tender, cash), r_{MR}: minimum reserve rate, r_{ER}: excessive reserve rate, D: demand deposit (overnight deposit)

Based on Formula 2 and Formula 15 the coefficient formula for M_0 is derived as follows:

$$M_0 = C_{NB} + R_{NB} = \beta D_{NB} + \alpha D_{NB} = (\alpha + \beta) D_{NB}$$

Formula 16 Monetary Base using money Reserve and Affinity Coefficients

Entry: M_0: monetary Base, R: reserves, α: reserve coefficient, β: currency coefficient

Hence, the optimal level of base money (M_0) depends on the coefficients α and β. α is determined by the (weighted) ECB minimum reserve requirements for the specific liabilities subject to reserve requirements, while the introduction of β is useful as it isolates and includes the variable of mean liquidity preference toward pocket money. The money creation multiplier (m) can thus be derived via α and β (adapted from Görgens et al. 2014):

$$M_{0,1,2,3,4} = C_{nonMFI} + D_{nonMFI}^{0,1,2,3,4} = \beta D_{nonMFI} + D_{nonMFI}^{0,1,2,3,4} = (1+\beta) D_{nonMFI}$$

$$m_{1,2,3,4} \equiv \frac{M_{0,1,2,3,4}}{M_o} = \frac{(1+\beta) D_{nonMFI}}{(\alpha+\beta) D_{nonMFI}} = \frac{1+\beta}{\alpha+\beta} \approx \frac{1+\beta}{r_{MR}+\beta}$$

$$M = mM_0 = \left(\frac{1+\beta}{\alpha+\beta}\right) M_0 = \frac{M_0}{\beta + \alpha(1-\beta)}$$

Formula 17 Generic Derivation of the Money Creation Multiplier

$$(a)\ max.m = \left(\frac{1+\beta}{\alpha+\beta}\right) \quad (b)\ real\ m_{1,2,3,4} = \frac{M_{1,2,3,4}}{M_0}$$

Formula 17 Generic Derivation of the Money Creation Multiplier

Entry: C: circulating currency, R_{MR}: minimum reserve, R_{ER}: excess reserve CBs, $D_{non\text{-}MFI}$: non-bank liabilities subject to reserve requirements, deposits of monetary aggregates, α: reserve coefficient, β: currency coefficient, 1-4: denoting the various monetary aggregates, respectively. With this formula the amount of amplified money and its coefficients are found for (a+b); see also previous page

2.3.8 Monetary Transmission Channels (MTCs) and Theories (MTTs)

MP decision-makers rely on a set of appropriate operational tools and an accurate analytical assessment of the situation to find the right timing and magnitude for their MPs actions for that they best translate into the real economy via various monetary transmission mechanisms (Mathews et al. 2013). Monetary transmission theories (MTTs) describe and analyze these interrelations and coherencies, theoretically and empirically, to optimize MP output.

Monetary reform that installs a semi-digital full-reserve is by far the best solution found by MP research, and is fully in line with important MP expert views (see 5.2 for more information), but it is still not clear if it will be implemented or when. Thitherto, optimizing MP led monetary transmission of all MTCs remains the only, although liberticidal, alternative.

MTTs and MTT tools help meeting MP objectives (listed in chapter 2.3) and targets by searching for better settings and optimal macro and monetary environments for the economy: with stable prices, economic growth, a better business cycle and future standard of living. For research purposes MTTs are to be 'decomposed' into multiple monetary transmission channels (MTCs) and pathways so that all of the individual MP effects can be studied in a 'reductionist approach'. These channels may be re-linked into a holistic cooperative network to model complexity of all MTC effects that transmit throughout the economy in many overlapping time windows. Many MTT and channel based models have at its core the IS-LM framework, which has had a huge impact on MP theorists (a new IS-LM-ADAS model is proposed in this study as graphical-arithmetical platform; see Appendix S7-13).

At the ECB 'Technical Monetarism' and 'Technical Keynesianism' are often replaced by an 'empirical approach', 'MP rules' (e.g. the Taylor rule) and MTC based models fed by central bank's own data of its two-pillar research strategy (ECB 2015b). Although MP tries to be

less discretionary and supportive today, its main operational targets are still the quantity of money, interest rates and a low inflation - targets are empirically-incrementally actuated.

MTTs help understand coherencies, causalities and pathways by decomposing them into a set of key monetary transmission channels (MTCs) that all affect economic output (e.g. GDP). An new systematic overview list is elaborated here that reviews important and relevant MTCs in effect, driven by today's MP (see Table 5 adapted from Mathews et al. 2013).

Table 5 Newly Completed Overview Table of Monetary Transmission Channels

- **MTC1**: Real Interest Rate (*Traditional View*): low interest rate drives expenditure
- **MTC2**: International Account, Fx (*Asset View):* low interest rate drives Fx and exports
- **MTC3**: Keynes' Stock Market or Tobin's q Channel (*Asset View):* equity drives investment
- **MTC4**: Financial Wealth Channel (*Asset View):* securities and income drives consumption
- **MTC5**: Traditional Credit Channel (Credit View): liquidity drives bank lending, investment
- **MTC6**: Balance Sheet Channel (*Credit View*): less moral hazards more lending/investment
- **MTC7**: Cash Flow Channel (*Credit View*): nominal interest rate, CF lending channel
- **MTC8**: Unanticipated Price Level Channel (*Credit View*): less moral hazards, more lending
- **MTC9**: Household Liquidity Channel (*Credit View*): less financial distress, more expenses
- **MTC10**: Expectation Channel (*Prospect View*): Fisher and Cagan, prospected expenses
- **MTC11**: Money Multiplier Channel (Fractional Reserve View): elasticity of money supply
- **MTC12**: Monetarism Channel (*Traditional View*): Cambridge Effect: money drives prices
- **MTC13**: Governmental Channels (*Fiscal View*): fiscal money supply drives GDP (incl. debt based investment heightening of the real economy's money supply)
- **MTC14**: Behavioral Economics (*Behavioral View*): psychology drives output
- **MTC15**: Commercial Banks Channel: idiosyncratic or private MFI decisions affect output
- **MTC16:** Portfolio Channel: monetary vs. non-monetary portfolios shifts affect output

MTC_1: Real Interest Rate Channel (*Traditional View*): IS-LM and AD-AS modeling view

$$M \uparrow \Rightarrow r \downarrow \Rightarrow \left[I + C_{durable,\ housing}\right] \uparrow \Rightarrow Y \uparrow$$

Entry: M: money, r: real interest rate, I: investment, Y: output, income (e.g. GDP), C: consumption

The real interest rate (r) has a stronger impact on GDP in the long run than in the short run when prices are sticky as aggregate price level adjust slowly. Thus, effects in $MTC_{1,}$ among the strongest of all 16 MTCs, are naturally delayed and timely blurred over several quarters and usually years, like a return on macro-investment. The effects resulting from a change in r_{ST} will slowly alter the effect of $r_{LT,}$ through the relevant time-window, time t (Formula 18).

$$\bar{r}_{long-run} = \frac{1}{t}\sum_{i}^{t} r_{i,\ short-run}$$

Formula 18 Long-Term Real Interest Rate in Monetary Transmission

Entry: r: real interest rate, t: time, i: interval point in time; simplified formula to exemplify the effect

If MP achieves a low real interest rate, e.g. via QE, M_0 or key rates, it profits investment and consumption, including durable goods and housing, yielding a higher output (real GDP).

MTC_2: International Account/Fx Effects (*Asset View*): MTC_2 comprises effects of the 'International Account', international trade and capital flows. MP affects Fx via the relative inflation rate that effectuates the relative interest rate and spot and forward exchange rate (Giddy 1976; Sperber 2015). The Fx rate effects of MTC_2 can be also explained in the IS-LM-ADAS open-market model (see 6 Figure S7). The medium-term equilibrium rule of purchasing power parity (PPP) weakens the exchange rate at the difference of inflation rates.

$$FX_{A/B} = \frac{P_A}{P_B} \quad ; \quad \Delta\%FX_{A/B} \approx \Delta\%P_A - \Delta\%P_B$$

Formula 19 Monetary Effect on Foreign Exchange Rate under the Law of One Price

Entry: Fx: foreign exchange ratio of currency ratio A/B, $P_{A,B}$: price level of country A or B

Keynes' Interest Rate Parity aka the International Fisher Effect states that (Giddy 1976):

$$arbitrage = i_{foreign} + \frac{FX_t + FX_{t+1}}{FX_t}$$

$$\frac{i_A - i_B}{1 + i_B} = \frac{Future(FX_{A/B}) - Spot\left(FX_{A/B}\right)}{Spot\left(FX_{A/B}\right)} = SWAP\ rate \approx i_A - i_B$$

$$\%\Delta FX = \frac{i_B - i_A}{1 + i_A} \approx i_B - i_A$$

Formula 20 Keynes Interest Rate Parity Theorem and International Fisher Effect

Entry: i: interest rate in country A and B, future rate, spot rate, Fx: foreign exchange rate [A/B]

Fx arbitrage converges towards an equilibrium in which the swap rate approximates 0. MP affects MTC_2 and hereby the exchange rate (Fx, Forex) and expected inflation and subsequently export and import, consumption and tourism, by altering the aggregate purchasing power of the economy in the world market. The Fx rate of 'free' floating currencies, like the Euro or Dollar, equilibrates in the Fx market and intersecting demand and supply for the currencies is linked to domestic interest rates and prices of goods and services, only with the exception of some traded raw materials that may adjust differently in the internationally markets and that sometimes may be more sticky (since differently determined) then the Fx rate. There are manifold domestic and international factors and functions that eventually affect the Fx rate: income, prices, politics, media, prospects, flow of goods and services, capital, interest rates, etc (Sperber 2015). As a result, the Fx rate fluctuates more dynamically or volatile, or variable for many currencies than for example aggregate prices levels do. Capital transactions also adjust to equilibrate day-to-day Fx rates, but effects are also mid-term and long-term. This can be simplified and summarized (Mathews et al. 2013):

$$M \uparrow \Longrightarrow r_{ST,LT} \downarrow \Longrightarrow \pi \uparrow \Longrightarrow Fx \downarrow \Longrightarrow Nx \uparrow \Longrightarrow Y \uparrow$$

Entry: M: money, r: real interest rate, π: inflation, Fx: Fx exchange rate, Nx: net export, Y: income

MTC_3: Keynes' Stock Market and Tobin's q Channel (Asset View) MP affects the real economy through its effects on the valuation of equities (stocks) (Mathews et al. 2013; Keynes 1936; Tobin 1969). Keynes sees a positive effect of a rising stock market on the rate of investment, that is often described today as Tobin's q MTC: if money increases, interest rates (yields) on bonds falls, stocks become more attractive and rise, q rises, property and wealth rises and drives new expenditure in investment and consumption.

$$q = \frac{market\ value\ of\ firms}{replacement\ cost\ of\ capital}$$

Formula 21 Tobin's q Formula

Entry: q: Tobin's q, market value of firms (selling price, total value of shareholder's equity, or NPV: net present value), replacement costs (e.g. of a green field investment substitution or book value)

$$M \uparrow \Rightarrow \left(\frac{L^S}{L^D}\right) \uparrow \Rightarrow B \downarrow \Rightarrow S \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Entry: M: money, L: liquidity, B: bonds, S: stocks, q: Tobin's q, I: investment, Y: GDP

MTC_4: Financial Wealth Channel (Asset View): According to Franco Modigliani, MP affects the spending and total consumption also of durable goods when stock prices rise, which is thought to increase with the 'perceived long-run wealth' of an economy (Mathews et al. 2013), though it may only be a short-run effect and could be neutralized via circumstances.

$$M \uparrow \Rightarrow P_{Stock,\ Houses,Land} \uparrow \Rightarrow wealth \uparrow \Rightarrow \left(C_{durable\ goods} + I_{residential}\right) \uparrow \Rightarrow Y \uparrow$$

Entry: M: money, P: price, C: consumption, I: investment, Y: GDP

MTC_5: Traditional Credit Channel (Credit View): liquidity drives bank lending and output

Bank lending channels benefit output because more deposited savings are available for lending, investment and durable consumables, like residential housing (Mathews et al. 2013). Asymmetric financial information benefits the MFIs that act as 'mediators of scale and scope' in the credit and financial markets (Mathews et al. 2013) acting via: lot size, term, and risk transformation (Sperber 2015) and the money creation multiplier (Görgens et al. 2014). Newly created money mainly enters the real economy as loans with interest. The CBs reserve accounts at the NCBs increase (due to the ECB operations outlined in The Structural and Operational Framework of the Eurosystem) and fractional reserve money multiplication allows for higher volumes of TA bank deposits, loans and thus more investment, consumption and GDP (with a smaller monetary base):

$$M \uparrow \Rightarrow reserves \uparrow \Rightarrow bank\ deposits \uparrow \Rightarrow volume\ of\ bank\ loans \uparrow \Rightarrow I \uparrow C \uparrow \Rightarrow Y \uparrow$$

Entry: M: quantity of money, I: investment, C: consumption, Y: GDP

This effect is thought to be bigger in the euro area than in the US that inherits a stronger bond market. In 2011, total bank loans in the euro area made up almost 142% of GDP and only 55.6% of GDP in the US. Loans to non-MFI were after all 52.4% of GDP in the Eurozone and only 22% of GDP in the US (Mathews et al. 2013). Additionally, the effect of MTC_5 is also more dominant for smaller and medium size enterprises (SME), while larger firms have other, better, i.e. more affordable channels (e.g. stocks and bonds) (Mathews et al. 2013).

MTC_6: Balance Sheet Channel (Credit View): stocks reduce moral hazards and drive lending

$$M \uparrow \Rightarrow stock \uparrow \Rightarrow firm's\ net\ worth \uparrow \Rightarrow moral\ hazard \downarrow \Rightarrow lending \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Entry: M: money, I: investment, Y: GDP, moral hazard and adverse selection

Like for Tobin's q the short-term effect could be neutralized by the effect of the long run.

MTC_7: Cash Flow Channel (Credit View): the cash flow channel assumes that MP can lower the nominal interest rate i and improves the balance sheets of firms and households. This is thought to reduce moral hazards, to increase lending and to drive investment and GDP.

$$M \uparrow \Rightarrow i \downarrow \Rightarrow cash\ flow \uparrow \Rightarrow moral\ hazard \downarrow \Rightarrow lending \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Entry: M: money, I: investment, Y: GDP, i: nominal interest rate, moral hazard and adverse selection

Like previous channel's MTC_7 has a short-term effect can be neutralized in the long run.

MTC_8: Unanticipated Price Level Channel (Credit View): inflation can drop the debt burden

$$M \uparrow \Rightarrow P_{unant.} \uparrow \Rightarrow\ fixed\ debt \downarrow,\ assets \uparrow \Rightarrow moral\ hazard \downarrow \Rightarrow lending \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$$

Entry: M: quantity of money, debt nominally fixed, liabilities of firms in real terms

MTC_9: Household Liquidity Channel (*Credit View*): households' liquidity drives GDP

$$M \uparrow \Rightarrow housholds' financial\ assets \uparrow \Rightarrow financial\ distress \downarrow \Rightarrow consumption \uparrow \Rightarrow Y \uparrow$$

Entry: consumption of durables and housing, M: quantity of money, Y: GDP

MTC_{10}: Expectation Channels (*Prospect View*): Fisher, Cagan, and expectation models
Forecast of economical, political, and monetary development drives economic behavior.

MTC_{11}: Money Multiplier Channel (*Reserve View*): Fractional reserve lending effect
Money creation multiplier drives money elasticity and 'pre-amplifies' loan market effects. As the same effect can be yielded in a full-reserve system it can be considered as a zero sum effect at best, but generally a negative effect if the channel operates below 100% efficiency, which is impossible to achieve. It is thus a 'negative impact channel' for the real economy. Positive impact arises only due to a higher elasticity of the money supply and due to private non-governmental spending effects that can be easily compensated in a full-reserve system that works at higher efficiency and effectiveness due to no monetary losses.

MTC_{12}: Monetarism Channel (*Traditional View*): Cambridge Effect (money drives prices)

Money drives prices (%ΔM ≡ %ΔP) and stimulates short term and nominal GDP growth.

MTC_{13}: Governmental Channels (*Fiscal View*): the public sector effect on GDP, spending
Government spending increases the money supply in the real economy, especially via debt.

MTC_{14}: Behavioral Economic Channel (*Behavioral View*): psychology in markets on output

The psychological and behavioral part of MP influenced economic decision making.

MTC_{15}: Commercial Banks Channel: the MFI-networks form an own decision making instance in most MP MTCs and are influences by private and idiosyncratic factors. The confidence of CBs and other MFIs and their (very own) risk perception of economic trends (and entities) can much influence e.g. the granting of loans. The CBs channel also depends on the homogeneity or heterogeneity of CBs and other MFIs in the currency area (e.g. Eurozone is very heterogeneous). Diversification, or the market power of the banks, and on the microeconomics of the individual settings (local demand, supply) also play a role. MTC_{15} also comprises any deviation from perfect competition and profit maximization strategies, and the 'level of distribution of earnings', capital consumption and 'uncontrolled write offs'.

MTC_{16}: Portfolio Channel: preferences between monetary and non-monetary portfolios

Portfolio shifts can play an important role on the financial setting of firms and investment.

$$\left(\frac{M}{P}\right)^{D} = L(r_S^-, r_B^-, E\pi^-, W^+)$$

Formula 22 Portfolio Money Demand Function

Entry: r_s: expected real return on stock, r_b: expected real return on bonds, Eπ: expected rate of inflation, W: real wealth that can be approximated by income, -/ +: negative or positive role on liquidity preference for real money balances, respectively

Money differs from other assets in its risk-to-return ratio (Mathews et al. 2013). Its nominal rates are often fixed (e.g. for 1-2 years, or longer) and are only exposed to the risk of inflation and default, while other assets also depend on diversifiable and non-diversifiable risks like beta (β, the general market risk that arises from market exposure). This can be conceptualized as shown in Formula 22 (Mankiw 2014). A comparable and related portfolio theory is known as Friedman's QTM, which was already introduced earlier (see Formula 10).

2.4 Empirical Monetary Policy Research

2.4.1 Empirical Monetary Policy Theory

Empirical research on MP is an applied science. A great body of work has focused on the Federal Reserve System since its establishment by the Federal Reserve Act in 1913, the Bank of England (BoE), and other traditional central banks. Much less independent research is available for the much younger Eurosystem, established in 1999 (see 2.1 and 2.4.9).

The comparison of a variety of international monetary systems and their effect on economies is an important discipline of empirical MP research. Peculiar trends are revealed and specific lessons are also learned from country cases: e.g. hyperinflation in ancient Roman Egypt, during the French Revolution, the US Revolutionary and Civil War, in Early Soviet Russia, The German Weimar Republic, Hungary after WWII, Brazil in the 90s, Yugoslavia during the UN boycott, Japan's stagflation in its lost decade, the UK's credit crunch, the list is long and spans thousands of years. Also data (see overview on www.dollardaze.org) from many country specific cases allows to extract and research meaningful information and an understanding of macroeconomic dynamics, causes and effects, to improve MT (Hanke & Krus 2012; Hayashia & Prescott 2002). Empirical research of the Eurosystem is one of these very important prototype MP cases and its functioning and performance will have a huge impact on other central banking systems that operate in many countries world-wide

For example, inherent to hyperinflation cases is: (1) a higher and rapid growth of money that is not covered by economic growth; (2) coinciding wars and political instability, (3) ill-advised fiscal policy or very high indebtedness or other liabilities and financial tensions.

The EMU represents a unique case to study the MP effects and MTs in a heterogeneous country group with a monetary union that 'must' politically, fiscally and economically converge. Much empirical MP research exists with different roots (Keynes 1923; Douglas et al. 1939; Friedman & Woodford 2010; Friedman 1968; Friedman & Schwartz 1963). Today's, empirical MP recommendations go back to Knut Wicksell who suggested that central banks should set 'natural rates' that stabilize inflation at a low level: if rates are too low inflation rises, if rates are too high inflation would fall (Bernanke & Mishkin 1997). This traditional view is still found in many or most recommendation models, MTs, or rules (e.g. Taylor Rule). But empirical research also shows that a low key rate and too much base money could hamper 'financial stability' by causing crisis, mainly because of unfolding too much extra leverage in fractional reserve banking that then strives to store PP more speculatively.

2.4.2 Normative Empirical Models and Empirical Theories

There is a huge amount of different normative empirical models and empirical theories published so far - some started as generic and graphical models and ended as highly sophisticated and complex MP computer simulation, econometrics tools, prediction systems and

reference rules and frameworks (Friedman & Woodford 2010). Table 6 aims to give a brief overview of some of the main findings, models and theories that have evolved over time.

Table 6 Normative and Empirical Models of MP

- Optimal Control Theory (OCT), discretionary MP, Keynes models (Keynes 1923/30)
- Friedman refutes OCT and suggests 'Simple Rule Approach (SRA)' (Friedman 1948)
- Flexible prices and sticky price enter the models (Keynesianism, Monetarism, 50s)
- Descriptive functions for MP (Dewald & Johnson 1963)
- Dornbush's overshooting model of MP and exchange rate effects (Dornbush 1976)
- Co-modeled functions of fiscal policy and central banking (Fair 1978)
- OECD Interlink: short-Keynesian-long-neo-classical (Blundell-Wignall et al. 1984)
- A Fed-reaction function of MP in response to economic data (McNees 1986)
- Taylor's rule: MP to stabilize output and prices (Taylor 1993b; Taylor 1979), (The Taylor Rule - A Monetary Rate Model)
- Multi-equation international empirical models (Bryant et al. 1993)
- Inflation targeting (Bernanke & Mishkin 1997)
- Quantitative evaluation of MP rules (Rotemberg & Woodford 1997)
- New Keynesian Philips curve with nominal rigidity (Clarida et al. 1999)
- Econometric robustness analysis (Levin et al. 1999)
- Woodford's general theory of micro-founded rules (Giannoni & Woodford 2002)
- New Keynesian model and analysis of MP (Woodford 2003)
- Policy projection model tools (Svensson & Tetlow 2005)
- Nominal rigidity models (Lawrence et al. 2005)
- Simple rule approach can be helpful, but OCT is also needed (Mishkin 2007)
- DSGE(+VAR): dynamic stochastic general equilibrium model, Keynesian model also based on price and wage stickiness, combining rational expectation and microeconomic foundation, to evaluate MP welfare effects (Rotemberg & Woodford 1997)
- ECB-DSGE: a DSGE model for MP in the Eurozone (base on Smets & Wouters 2010)
- Taylor model in Eurozone and foreign exchange rates (Molodtsova et al. 2011)

And many more sophisticated models that tackle a specific question. Importantly, they all fail to fully resemble the real world economy as they are not holistic enough and cannot cope with all important complexities - also due to a lack of data. Nevertheless, they bear

some utility for predictions of more general trends, or assist in basic and applied research questions. Some make risk assessments more feasible, or offer a general reference rule, or model the likelihood of macro-economical trends based on statistical analysis former data.

Several rational expectations models appeared after the transition of the US economy's Great Inflation of the 70s to the Great Moderation. They already resembled the new thinking about MP seeking price and output stability (Friedman & Woodford 2010). Most models are to be regarded as reductionist tools that may help to model only a sub-fraction of real world events and until today there is no precise holistic model that can integrates efficiencies of all MTCs, except maybe the basic preliminary first-try multi-matrix-model of this study (see 6.1 Figure S18). Thus, MP decision making furthermore relies much on human intellect that is only supported by mathematical models and tool (e.g. inflation targeting), theories (Keynesianism, Monetarism), or MP schemes (e.g. Taylor rule) to still incrementally and empirically deal with specific monetary scenarios and situations, including MP CM (crisis management). MTCs can be optimized and used separately, but for MP the variegated impact of MTCs also makes a holistic-integrated-network 'estimate' more essential to estimate and score the overall effects of MP to stabilize prices and economic growth - at once.

2.4.3 Inflation Targeting

Since Fisher and Friedman, Monetarism has (re-)gained much momentum for MP and central bank's mandated priority, i.e. the Fed, BoE, DB, and also the ECB, was readjusted towards the goal of maintaining price stability in the medium term, also as a major rule: achievable by controlling money supply more proportional to economic output, in axiomatic accordance also with Keynes and QTM (see 2.3.2). This type of empirically derived rule for MP that has become an implicitness was later standardized and globally termed 'inflation targeting' (Bernanke & Mishkin 1997). It became a more general rule for independent central banks around the world: Bernake and Mishkin defined as its requirements: (1) target series definition, (2) target level definition, and (3) target time horizon (Bernanke & Mishkin 1997). The ECB has specified it as: HICP, below but close to 2% in the medium term, as its performance benchmark. The HICP rate is more relevant on a yearly basis, but the ECB still lacks a more precise definition of 'medium term' to be ascertained. Coincidentally, slightly before the Euro was launched in 1999 a peak of MP research publications was reached that proposes 'inflation targeting' in many facets (Haldane 1998; Lowe et al. 1997; Bernanke & Mishkin 1997; and all related references within these works).

In open economies there is also model evidence that inflation targeting should not be performed too strictly in the short-run (Ball 1998), as it might cause fluctuations in output and Fx rates. This hypothesis is not empirically proven yet, but seems to play a vital role for ECB MPs decision making, or rather short-run price fluctuations also escape its direct control.

2.4.4 The Taylor Rule - A Monetary Rate Model

The Taylor model represents a simple rule how central banks should respond to the monetary and economic settings to achieve a good performance of price stability and output. This approach has had significant influence on many MP decisions till today (Taylor 1993a).

$$r_{MRO} = \pi + r \ + \frac{(y - y_{target}) * 100\%}{2y_{target}} + \frac{\pi - \pi_{target}}{2} \qquad (the\ original\ rule)$$

$$r_{MRO,t} = \pi_t + r_t \ + \alpha \left[\frac{(y - y_{target}) * 100\%}{y_{target}}\right] + \beta \left[\frac{\pi_t - \pi_{target}}{1}\right] \qquad (parametric\ rule)$$

Formula 23 Taylor's Representative Monetary Policy Rule

Entry: r_{MRO}: key rate (e.g. central European rate, main refinancing rate, or in the US the real fed funds rate), r: real equilibrium funds rate, π: inflation, π_{target}: inflation target (e.g. 0< π <2%), y: GDP, α: output gap coefficient (default 0.5), β: inflation gap coefficient (default 0.5)

If the 'output gap' (α) (the lack behind economic potential and employment) increases the key rate decreases to allow for more investment to close the full employment gap. If inflation is above target then it is suggested to increase the interest rates to soak liquidity out of the money market. It is possible to extend this formula to build-in a forecasting model using a temporal feed forward loop and a parameter that describes the effectiveness of how the central rate affects the equilibrium interest rate and π in the market in a time horizon (t_n). An inherent short-coming of the Taylor model, and all Taylor-like models, is that they are not suitable for zero nominal lower bound (ZNLB) interest settings (see 2.4.5) as the key rate (MRO) usually doesn't turn negative, nor market interest rates. Another drawback is the requirement of a standardized parametric model but parameters may be not grounded. This may lead to corridor of recommendations that might become too vague, or unproven. New Keynesian models circumvent some of these issues (Eggerston & Woodford 2003).

Taylor's model is adjustable towards open economies via MCI/long-run inflation (Ball 1998).

2.4.5 The Zero Nominal Lower Bound (ZNLB) and Liquidity Trap

If the overnight (or even the short-term) nominal interest rate (i) is at or closer to zero, several famous monetary theorists and macroeconomists have argued, the central bank has exhausted its capacity to stimulate economic growth (Eggerston & Woodford 2003). This complex of problems is referred to as the 'Keynesian liquidity trap' (Keynes 1936; Hicks 1939), a result of the zero nominal lower bound (ZNLB), also known as zero lower bound (ZLB). Since the interest rate cannot drop below 0% - the natural nominal interest rate of cash, and due to collective MFI behavior to not lend money for a negative interest rates to the real economy (due to 'pillow-banking'), only for other MFIs, e.g. the interbank lending market where 1-3 month EURIBOR rates are negative throughout 2015. Some empirical MP research exists about the ZNLB in the euro area, e.g. (Protze 2008; and references herein).

In turn of the economic downturn of the FC in 2008 - the worst recession since the Great Depression (Beblavý et al. 2011) - once again directly and solely caused by the financial sector -, the US and Eurozone, and other central banks, were taking unprecedented measures, standard (policy rate and overnight liquidity) and non-standard actions (any other operations), and until today lowered their key interest rates to close to zero. The legal frameworks of the Fed and the Eurosystem comprise instruments to grow the monetary base even at the ZNLB, e.g. via outright monetary transactions, QE, buying foreign currency or assets (securities, bonds) or by making almost free loans to MFIs, (see 2.1.5). Bonds could be bought from the secondary market, and if still needed even from a semi-secondary market, as 'buyer of last resort' to refresh the currency in circulation to act deflationary and to stabilize the economy - as a part of the ECB's mandate (see 2.1.3). Additionally, a central bank can manipulate the price level by announcing MP actions that influence expectations of future prices or interest rates, but only little scope is left for the standard MP operations.

Friedman and Woodford have rightly proposed drops of 'Helicopter Money' (Reichlin et al. 2013). If economic incentives are not undermined they indeed represent a key solution. But the non-governmental sectors need to benefit equally. 'Helicopter Money' as fair drops for all people (e.g. financing a tax cut for investment) is an appropriate mean (Bernacke 2002).

Empirical evidence supports the view that MP of a central bank can be as much effective as before or without a ZNLB. For instance, the federal funds rates (FFR) has been at the ZNLB since 2008's 'forward guidance' of the Fed and it could be shown that monetary and fiscal policy were effective till 2010 with regulative potential (Swanson & Williams 2013).

Empirical ZNLB research also sources form the lessons learned in countries cases like Japan's Recession in its lost decade. Empirical studies of econometric models are often not reliable at the ZNLB or liquidity trap: for example the Taylor and Taylor-like models don't work at the ZNLB, as the central bank has to regulate the markets via 'non-standard' open market instruments that are not an integral part of such models (e.g. see 2.4.4). Some New Keynesian models can be used to circumvent some of these significant issues (see 2.4.4).

2.4.6 Keynesianism, Post-Keynesianism, and New Keynesian Models

The term Keynesianism was coined when John Maynard Keynes published his set of seminal economic assays in his General Theory of Employment, Interest, and Money in 1936 (Keynes 1936), during the US Depression that followed after Black Tuesday's Great Crash; aside also a financial sector and monetary system caused crisis like almost all non-war economic crisis so far. This also happened behind the background of all effected economic turbulences like fluctuating output and high unemployment, which all together urged for a better economic and monetary theory and thinking (till today). He found that fiscal and monetary policy needs to be harmonized, coordinated and adjusted to provide for better economic settings, conditions and times (Keynes 1936). His main propositions were later summarized in the Post-Keynesian Hicksian IS-LM model (see 2.3.5) and Post-Keynesianism. According to these hypotheses governments should take a 'broader approach' and a more 'modern responsibility' for economic stability and growth, also by extending public sector spending when needed in downturns: e.g. if required by demand, economic business cycle, recessions, temporary instability of the economy, or 'whenever markets fail otherwise'.

The General Theories (Keynes 1923; Keynes 1936; Keynes 1930; Clarida et al. 1999) provide compelling micro-founded evidence that 'good government spending' is pivotally required to manage economic fluctuations in the short-run, especially in crisis situations, like a recession, and also to set the stage for potential long-run growth. Central banks can act faster but fiscal policy is more robust to stabilize economic fluctuation. Nevertheless, this bears the risk of lacking sound economic incentives: to efficiently and effectively provide utility at a good cost-benefit ratio, in comparison to utility and productivity driven types of private investment. To accommodate and respect this point, Keynesian Economics steadily urges for low real interest rates to foster private investment and private capital stock formation.

Post-Keynesian Economics also argues that a higher government spending in a recession leads to a 'crowding-in' effect that progressively revitalizes the economy via a government spending multiplier effect (Formula 24). Thereby, it severs as a powerful monetary transmission channel (MTC, see 2.3.8), generally it should be higher in a recession to stabilize the domestic market known as 'resource crowding in', while fiscal policy should be contracted in times of a boom (Keynes 1936; Mankiw 2014) - to avoid a 'resource crowding out'(Friedman & Woodford 2010; Keynes 1936; Clarida et al. 1999). Despite of its unambiguousness and simplicity this canonical rule is not always followed (e.g. Greece 4.1.1.1).

$$\frac{\Delta Y}{\Delta G} = \frac{1}{1 - MPC}\ (fiscal\ multiplier) \qquad \frac{\Delta Y}{\Delta T} = \frac{-MPC}{1 - MPC}\ (tax\ multiplier)$$

Formula 24 Keynesian Fiscal Multiplier and Tax Multiplier

There are several 'New Keynesian Models' that are based on the 'Keynesian Framework': for example the 'FRB/US model' that became the 'workhorse model' of a central bank's board staff (Svensson & Tetlow 2005), or Woodford's Keynesian General Theory Model (Giannoni & Woodford 2002; Rotemberg & Woodford 1997; Woodford 2003), and other big models that are used for 'Optimal Policy Projections' (OPPs). The New Keynesian FRB/US model incorporates rational expectations and is used in forecasts, modeling scenarios for MP, generating alternative Greenbook simulations with extensions, and probability tests. The model is not used for official Greenbook forecast that remain judgmental (Svensson & Tetlow 2005), but serves widely as MP tool. Woodford's new Keynesian linear-quadratic model for MP is another widely acknowledged basic model of the Post-Keynesian Framework (Woodford 2003; Giannoni & Woodford 2002). An example is the New Keynesian Phillips Curve for which intertemporal IS relations are used, like in other 'New Keynesian models' (Clarida et al. 1999) (Formula 25). But all published models remain 'work in progress'.

$$\pi_t = \kappa(y_t - y_t^n) + \beta E_t \pi_{t-1} + u_t \quad (aggregate\ supply)$$

$$y_t = E_t y_{t+1} - \sigma(i_t - E_t \pi_{t-1} - \rho_t) \qquad (aggregate\ demand)$$

Formula 25 New Keynesian Phillips Curve and Intertemporal IS Relation

Entry: y: log output, π_t: period t inflation rate, i_t: period t nominal interest rate κ: supply coefficient, u, ρ: general disturbance terms

Nearly all Keynesian and Post Keynesian theories and models are based on a full-reserve system, incompatible with fractional banking systems, and fully dysfunctional to measure

inefficiencies or effectiveness ECB money and MP: a flaw that is not overcome until today. New money, of course, always has an effect and can be efficiently used via MTCs - or not. Although this is known since a long time and in Keynesianism it was widely forgotten today.

2.4.7 Monetarism and Neo-Monetarism

The term Monetarism was coined for the works of Early Monetarist Irving Fisher (especially Fisher's QTM 'equation of exchange', but also: Fisher Effect, Fisher hypothesis, Fisher Effect, Fisher separation theorem)(Fisher 1930), and Milton Friedman and Anna Schwarz from University of Chicago, who had to (!) (re-)proclaim that inflation is mainly a 'monetary phenomenon', as money supply affects prices at least in the long-run (Friedman & Schwartz 1963; Mankiw 2014): Friedman even believed in a ca. 1:1 relationship of money and prices.

Since then Monetarists deduce as main function of MP to regulate the money supply in a way to maintain price stability and adequate interest rates. Seemingly opposite to Keynesian Theory they generally discourages from higher governmental spending due to its effect on inflation, and the 'crowding-out' effect: when government spending competes with private spending about resources such as money, driving the real interest rate up (Friedman & Woodford 2010; Friedman 1968). In such a form 'crowding out' can be repulsive for private investment and economic growth in the long-run. Friedman, like most Monetarist experts clearly advocated a full-reserve banking system (Goodhart & Illing 2003; Friedman 1948).

2.4.8 The Dichotomy of Keynesianism and Monetarism

Today, professed or not, the two Schools of Neo-Monetarism and Post-Keynesianism continue to be highly influential, also with respect to the empirical part of MP and its focus, interpretations, and recommendations. They oblige each other, converge on the generic rules of the Quantity Theory of Money (QTM) (see 2.3.2), and differ only in the specific weighting of factors and laws. There is still the view that monetarist prefer to assume a constancy of velocity and output in the short run, while Keynesian are more business cycle focused. Monetarist and the Cambridge School assume that inflation is mainly driven by money supply, while Keynesians agree but comprise additional models and types of inflation in their theories, e.g. demand driven inflation in ISLM models (see 6, Figure S7, S10).

Both schools of thought empirically and theoretically agree that MP has a short-term influence on the real economy, due to temporary nominal price rigidities, and a long-term effect on prices, and both can't subvert QTM. Monetarism has its emphasis on the value of tight

MP and gives priority to price stability as discrete economic factor that supports growth as its narrow objective. Keynesianism also supports price stability but emphasizes more the role of fiscal policy, interest rates, output and the level of employment as 'first-order goals' that act in concert and have to be comprehensively modeled and included in MP objectives (Friedman & Woodford 2010). A difference in emphasis between Neo-Monetarism (Romer & Romer 1989) and the New Keynesian Economics (Clarida et al. 1999) is found regarding both expansionary or contractive fiscal and MP, and concerning the right combination and concerted action in different contexts of fiscal, economic and monetary policy.

One crux of the matter is the quandary of achieving optimal fiscal and private spending by providing the right monetary-economic environment and incentives, concomitantly improving the globally competing local factor. Still both schools are known for their opposing claims, and these dichotomies have educative value: crowding-in (Keynesians), vs. crowding-out (Monetarists), 'money doesn't matter' (Keynesians) vs. 'money matters' (Monetarists), (Monetarists), anti-cyclic growth stimuli (Keynesians) vs. priority of price stability (monetarists), guided market development if needed (Keynesians) vs. only free market development (Monetarists) coordinated MP and fiscal policy (Keynesians) vs. independent MP (Monetarists), and so on. Today, positions meet along the scale somewhere in the middle. For example, monetarists also re-introduced QTM, money balances, liquidity preference, and Friedman even also proposed a 'monetary and fiscal framework' (Friedman 1948).

2.4.9 Independent MP Research about the Eurosystem

The ECB has a scientific island position in the field of empirical research about the Eurosystem (ECB 2011a; ECB 2004; ECB 2015b; ECB 2015a). Its two-pillar approach (ECB 2011a; ECB 2004; ECB 2015b) tracks and researches the economic and monetary developments, and several detailed reports, bulletins, ECB working paper series about MP, monetary and economic developments are released every year (ECB 2015a). However, due to its close relationships to authors and researchers, and due to its public relation strategy the ECB, like most other central banks staff, has to be considered as 'completely biased towards its own short, medium and long-term objectives'. Central Banks or MFIs own research studies cannot be considered as independent or unbiased research as principal agent problems arise (Ross 1973): Hence, all data and sources, reviews and bulletins, trends and coherencies must be independently re-elaborated. An external assessment of the ECB's research was conducted only as 'invited' remittance work for the ECB (ECB 2015b).

For example, the ECB has reviewed its own conduct of MPs since 1999 (ECB 2011a): it concludes its outstanding performance until today, despite all economic shocks. This research review is going to uncover the true performance on prices and GDP in an independent way. The ECB also claims that there is 'high confidence', and that the markets have 'faith in the ECBs determination' to maintain price stability (ECB 2011a), in the medium term. However, the recent devaluation of the Euro against the Dollar has much increased the factor costs for import-sourcing industries and partly also for import-intense consumption. The need of the expanded asset purchase program (APP) and the Euro Crisis have also caused reasonable public doubts on the sustainability of the Eurosystem. Economic stabilization, job market trends, GDP and investment targets post FC are also 'only insufficiently achieved'.

Besides the overwhelming amount of own central bank research there is also some independent research: The majority of all comprehensive review works that systematically research monetary trends and developments in the EMU are only spanning data from 1980 till 2003 (Angeloni et al. 2001; Issing 2001; Ehrmann et al. 2001; Peersman & Smets 1999; Cassola & Morana 2004; Faust et al. 2001; Gerlach & Svensson 2003; Ehrmann et al. 2003; Peersman 2004; Clausen & Hayo 2005; Mojon et al. 2002; Chatelain et al. 2002; Gaspar et al. 2001; Angeloni & Ehrmann 2003; Sander & Kleimeier 2004; Aarle et al. 2003; Angeloni et al. 2003; Welfens 2001; Müller 2003; Cornelius et al. 2000; Meeusen 1999; Masson et al. 1997; De Haan 2005; Pelkmans 1998; etc.). Most are all published around the turning millennium. The majority of reviews don't cover the important recent trends in the EMU.

'Biased' publications associated with the ECB or ECB affiliated authors have revealed a decline in the money multiplier, an increase in the pass through spread, a one year delayed effect of interest rate changes on prices and economic activity, and a half year effect of a changed monetary base (Peersman 2011; ECB 2015b). Stylized facts in the euro area seem to resemble those of the US Federal Reserve System, such as aggregate monetary and real variables, and only some specific deviations in disaggregate loans and deposits are found (Giannone et al. 2012). Many 'snapshots of ECB research' exist that do not try to reveal causes or efficiencies but represent 'detailed snapshots of trends' (ECB 2015b; ECB 2015a).

There is one independent research review that also reviews the EMU but again only from a central bankers perspective (Cecchetti & Schoenholtz 2010): it separately discusses HICP, G-Bonds, GDP, yields, and current accounts trends. Additionally, only few independent books have been published about the topic: Although very interesting works, most of them clearly

have a different focus than this analytical review here and only secondarily cover, review or analyze the main coherencies of the monetary trends and MP transmission in the EMU, nor do they try to evaluate the efficiency and effectiveness of MP, or do they try to reveal the functioning of the MS and its causes - the most important part of MP research (Görgens et al. 2014; Hamori & Hamori 2014; Mercier & Papadia 2011; Haan & Berger 2010; Beblavý et al. 2011; Tamakoshi & Hamori 2015; Ehrig et al. 2011; Tsionas 2014; Hummel 2013; Bitzenis et al. 2014). But they are informative of how MP is still taught today.

Several works have researched the influence of the US MP on EMU including its MTC mechanisms that act via the Fx rate, commodity prices, short-term interest rates, and the trade balance, among others (e.g. Boivin et al. 2008; or Neri & Nobili 2010). Until 2009, the pass-through (PT) has been correctly reported as inefficient (Blot 2013), but inefficiency was not correctly estimated, termed ('a not complete PT'), nor concluded appropriately: PT-inefficiency is of course much higher than the sole difference in PT - a very commonly found but unacceptable 'scientific flaw' of MP research: inefficiency always must be estimated or concluded. This most relevant study also correctly tests for homogeneity in the EMU and finds - also in line with this study - persisting sub-optimal features (Blot 2013).

Another study finds a significant relationship between the major monetary aggregates, interest rate and economic activity (Kapounek 2010). Furthermore, 'money exogeneity' could only be found for the monetary aggregate M_1. 'Money endogeneity' hypothesis was verified for money aggregate M_2 and M_3 (exogeneity was rejected at 5% significance level) (Kapounek 2010). The causality was proposed to stem from economic activity that pulls the money demand and then supply (Kapounek 2010). Some interesting but basic and preliminary models are published for the Eurosystem, e.g. different types of New Keynesian DSGE models (Chen et al. 2014), but they also cannot provide a comprehensive understanding or modeling of the real developments and still serve only specific basic research questions.

In summary, an analytical review that provides the 'big picture of the monetary euro area trends still remains much elusive. Most related books and reviews have only partially covered the core trends, coherencies and topics, and only very few recent reviews exist, which are also only very scarcely empirical and mainly non-evaluative. Without any doubt, evaluation of the efficiency and effectiveness is the most important part of MP research, like for any other economic or business field. The much-biased MP research of today has led to huge risky knowledge gaps. This research review sets out to begin with closing these gaps.

3 Materials and Methods

3.1 Materials, Data Sources, and Software

3.1.1 Databases and Data Retrieval

If not otherwise stated differently, data was extracted from of the statistical data warehouse (ECB 2015c) of the European Central Bank (ECB) or Eurostat (Eurostat 2015) for the euro-area-19 (changing composition), or euro-area-18 (changing composition), or world bank (WB 2015), or Fact Book (CIA 2015) and was processed, standardized, normalized, and chronologically time adjusted (to achieve compatible and complete data with fully matching time data) with corrected mean and moving averages. A huge amount of additional information of database sources and statistical methods for all figures is given in the Appendix (see chapter 6 and 6.3). ECB sample design was adapted for the title pages. Software tools are given in the next chapter (3.1.2) and statistical methods are given in section 3.2.

3.1.2 Software Tools

Microsoft Excel 2000 (2007) - also based on (Griffiths 2007), Microsoft Word 2000 (2007), Microsoft PowerPoint, R (3.1.3), Mendeley Desktop Reference Manager (1.13.8, Mendeley Ltd., 2015), Origin, Chrome Internet Browser, Google and Google Scholar searches, NBER, SSRN, Hidden Markov Chain Probability Modeling was performed using the Microsoft Excel platform and ModelRisk (Vose Quantitative Risk Analysis) and Excel, Microsoft PowerPoint, Gretl, Gauss-Markov modeling was further processed with Microsoft excel (2007), semi-quantitative IS-LM-ADAS modeling was performed using Microsoft Excel 2000 (2007), Business Intelligence Microsoft SQL server 2008 excel data and predictive analytics, X-12-Arima model tool for excel, Excel analysis tools (regression, multivariate regression, statistics and diverse correlation formulas), Microsoft PowerPoint 2000 (2007). Image processing was performed with Macromedia's Freehand and Adobe Photoshop CS4. Econometric functions were visualized with Online-Physics' 3D Function Blotter (Live-Physics.com).

3.2 Statistical Methods

3.2.1 Arithmetic Mean, Standard Deviation, Standard Error of the Mean (SEM)

Arithmetic mean (measure of central tendency, the mean of n values of a): $\hat{x} = \frac{1}{n}\sum_{i=1}^{n} a_i$

Friedrich Bessel's Corrected Sample Standard Deviation (SD): $SD = \sqrt{\frac{1}{(n-1)}\sum_{i=1}^{n}(x_i - \hat{x})^2}$

Standard Error of the Mean $SEM = \frac{SD}{\sqrt{n}}$; Variance (VAR) $VAR = SD^2$

3.2.2 Pearson's Correlation Test and Linear Regression Analysis

Statistical PPMCC Analysis (Pearson's Correlation Coefficient Studies):

Dependency, as a linear association of two individual data sets, was assessed in Pearson's product momentum correlation coefficient of each array of data (X, Y), only in standard two-dimensional setting, and according to the formula:

$$Dependence\ R_{x,y} = \frac{\sum_{i=1}^{n}(x_i - \bar{x})\,(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})}}$$

Formula 26 PPMCC - Pearson's 2D Product Momentum Correlation Coefficient

Entry: x, y: arithmetical mean of the samples, R: Pearson's R (correlation coefficient)

Coefficient of Determination of Regression Analysis:

$$R^2 = 1 - \frac{\sum_{i=1}^{n}(Y_i - \hat{Y}_i)^2}{\sum_{i=1}^{n}(Y_i - \bar{Y})^2}$$

Formula 27 Coefficient of Determination of Regression Analysis

Entry: $\bar{Y}: arith.mean\ of\ sample\ \hat{Y}_i: estimated\ regression = \hat{a}_o + \hat{a}_1 x_{i1} + \cdots + \hat{a}_z x_{iz}$

Linear, logarithmic, and polynomial regression analysis were performed according to common standards to reveal two-sample dependency as coefficients of determination.

3.2.3 Stationary VAR Analysis

Stationary VAR analysis (vector auto-regression analysis): if stationarity was not given (via regression tests) it was derived via the difference of incremental time series steps resulting in N-1 data points, or linear trend fit for dynamic sample based chain-rule forecasting methods (Theil 1966; Sims 1980; Davidson & James 2004) based on time lagged data intervals. A VAR structure to model time perseverance of a vector (y_t) of i time series for multivariate auto-regression is conventionally given by (Sims 1980):

$$Y_t = x_t - x_{t-1} : data\ input\ series$$

The basic p-lag vector autoregressive (VAR(p)) model has the form:

$$y_t = C + A_1 y_{t-1} + A_2 y_{t-2} + A_p y_{t-p} + D x_t + \epsilon_t$$

e.g. bivariate VAR(1) model:

$$y_{1,t} = C + A_{1,1}y_{1,t-1} + A_{1,2}y_{2,t-1} + Dx_t + \epsilon_t$$

$$y_{2,t} = C + A_{2,1}y_{2,t-1} + A_{2,2}y_{1,t-1} + Dx_t + \epsilon_t$$

Formula 28 p-lag VAR (Vector Autoregression) Model

Entry: y_t: vector i time series, n: VAR order number and amount of (time) lags to be included into the calculation, A_p: (n*n) coefficient matrix A, ε: error vector, x_t: exogenous vector with factor D

$$\begin{pmatrix} y_{1,t} \\ y_{2,t} \\ y_{n,t} \end{pmatrix} = \begin{pmatrix} C_1 \\ C_2 \\ C_n \end{pmatrix} + \begin{pmatrix} A_{11}^1 & A_{12}^1 & A_{13}^1 \\ A_{21}^1 & A_{22}^1 & A_{23}^1 \\ A_{n1}^1 & A_{n2}^1 & A_{n3}^1 \end{pmatrix} \begin{pmatrix} y_{1,t-1} \\ y_{2,t-1} \\ y_{n,t-1} \end{pmatrix} + \begin{pmatrix} A_{11}^p & A_{12}^p & A_{13}^p \\ A_{21}^p & A_{22}^p & A_{23}^p \\ A_{n1}^p & A_{n2}^p & A_{n3}^p \end{pmatrix} \begin{pmatrix} y_{1,t-1} \\ y_{2,t-1} \\ y_{n,t-1} \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_n \end{pmatrix} + Dx_t$$

Formula 29 Matrix Form of an n-Variate VAR(P) Model

Entry: as specified for the formula above, VAR were 'well specified' and included enough lags to bypass background autocorrelation

3.2.4 Residual and Data Autocorrelation

Autocorrelation was assessed for VAR analysis, regression analysis, and multivariate regressions, or additionally and newly to characterize the real-world macroeconomic data sets with respect to business cycle effects (Andrews & Monahan 1992; Newey & West 1987).

3.2.5 Engle's ARCH (Autoregressive Conditional Heteroskedasticity) Test

ARCH test was performed to measure if the variance of the error (of VAR models, and regression time series data) displays autoregressive behavior. Autocorrelation in the squared time series - i.e. conditional heteroskedasticity is measured for all models (Engle 1982; Andrews & Monahan 1992; Newey & West 1987). Let the first order auto-regression be:

$$y_t = A_{nn}^p y_{t-1} + \varepsilon_t; \quad V(\epsilon_t) = \delta^2$$

The conditional variance of a one-period forecast (E), V(yt, y_{t-1}) depends upon past information. The conditional mean of $y_t = Ay_{t-1}$, the unconditional mean is zero. The conditional variance of $y_t = \delta^2$, the unconditional variance of $y_t = \delta^2/(1-A^2)$.

The conditional variance of y_t is thus:

$$V(y_t; y_{t-1}) = (\varepsilon_t; y_{t-1}) = E(\varepsilon_t^2; y_{t-1}) = \delta_t^2$$

Hence, the null hypothesis of Engle's ARCH autocorrelation of the squared time series is:

$$y_{t=0} = \alpha_0 = \alpha_1 = \alpha_n = 0 \;\; y_\alpha: e_t^2 = \alpha_0 + \alpha_1 e_{t-1}^2 + \alpha_m e_{t-m}^2 + w_t \;\; ; \;\; e_t = y_t - \hat{y}_t$$

Formula 30 Null Hypothesis Test of Engle's ARCH Autocorrelation of Squared Series

Entry: V: variance, y_{t-1}: conditioning variable, y_t: random variable from conditional density function, w_t: white noise error process, ε_t: innovation process with mean zero ($y_t=\varepsilon_t$ + cond. mean of process), α: regression coefficients [for autocorrelation in the squared residuals of the time series]

3.2.6 Student's T-Test (W. S. Gossett T-Test)

The scientific 'signal-to-noise metaphor' was assayed based on the Gossett's T-test formula:

$$t = \frac{\hat{x}_1 - \hat{x}_2}{\sqrt{\frac{VAR_1}{n_1} + \frac{VAR_2}{n_2}}}$$

Formula 31 Basic Formula of the Gossett T-Test for a Signal's Confidence Interval

Entry: VAR_i: variance, n: amount of measurements, x: arithmetic mean of population

3.2.7 Net Present Value (NPV)

$$NPV_i = -C_0 + \sum_{t=1}^{T} \frac{C_t}{(1+r)^t} = \int_{t=0}^{+\infty} (1+r)^{-t} r_t dt$$

Formula 32 Discrete and Continuous Riemann Net Present Value (NPV) Formula

Entry: $-C_0$: initial costs of change or investment, T: number of periods, t: time of the cash flow, r: discount rate, C_t: net cash flow at time t, dt: time period of measurement (viewed as continuous), r_t: rate of cash flow per time

3.2.8 MCI (Monetary Condition Index Formula)

The MCI is based on (Ball 1998; ECB 2015b): it is adjusted as the weighted average of the real short-term interest rate (r) and the real effective exchange rate (Fx) to their value in a base period (1999). The weights (6:1 for r:Fx) stem from OECD interlink model (Blundell-Wignall et al. 1984), of a time span of two years.

$$MCI_t = \frac{6}{nr_0} \sum_{t=1}^{n} r_t + \frac{1}{nFx_0} \sum_{t=1}^{n} Fx_t$$

Formula 33 MCI Formula (Monetary Conditions Index Formula)

Entry: MCI: Monetary condition index, n: amount of measurements, r_0: real interest rate at reference period (1999), Fx_0: real effective exchange rate at reference period (1999), n: amount of moving average interval time points, t: time, ECB version of the MCI index

4 Analytical Research Review

4.1 A General Analysis of the Monetary Eurosystem

Today's MPs and MTs are strongly influenced by two major economic schools of thought (see 2.4.8): Keynesian Economics (see 2.4.6) (Keynes 1930; Keynes 1936; Clarida et al. 1999) and Monetarism (Friedman & Schwartz 1963; Friedman 1968; Fisher 1930) (see 2.4.7).

These two theories offer some dichotomy and a different focus, modeling and weighting (see 2.4.8) of variables. Both are predicated upon the Quantity Theory of Money (QTM) but use it in different ways: Briefly, monetarists see a 'major' direct relationship between money and prices, at constant velocity, or prioritize price stability, and QTM. Keynesians see more factors dynamically at work and prioritize output and employment in MP strategies.

As QTM still represents the core of all monetary theories (MT) it is of first importance to apply the neoclassical QTM formula (see 2.3.2) to the case data of the EMU from 1999 till 2015: Hence, this chapter analyzes the monetary aggregates, the velocity of money, output and price levels that are all part of the QTM formula and serve in the evaluation of MP and the monetary system (MS). Interrelations and correlations are derived and a VAR model forecast is provided. Real money balances, used by both schools, and the offsetting item of debt formation, also in two extreme country cases, are reviewed. In general, the most basic trends, dependencies, and factors found are also the most important and relevant for MP.

4.1.1 Inflation, GDP and Money Growth, and its Forecast for the Eurozone

The ECB primarily aims at maintaining price stability of close, but below, 2% in the medium term. If this refers to the EMU's entire 16 years then the ECB is in fact on target with slightly below 2% of price increases on average, using its own HICP 'inflation targeting' measure. However, if different time intervals or measures are chosen, the result can look different.

The annual volatility of inflation clearly has overshot its target and spans: -0.5% (in 2009, and 2015) or 4% (in 2000 and 2007). This is a difference of 4.5% in range (see Figure 3). Although these were relatively moderate and very temporary price shocks, it can be estimated that this volatility had an impact on the real economy, causing a loss of GDP growth [ca. 0.15%], albeit this effect is still marginal according to recent empirical research (see 2.1.4). The growth rates inter-correlate and reveal their interacting dynamics since 1999 till today. Statistical stationarity can be shown for the data. Correlation results reveal a dependency of inflation on monetary aggregate M_3 (R=0.39), for GDP and M_3 (R=0.3), and GDP and HICP

(R=0.32) at monthly interval-resolution (see Figure 3). VAR (vector auto-regression) and multivariate regression analysis (Sims 1980) confess that the dependency of HICP on M_3 is highly significant ($p<10^{-6}$) c.p. if GDP's effect is omitted, and GDP depends on both M_3 and HICP. Importantly, a new sub-division of inflation could hereby be arithmetically found in the function of the respective regression models, probably for the first time in MP research: (I) Monetarist inflation via the quantity of money (27%) and (II) 'EMU background inflation' (ca. 63%; ca. 1.3% + $0.1M_{3,growth}$): inflation independent of M_3 money and GDP growth, and (III) Keynesian inflation via output and velocity and other effects (only ca. 10% in net).

The results are highly relevant as they unveil that Monetarism's 1:1 effect of (legal) money on prices is not the case in the EMU - uncovering 'fractional reserve banking inflation' (FRI): 'money and leverage that is illegitimately and constantly recycled and created by MFIs' driven inflation. The p-values of FRI background inflation are outermost significant (Formula 34). Although the regression cannot explain much of the monthly volatility, it is accurate about the FRI constant and gives a rough picture of the role of M_0, M_3 and (chain-linked) GDP: contrary to all Economics textbooks, Monetarism, and Keynesianism, the role of M_0 is clearly and definitely 'not significant' in several regression models (but still highly significant in its background inflation constant). This is because of the more technical role of ECB legal tender in comparison to the much higher volumes of multiplied non-legal money (here e.g. M_3 consists of only 15% M_0). M_3 is more relevant for inflation, has a highly significant background FRI inflation constant, and on average explains only 27% of inflation. Thus, most inflation must be FRI-caused, and is a result of liquidity re-leverage and re-cycling, not M_3.

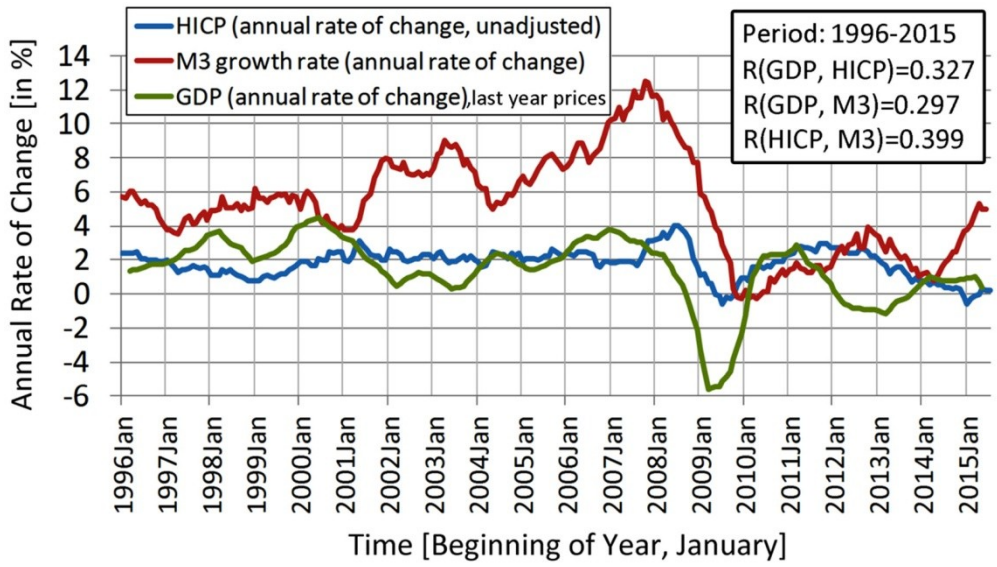


Figure 3 Monthly Annual Growth Rate of HICP, M_3, and of GDP (Moving Average)

$$Inflation = \mathbf{1.87}_{\boldsymbol{\alpha}} + 0.014M_0 = \mathbf{1.26}_{\boldsymbol{\beta}} + 0.115M_3 = \mathbf{1.24}_{\boldsymbol{\gamma}} + 0.12GDP + 0.09M_3$$

$$\boldsymbol{p - value\ of\ (FRI)\ background\ inflation\ constants\ \alpha, \beta, \gamma}:$$

$$\boldsymbol{p(\alpha) = 5.7 * 10^{-71},\quad p(\beta) = 5.5 * 10^{-22},\quad p(\gamma) = 8.4 * 10^{-23}}$$

Formula 34 Derivation of EMU Background Inflation (FRI) using Regression Analysis

Entry: Red: constant background inflation (independent of M_3, GDP, M_0), p-values for variables (M_0)=0.45, p(M_3)=3.6*10^{-9}, p(GDP)=1.8*10^{-5} and p(M_3)=4*10^{-6}; R low due to monthly-noise data

EMU money grows faster than inflation as it does not represent the full amount of all real EMU money: in the last 16 years $M_{1,2,3}$ grew approx. 5-7% p.a., while M_0 8% or up to 15%. Only if the real money volume or velocity (resulting in a similar situation for MFIs in fractional reserves) is higher, a growth percentage in M_3 would in fact be a much lower growth rate of a higher and hidden money volume [7% would be in fact be 2% leading to 2% inflation, which is exactly the inflation rate of the EMU]. This is incontrovertible evidence that huge amounts of additional money must exist or flow. This money is withdrawn from dynamic cash flows of MFIs, stored as private property, and escapes all M_3-statistics of MFIs.

Astoundingly, these basic results can be even claimed a world break-through of MP research, as no other research has found this technically simple coherency. It requires more attention by the media, follow up research of the details, and monetary reform (see 5.2).

The financial crisis (FC), in 2008/2009, and the Euro sovereign debt crisis (EC), which began in 2012, could in fact be a direct effect of such an uncontrolled way of private money creation. Until today, such a steady potential massive financial fraud is not known or prohibited. The US-EMU-FRI-driven global FC has had a deep impact on the apparent growth rate turbulences (Figure 3) of GDP, M_3 and HICP. The ECB had to manage price re-equilibration and economic and financial sector de-escalation, GDP, and a new risk: 'banker's bank-runs'.

Nonetheless, pertinent monetary-economic shock waves still seem to persist - resulting in a 'deflationary scenario' today in 2015. This is likely to be also a result of the FC and EC stabilization policy, the new level of EU-wide austerity, global price referencing ('global pricing'), normalizing energy (e.g. oil, gas), IT and 'communication services' prices (for all inflation sub-indexes see 6.1 Figure S1). Still, in comparison to past EU trends and historic inflation in economies world-wide (CIA 2015; WB 2015), the EMU indeed possesses robust price stability even in difficult times of three crises (world inflation in 1995: 15%, 2000: 5.1%, 2005: 3.8%, 2010: 3.7%, 2014: 4%, developed countries: 1.4%, developing countries 5.4%), and also admittedly, MP generally can't optimally assure prices in the short-term (Ball 1998).

But the performance of the ECB's 'inflation targeting' (see 2.4.3) of the ECB/Eurosystem can also be critically assessed regarding its target series definition (point 1) (Haldane 1998), besides the target level: e.g. when the Euro was introduced in 2002 the population of some stage III countries like Germany experienced a by far higher rate of inflation (up to 25%) than was recorded by the HICP: only 3% were officially admitted. The media termed the huge discrepancy unanimously the 'German felt inflation'. At that time a new consumer price index was developed known as Brachinger's IWI inflation index (Destatis 2015) that perceived almost 10% price increases from 5-2001 to 6-2002, and 7% on average, which is four-fold higher than the ECB's official HICP rate of the same time (see Figure 3). Thus, an alternative and competitive price index is needed, and the mandate definition medium term needs to be specified. The lack of reliable or 'optimal inflation indices' and 'segmented sub-indices' is still a global challenge for macroeconomics (Mankiw 2014). Only the HICP is accepted by the EU and compiled and controlled by Eurostat/Commission (EC 223/2009).

Now, this monetary survey shall provide an overview of key facts and stats: starting with the nominal trends of all monetary aggregate (see 2.2.3) from 1999 till 2015 (see Figure 4). The monetary aggregates M_1-M_3 grew in an almost linear fashion from 1980 till 1999 when the Euro was introduced. From then on, nominal growth of the higher monetary aggregates became more non-linear. A slight exponential growth in the quantity of money was halted after the appearance of a $M_{2,3}$ bubble in 2008 at the onset of the FC in Europe (Figure 4).

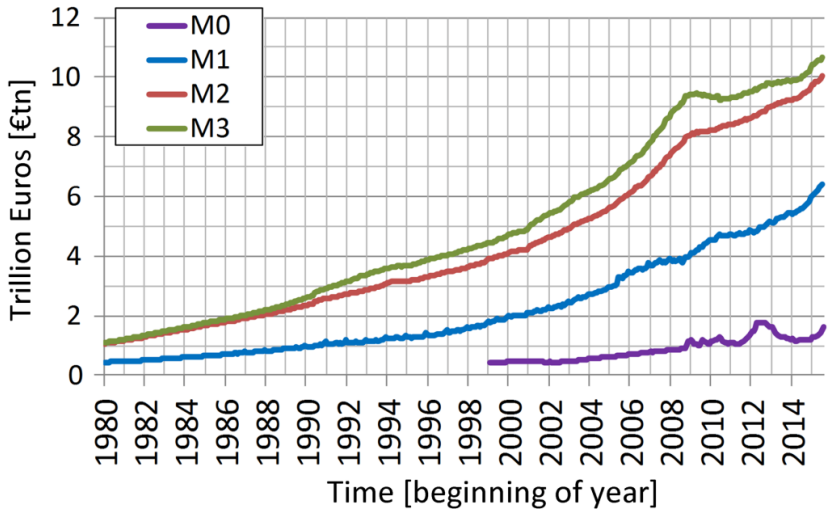


Figure 4 Money Aggregates M_1, M_2, M_3, and Monetary Base M_0 in the Euro Area

Noteworthy, in 2008 at the peak of the $M_{2,3}$ money aggregate bump, HICP inflation had also soared before the FC swashed over to the EU, coinciding with a fall in all growth rates. The FC-data also confirms, analogous to a macroeconomic intervention experiment, all above

correlations of interdependent growth rates. Later they returned to a more natural rate like in a modeled shock-response curve. During the FC the growth of M_2 and M_3 stagnated until ca. 9-2011, while the natural trend of M_1 was slightly less disturbed, and M_0 shows peaks and many unconventional, artificial bursts that almost doubled its amount, e.g. in 2012 and late in 2015 (Figure 4): this reveals that the growth of legal tender is not normal, or natural. Only a system that is in reality not MT-conform could require an unnatural M_0 growth rate.

The bubble of M_{2+3} aggregates also represent an 'ominous coincident' to the FC timeline: this atypical growth of $M_{2,3}$ speaks for a possible EMU MFI involvement in the FC, while liquidity preference for legal tender remains relatively low: ECB 15.2% vs. Fed: 22.7% of GDP (M_0). During the FC+EC the growth and volatility of M_0 was much altered by ECB operations. Although 'Divisia analysis' (Barnett 1980) indicate that the fluctuations of 'money's transaction services' are slightly less pronounced for $M_{1\text{-}3}$ (Dravas 2014), they still represent the same curves and kinetics, also as simple-sum, and also if corrected for aggregate heterogeneities: thus monetary growth might have had a role in the FC, or economic down-turn.

What explains the money bubble preceding the FC? The European economy was growing and 2008 forecasts of the European Commission and ECB all indicated future growth and stable prices (EC 2008): Both legitimated a more loosely ECB MP before the crisis ran rampant. For instance, between 2007 and 2009 the euro area was expected to create 4.6 million new jobs and even 7 million EU wide, due to a 'growth momentum of 2007'. Growth was predicted to fall only from 2.5 to 1.5% (EC 2008): indicators allowed for growing base money but the ECB had already lost control over the higher monetary aggregates (M_2-M_3): an increase in the MRO rate to 4% in 2008 only barely had an effect on M_3 (see Figure 4). Some month later, indicators (GDP, employment, consumption, investment, etc.) turned strictly negative and unemployment rose rapidly till 2013 in the world's deep FC recession.

M_0 strongly fluctuated in 2008 and in 2012, when it almost doubled without causing any significant effect on the monetary aggregates M_1-M_3: again exemplifying that the ECB's claimed regulatory power and influence to control M_1-M_3 via M_0 has been lost very much. These strong fluctuations provide momentum for empirical MP research to study system dynamics: they already reveal that Phillip's money creation multiplier (see 2.3.7) cannot be stable or stringent, as seen for the exogenous perturbance of M_0. Moreover, after the ECB almost doubled M_0 via programs like long term refinancing operations (LTROs), monetary aggregates even slightly decreased and the M_0 peak in 2012 also had no distinct effect. This

is fully in accordance with the previous regression results of this study, but causes deep discords with all previous prevailing MTs and MTTs, and highly necessitates a new unbigoted research based on this review to better our understanding of fractional reserve banking.

A VAR analysis of GDP, HICP, and M_3 growth rates (see Figure 3) can help to estimate future trends. A forecast for GDP growth, HICP growth, and M_3 growth using 12 month p-lags until 2016-3 is depicted in Figure 5: a slight recovery of HICP and GDP, 2% growth p.a., and the annual M_3 growth rate lingering at 5-6% p.a.. A prediction using the intrinsic forces of past trends without information asymmetry VAR-adaption [for the ECB or MFIs] (Bernanke et al. 2004) is employed here, as the natural behavior and trend of the system is to be elucidated.

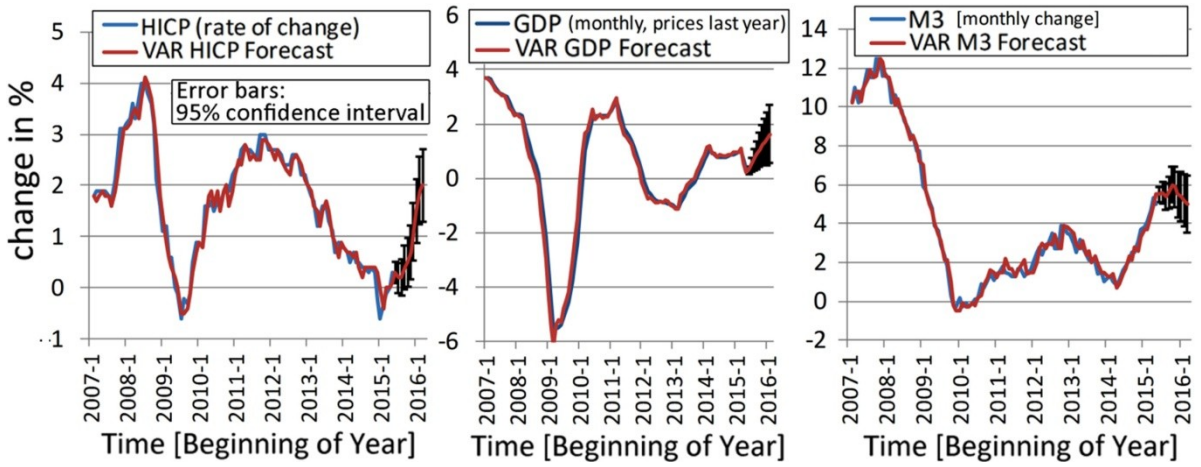


Figure 5 Vector Autoregression (VAR) Analysis of M_3, GDP, and HICP Growth Rate

A state of the art MP VAR analysis always depends on the timed resolution of the vectors used for autoregression, like in multivariate regressions. Monthly data are precise but may often exhibit autocorrelation features (for the statistical tests see chapter 3.2 and 6.3), as can be expected from unadjusted annualized monthly data. Especially GDP is influenced by the seasonal business cycle and reporting practices. Thus, a lower resolution - to even out economic business and reporting cycle dependent short-term fluctuations - and adjusted data, as well as moving averages are all helpful and covered here, and later (e.g. 4.3.4).

The monetary aggregate M_3 is still 'believed' to be an important indicator for EMU MP. To understand how it connects to output (n/rGDP) and prices (HICP) and for correlation studies, the growth patterns are shown in quarterly (Figure 6) and annual resolution (Figure 7).

Instructively, during the onset of the FC in 2008 the growth kinetics succeeded as follows: (I) GDP, then M_3 and then HICP sequentially peaked, and (II) dropped in the same order. Consumption fell in the fourth quarter of 2008 (not shown here). This was followed by a

decline in M_3 in the first quarter of 2009, a troubled financial and inter-banking market, ECB MP crisis operations, GDP and HICP growth that recovered first, and M_3 approximating its natural level again. While M_3 growth picked up recently, HICP became slightly deflationary.

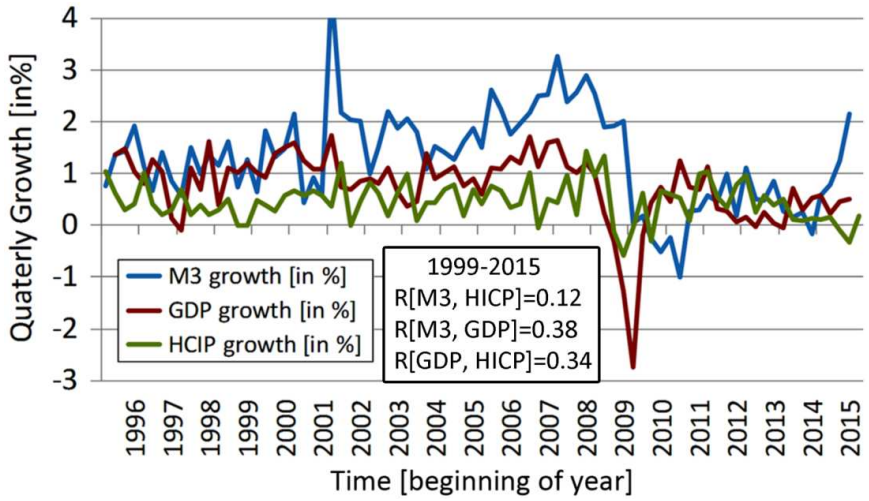


Figure 6 Quarterly Growth Rates of HICP, GDP and M_3 in the Eurosystem, 1995-2015

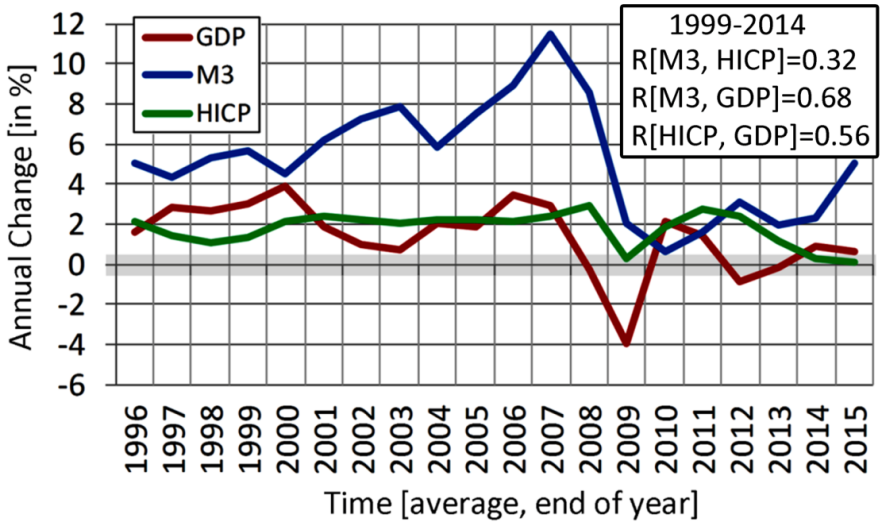


Figure 7 Yearly Growth Rates of HICP, GDP and M_3 in the Eurosystem, 1995-2015

The drop in GDP growth rate was accompanied by a 'negative press' about economic prospects, which intensified in 3Q-2008, on September 15th, 2008, when US Lehman Brothers filed chapter 11 bankruptcy and the Dow Jones has slumped -788 points, while the consumer sentiment indices reached all time lows in the US and three month later also in the EU in January 2009 (consumer confidence index; EC, 2009). The following logic seems to apply: the entire economic prospects have led to more pessimistic broad-sense business expectations, which in turn affected prices to avoid a crash in quarterly sales figures, which diminished credit-worthiness and diminished M_3 and hereby worsened the crisis.

In the three correlation studies (see Figure 3, Figure 6, Figure 7) the time resolution (data grouping, or arrangement) has always had a respective impact on the Pearson's Correlation Coefficients (R), which are depicted in the self-explanatory figures. At lower time resolution R is higher due to less noisy data series with less business cycle dependent autocorrelation.

MP today is still influenced by Monetarism and its priority of 'inflation targeting'. In fact, the relationship of 'money and prices' had already changed, when the Monetarist Friedman obtained his Nobel Prize in 1976: money began to grow faster than inflation, and subsequently money (US$) grew also faster than inflation plus output combined. As mentioned, the same phenomenon of a 'monetaristic discrepancy' can also be seen in the euro area by simply comparing the growth rates of money, inflation, and output. This phenomenon is only explainable by fractional reserve credit methods that secretly re-use extrinsic liquidity.

The assumption of a constant velocity - the view of Monetarists like Friedman does not oppose the view of the Monetarist Fisher, who claims a non-constancy of velocity, due to the following reason: technical the velocity of money should be almost stable for the majority of people and non-MFIs - if the right amount of money is known (and striking evidence was presented here that it must be much higher). However, when Fisher used his QTM he predicted that velocities must fall - as he was only using the reported money aggregates, or TA that never can be fully assessed (they could be only fully assessed in a full-reserve system). Hence, paradoxically, depending on what is meant with 'money' both Monetarists are in fact approximately right - although they have opposing positions. Fisher is again more precise, as velocity must decline ultimately, also in his TA-based QTM model, but the true total amount of money and TAs cannot be measured comprising all property and assets changing hands today. Today's complexities of 'financial intermediation' make it almost impossible. A full-reserve system could easily solve this otherwise insolvable problem via IT. Hence, empirical MP research has to use the reported fraction of money or TAs for QTM models of growth rates of GDP, HICP and monetary aggregates $M_{0\text{-}3}$ (see Figure 8). And even here - so without using the total amount of money but only $M_{0\text{-}3}$ - it still becomes immediately obvious that money still grows faster than QTM allows - explicable via 'velocity identities'. The real-world reason is however a subdivision of money of (A) non-MFIs (B) MFIs, and (C) non-MFIs that profit from unilateral MFI cash-flow, or privileged and selective debt relief, hidden or not. Only (A) non-MFI money is reported in the aggregates. All additional money flows and fully escapes a statistical assessment, once converted into a non-monetary asset.

Coherent, the velocity must be much higher like the total amount of money used for TAs. Refutation of the 'constant velocity assumption' of 'income-QTM' can be easily visualized using aggregated growth factors for QTM (see 2.3.2): by simply depicting monetary aggregate, HICP, and GDP growth (see Figure 8) the 'monetaristic discrepancy' becomes apparent. In the Eurozone, like in the US, starting from 1999, the quantity of money grew faster than HICP, real GDP (not shown), or nominal GDP. Legal tender and virtual credit also grew faster than the sum of the growth rates of output and inflation together (see Figure 8).

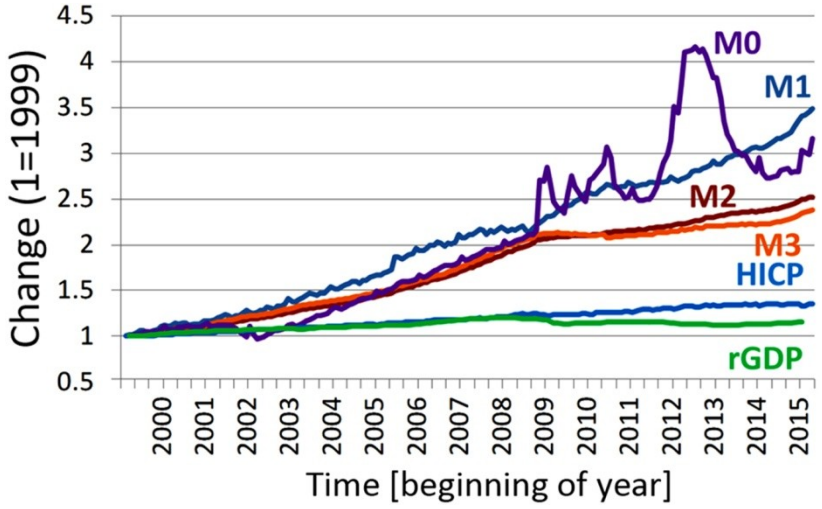


Figure 8 Money (M_0-M_3) Grows Faster than Inflation plus rGDP in the EMU

As a direct consequence and implication, a new understanding of QTM and velocity of money is to be found: (I) the real quantity of money, in fractional reserve banking, is not known, and either the velocity of money or money must be much higher than reported by the ECB and MFIs. (II) QTM has to be treated as identity formula, which is also an equation, but as long as the velocity (Morgan 2006) or real amount of money cannot be correctly measured it only provides identity-information for a sub-fraction of money; eminently, a mathematical peculiarity of QTM is indeed that it first becomes a true scientific equation when the total amount of money and TAs is found. (III) Velocities of money are a sum of (A) regular non-MFIs, (B) MFIs, and (C) non-MFIs profiting from MFI CFs or 'debt release'.

The simplified and dynamic version of neoclassical QTM states the following relationship:

$$\Delta\%M + \Delta\%V \cong \Delta\%Y + \Delta\%P, \quad or \quad logM_t + logV_t \cong logP_t + logY_t$$

$$or\ more\ simple\colon\ M_tV_t = P_tY_t$$

Formula 35 Income and Growth Rate QTM Identity Formula

Entry: M: quantity of money, Y: output, P: price level, t: at time period t

According to QTM (Formula 5) any effect is counterbalance by one of the three other identities. As not all money is known velocities and monetary aggregates are only indicators, and the true velocity cannot be assessed (identity formula) - meaning also that all stock data are not fully informative as the power of money is its use in TAs: only found in CFs.

In consideration of the income-QTM data the income velocity of non-MFI money must have changed considerably: here, money is not exogenous and the velocity of money is not constant enough to be neglected. In fact, the velocities of money are 'real-economy-indicative'.

4.1.2 Velocity of Money in the Eurozone and its Impact on the Real Economy

The income velocities of money (based on GDP-TAs) have changed considerably in the EMU from 1999 to 2015. This represents a break with Monetarist MTs and MP models that do not include these factors, and is going to be studied in more detail here, e.g. in 4.1.2. Monetarist's velocity of money mainly changes due to technical banking rules and alike. One day, Monetarist could turn out to be right, when the total quantity of money is found. But most likely I. Fisher is again right: as the storage function of money rises, velocity must fall. Exact velocity measures are difficult to find (Morgan 2006) and can only be determined if M, TA, or V is correctly measured that is totally infeasible in fractional reserve MSs (4.1.1).

QTM states that MV=PY. Hence, in the EMU, the non-MFI real-economy velocity (identity) must have fallen to compensate for the disproportionate increase in 'real economy money' (not purely real economy money due to MFI-CF-non-MFI money that might be a relatively stable stock and flow). This diminishing 'non-MFI' income velocity of money is predicated on domestic income (or TAs) and represents an individual function of the specific monetary aggregate $M_{1\text{-}3,}$ respectively (see Figure 9). The optimal velocity is indeed economically of big importance owing to its relative effect of PP on output (GDP). Multiplying the velocity of all monetary aggregates ($M_{1\text{-}3}$) with their respective money multiplier ($m_{1\text{-}3}$) yields v_0 (Sperber & Sprink 1990), or real v_0: how much output an amount of money yields (as ratio).

$$v_i m_i = v_{1,2,3} m_{1,2,3} = \frac{nGDP}{M_i} * \frac{M_i}{M_0} = E_M = \frac{YP}{M_0} = \frac{nGDP}{M_0} = v_0$$

$$v_{i,real} m_i = v_{1,2,3,real}\, m_{1,2,3} = \frac{rGDP}{M_i} * \frac{M_i}{PM_0} = E_{M,real} = \frac{Y}{M_0} = \frac{rGDP}{M_0} = v_{0,real}$$

Formula 36 Product of Velocity and Money Multiplier (v_0, real v_0)

Entry: M: quantity of money, v: velocity, m: money multiplier, E: money efficiency product

Velocities represents a 'real economy indicative' ratio of the economy's output over MFI reported money stocks, or: an output index ratio a money stock 'yields' (see Figure 9). Nominal velocities v_0-v_3 are strikingly declining, an effect that is quantifiable and requires interpretation. This holds also true for real velocity of money depicted here as a newly introduced price-adjusted real ratio for monetary macroeconomics (see Formula 36 and 37). The declining rates vary: velocity v_0 is most volatile for the monetary base aggregate M_0.

Volatility of v_1 is comparably low, like v_2, and v_3. The cave-ins of v_0 reflect the MP action-programs and rescue operations after the FC and the EC. Complementarily, those are reflected in the monetary base M_0 volumes as its artificial post crises pikes (see Figure 8). All velocities are not constant: velocities have fallen by almost 40-50% in only 15-16 years. Such a glaring change of crucial parameters need to be in fact accounted for in MTs/MTTs.

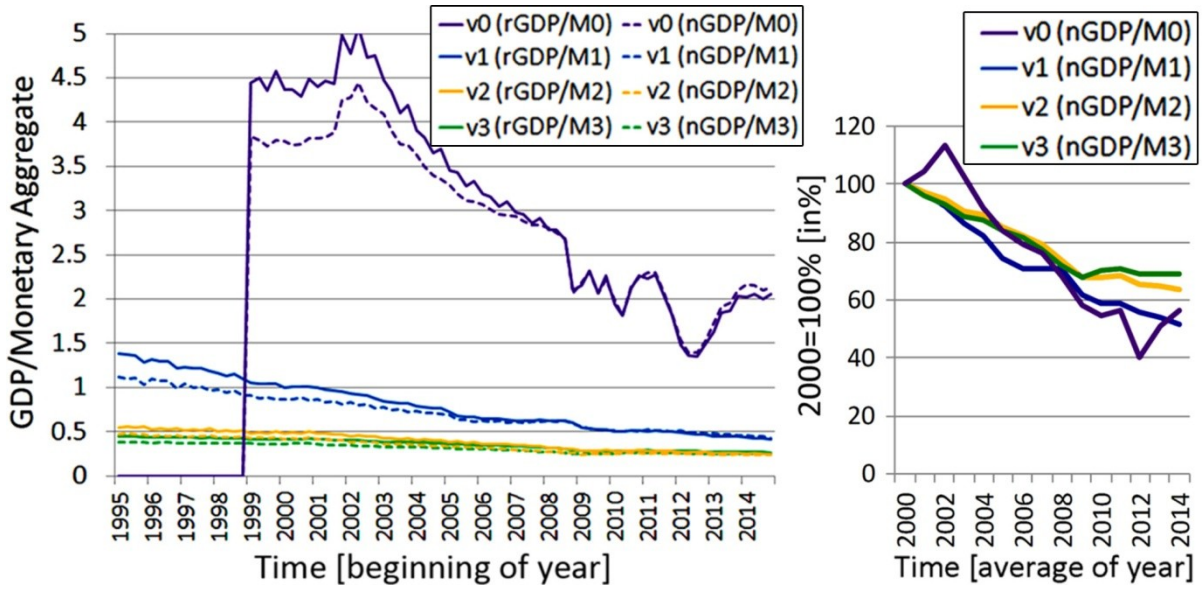


Figure 9 Income Velocities of Monetary Aggregates (M_0-M_3) and Real Income Velocities

$$Velocity\ of\ Money = V = \frac{nGDP}{M} = \frac{PY}{M} = \frac{PT}{M}$$

Formula 37 Velocity of Money as a Function of Turnover

$$Real\ Velocity\ of\ Money = V_{real} = \frac{V}{P} = \frac{rGDP}{M} = \frac{Y}{M} = \frac{T}{M}$$

Formula 38 Real Velocity of Money as a Function of Turnover

Entry (37+38): V: (income or transactions) velocity of money, V_{real}: real (income or transactions) velocity rGDP: real GDP, Y: output, T: transactions, P: price level, nGDP: nominal GDP

Declining income velocity identity-variables externalize how EMU GDP-relevant economic transactions volumes show systemic weakening since decades. In turn, the 'output relevant transactions (TA) function' of money, i.e. for real economy TAs of goods and services (and other property), has slightly fallen in relative terms (see Figure 9). Inevitably, the storage function of money must have inconspicuously aggregated disproportionately, cumulatively.

The results in Figure 9 show for the EMU that the changes in velocity of money are too strong to be fully explainable with Friedman's technical reasons as all technical changes in the banking sector in the euro area should have had an opposite effect on velocity (e.g. improved settlement procedure, less costs, etc.). Therefore velocities reveal an important unexpected other function linked to the transactional power efficiency of money, output, and GDP. The quantification using the change equation of income velocity (1999-2015) finds striking differences, as follows: $v(M_0)$: -44%, $v(M_1)$: -53%, $v(M_2)$: -37%, $v(M_3)$: -33%.

The determinant variables of the income velocity of money should have changed equally in 15 years. They consist of (1) technical, (2) behavioral, and (3) systemic features of the MS.

Per definition, money's 'transactional function' is higher in the lower monetary aggregates (see Figure 1), i.e. $M_{0,1}$ vs. $M_{2,3}$, as this money changes hands more frequently (in this QTM form of calculation). This is 'semi-reflected' in the sequential order of velocities in Figure 9.

In fact those 'lower' income velocities $v_{0,1}$ also decline faster (ca. -50%), compensated by a rising 'storage function', that is also especially found in monetary aggregates $M_{2\text{-}4}$. In line, velocity of $M_{2\text{-}4}$ has also declined to a lesser extent (ca. only -35%). The transactional capacity decreases in higher money aggregates, as the storage function increases. GDP irrelevant transactions increase (property, trading, portfolio, MFI deprivation TAs). The loss in capacity of the transactional function must coincide with a gain in its capacity as storage function. This 'semi-trend' is corroborated by recent portfolio investment and rising stock markets.

The storage function of money is on the rise whenever the time between transactions is extended. This finding should be also reflected in a second key type of velocity: the transactions (TAs) velocity of money comprising all economic transactions (see introduction 2.3.2).

As the time interval of portfolio investments is naturally longer than in real economy TAs, one has to expect a similar but less strong decline in the TA velocity of money. This sub-hypotheses is testable by simply employing an hybrid transactional composition of TA volume of the EMU (ECB 2015b). As expected, the TA velocities of money also declined from

2000 onward till 2015, but to a lesser extent (Figure 10): $v_{TA}(M_0)$: -30%, $v_{TA}(M_1)$: -39%, $v_{TA}(M_2)$: -21%, $v_{TA}(M_3)$: -15%. This validates previous hypotheses - but total TAs are missing.

If the changes of both types of velocities (v_{TA}-v_{income}) are compared we find a new indicative difference: $\Delta v(M_0)$: -14%, $\Delta v(M_1)$: -14%, $\Delta v(M_2)$: -16%, $\Delta v(M_3)$: -18%. Expectedly, for $M_{0^-3,}$ the GDP-relevant income velocity has declined much stronger from 1999 to 2014. This coherency is not an intrinsic necessity. Velocities are shrinking sub-optimally, which could be impedimental to future GDP growth rates and related increases in income. This provides the first indication and evidence that velocities are more important for the real economy than previously anticipated. They diminish not only due to technical reason, but due to 1-3.

The averages of all monetary velocities analyzed in the time of the EMU have declined by almost 34% (SEM 4%). This represents an annual rate of a -2.3% of reduction in velocity. The precise and specific annual rates of all velocities derived for the last 15 years are as follows: $v_{TA,I}(M_0)$: -2%, 2.9%, $v_{TA,I}(M_1)$: -2.6%, 3.5%, $v_{TA,I}(M_2)$: -1.4%, 2.5%, $v_{TA,I}(M_3)$: -1%, 2.2%. All velocities slightly seep away and the 'real velocities' (Formula 36-38), showing the effect in real terms, do so even stronger. Real velocities are 15-20% more shortened in only 15 years: an effect of up to -70%, which founds the big picture of the EMU's velocity trends.

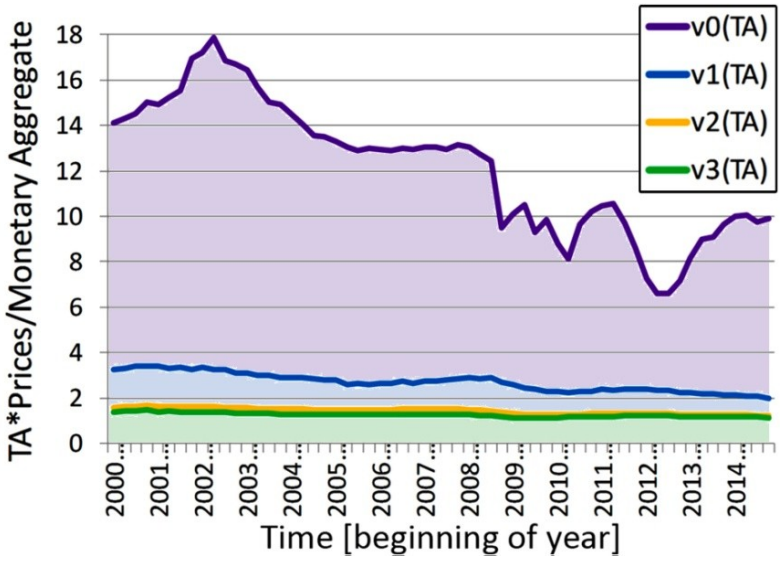


Figure 10 Transactions Velocity of Monetary Aggregates in the EMU

These trends are ambivalent: 'promising and alarming' as an ongoing decline in the velocity of all relevant monetary aggregates means that more wealth is stored in money in the EMU. On the other hand the transactional effectiveness of money declines, which is a sign of economic inefficiency and could be detrimental to future growth of real GDP, in theory: if velocity drops the relation of money and economic performance is rendered towards

more inefficiency and ineffective usage of resources and more principal agent (Ross 1973) and social-economic disparity problems, and the EMU economic circuit could be hampered. Moreover, steadily falling velocities increases also risks of a deflation, as a relatively lesser amount of the money hunts goods and services. While the international money leverage might benefit CFs of huge EMU businesses, MNCs, banks and global investors, the domestic market and SMEs might face more negative consequences: distortion of incentives, inefficiency, and deflationary potential, and thus more indebtedness in the future. Indeed, a few structural deflationary features are reported for the EMU since 2014-2015 (ECB 2015b). Figure 11 co-depicts the relative growth of monetary aggregates together with their income velocity. A growth of monetary aggregates was accompanied by a respective fall in velocity. The positive economic developments in the EMU before the crisis (EC 2008) have not had an equally positive effect on the kinetics of velocities. The symmetrical volatility of monetary aggregate on velocities indicates an 'unnatural inefficiency' of the MS, post FC and EC.

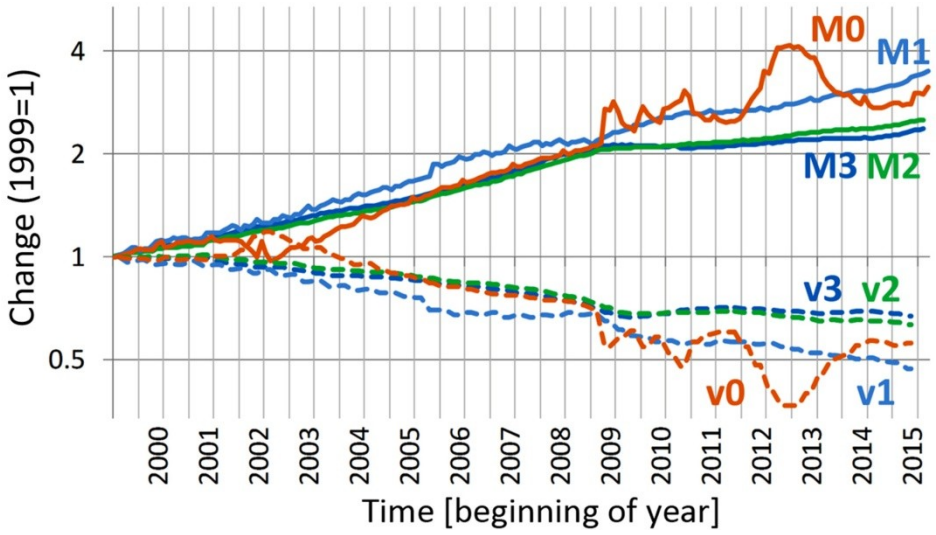


Figure 11 Co-development of Income Velocity and Quantity of Monetary Aggregate

Figure 12 provides a trend map overview of HICP and moving averages of real v_0 and v_1. As expected, the real economy's velocity only hardly affects inflation (HICP). Thus the natural recycling of money by real non-MFIs - i.e. money changing hands for economic actions - only has marginal role on inflation. Thus, it is mainly caused by MFI-related velocity (=FRI).

From 1-1999 till 06-2002 the income velocity of base money has initially increased due to a stepwise expansion of the euro as the legal currency also for daily businesses of all Europeans in the EMU (see Figure 13), a process that started in 1999. This also coincides with the pre-dot-com bubble that temporarily elevated transactions.

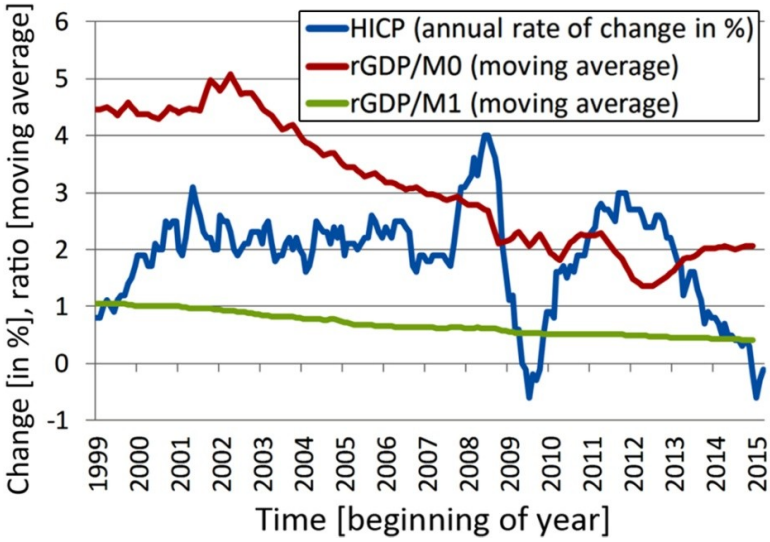


Figure 12 Velocity of the Monetary Base and Inflation (HICP index)

From then on velocity steadily and slowly declined every quarter by 2% on average (SEM: 0.3%) due to the immediate effect of faster growing money supply that real value of all transactions, until the fourth quarter (Q4) of 2008 when it sharply dropped by 23% in just one quarter (Q). Velocity of the monetary base drops slightly before the FC hit the real economy of the EMU: velocity already falls significantly in Q4 of 2008 and GDP drops stronger in Q1 of 2009 (see Figure 13). These co-developments further support the hypothesis that the velocity of money is positively related with income, output and all major GDP-related indicators, previously found in my vast correlation network study (paper available at HfWU or from the author: Intrapreneurialism 2.0, 2014, see 6.1 Fig. S17). The slavery elements of fractional reserve banking could inhibit innovation and GDP (6.1 Fig. S17). Directly comparing GDP growth rates with changes in velocity (v_0) provides a 'new view' of the monetary-economic mechanics: they can partially explain key dynamics, e.g. of the FC:

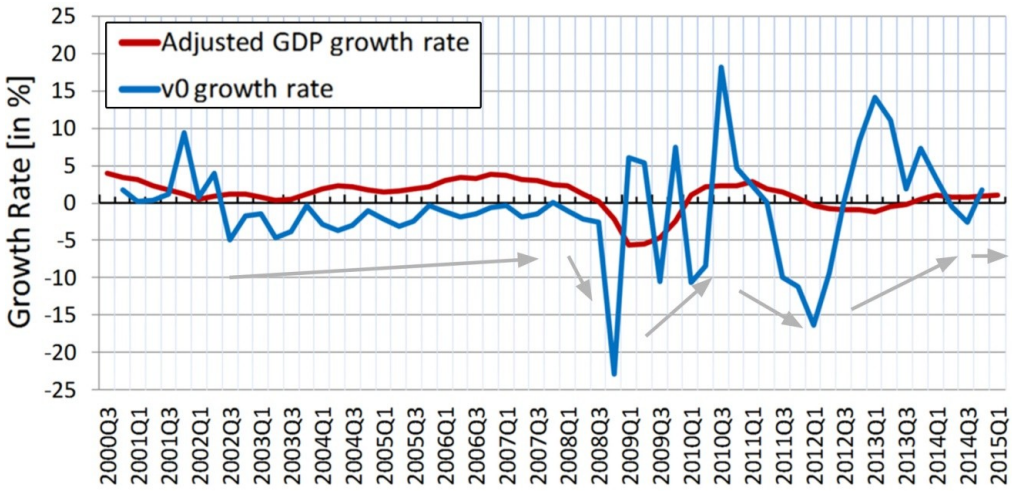


Figure 13 Growth Rate of the Velocity of the Monetary Base and Adjusted GDP

The drop in the velocity v_0 in Q_4-2008 corresponds with an aggravation of the crisis and its transduction into the real economy. Subsequently, real GDP has drop sharply and the increase in velocity corresponds with a stop of a further decline of GDP growth in the next quarter (speaking for a stronger anti-cyclic fiscal and monetary policy). These are only two snap shots that reveal a positive impact of v_0 and GDP growth rates. This dependency can also be seen throughout the entire 15 years, if looked at the 'natural trends'. E.g. till Q1-2011 the velocity has a slight positive average trend and seems to benefit GDP. And also, after Q1-2011 v_0's moving average and GDP suddenly breaks down again, coincidentally.

Although GDP is a part of the QTM identity and as such also velocity, it is important to note that the ratio of GDP over money volume is more important than previously thought. The growth rate volatility of v_0 is much higher than v_1-v_3 but the mean average of the velocity of the higher monetary aggregates describes the same effect on GDP as v_0 (Figure 14). A smaller change in % of higher aggregate has a bigger effect than v_0 due to volume.

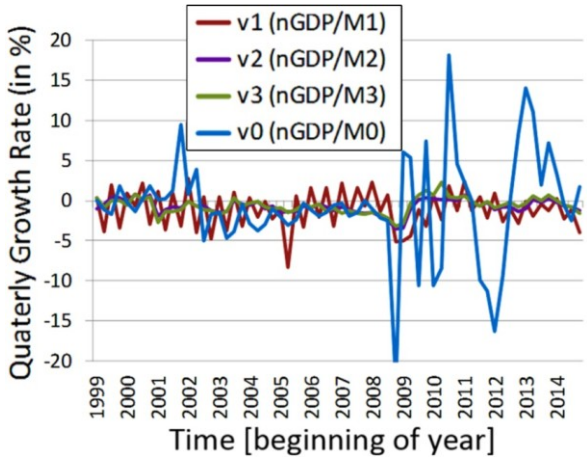


Figure 14 Quarterly Growth of the Velocity of Money in the Euro Area, 1999-2015

In summary, the growth rates of all monetary aggregates illustrate a related growth pattern (Figure 14) mainly due to their composition (see 2.2.3). The growth rate volatility increases from huge to small monetary aggregates (from M_3 to M_0) with similar natural trends. A new hypothesis is empirically deduced: velocity can be used as indicator - for a 1-2Q tow-range effect - and bears some causation on economic growth. If v_0 rises it further lifts the trend of $v_{1\text{-}3}$ upwards for as long as its 'natural rate trend' (roughly moving average) is improving (Figure 14). At same, natural velocity trends positively affect output and high debt represses velocities and thus also output, and prices and may be deflationary. This newly discovered role recommends, to MP-decision-makers, to optimizing 'velocity ratios' for real GDP and a better real economy with a higher employment level (a result of 4.3.6, see also 4.3.7).

4.1.3 The Money Multiplier and the ECB's Control over the Money Supply

The 'Money Multiplier' is another huge scientific affair of a long 'banking tradition and history' with far reaching implications for everybody and every business in the real economy (see introduction, 2.3.7). The main regulative power of the ECB is exerted by controlling the money supply and key rates for MFIs. Owning to both facts, the MS has to be seen as a designed dilemma or MFI-profiting trap: the more liquidity the MS supplies the less regulative power remains, the less limitation to MFI money creation and deprivation, and the less competitive the financial lending market behaves. The PTs can of course only a 'very weak indicator' due to the principal repayment and multiplier effect - a fact that is deliberately ignored by science e.g. Blot 2013; Paries et al. 2014). The alternative, signalizing a profound dilemma, is tight money that would raise interest rates and lower investment and GDP.

Due to this, much critique about fractional reserve banking and the money multiplier exists since a very long time (Douglas et al. 1939; Kumhof & Benes 2012; IMMR 2015). Recently, even some BIS research (Bank of International Settlement), and IMF (International Monetary Fund), and a Federal Reserve Board, among the most powerful and well-heard institutions of the financial world, have criticized fractional reserve banking and money multipliers and its overwhelming debt creating mechanisms, and the financial crises it causes. Even the BIS, the 'HQ of fractional reserve central banking' has found that the FC was caused by MFIs of many countries that have built up 'unbacked' fractional reserve banking 'on- and off-balance sheet leverage' (BIS 2011) and debt (Kumhof & Benes 2012), urging for MS reform.

All issues center on the money multiplier that is 'managerially flawed' and 'partially uninformative' in terms of what really happens in the real world of banking. It takes away the most important role of the ECB's control of the money supply and MTCs: to also efficiently and sustainably stimulate economic growth at steady prices (Carpenter & Demiralp 2012; BIS 2011; Kumhof & Benes 2012; Cecchetti & Kharroubi 2013).

Despite its devastating flaws - it is to be topically covered without scientific bias here: First, the trends of the money multiplier are going to be reviewed and analyzed. The definition of the money multiplier is also given in the introduction (Formula 14, 17): it is the ratio of the monetary aggregate over the monetary base, or simplified to: $m = M_{1,2,3}/M_0$. It is also known to be decomposable into the contribution of the currency-to-deposit (C/D) ratio and reserve-to-deposit ratio (R/D) (ECB 2011b): it indicates how much money stock is created in the respective categories of monetary aggregates by MFIs on top of the legal tender money

(M_0). [Noteworthy, MFI money deprivation cannot be measured as stocks, but in capacities of CFs and TAs, as MFI monetary assets are steadily transferred into non-MFI assets, etc.].

The growth rates of the monetary aggregates are reviewed in Figure 4: from linear to disproportionate semi-quadratic growth to weakening post-crises trends. Post FC, strong fluctuations of the monetary base (M_0) occurred that did not much impact the growth of the higher monetary aggregates - a typical lack of control of most MPs: this effect is also represented by the changing money multipliers of the aggregates depicted as m_1-m_3 in Figure 15.

The money multiplier chart of the EMU reveals the following progression: $m_{1,2,3}$ all grew from 1999-2002, from when on a deceleration begins - this much corresponds to the velocity effects reported in Figure 11 - the launch of the physical legal tender across the EMU - the increasing demand of the Euro-vehicle and holding of monetary assets, a more efficient payment and settlement system, and the ECB's more adjusted MPs for MFI competition.

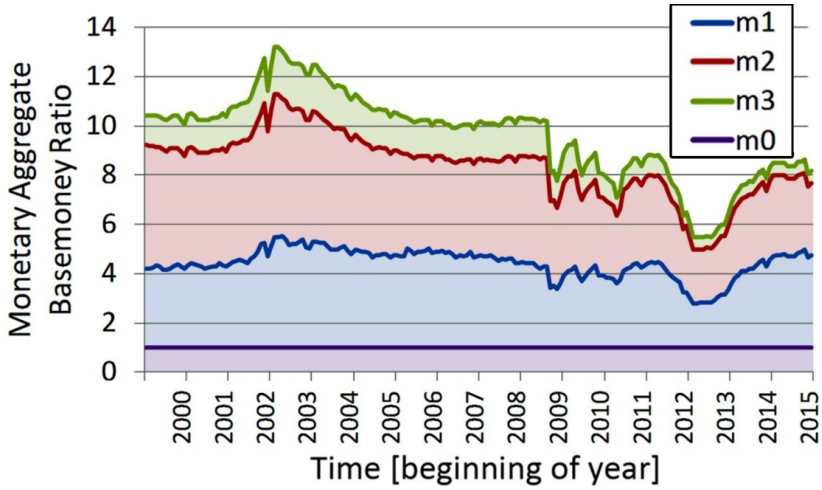


Figure 15 Chart of EMU Money Multiplier m_1, m_2, m_3 ($M_{1\text{-}3}/M_0$), from 1999-2015

After the internet bubble crisis in 2003 money multipliers had fallen until 2008, when m_2 and m_3 eventually recovered, but only for a few quarters until the FC. ECB's 'rescue packages' dropped them to all-time lows: Figure 15 shows 'lose and unnatural trends of $m_{0\text{-}3}$', which must be interpreted as non-tight and too flexible as a result of MS inefficiency and a defective bank lending channel. After multipliers had recovered, the EC again broke all-time-low multiplier records owing to excessive reserves and explosive growth of M_0. Multipliers again recovered until today but do not seem to reach their original 'natural pre-crises level' despite all much better legal and business terms for MFIs. The stringency of money multipliers with respect to MFI credit extension potential is the only way the ECB could improve the efficiency, theoretically - but this has become fully infeasible in practical terms.

The minimum reserve requirements were shifted from 2% to 1% post crises, more precisely on January 18, 2012. Although, this might have helped to push terms out of the slump, the multipliers overall performance did not improve with respect to pre-crises levels (- in fact it must have increased overall 'fraud' of fractional reserve banking due to a higher leverage).

The monthly growth rate of the monetary base (M_0) is not significantly correlated with the monthly growth rate of any higher monetary aggregate, M_1, M_2, nor M_3 (-0.05<R<0.085). Using annualized or quarterly data leads to the same result and the same conclusion. A dynamic correlation over 12 month also reveals the same result for a one-year lag tolerance: $R_{M0:M1}$=0.01, $R_{M0:M2}$=0.03, $R_{M0:M3}$=0.01. Also within 2 years there is no dependency to M_0. This is an important point as the ECB still claims that its MP regulates money growth via M_0.

This means if the monetary base is increased by the central bank it doesn't have any immediate effect on any monetary aggregates: the ECB has fully lost its control over total money.

This is also revealed by comparing a theoretical-mathematical capacity of the multipliers with the real-world multipliers. The changed EMU minimal reserve requirements in 2012 are of course included in the calculation. The conventional capacity for Fisher's 'money multiplication' of MFIs and CBs (Formula 17) has been specified as a relation, as follows:

$$(a)\ max.m = \left(\frac{1+\beta}{\alpha+\beta}\right) \quad (b)\ real\ m = \frac{M_{1,2,3,4}}{M_0}$$

Entry: α: reserve coefficient (reserve deposit ratio), β: currency coefficient (currency ratio, the affinity for real legal tender or cash)

If the capacity of the monetary aggregates were constrained by the money multiplier, according of the above formula, traditionally used by conventional MP research and also by the ECB (Görgens et al. 2014; ECB 2011b), then it would reveal the multipliers potential (see Figure 16): but the formula is only true for stock data and thus also flawed. Another simplified formula for capacity can be derived: in a 1% reserve system the capacity of a money multiplier is 100 fold. Simplified, the money multiplier turns 50-fold if 50% of money is demanded by MFIs and is thus 'in circulation' (due to liquidity preference of holding money, and interbank TAs). Thus, in a perfect financial market the maximal book-money would be:

$$m_{max.} = \left(1 - \frac{C_{non-MFI+MFI}}{M_0}\right) * \frac{100\%}{R_{mini}[in\ \%]}$$

Formula 39 Simplified Money Multiplier's Capacity Formula

Entry: m_{max}: capacity of multiplier, C: currency in 'demanded circulation', R: minimum reserve requirements in %, non-MFI: non-banks (firms, people), MFI: banks (monetary financial institutions)

Predicated on the formulas the mean leeway of the money multipliers can be reckoned as the % difference of the real world multiplier (of m_{1-3}) compared to a full-reserve employment, and a maximal capacity without a real reserves but a theoretical 100-fold limit to book money creation. First order inefficiency is found as a lack of resource usage for the money multiplier, as follows: m_1: ca.30%, m_2: ca. 20%, m_3: ca. 20%, or leveraged (Formula 39): m_1: ca. 40%, m_2: ca. 35%, m_3: ca. 35%. Higher order inefficiency must be much higher.

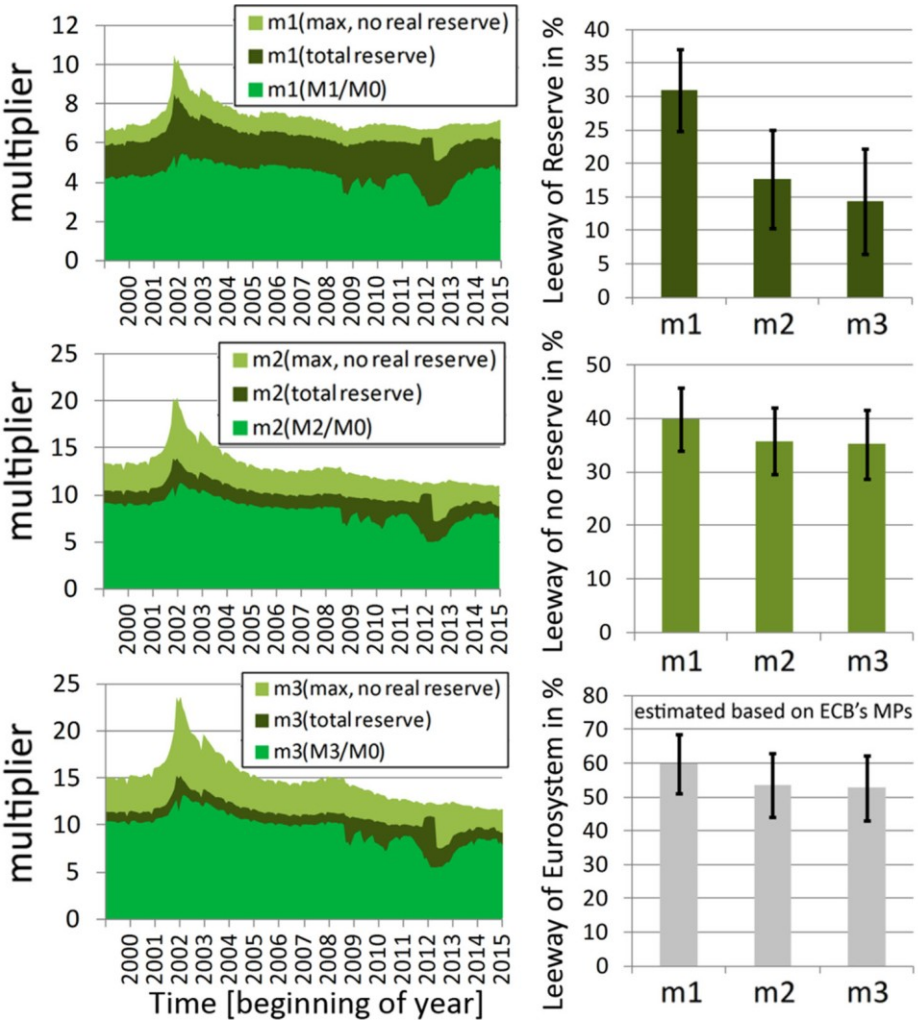


Figure 16 Capacities of the Traditional Money Multipliers and their Utilization

It can be also interpreted as margin of risk awareness, or margin of safeguarding measures. The global risk aversion on part of investors and MFIs has heightened since the FC and EC. The individual reasons of why MFIs and CBs don't make use of their full potential, however, might be very diverse, follow strategic plans of consortia, or might be a result of other constraints to these banks: e.g. very different MFIs constraints exist in the EU. The latest MP of

the ECB are a game changer to monetary financial sector: if we assume that the ECB 're-mains responsive' to MFIs liquidity demand (own estimation based on ECB announcements e.g. QEs), as in the past and much more after the FC and EC, the future total leeway would be even higher: ca. m_1 60%, m_2 52%, m_3: 51% (at a MP elasticity assumption of only 1.5). The remaining leeway is only a traditional capacity - not the full capacity to create money that is by far higher (owing to CF cycles). Still, these capacities - that are lower than the real ones - already reveal a high level of first order inefficiency, of money that escapes MTCs, and the potential to create high volumes of money and show a lacking basis for price com-petition. Moreover, this leeway allows more 'frauds' by MFIs to dynamically deprive money and cash out of the legal system via hidden reuse, principal repayments, and depreciations.

The strongest crisis to the MS and money multiplier was probably the EC in 2012: in this time the multipliers fell sharply by 30-40%. Historically, this much resembles the sharp drop of the money multiplier that coincided and caused the Great Depression in 1929-33 in the US, when money supply fell by 28% (Friedman & Schwartz 1963; Mathews et al. 2013).

At that time, the historic 'lesson learned' in the US allowed for the establishment of the Federal Deposit Insurance (LOLR) to dam up the risk of bank runs for the economy. Also the ECB acts as 'lender of last resort' resulting in principal agent problems (Ross 1973). And, the real-world lesson wasn't learned: 'that the reserve is no reserve' making crises inevitable.

The ECB and the Commission responded to the EC by lowering the legal requirement and system constraints in the Euro banking system to achieve a pre-EC crisis situation. Although partially successful, the low utilization money multiplier might have had different reasons: it might resemble a similar condition that is found in the UK where 'credit worthiness' is the main driving factor for 'credit extension' and monetary growth (Ryan-Collins et al. 2014) or the US (Friedman & Schwartz 1963). EMU credit risks seem to play a more important role in this context but are a different topic and hence researched in another chapter (see 4.3.8.5).

In summary, MFI money creation is only based upon stock not flow data, which remains hidden, and escapes all constraint of money multiplier, reserve requirements, or Basel I-III.

All money multipliers became less stringent after the FC and can't constrain MFI money creation effectively. They all have the high powered money M_0 as their base, which also develops unnaturally since the FC and EC. Hence, it is interesting to reveal specific features of money multiplication with respect to the monetary base. Figure 17 illustrates (1) the

fraction of excess reserves the MFIs have with their NCB. 'Legal tender resource wasting' started in 2012 and has continued till today (shown as % of M_0, pink line). Since then the real capacity of the money multiplier has much increased (blue line: total potential of M_0 including all legal reserve requirement, and green line: minimum reserve based potential). The minimum reserve is managed by the MFIs *ex post* and not *ex ante* as the green line (minimum reserve capacity) adjusts to the legal requirements - corresponding to the MFI monthly reporting requirements (SNA 2008/ESA 95-based 'end-of-month' ECB/2008/32).

The ECB is of course aware of some of these inefficiencies and has also taken first CM action e.g. with respect to the recent excess of MFIs excess reserves (ECB 2015b). As the first central bank in the world it has lowered its key interest rate on reserve deposits (deposit facility) from 0% to -0.1% on 11.6.2012, and as MFIs still poorly reacted even to -0.2% on 10.9.2012 (ECB 2015b). MFIs seem idiosyncratic in that they still don't react to pay negative interest rates, nor do they adapt to better use m because it is totally irrelevant for them. In comparison to the money that can be repeatedly deprived interest rates are fully negligible.

If there were any efficiency left in these MTCs a 5-fold higher capacity would have to better its utilization to drive investment, jobs and GDP in the EU economy. This is clearly not the case, like interbank competition. Moreover, the opposite seems to be true: the PT indubitably soars (see 4.3.2): showing a trend towards inefficiency in most Credit View MTCs.

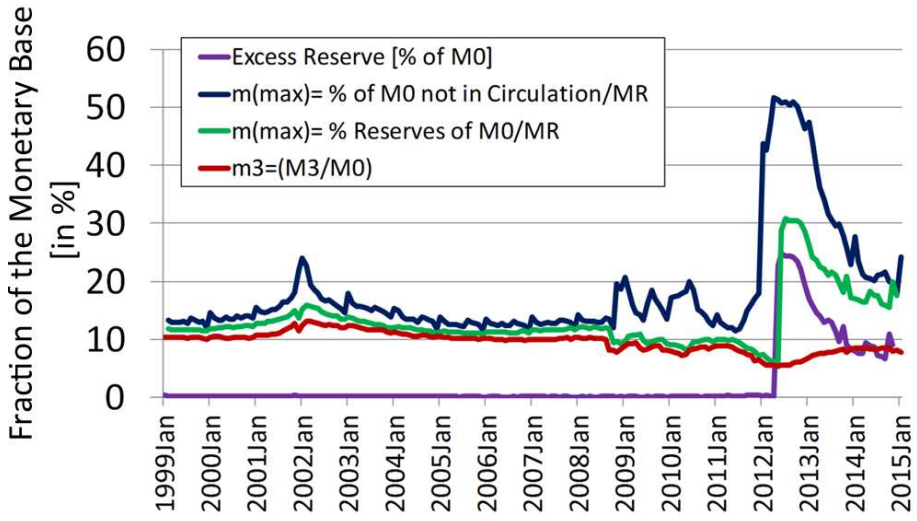


Figure 17 Capacity of Money Multiplication as M_0 in the Euro Area

Another way of describing the monetary developments of money multipliers is to analyze additional properties like constancy, residuals or deviations from main trends, or aggregate growth patterns. These are important to complete the 'big picture' for money multipliers.

Constancy: the analyze permanency of the money multipliers they can be represented as share of the respective nominal monetary aggregates over time. Therefore, all monetary aggregates are transformed into a percentage contribution of aggregate money (see Figure 18). This visualizes the contribution of each and their natural factors can be derived by integrating over time. If high powered money (M_0) is set 1 (or 100%), (see Figure 18):

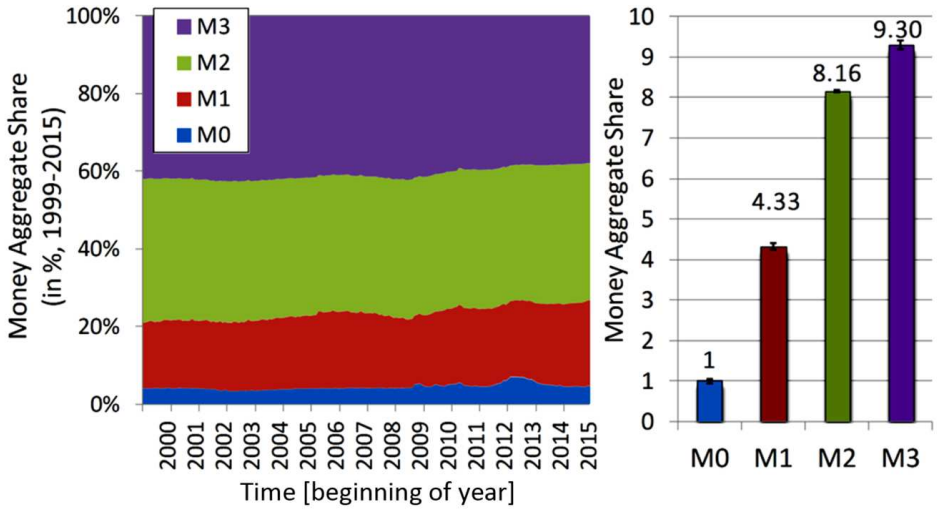


Figure 18 Constancy of Mean Share of Money Aggregates (+SEM) from 1999-2015

From 1999 till today (2015) the ratios of monetary aggregates to M_0 are highly constant and reveal relative statistical robustness of the money multiplication in the non-MFI-only real economy: M_0=1, M_1=4.3, M_2=8.1, M_3=9.3. SEM analysis is included to indicate robustness in graspable standardized means: SEM error bars are small in relative terms (Figure 18, right).

However, mild reduction of M_3 is seen since the FC and EC. To quantify these observations, obtained at first glance, in more mathematical-scientific and visual terms, the variation was calculated as residual from the integrated mean share of all aggregates (see Figure 19).

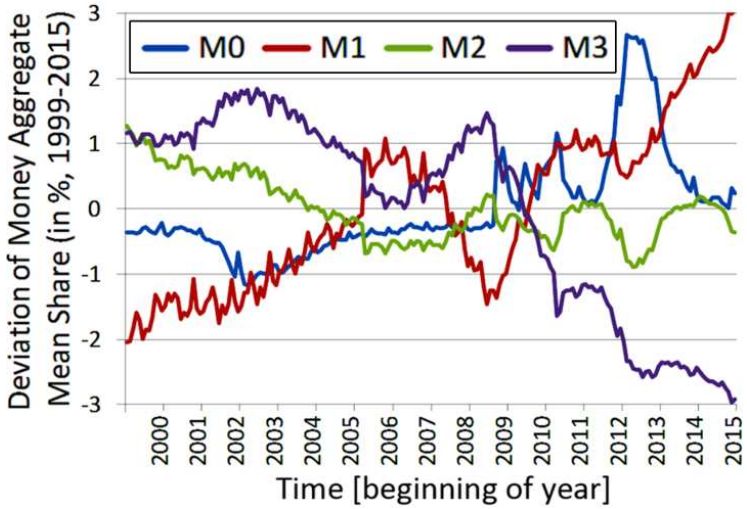


Figure 19 Trends of Money Aggregate Shares as % Deviation from Mean, 1999-2015

The following slight trends are seen on top of the background of the monetary constancy of multipliers: M_1 share trend: +4% in 16 years; M_2 share trend: -1%, M_3 share trend: -4%.

Aggregate Monetary Growth: next to the 'constancy of multipliers (above)' it is also illustrative and revealing to represent and review the data as aggregated growth volumes since the introduction of the Euro (see Figure 20), starting with zero, to have the full focus on the proportionality of monetary Euro growth (the exchanged and cycling money is not included). As a result, there is less constancy than in the monetary share perspective with implications to interpret the 'monetary aggregate growth multiplication pattern'. Linear regression analysis was carried out to reveal the real-world 'monetary aggregation multipliers' - given in Figure 20 M_0: 1, M_1:4, M_2: 6.2, M_3: 6.2, R^2 coefficients are very high except for M_3.

These results clarify that the money multiplication is stable for M_1 (ca. 4 fold in both: share and aggregate view). M_2 and M_3 empirical factors differ in that they are lower in the aggregate growth representation (see Figure 20). This indicates a lower trend of M_{2+3} post crises.

The low (reported) utilization of MFI book money capacity requires more interpretation: Market imperfections cannot fully explain it as a much higher utilization was possible before, from 1999-2008. The interbank market is an important hub measured in EURIBOR. Low transaction volumes in the interbank market have contributed to the worsening of the crisis, caused a MP dilemma, but don't explain the 'post crisis syndrome' of the Eurozone.

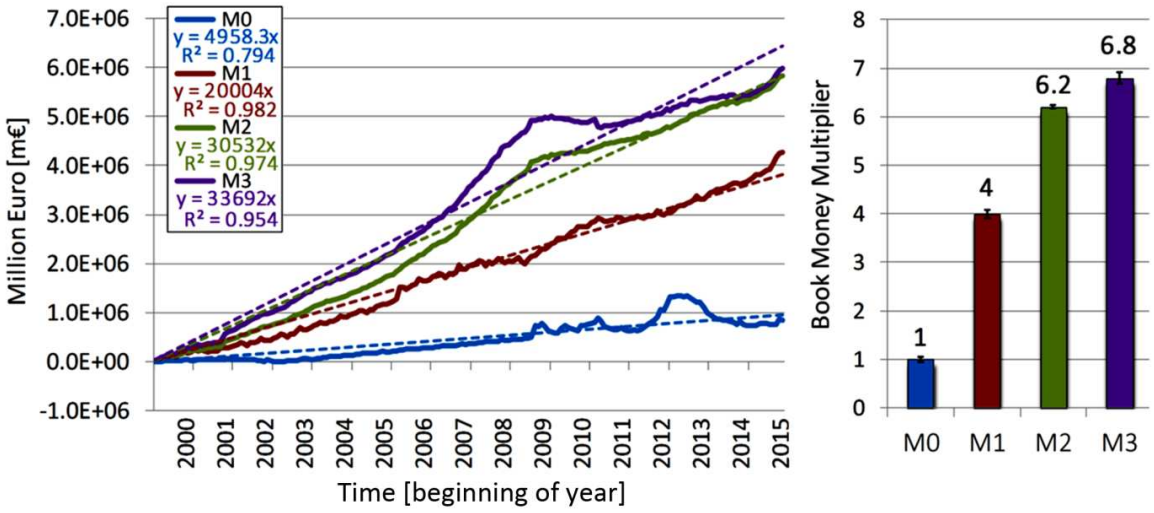


Figure 20 Aggregate Growth of Monetary Aggregates Derived Money Multipliers

Also, the legal situation cannot fully explain the lagging: e.g. the Basel accords don't much constrain the money supply via a 4.5% equity rate; minimum reserve requirements have also fallen from 2% to 1%. Both should outweigh all possible other negative impacts. In fact,

much excess reserves are available (see Figure 17). The balance sheet adjustment (Basel III) requires a higher Tier 1 capital level, and relatively less assets and risk; maybe more precaution of MFIs has happened due to the ECB's 'Comprehensive Assessment' in 2014; smaller ROE (return on invest) have contributed to the effect - due to higher equity requirement and lower international investor's expectations (bank shares, etc.), or technical-structurally: the financing market slightly shifted from MFIs to non-bank financing by investors (-9% CB/MFI share, ECB 2015). In fact, there seems to be a new risk awareness in banking and in businesses that plays a key role, e.g. capital buffers are increasing and less debt-related risk became the new slogan in corporate risk management (EY & IIF 2012). MFI 'profitability' - that, very importantly, is definitely not comparable with firms or corporations financial accounting, and its related profits, margins or retained earnings, etc. - still depends on 'interests earned' and thus PTs to improve the 'officially published account margins'. PTs etc. are thus furthered by lower Basel III ROEs - since the main 'income' from MFIs is not financially accounted - astoundingly and alarmingly not even the real money of the principal repayment, an true income CF (ECB 2015b) cannot be found in any MFI income statement. The expected low real GDP growth rates impact, as culminated degrees of difficulty and risk, the leveraged profitably ROI calculations on behalf of the industry and the lending market.

E.g. imagine the example of the two big CB networks in one country, each covering 50% of the population's customers. If CB A buys (e.g. millions of houses and thousands of firms) from their own customers these customers get paid with their own money that ends up in the same CB's accounts - and can be relend or reused to buy. CB A doesn't bear any real costs - it only has to deposit 1% of the cost as reserve with the NCB (a 99% discount) - and only temporarily. If CB A buys from customers of CB B and vice versa the same situation appears: due to a process known as 'clearing' by (interbank funds transfer systems; e.g. SEPA clearance, RTGS, TARGET II in the EU, Fx clearance or CHIPS in the US, SIPS) both banks end up paying again nothing and only minimum reserves have very slightly increased, but only temporarily (due to the system's intrinsic inescapable-arithmetic debt pressure).

The property might be resold or not - the MFIs have gained its full value for absolutely nothing. Claims might have increased on the balance sheets of CBs but reserves are up to 100 times less (1% liquidity ratio) and almost freely available to big CB (liquidity is steadily soaked out of the real economy and ECB MP fulfills all of the demand of MFIs due the dilemma that the real economy requires low interest rates and liquidity). As a result excessive

excess reserves (see 4.2.2.3) do not limit CB book money creation any longer (an early pre-condition of Voltaire's Fiat money effect) and minimum reserves do not count any more, as they don't limit or demark 'credit extension' any longer for the financial sector (CB A+B).

The sell-off of anything precious in the real economy has long begun, via non-MFIs that use a hidden MFI leverage, which is not only a scientific conspiracy theory, but the most plausible explanation of all (who would not use this totally free extra money leverage?).

And in the long run new debt is arithmetically re-created also assured by the 'architecture' of the MS and MP: E.g. all of the ECB's standard procedures (see 2.1.5) supply new money to MFI in the form of debt obligations to non-MFIs plus interest to be paid back (that was never supplied to the euro area and cannot be earned in the aggregated view). The counterparts of all monetary aggregates and debt reveal that credit and money is also intertwined, shrinking velocity and keeping a high debt level as inherent MFI-wanted feature of the Eurosystem. Although debt is a normal monetary tool that is always needed it is misused to extend the purchase leverage of EMU MFIs and a positive money supply is missing. This causes lower CFs for firms and FRI-costs. Credit Extension Theory only covers a part of the 'fraud' (2.2.3) - the scenario thus supports the Deprivation Theory (DT) view (see 2.2.3).

4.1.4 Real Money Balances in the Euro Area

Real money balances - money divided by the 'index of prices' - represent another basic but important factor and indicator for MP. It represents the value and purchasing power (PP) of the money stock and is a measure of the quantity of goods services and property it can buy:

$$Real\ Money = \frac{M_{0,1,2,3}}{P} = \frac{M_{0,1,2,3}}{HICP}\ ;\ \left(\frac{M}{P}\right)^{D} = kY;\ or\ \ logm_t - logp_t = logy_t - logv_t$$

Formula 40 Real Money Balance Formula

Entry: M: money aggregate, P: price Level, D: demand, Y: output, k: money preference per income (= v^{-1}, v: income velocity of money; proportionality factor for the income dependency)

Traditional Monetarism papers or theories assume that real money balances are relatively constant in the short run, and not highly important indicators for MP (Karnosky 1974). However, even Milton Friedman (a 'father of Monetarism') had actually used this concept in his modern QTM approach (Friedman 1956)(see 2.3.4). He also argues that the demand for real money balances is a function of income and return. It is a tool of the Keynesian Framework models that are based on ISLM and ADAS (see 2.3.5). They convey a major im-

pact of real money balances level on the interest rate - a very important node of the entire model (Walsh 2010; Friedman & Woodford 2010; Mankiw 2014). Other models, like the 'Standard New Keynesian Models' assume that the central bank, here the ECB, already effectively regulates the interest rate via 'other means' (e.g. the MRO). Hence the real money balance wouldn't have a strong role in this context (Woodford 2003; Ireland 2001), due to 'non-stringent credit-extension practices' and influential 'short-term ECB rates'.

Figure 21 depicts the real money balances of the euro area from 1999-2015. It immediately reveals that the real money balances are not very constant over time. Thus, the purchasing power (PP) of the money stock in the economy is changing over the time series and steadily hikes for the ever-expanding real money balances of all monetary aggregates (solid line).

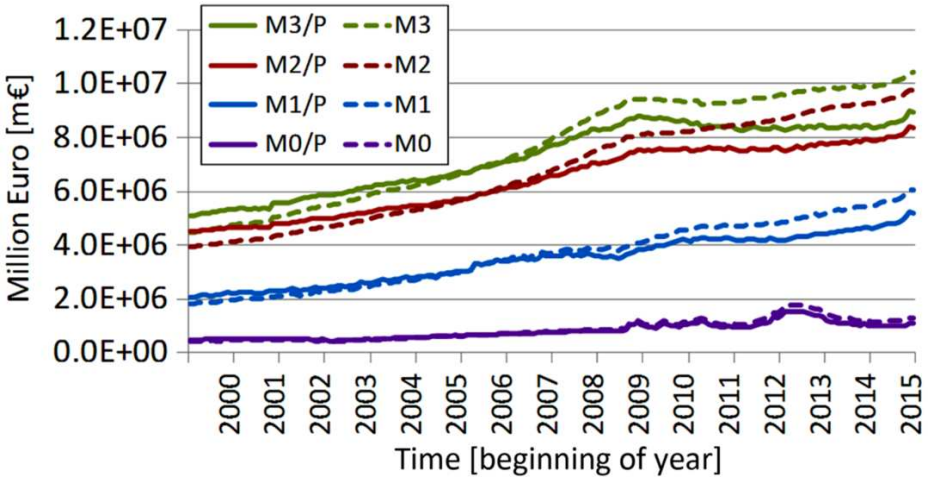


Figure 21 Money Balances in the Euro Area

From 1999 to 2015 they gained M_0/P: +133% M_1/P: +157%, M_2/P: +86%, M_3/P: +75%. Thus, the real money balances change significantly in the short run: M_0/P: +8.3% p.a. M_1/P: +9.8% p.a., M_2/P: +5.4% p.a., M_3/P: +4.7% - the annualized average for the 16 years. This much corresponds with but exceeds the continuously falling income velocities (see 4.1.2).

If we enter these figures into the QTM formula (see 2.3.2) M/P=Y/V, we obtain for M_0: 1.33=Y/0.54 → Y=0.74 a negative relation for output. For M_1: 1.57=Y/0.47 → 0.74, also a negative effect for output. For M_2: 1.86=Y/0.63 → 1.17 a positive relation for output. And for M_3: 1.75=Y/0.67 → 1.17 again a positive relation for output. These output relations for M_0 and M_1 behave identical ($\Delta Y_{0,1}$=0.74), as much as M_2 and M_3, which also show exactly the same relation ($\Delta Y_{2,3}$=1.17). A further relatively declining M_2 and M_3 in the future, derived from Figure 19 and Figure 20, or a loss of its endogenous homogeneity and distribution, could represents a risk for the EMU, if M_{2+3} trends steadily persist in the future.

Furthermore, this calculation reveals another drawback in the QTM equation. A major discrepancy arises from the annual accounting of money (stock value) and output (annual flow value) in QTM, while velocity and prices actually serve as proportionality coefficients, at least to some degree a comparison of 'apples with pears'. Thus, a new QTM formula needs to be derived. Maybe only a first 'preliminary encouragement' is given in Formula 41:

$$M_t V_t = P_t(Y_t + Y_{t-n}(1 - \delta_n))$$

Formula 41 A New Modern QTM Formula Comprising all Depreciating Property

Entry: M: quantity of money (stock), V: velocity of money (proportionality parameter), Y_t: output (stock value) at time t, Y_{t-1}: output (stock value) at time t-1, δ: depreciation of output components

As purchasing power needs to be defined by comparing parametric stock with stock or flow with flow values, and because money's purchasing power is dependent on the real economies 'counter value', a stock value of 'what money can buy', and because the stock value is depreciated over time affecting all durable and non-durable goods, property and services, the new formula represents a fine-tuned correction of the neoclassical QTM (Formula 41).

Hence, it is possible that the money supply for real-non-MFIs has been calculated slightly too tight in the past: all economic actors are to be adequately supplied with debt-free money, not only MFIs: and a 'countervalue' of what money can buy should be a reference. Unexpectedly, if M_2 and M_3 is more important for future GDP growth (at constant homogeneity) than the growth rates of M_2 and M_3 seem more important than M_0, M_1, and M_2 for MTCs. Figure 19 and Figure 20 have demonstrated that expectations tend towards a lower relative share of future M_2 and M_3, which could slightly decrement economic growth rates. To further underline this coherency the mean monthly growth rates of all real money balances and aggregates (in %) is shown in Figure 22, which allows for a direct comparison.

In line with the previous results, the real money balances of M_2 and M_3 only grow at ca. 60% of the speed of M_1 and M_0, which is around 0.3% per month. Regression analysis show that this difference is even more pronounced for real money balances' purchasing power.

Demand for real money balances in the euro area seem to be constant in the first decade of the new millennium as M_3 growth coincides with net portfolio inflows (Santis et al. 2013) - the remaining PP until 2015 represents demand based on the stock of all values, including all other investment, inflowing FDI, persistent and depreciated values.

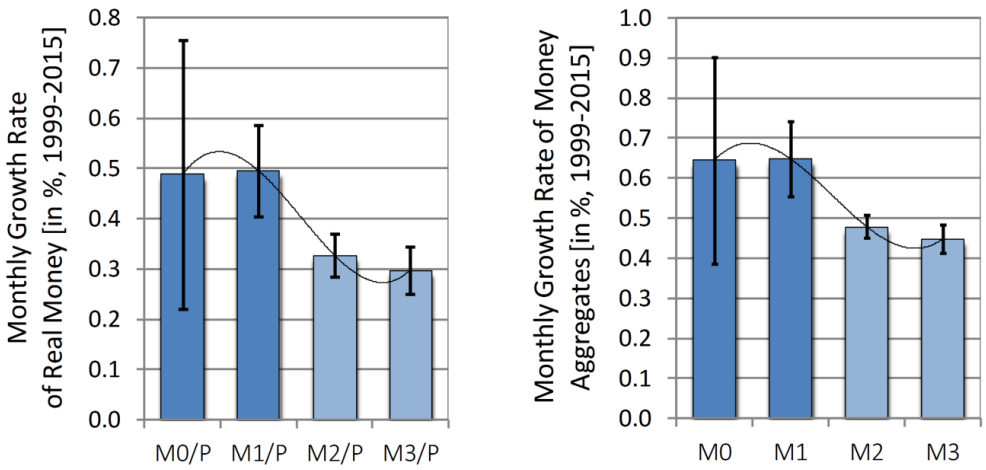


Figure 22 Mean of Monthly Growth Rates of Real Money and its Aggregates

4.1.5 Debt Generation in the Eurosystem

Figure 23 gives the 'big picture' of the European public and private debt generation over time. Aggregated public and private debt (only domestic, international debt not included here) developed from approximately €10tn (Trillion) when the Euro was introduced in 1999 to above €20tn trillion today, in 2015 (Figure 23). Equity is included as a secondary economic financing of investment: in the EMU equity is still much underrepresented compared to the total amount of debt, which might reveal a potential EMU investment bottle neck.

Overall debt trends can be compared to the money stock: The sum of all European money today cannot repay its debt (at once), which is always about twice as high, and this ratio only changes mildly (see Figure 24). The same holds true for the US Dollar and most other currencies of fractional reserve systems. It has to be considered that the real, hidden (out of balance sheet), global debt is even higher. Since 2003 gross external debt and interest payments have increased by over 40% in the EMU due to higher national debt outpacing GDP growth, including major economies (Dias 2010). The EMU's debt position vis-à-vis the rest of the world (ROW) is another €13.5 trillion. Adding this to domestic debt (Figure 23) would make $35 trillion in debt for the EMU 2Q-2015 but it is one side of a multilateral figure. Still it is three times the amount of all liquid assets available in the EMU. Considering the lowering velocities - there simply is not enough money to be earned to repay all debts with respect to maturities - a game-theoretical issue that causes defaults and bankruptcies.

The implications again are far reaching: too high levels of inherent debt diminish V and economic and business growth and profit potentials, due to polarized constraints to expenditures. Moreover, debt-based growth of the financial sector is shown to empoisons the

real economy, 'value creation', and GDP (Cecchetti & Kharroubi 2013) - via MFI crowding out - even found by BIS research, probably one of the most pro-bank organization globally.

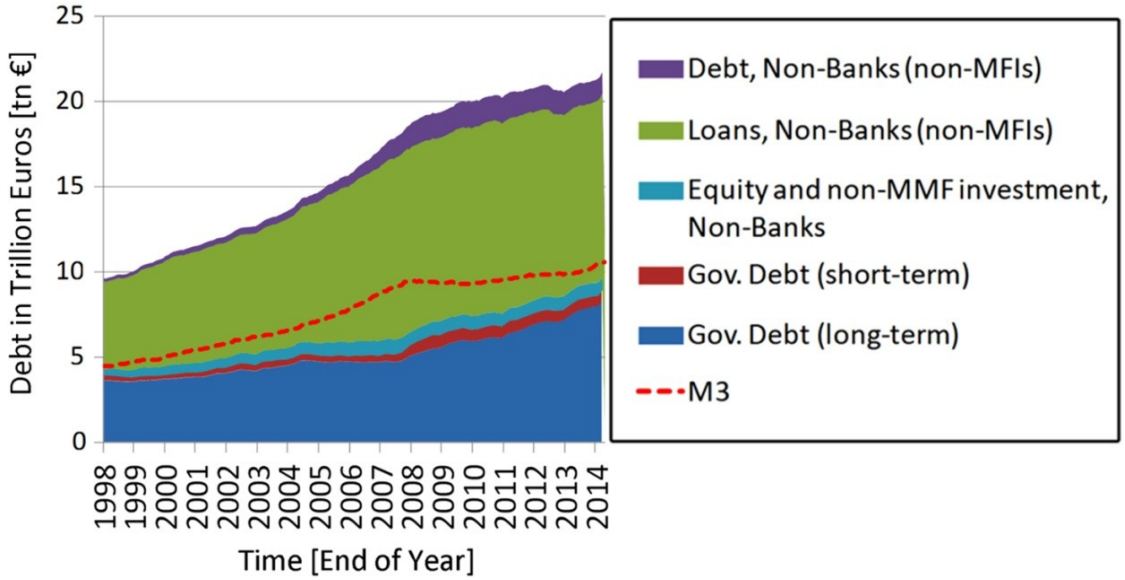


Figure 23 Credit Debt to Euro Area Residents is not Covered by M_3

Figure 24 Total Credit to Money (M_3) Ratio as Macroeconomic and Crisis Indicator

A prevalent way to illustrate a country's debt is to present it as a share of GDP volume. This depiction also serves as an indicator of an economy's ability of future debt redemption - how high the debt burden is with respect to economic strength. Nevertheless, benchmarking thresholds are ever-increasing, even globally for most countries, and the EMU. This data is available on World Bank, the UN, IMF and ECB web-pages (WB 2015; ECB 2015b).

Figure 25 illustrates Eurozone debt as loans to non-MFIs, short-term government debt, long-term government debt, and their respective interest rates as % of GDP.

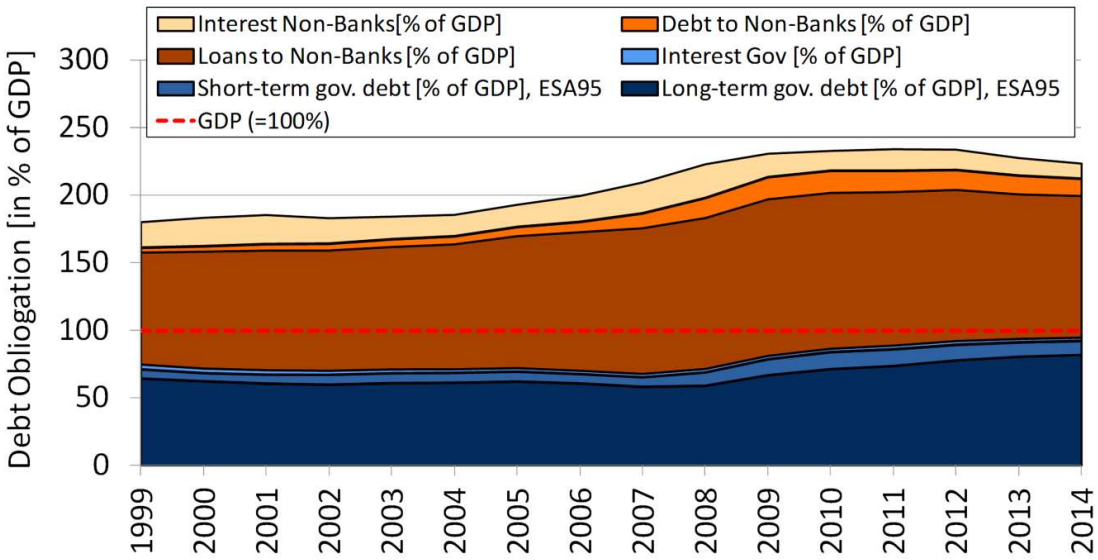


Figure 25 Increasing Private and Public Indebtedness (as % of GDP), ESA95-based

Indebtedness was already high in 1999, when the Euro was launched, at 180% of GDP. Debt has reached an all time high during the European debt crisis in 2012 (240%) and has only slightly fallen, or recovered, till today in 2015 (230%). This assures MFI extension of DT-PP.

Of note, in many publications, newspapers, and the media, only the public debt is represented as % of GDP (and without interest), which doesn't tell the full story. To close the gap, this review must report about both forms of European debt (see Figure 26). It must be also noted, that the common use of debt as % of GDP can be misleading as new government debt always increases GDP too, although it doesn't necessarily represent an equivalent output power added, that repays: thus 60% of GDP was set as a limit. Government debt issues would be minimal (Kumhof & Benes 2012) if money creation were not private.

This threshold level is widely used and forms a core of the third European Maastricht criteria, 60% of GDP, and if slightly above the limit it must be 'sufficiently diminished and approaching the reference value'. The truth is, it approaches 100% not 60%, which cannot be considered Treaty-conform, nor does it comprise the even higher private debt, somehow.

The debt problem in the euro area has reached a new dimension putting EU core values at risk: political values of integrity, integration and sustainability, financial and economic values, even its legal values such as the mentioned Maastricht criteria (Criteria 2 and 3) (ex-Art 121 of the EC treaty; now Art. 140) (see 2.1.1) and MPs are only partially responsible for it.

The strong indebtedness in the euro area, using its 'official ESA95 definition of debt' (EC 2002), is a sign of a blended fiscal, political, economic, MP and MS 'system design' problem.

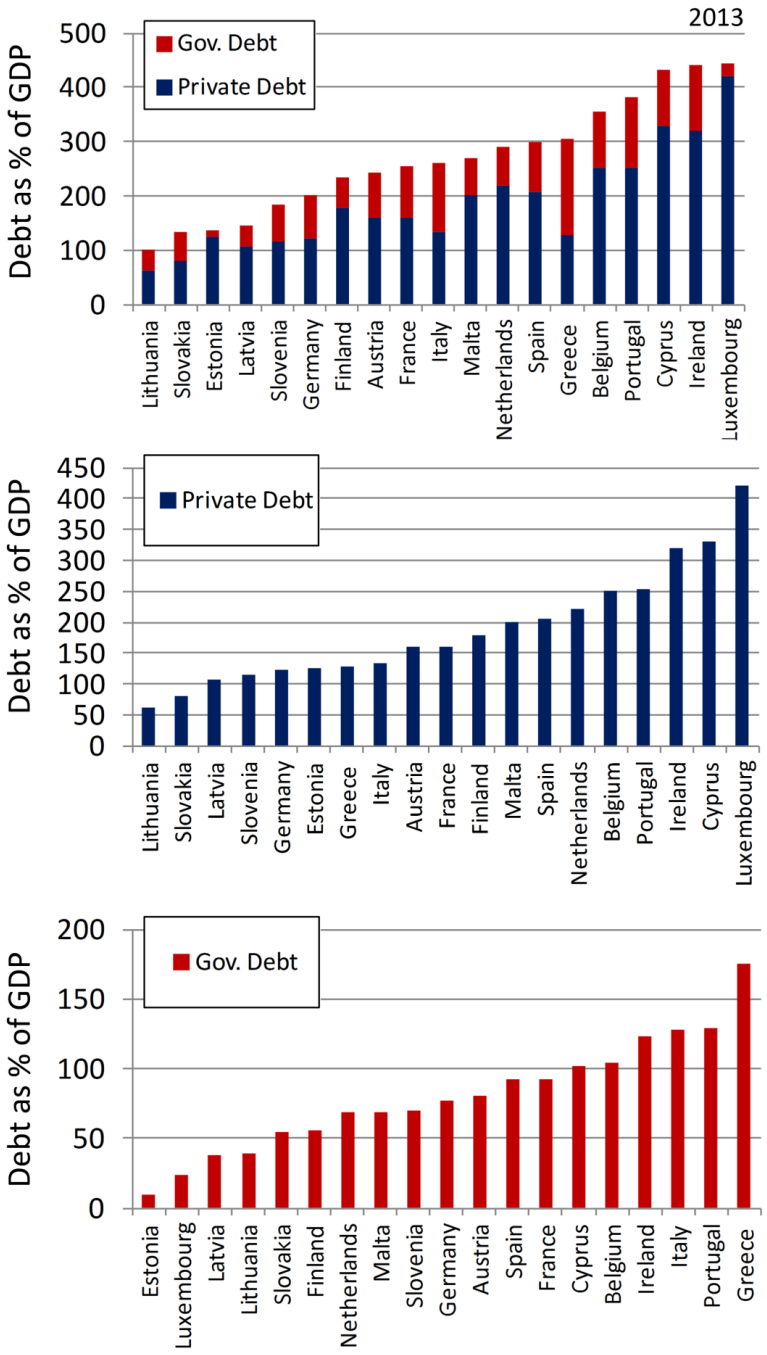


Figure 26 Public and Private Debt (as % of GDP) by Euro Area Countries

To keep a stable debt-to-output ratio, if the interest rate of nominal debt exceeds the nominal growth rate of GDP (which is usually the case - also in the EMU) then New Keynesian econometric models predict (Friedman & Woodford 2010) that the government 'must run a budget surplus'. This however virtually never happens in real-world scenarios: e.g. when GDP slows down they clearly must indebt: causing inherent never ending EMU system debt. The highest public debt (% of GDP) is inherited by Greece, and the highest private debt (% of GDP) is found for Luxembourg (Figure 26). Hence, it makes some sense to analyze these two extremes of the effective spectrum in more detail to see the range (4.1.1.1, 4.1.1.2).

4.1.1.1 The Case of the Greek Government Debt Crisis

The Hellenic Republic, Greece, is a central case to study the Euro Sovereign debt crisis (EC) and prejudicial effects of a liquidity shortage in an economy, over time: (1) the Greek deficit soared to 177% of GDP in 2015 (ESA-95 Maastricht definition of debt), (2) investment fell by 15-20%, (3) a sudden dramatic rise in official unemployment rates from 7.5% in 2008 to 27.7%, in 2015, (4) at the same time wages started to fall again by 20%, (5) GDP fell 25% from 2008 till 2015, and consumption declined strongly: e.g. new car registrations dropped by 70%. Today, interests paid as % of GDP recently (temporarily?) declined and loans and deposits received by investment funds climbed again above €300 million but are still low (ECB 2015b). Greece faces liquidity shortage and is at risk to default on payments in 2015.

In 2009, the Greek government revealed its true indebtedness by announcing a 12.7% budget deficit and public debt soaring to 121% of GDP in its 2010 drafted budget. Singly, the level of net external debt reached the 60% reference value without comprising any domestic debt (Dias 2010). In the wake of Fitch and S&P ratings that downgraded Greece from A- to BBB- with negative outlook, because the austerity plans announced by Papandreou wouldn't provide a sustainable long-term solution with growth, it had to pay a higher price for its debt and entered the economic viscous cycle of a debt driven downward spiral.

After Moody's also downgraded Greece's debtor position it had to apply for EU and IMF financial aid packages. The first economic adjustment program (EC 2015, 5th review October 2011) retrospectively granted international assistance loans of €65 billion Euros (€47.1bn by EMU member states, €17.9bn by the IMF). This sum was extended to €77.3bn under the GLF (Greek Loan Facility). The Second Economic Adjustment Program was approved in March 2012 committing the disbursement of the first and another €130bn for the years 2012-2014 (EC 2015b). The second program foresaw €164.5bn until the end of 2014 (€144.7bn; an additional €14.7bn) provided via the EFSF (European Financial Stability Facility) and €19.8bn by the IMF (EC 2015b). The Greek Debt restructuring sticks out in the EU and world, also again in 2012/13 when the majority of private holders of Greek G-Bonds had to swap their bonds for new long-term ones with less than 50% of the original face value - another ca. half debt relieve for Greek G-bonds of ca. €125bn (ECB 2015b; ECB 2015c).

The first Greece bailout programs I+II sum up to approximately €294bn - not fully disbursed yet but the highest EU 'bailout sum' so far and a Third Economic Adjustment Program is 'under way' and was temporarily on hold since summer 2015. An EU summit in July 2015

helped mobilize another €35bn to bridge the time gap (SN4070/15). EU Commission President Jean-Claude Junker (EC 2015c) commented that Greece has received more international financial aid than all of Europe did by the US Marshal Plan after WWII ($127bn in current value). It received more than all other countries and is a relatively small economy: Key stats of Greece are summarized in Figure 27. Greece adopted the Euro in 2001 and since then debt - from central government and domestic credit - has by far overshot GDP growth. The gap between expenses and revenues widened and was further aggravated by the FC and EC. The net international investment position (NIIP) fell from €-100bn in 2012 to €-121bn in 2013 and 2014, and house prices and nominal labor cost fell ca. 10% (ECB 2015b; MIP scoreboard). When government debt reached 177% in 2014 unemployment rates have skyrocketed to 26%, as the current account balance turned neutral again after years.

Greece already serves as a paradigm and country case showing that hyper-indebtedness and lack of liquidity for businesses inhibits industry value added, and market capitalization.

The Greek debt crisis is a symptom and sign of a European challenge that has to be mastered without putting its own values and future growth and vitality at risk: integrity and integration, financial and economic stability and prosperity for all members and people are questioned like the Maastricht values, i.e. criteria (Criteria 2 and 3) (ex-Art 121 of the EC treaty; now Art. 140) (2.1.1). The strong indebtedness of EU countries like Greece, in ESA95 terms of debt' (EC 2002), is a clear sign of a blended fiscal, political, and monetary systems problem. A better coordinated, sustainable, fiscal, political and new MS is clearly needed.

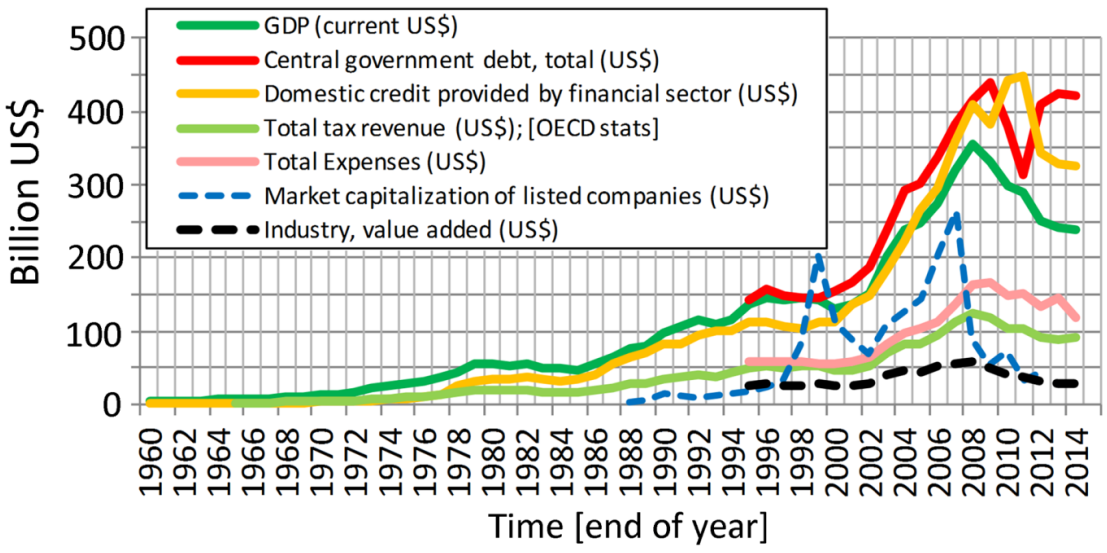


Figure 27 Main Economic Indicators Time Series Analysis for Greece

4.1.1.2 The Case of the Luxembourg Private Debt Location

The Grand Duchy Luxembourg - on the other hand - is a very small country in the middle of Europe, harboring one of its two capitals and an economy of only 0.54m people producing an annual GDP of about €45.5bn. Since the launch of the Euro and due to its antecedents it has evolved into a prime location for private debt in Europe. Luxembourg has become the front-runner in private non-MFI indebtedness summing up to a magnitude of about 400% of its yearly GDP (see Figure 26). It has the world's highest external gross debt (ca. 4000% of GDP in 2014) but this position is much balanced by an even higher external volume of assets - mainly equity of the investment industry - leading to net assets of ca. -3000% of GDP in 2009, yielding a net creditor position (Dias 2010). Luxembourg's large financial sector ranks as a financial hub in the EU, e.g. international investment fonds residing in Luxembourg manage more than three trillion in equity assets (Bieber et al. 2011). It receives by far the highest net interest payments in the euro currency block of a magnitude of nearly 100% of its GDP (since 2003 till today, only few exceptions). These private dividend and interest based cash flows are considered as 'transfer payments' and are thus not accounted in GDP calculations (Mankiw 2014; IMF 2003), nevertheless they are true income. If they were included, Luxembourg's GDP per capita, already the second highest in the world, would even outperform Qatar, an only city-sized country that harbors the third largest natural gas and oil reserves in the world. Recently, it also became a leading offshore foreign currency hub, e.g. 50bn Renminbi were granted by the Bank of China's RQFII (BoC 2015).

Only MFI transfer payment are accounted in GDP, such as interests but not the principal repaid (=real money), first of which contributes to 36% of its GDP (WB 2015; EC 2015a). The financial and service sector amounts to 80% of GDP (EC 2015a). Other EMU member nations have to pay interests or only receive much lower and maximal single digit interest percentage magnitudes of their GDP (Dias 2010). These cash inflows help Luxembourg to inherit and manage the lowest government debt depicted as % of GDP in the euro currency block. Most of the private debt belongs to non-financial (non-MFIs) and multinational corporations (MNCs), that oversee the above mentioned €3 trillion in equity assets, *inter alia*.

The 'Luxembourg financial sector' is spatially concentrated and has features of an interactive financial cluster (Porter 1998), that seems to be non-publicly managed and coordinated by IFCs (institutes for collaboration) and also spans a public-private governmental network throughout its economy: e.g. until 2015 it had offered 'intensive and extensive' tax incen-

tives and provided for premium levels of 'banking secrecy' in Europe, to attract *incognito* investors and MFIs; only recently it has complied some EU and OECD standards (CIA 2015).

Luxembourg also hosts the political EU: namely the ESM (the Treaty clearly states that the seat of the ESM 'must be' in Luxembourg), the Secretariat of the European Parliament, the Council of the European Union (in April, June, and October; causing transactional costs). Also, e.g. it's previous prime Minister Jean-Claude Junker is now the President of the European Commission, and it hosts 'key translation/information services', the European Investment Bank (EIB), and many other organizations, making it the financial-political center and a money-capital of the EU (EC 2012; CIA 2015; EU 2015) located in a big EU financial cluster.

Another reason for its top private debt position is its 'pro-finance and pro-business' legislation, and more than that: also its jurisdiction. Many financial and legal 'gifts' have been made e.g. for private equity (PE) transactional corporations (Bieber et al. 2011). This is the main reason why many MNCs and PE firms source in Luxembourg to harvest all of these legal and tax-related benefits and because of legal risk avoidance in comparison to other EU countries with a stricter legislation and jurisdiction for PE firms (Bieber et al. 2011). Thus, other EU country's debt and PE is preferably sourced in Luxembourg's private debt cluster.

Figure 28 depicts the main economic indicators of the Grand Duchy Luxembourg that can be compared with that of the Republic of Greece at the other end of the spectra, Figure 27. Both domestic credits soar since 2002, but Luxembourg has better recovered from the FC. Public debt of Greece limits, and private debt/assets of Luxembourg guarantees, its future.

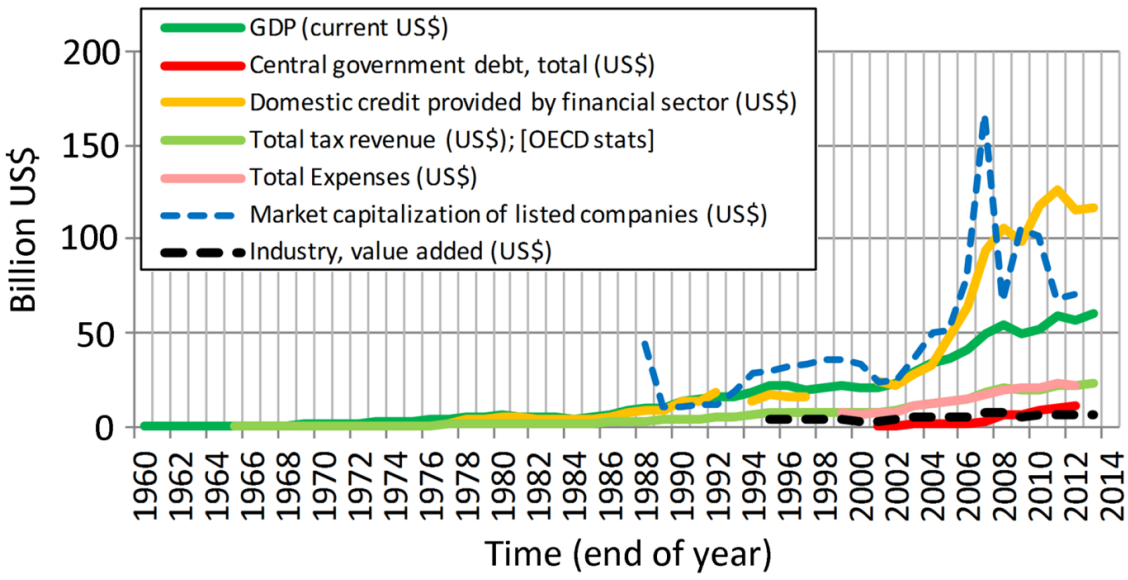


Figure 28 Main Economic Indicators Time Series for Luxembourg (LOG)

4.2 The ECB and Instruments of the Eurosystem

4.2.1 The Balance Sheet of the Euro-System from 1999-2015

Unlike any other non-MFI balance sheet in the 'real economy', the ECB, like most other central banks (like the Fed, the Bank of England, the Bank of China, the Bank of Canada, the Swiss National Bank, and many more), can expand it by simply creating more money, both virtual and real legal tender (ECB 2015b; ECB 2004; ECB 2013b). Legally and officially, it is only indirectly bound by its objective to maintain purchasing power or price stability (see 2.1.3). The ECB compiles, consolidates and publishes updates of its ESCB consolidated balance sheet on a weekly-yearly basis, with all respective ECB accounting items (ECB 2013b).

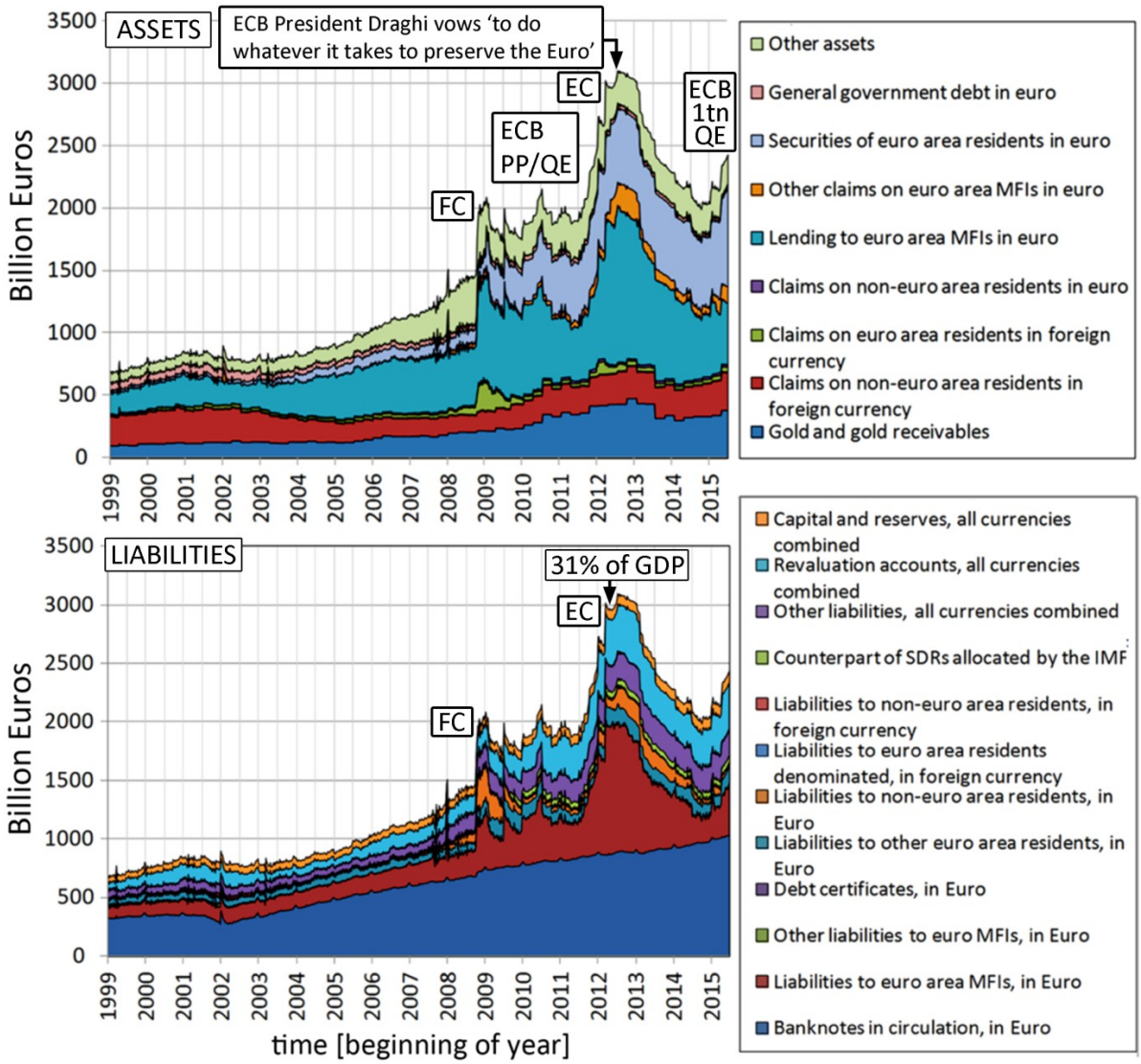


Figure 29 Balance Sheet Assets and Liabilities of the Euro-System

Figure 39 depicts a time series co-presentation visualization to make these bigger amounts of data and trends more graspable, analyzable, and interpretable. Whenever the ECB 'purchases' something with its legal tender the object becomes one of its assets and an equiva-

lent amount of money is supplied to counterparties of the economy. However, in reality this is mainly MFI money (irrespective of being borrowed or earned) and doesn't directly enter the real economy, only subsequently as debt [which is one of the key problems of the overall monetary transmission procedures (covered in chapter 4.3)]. For instance, if the ECB purchases gold its reserve assets rise in conjunction with its liabilities that were taken (ECB 2013b). Weekly liabilities and assets make up the dynamic ECB's balance sheet (Figure 29).

The three main drivers of the Eurosystem's balance sheet are: (1) financial market developments and portfolio management decisions, or changes in the value of the foreign reserve and own funds portfolios (ECB 2010). (2) Liquidity demand, banknotes in circulation, making a €100-600m seigniorage income in the profit and loss account p.a. (ECB 2010). (3) Liquidity-providing operations and lines in foreign currency since the FC in 2007 (ECB 2010).

Basically, there are different types of liabilities roughly categorized in 'to whom', and types of assets, claims, securities, debt and CDs (certificates of deposit) that show 'with whom'.

The example of the ECB's assets of gold deposits continuously increase and have only fallen during the EC due to a mild gold price shock. Although, it is officially not a task of a central bank to hoard gold reserves in fiat money systems, it is still very typical for most central banks, e.g. the Fed, etc., only Norway has sold its gold reserves in 2004 (WGC 2015) except seven bars for exhibition purposes. Reserves give value to savings and 'credibility' and must be 'sufficiently liquid' to supply 'three month of international trade obligations' (IMF 2008).

At a glance, the ECB's total assets skyrocketed in 2008 and 2012/13 as a reaction to the FC and EC. Liabilities and many other types of liabilities to euro area MFIs boosted backed only by respective assets from lending to euro area MFIs and securities of these MFIs. Monetary relaxing took also place in the US Fed's balance sheet accounts, which is even more pronounced and also shows strong augmentations in mortgage backed securities (MBS) and US treasury securities in the FC. Assets and liabilities are analyzed to provide the big picture:

ECB's Assets Side: During the crises a very strong accretion of 'lending to euro area MFI (in Euro)' has occurred by means taken to maintain and support 'struggling CBs'. How well did the ECB, CBs and MFIs manage the crisis with the new liquidity injection? Although the crisis could be ended, a huge inefficiency gap arose and has not been closed until today: The balance sheet items reveal four consecutive flurry liquidity injections to MFIs, three after the FC and one big one after the EC, in the shape of three plus one tips in Figure 29. The

pattern resembles M_0 because the ECB is only lending legal tender and because of the extreme disproportional magnitude of injections (reaching up to two-fold of the natural M_0 mean). This hectic post-crises lending in addition to the backing of euro area MFIs using tax payer's money to bail-out too-big-to-fail MFIs, the ECB asset side correspond with spike in liabilities to euro area MFIs. Interbank lending was troubled, but most of the amplitude and area of the liquidity spikes can in fact be found to have ended up again in the deposit facility and/or reserves (see 4.2.2) at the same time. This reveals a high level of inefficiency and strategic games played behind the scene, or alternatively miscalculation of the CBs and ECB. It could be picturesquely viewed as the tip of an iceberg awaiting the titanic of monetary transmission to the euro area. Basically, the money simply did not pass into the real economy where it was needed, but it was only 'lazily sitting at the ECB' - and still does so today. This way it creates costs for the EMU until today, and earns a negative interest while doing so, while the real economy is not supplied (functional inefficiency) (ECB 2015b). It takes away leverage and liquidity constraints of major MFIs that allows money deprivation.

A significant quantity of securities - public and private bonds - have also been purchased after the FC in turn of the Securities Markets Programme (SMP), which was conducted as generally sterilized outright monetary transactions (OMTs) (ECB 2015b) totaling €218bn. This led to a broadening in the asset side since 2008 (pale blue, Figure 29). A closer look reveals that they consist of 'troubled' sovereign bonds from Italy, Greece, Spain, Portugal, and Ireland (ECB 2013c) of that time, as the EC had much increased the risk of sovereign defaults and the ECB had to 'step-in' and thus lost a bit in financial strength and credibility.

Furthermore, the recent PSPP (Public Sector Purchase Program) with an announced €60bn per month since 2015 ending in 2016 shows its first signs. A forecast - based on ECB press releases - would yield total assets and liabilities of €3.55tn by the end of 2016 (ECB 2015a, Press Releases 4Q-2014, 1Q-2015). They could bear an unpredictable medium-term risk of inflation and disadvantages all EMU small savers. These non-sterilized QE actions already bear effect on major economic indicators in 1Q-2015: depreciation of the Euro, increasing European stock indexes, declining Euro benchmark bond yields, on so on with this pattern of stylized facts (OECD 2015). The aforementioned inefficiency in monetary transmission is corroborated by negative changes in the PMI™ (Purchasing Managers Index) index, which dropped when the ECB announced its plans and then showed a recovery after 4-6 month. The expected economic stimulus has remained obsolete clearly demonstrating MTC ineffi-

ciency, at least in the short-term. Remarkable, with several hundred billion Euros since 2015 no direct economic benefit can be measured so far of these MP actions. This again highlights the tremendous importance of monetary transmission research, like in this study.

ECB's Liabilities Side: The liabilities side of the ECB's statement of financial position, of course, matches at any given time, at a weekly 'snapshot' or 'stock' resolution, its respective asset side (it represents more than 800 balance sheets of the entire Euro System in sequential steady-chronological order)(based on ECB items, ECB 2015b). The liabilities lay open with whom 'how', and in which form obligations were taken. A major accrual was seen for euro area MFIs - though much of them stayed unused, as noted. Banknotes in circulation represent a 'quasi liability' of the central bank that has steadily increased over the years, from €400 to €1000bn. The FC and EC had almost no effect on its growth, again indicating MFI inefficiency, post-deprivation and risk aversion effects of MFIs as only little escalation of non-MFI liquidity preference occurred, only a fear-driven decline in consumption.

A shift also occurred in the revaluation accounts that bear the recent 'value corrections of ECB's equity' as required by the ECB/ESCB accounting rules (ECB 2010): this essentially dates from changes in the value of e.g. US$ holding reserves (but not the SWAP lines which are at a fixed repo Fx rate at the time of transaction) and gold (ECB 2010). The liquidity measures in foreign currency after the FC had a smaller impact on the total of liabilities.

In summary, after the FC, the ECB has provided domestic and foreign 'liquidity lines' to stabilize the euro area's and global banking funds markets that had at times broken down. This led to excess reserves and a more uncontrollable money creation potential of MFIs. To provide foreign liquidity the ECB has taken some temporary reciprocal currency arrangements (SWAP lines; with the Fed's FOMC, BoE, BoC, among others) since 2008 when the global bank funding exchange market had at times broken down or became periodically weak. These means were initially temporary and were planned to be terminated in 2010. Today they still exist because they were inwardly converted into 'standing swap arrangements' (ECB 2015c; ECB 2013a) with major central banks (Fed, BoE, BoJ, SNB, etc.). Eventually they were extended as needed, indefinitely (e.g. ECB Fed SWAP lines)(Fed 2015). Interestingly, already since December 2007 (FRBSL 2015b), before 'the official FC', they have increased the position 'claims on non-euro residents in foreign currency' and helped safeguarding these markets (ECB 2015a, Press release 25.7.2009) from MFI inefficiency heralding the FC.

ECB operations: The balance sheet basically reveals all of the quantitative means taken by the ECB from 1999-2015. It can be used to track repurchase agreements and QE programs (other liabilities to euro area MFIs, and Non-Euro liabilities of euro residents) but all key details about the deals are not provided (with who, how, TA specifications, price, quantity). This might seem a trivia, but in only one of the latest QE APP program €1tn are intended to change hands and the public is not told any details where the money will end up. Moreover, all TAs between the ECB and the EMUs resident commercial banks (CBs) are 100% confidential and can also not be checked by the public or journalism, even not by most politicians. Furthermore, only 'big' MFIs are eligible for such operations and may create up to a 100-fold of book money on its top. This allows for an extreme leverage allowing MFIs 'theoretically' to buy extreme amounts of precious assets plus new recycled liquidity of the MFI meshwork. Admittedly, this is not in accordance with a 'free market economy' or 'democracy', as most of these ECB operations only benefits MFIs at the cost and sellout of the real economy. The ECB, cynically, still has no real alternative to recent QEs to fulfill its mandate.

4.2.2 The ECB's Instruments: Open Market Operations and Standing Facilities

The ECB provides collateralized credit-liquidity in open market transactions and standing facilities. Additional liquidity is infused into the system in outright transactions (see 2.1.5).

4.2.2.1 Open Market Operation

Open market operations for eligible counterparties (mainly big MFIs, e.g. small CBs might be discriminated, like non-MFIs) consist of (1) weekly main refinancing operations (MROs) and (2) monthly longer-term refinancing operations (LTROs, mainly 3-month) (see 2.1.5).

The sum of these open market operations (MRO, blue; plus LTRO, red) are depicted in Figure 30 (MRO+LTRO, green)(ECB 2015c). They mainly reflect the ECB's assets of, and liabilities to, euro area MFIs (Figure 29). Since 2008/2009 there has been a strong shift away from MRO (duration: 7 days) to LTROs (duration: 91-1463 days). These long-term agreements, LTROs, are a technical reason for the inefficiency observed in excess reserve and overnight deposit facilities since the FC (ECB 2012; ECB 2015b). They were intended as 'crisis management tools' to provide 'more comfortable liquidity' also in the longer-term at a comparably low interest rate (recently 0.05-0.15% marginal rate, in 2015; related to the MRO rate of 0.05%). Several asset purchase programs were already launched with outright operations of €0.44tn in 2015. Non-Euro operations amount to €0.14bn (USD, 9-2015). On

June 2014 the ECB announced targeted longer-term refinancing operations (TLTROs) as non-standard MP measure with a goal other than regulating the structural liquidity position vis-à-vis MFIs of regular outright transactions: TLTROs are officially (3-4 years maturity plus earlier repay options) a credit easing strategy ($MTC_{1,5\text{-}9}$) for lending to non-MFIs, firms and households (excluding house purchases): 128 MFIs borrowed €73.8bn in the fourth tranche (6-2015), the peaked occurred in 12-2014 (€129.8bn), expected to total €0.5tn.

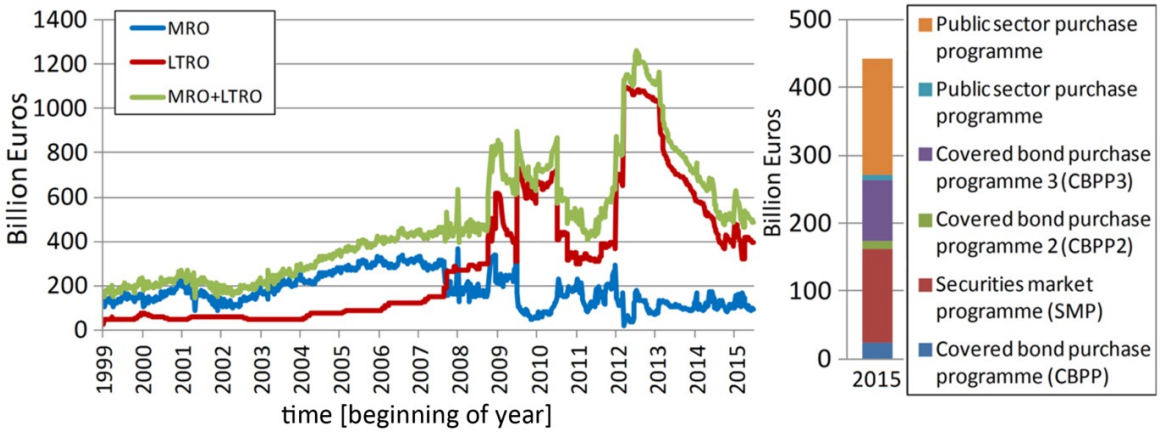


Figure 30 Open-Market Operations: MRO and LTRO and Outright Operations

4.2.2.2 Standing Facilities

The ECB provides its two domestic Standing Facilities only to eligible MFIs: (1) Marginal Lending Facility (0.3%, 2Q-2015), (2) Deposit Facility (-0.2%, 2Q-2015), and now also (3) International SWAP lines that were also converted into standing facilities to provide major foreign currencies to NCBs and local MFIs. Marginal lending is an ECB service of overnight credits to CBs and other MFIs. Figure 31 gives an overview of the two volume trends. Most of the called-for-liquidity (4.2.2) was subsequently found in the deposit facility, also due to the 'MFI comfortable' LTROs (see Figure 30) which can be criticized for a lack of stringency.

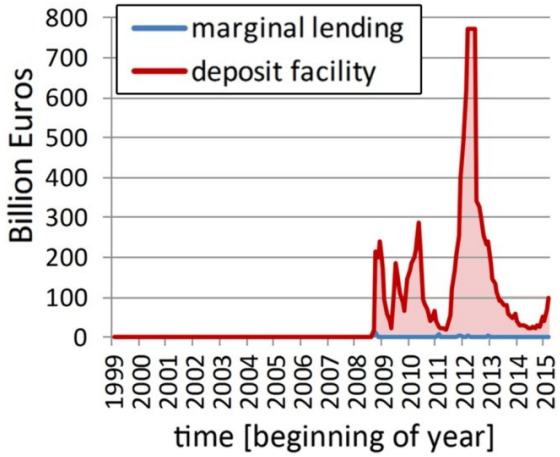


Figure 31 Standing Facilities: Marginal Lending and Deposit Facility

The marginal lending facility is a late resort for MFIs to borrow at a higher interest rate, over what is the current interbank lending rate. This affluence of liquidity for MFIs indicates a salvaged interbank lending market - at a high MTC cost - which was troubled following the FC+EC, which can be also seen in interbank volumes and rates (see Figure 33).

4.2.2.3 Minimum and Excess Reserves of Credit Institution Current Accounts

Minimum and Excess Reserves trended from €100bn to €200bn until 2012 when the reserve requirement drop from 2% to 1% (ECB 2015a; Governing Council 18-1-2012). MFI current accounts then started to soar mostly due to their aggrandized excess reserves. The nonrecurring negative deposit facility rate of -0.2% (ECB 2015c) since June 2014 did not solve the problem. Even though there is plenty of MFI liquidity, in fact more extra-cash than ever before, the ECB extends its QE programs in a Wicksell/Taylor-MP-manner, as inflation is still below target. €30bn EONIA volumes coincide with a current account and deposit facility (liabilities of the Eurosystem to EMU MFIs, see Figure 29) adding up to €200bn in 2014, but now soar again in 2015. Previously, these liabilities were tightly managed due to a good reason: financial stability. Since 2013, they were decoupled from minimum reserves.

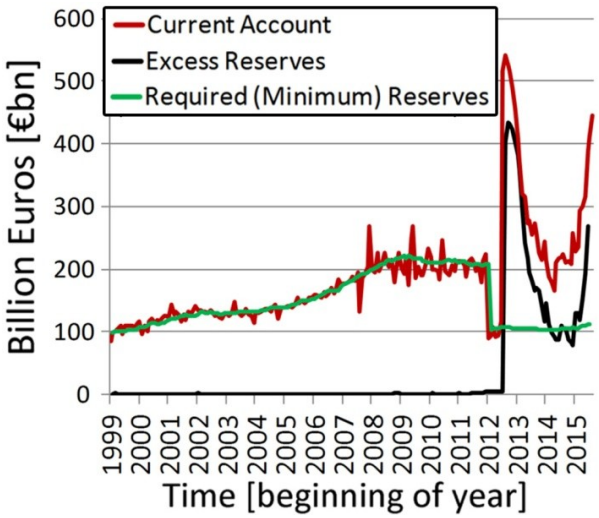


Figure 32 The Eurosystem's Current Account Covers Required and Excess Reserves

4.2.3 The ECB's Crisis Management and its Strategic Dilemma

Since the bankruptcy of Lehman Brothers (September 2009) and the unfolding of the FC (FRBSL 2015b; Beblavý et al. 2011) the ECB is dragooned to act as a safeguard of the financial sector - which is not its legal nor functional mandate: which is in fact to enable a fair MFI competition that drives down PT and interest rates and benefits financial service and supply across member countries. The ECB might have reacted to slow during the crises

(Figure 35) and might have contributed to its depth indirectly: e.g. the very slight accretion in MRO in 2011 and related rate expectations could have contributed to ignite the Greece EC. The previous chapters have revealed a deep and unsolvable dilemma between fostering the financial sector and an efficient and fair market competition. Hence, crisis management and all normal daily operations can no longer be cost-effective (due to this dilemma). The quandary has fatal consequences: to achieve its primary goal of 1-2% inflation, currently at the ZNLB-complex-of-problems (Eggerston & Woodford 2003), MP must be even more lax despite of the overwhelming issues of excess reserves, inefficiency, and risks of extreme MFI leverages that arise in fraction reserve banking - widely believed to pose new risks to 'financial stability' and could cause crises and deep economic disincentives for economic performance. Basically, it all comes down to this: the monetary transmission is inefficient and too much money is required to make it effective - while the real economy is held hostage by MFIs that are the only ones that still benefit from this dilemma. Vast amounts of new money have not much bettered the real interest rates that are key to economic stimulus and investment (Mankiw 2014; Friedman & Woodford 2010). The 'FC bailouts' of more than €4 trillion of guarantees and cash injections have not helped much the real economy.

4.3 Monetary Transmission in the Euro Area

4.3.1 Interest Rates in the Euro Area

The key interest rates in the euro area, the EMU, are set by the ECB's Governing Council (ECB 2004) that meets twice a month and publishes a schedule of planed meetings in which decisions about the key European rates are made: (1) main refinancing operations (MRO) including LTROs, (2) deposit facility, (3) marginal lending facility, and (4) others (TLTRO, etc). Decisions are made in accordance to these meetings and can be spontaneously scheduled.

These Key European Rates, especially MROs and the new LTROs and T-LTROs, are regulating the direct MFI rates, and money market interest rates, interbank rates. A chart analysis in Figure 33 directly detects a more 'stringent' effect on the very short-term interest rates, such as EONIA overnight deposits (Euro OverNight Index Average, 1 TARGET day, ACT/360, p.a.), or EURIBOR (e.g. Euro Interbank Offered Rate, e.g. one month). This is because MFIs only lend and borrow legal tender money on the interbank lending market from each other and no virtual book money is in play (Görgens et al. 2014; ECB 2015b; Eonia, Euribor rates). Of note, the real capacity of MFIs to generate returns on this money is not reflected as val-

ue in any of these rates - meaning that liquidity has not to be (much) competed for. EONIA and EURIBOR are virtually only redundant rates of intermittent market that act like money basins were banks further manage their liquidity: but falsely imply efficiency of MP.

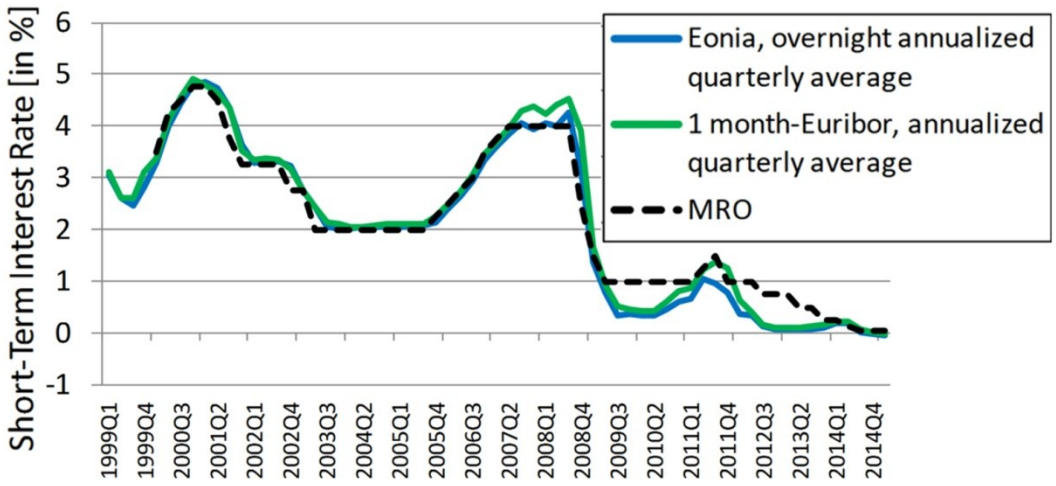


Figure 33 Interest Rates of the Short-term Money Market: Eonia and Euribor

All future returns on that money show no impact on the interbank lending market. Liquidity restoration of the 'interbanking market' came at a high cost and a loss of MFI competition. The trend of a tight interbank pass-through (PT) spans only few exceptions in the FC and EC, when the EONIA and 1M-Euribor dropped below the MRO rate for approximately a year (see Figure 33). Till today the overnight deposit rates still tightly resemble the MRO and became slightly negative with the deposit facility rate (-0.2%). MFIs recently pay money for short-term lending: e.g. 1-Week-EURIBOR (6-2015): -0.129%, EONIA (6-2015): -0.12%. Many economists believe that these negative interest rates indicate 'a big flaw' in the financial market and in the MS architecture of the Eurosystem (Reuters 2014; Friedman & Woodford 2010), as the ECB faces a dilemma that there is no real alternative to its MP. In the community it might also cause discrimination against smaller banks, and weaker economies, in the periphery (Reuters 2014): 'negative interest rates show cracks in the banking system'.

The overall economic and idiosyncratic behavior of MFIs/CBs indicates a deficient monetary transmission at its very origin - directly after the money is passed over to credit institutions.

An overview of all ECB's 'Key Rate' decisions is given in Figure 34: an overlay with the EURIBOR and 10-Y-G-Bonds is given to readout market effectiveness. The EURIBOR is a daily reference rate for many financial products (Sperber 2015), comprising forward rate agreements, interest rate future contracts, interest rate SWAPs, among others (Görgens et al.

2014). The 1-year EURIBOR and the 10-year G-bonds still follow the ECB MRO rate, but the longer the term or maturity date the less tightly correlated with the MRO rate, and also the PT increases with the duration or term and G-bond specifications (ECB 2015b; ECB 2015c).

Besides the key interest rates the Governing Council has also announces several relevant non-standard monetary policy measures post-FC: (1) enhanced credit support, (2) securities markets program, (3) outright monetary transactions, or (4) modalities of the early repayment of funds raised through the three-year refinancing operations (ECB 2015b).

The prospect of the introduction of the Euro in 1999 has led to declining interest rates (1-year EURIBOR, 10-year G-bonds) in the euro area for five consecutive years (see Figure 34). Later, the 1-year EURIBOR has fallen from 8% in 1995 to 3% in 1999. The 10-year G-bonds behaved in a similar way but 1-2 points higher. They always responded to the ECB's key interest rate with some latitude. The 1-year EURIBOR also follows the MRO rate in a tighter and much more responsive manner, while the 10-year government bonds (G-bonds) also react in the same direction but more loosely due to maturity dates and speculations. The interest rates also play a pivot role in the international financial markets. In concurrence with other international key interest rates and financial variables they determine the Fx rates, influence the interest and SWAP rates, and the global financial streams and flows. Figure 35 depicts the concert of four key central bank rates: the Fed, ECB, BoE and the BoC.

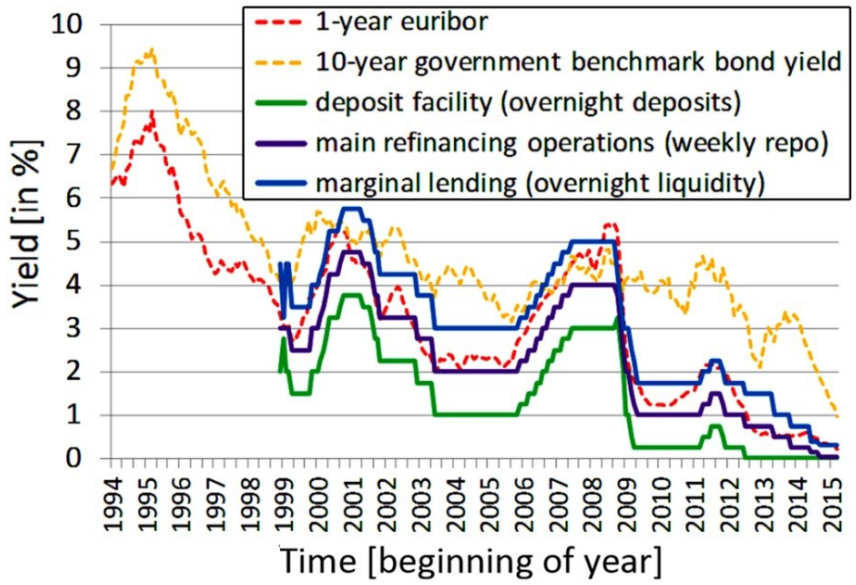


Figure 34 Key Central Interest Rates in the Euro Area, 1Y-Euribor and 10Y-G-Bonds

The overlay of key central bank rates of the ECB (EMU), BoE (UK), BoC (China), and Fed (US) in Figure 35 illustrates how interdependent the international financial sectors are - already

at the central bank harmonization is built-in and also downstream financial markets react. The Fed's FFR seems to have reacted faster during the FC, and more appropriate (see job creation post crisis), and has influenced the ECB reaction that affected the BoE. All three might have affected the BoC that sets its key interest rate at a higher corridor of 5-7.5%.

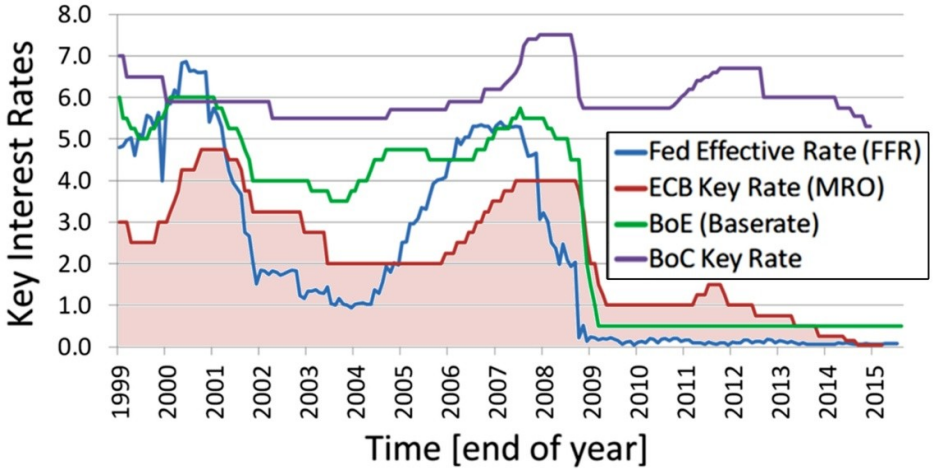


Figure 35 Key Interest Rates of the Fed, ECB, BoE and BoC

4.3.2 Pass-Through and Interest Heterogeneity in the Euro Area

The 'pass-trough' (PT) is used as an indicator (Paries et al. 2014; Blot 2013; Sorensen & Werner 2006; Sander & Kleimeier 2004; and refs herein) not as absolute measure for the effectiveness of the monetary transmission (due to a fractional reserve banking multiplication). Defined as the difference of nominal, or real, interest yield over the ECB's MRO rate it provides a statistical indication of how well the ECB's MP can regulate the market interest rate, and the relative effect on how efficient and effective the monetary transmission operates in Euroland's economy. Note, a PT of zero can still indicate a highly inefficient system (in the lending market, whenever MFI book money is involved) if new money is released by the ECB - as it represents an entire positive CF for MFIs: it means up to 100-fold of principals repaid and up to 100-fold interests for only 1% temporary minimum reserve deposits for MFIs - and equal amount of debt for non-MFIs and the real economy: 'the biggest economic scandal ever for any democracy or free market economy', could be the headlines of the media coming up soon. If the EMU's financial sector would converge towards more efficiency and homogeneity the PT of 1-Year Euribor and 10-Y-G-Bonds would progressively decline, however even the most efficient financial products have PTs (see Figure 36). The following rule or 'fractional reserve related financial product PT law' can be derived from extensive PT studies (only key results are shown): the more direct a financial product is

traded only between MFIs - the more real ECB money is in play per purchase - hence the lower and more efficient the PT (1-Y-EURIBOR, see Figure 33). Vice versa, the more book money, fractional reserve banking, of MFI is in play, the more a financial product is paid from a normal banking account or depot, the less real ECB money is in play, the more credit extension is involved by MFIs, and the less efficient is the PT (e.g. 10Y-G-Bonds) and MTC.

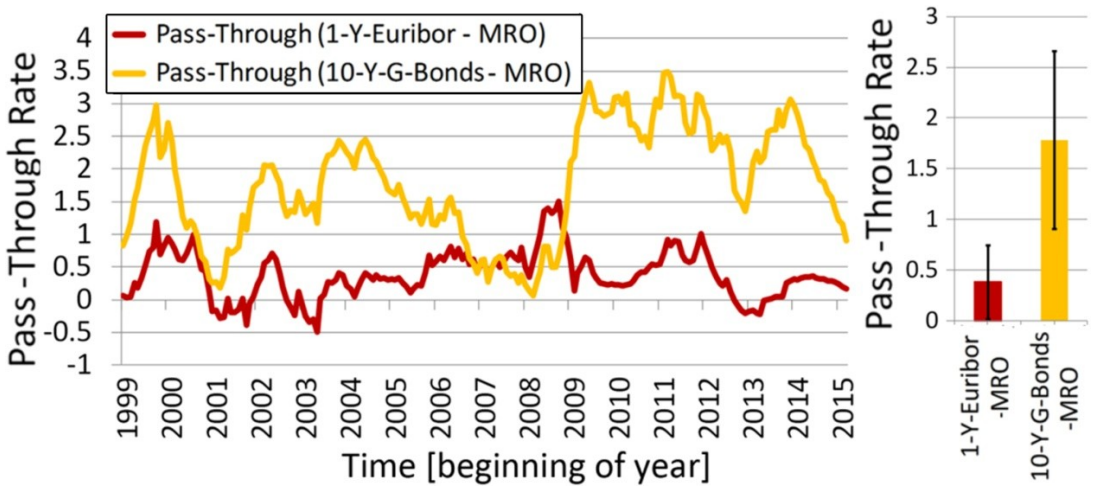


Figure 36 Pass-Through Trend Development of 1Y-Euribor and 10Y-G-Bonds

(1) Fractional Pass-Through in the Euro Area

The development of the PT (Figure 36) shows a lot of fluctuation over time especially for the 10Y-G-Bonds. The net interest margin (an US equivalent of PT but broader and accounting/tax based) of US banks falls more consistently and steadily by 1% since years until 2Q-2015 (FRBSL 2015a). Importantly, one should not forget that the PT must be multiplied by m_{total} as MFIs can rent out much more per 1€: $PT_{total} \approx [(100\%+i)*m_{total}$ (100%+i as the principal is fully paid back to MFIs in real legal tender[exception: default]; only a set of differential equations could better and dynamically describe what really happens). The total money multiplication (m_{total}) must be higher than m_{1-3} and is extended by cycles, estimated: 10-40.

Despite of lacking this multiplication in the real world (1% PT can be a 1010-4040% gain for MFIs; m_{total} and not the PT determines MFI 'real profitability' - PT only explains financial P+L account profitability that is more meaningless for MFIs and only meaningful for firms/non-MFIs) the PT must be still used as a standard to reveal the major trends - as m_{total} cannot be calculated due to a lack the comprehensive MFI CF data over time - even the ECB cannot.

Hence the PT (difference between market rate and MRO) still has to be used as global indicator to reveal the trends of interest-PTs, MTC-efficiency, and ECB rate market-penetrance.

PTs of various market interest rates can be tracked. This analysis hampered by (1.1) euro area cross-country heterogeneity, and (1.2) and overall heterogeneity of financial products.

Previous research has found a sluggish loose heterogeneous interest-rate PT across financial products and across euro area boarders (Sorensen & Werner 2006; Paries et al. 2014): For 2006 a 'persistent fragmentation' and 'lack a integration' was diagnosed in the EMU retail banking sector, mainly due to a lack of local generic competition. Rates on corporate loans appeared to react 'more efficiently', followed by mortgage loans, time deposits, consumer loans and rates of account deposits (Sorensen & Werner 2006; Paries et al. 2014):

$$E^{i}_{corporate} > E^{i}_{mortgage} > E^{i}_{time\ deposits} > E^{i}_{consumer\ loans} > E^{i}_{account\ deposits}$$

Formula 42 Efficiency of Pass-Through of Interest Rates (EMU, 2006)

New PT research can now be based on the steady-state-approach ECB/2001/18 (ECB 2003) to elucidate the trends and emerging big picture that requires updating empirical research.

The MFI's PT to non-MFIs (both residents) is to be seen as key monetary transmission element that is relevant for assessing and evaluating the performance of the ECBs MPs.

The architecture of interest rates is more complex, difficult to systematically assess, and a precise weighting is hard to handle due to customized lending. Nominal interest rates often represent only standardized products. Debtor's financial characteristics often have to be fully disclosed to MFIs that can be used for 'MFI network actions' and interest rate settings.

On account of this monetary and financial research makes use of 'normalized, standardized and annualized' APRC (annual percentage rate of change) and NDER (narrowly defined effective rate) rates. APRC (APRC, Council Directive 87/102/EEC) includes the total of all charges, a risk premium or discount, and hereby is to be seen as the 'effective rate', as opposed to the 'announced rate' (ECB 2003). Generally, all annualized MFI interest rates used in this study refer to 'agreed rates' between reporting MFIs and the non-reporting non-MFIs. These agreed rates are 'closed-door' negotiated and charges are generally excluded if not noted otherwise (Formula 43), and are represented as APRC or NDER, according to:

$$APRC\ or\ NDER\ [in\ \%] = \left[\left(1 + \frac{i}{n}\right)^{n} - 1\right] * 100\%$$

Formula 43 The APRC and NDER Formula (Council Directive Definition)

Entry: i: agreed interest rate p.a. reported by the MFI, n: number of interest capitalization periods for the deposit and loan per year (1: yearly, 4: quarterly, 12, monthly); if the interest payments are made at a higher frequency (n) then APRC increases slightly; aim: higher interest rate comparability

The NDER refers to an annual basis and is defined as the interest rate that equalizes as the present value (PV) of all commitments other than charges (that may apply) (ECB 2003). The NDER is equivalent to the interest rate component of the APRC, but the APRC shall take all additional costs (cost of administration, enquiries, guarantees, insurances, preparation costs) into the i component (ECB 2003); but it is not known how well this is done by MFIs.

In fact 43 out of 48 (89%) MFI interest rate statistics don't include all charges or fees. Only for consumer credit and loans for houses the APRC is required by regulations. The annualized agreed rate (AAR) used is the percentage of standardized interests on a yearly basis.

(1.1) The Heterogeneity of Interest Rates in the EMU

Using the moving 'weighted average - AAR based NDER method' for financial products per country, heterogeneity can simply be shown by visualizing all country's NDERs over time. The NDER trends for households and industry are depicted in Figure 37 and Figure 38.

The spread in between countries (indicating PT variance) can be illustrated as the standard deviation (that is the square root of the variance, see 3.2.1) of the mean (see Figure 39).

The unweighted form of country-heterogeneity is to be used as it is more indicative for the convergence and functioning of the EMU's retail banking sector as the effects of the national banking compartments need to be analyzed and not a representative average. Nevertheless, the unweighted average cost of borrowing in this case is in fact very similar to the weighted one and a main difference is only the variance or deviation (see Figure 27).

The convergence was previously tested and evaluated as highly heterogeneous and a lack of competition was found in retail banking, implicated in 2006 (Sorensen & Werner 2006). Still, it is time to revisit such assays with new data. The analysis reveals that recent interest convergence still remains a challenge but has slightly improved (10%, disregarding the crises). But it still reveals a too high level of market inefficiency, as it did before. But the conclusion differs: due to fractional reserve banking the inefficiency must be multiplied by m_{total} which is a tremendously higher inefficiency of monetary transmission as was previously reported, or concluded. Concomitantly, the effect of the FC+EC (Greece, Cyprus, Por-

tugal, etc.) have clearly exacerbate the convergence of NDER interest rates (Figure 39), which is also statistically significant ($p<0.05$). Furthermore, the variance, standard deviation and the SEM are significantly heightened after the FC and EC ($p<0.005$) for both the NDER of corporations and households. The joining of the new stage III EMU member countries with it inherent structural and economical differences, also including differing constrains in retail banking sectors and MFIs, has only partially contributed to the generic effect. Mainly the developments in seven EMU Countries explain the phenomenon, as expected.

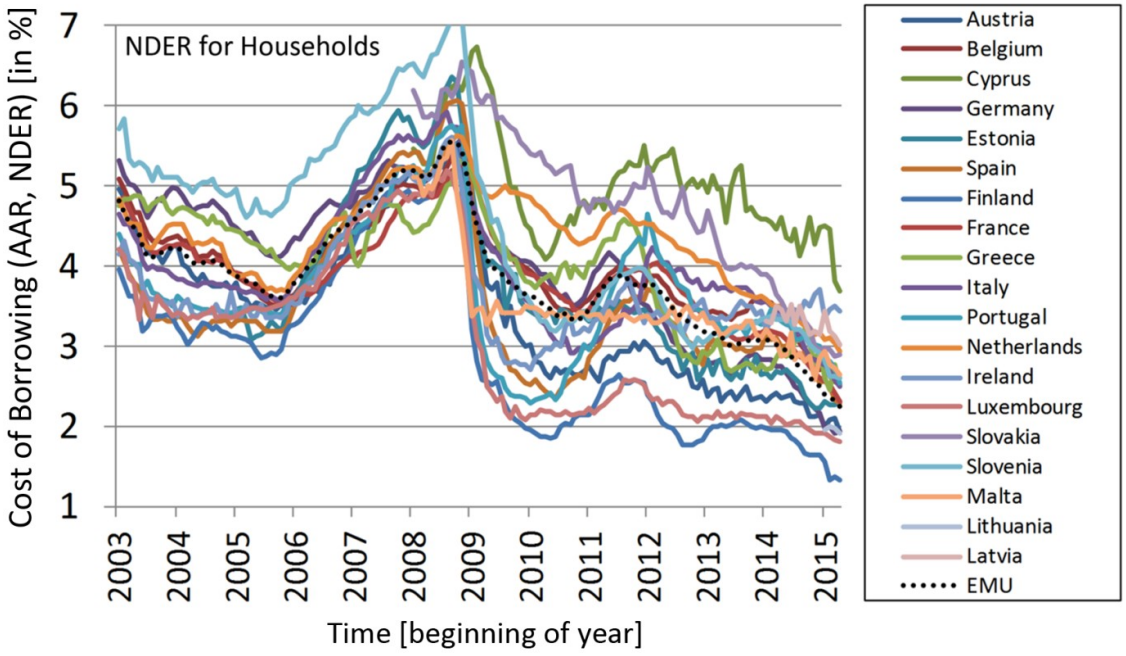


Figure 37 NDER for Households and Moving Weighted Average

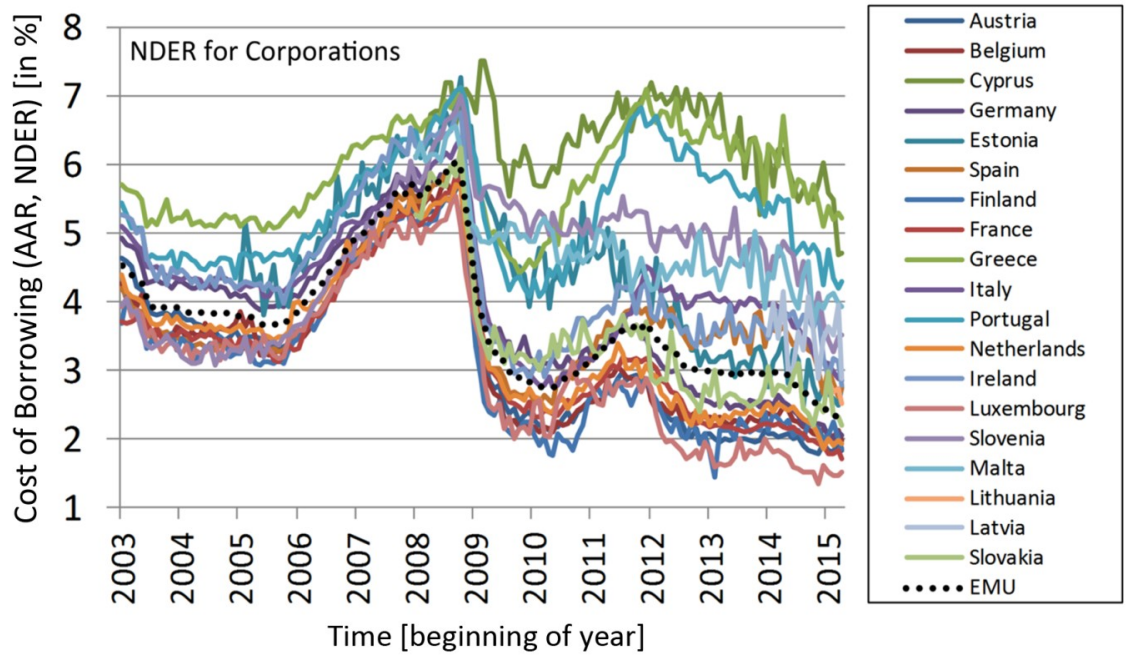


Figure 38 NDER for Corporations Moving Weighted Average

The mean of the corporation NDER is slightly higher than for households, likely, due to heterogeneity and a lower effective contribution of additional fees and charges to it. It is also possible that huge amounts of 'selective betterments' are not fully reported by MFIs.

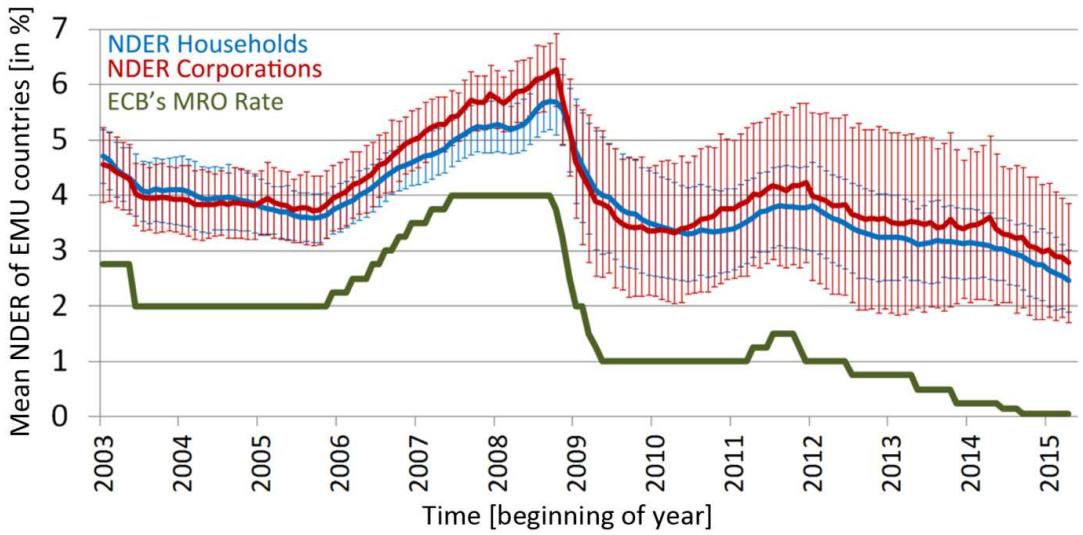


Figure 39 Unweighted Average of EMU Member NDER for Households and Corporations

Another interest indicator that is widely accepted to be highly important for measuring the financial heterogeneity of European countries is the meaningful 'secondary market yields' indicator e.g. of harmonized long-term interest rates on 10-year G-Bonds (see Figure 40).

The overall trend is clearly decreasing from 1999 till today. This is also seen for other related yields of G-bonds (see 6.1 Figure S15), comprising most relevant spot and forward rates.

This is also an achievement of the ECB's MP that was economically and fiscally required. Strong counter movements happened during the FC+EC (i.e. Greece, Cyprus, Italy, Spain, and Portugal). High GDP countries converge, low GDP members diverge. Financially troubled nations further disband - social gaps continue to grow (e.g. GINI index). Heterogeneities and very different MFI constrains persist throughout Europe. A lag or delay of political reforms (fiscal, monetary, political, economic reforms; compared with the US monetary entity) is the reason in a steadily transforming EMU market.

A low level of such long-term interest rates - with a 2% tolerance to the three best rates - is relevant for the fourth article of the Maastricht Criteria (see 2.1.1). They are annually assessed by the ECB and reported to the European Commission (Art 121 of the Treaty).

The broadening of the bond yield spread, mainly from Euro Crisis countries, represents also a crisis of confidence into the ability of countries like Greece to repay its debt obligations in

the future, which was also reflected in the time charts of Greek Credit Default Swaps (CDS). Aside, related 'naked CDS' speculation was prohibited in several European countries including Germany after the FC to prevent speculation misuses (Sperber 2015; ECB 2015b).

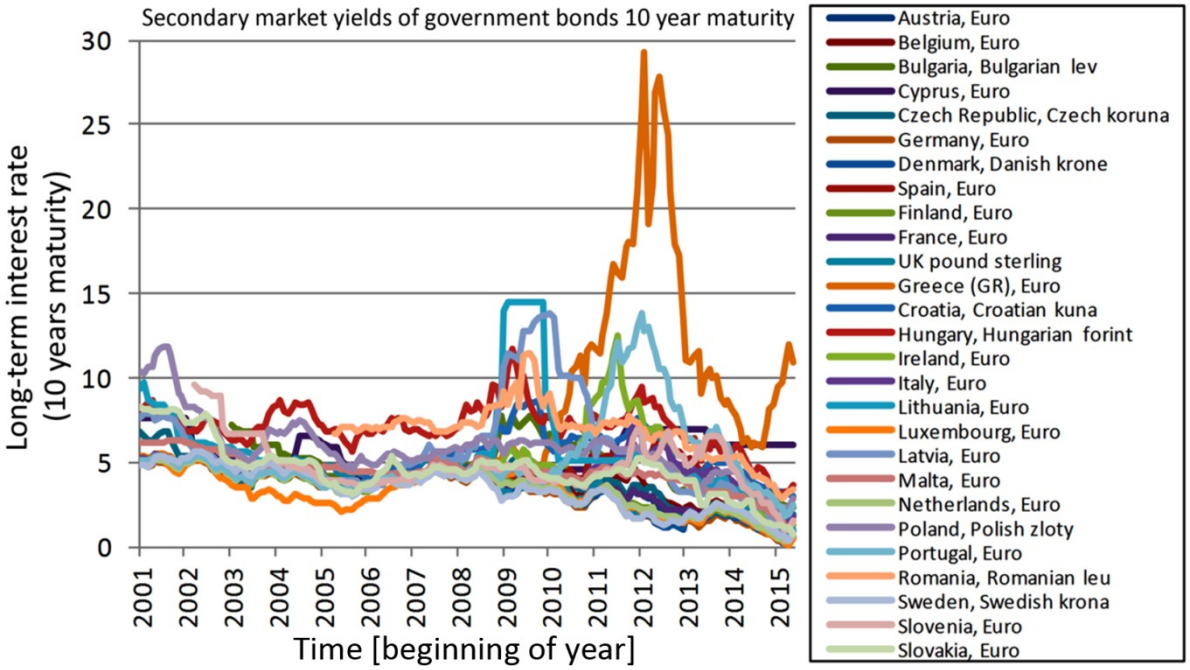


Figure 40 Harmonized Interest Rates on 10-Year Government Bonds

The distance (difference) between the average NDER's and the ECB's MRO depicts the PT. It reveals that the EMU NDER-PT is on the rise again due to a widening lack of competition.

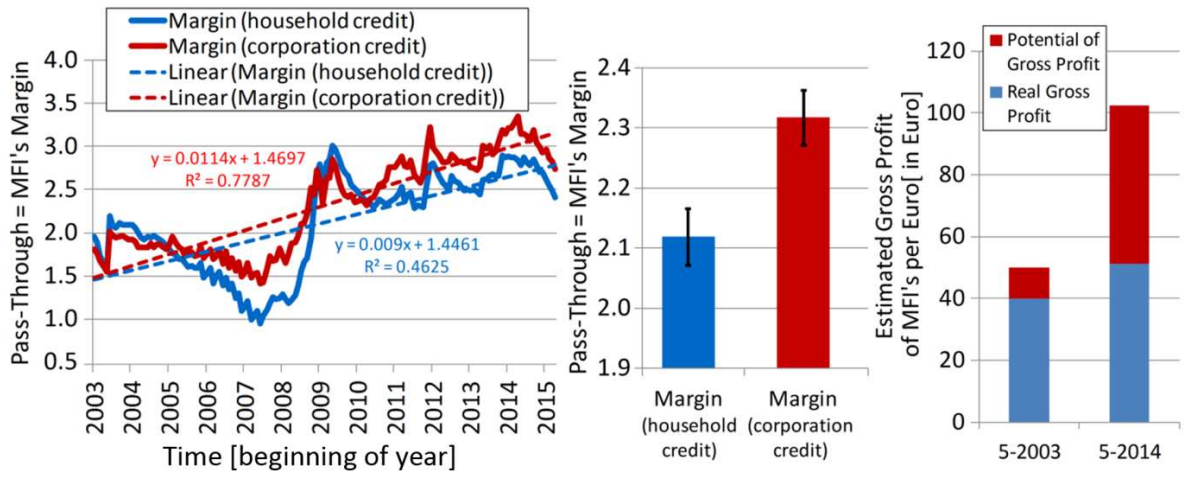


Figure 41 Further Increasing Pass-Through Inefficiency and MFI's 'Profits' in the EMU

Figure 41 shows that the financial markets become less efficient and more profitable for the banking sector in total. There is an ongoing upward trend of the margin from 1.5% to 3% in only 12 years (from 2003-2015). Meaning: the MFI sector's transmission into the real

economy is almost twice as inefficient as it was before: this is the reason of rising real interest rates despite of a lower MRO (see 4.3.8.1). Although this effect was partly already found and described in 2003 (Sander & Kleimeier 2004; Sorensen & Werner 2006), this study has its starting point in 2003 and provides important new results and a more correct and better interpretation. Furthermore, the PT margin is just 'trend-indicative' - meaning that the true inefficiency-increase could be even much higher than just two-fold, in reality, due to m_{total}. Potential 'profits' of MFIs are on the rise due to the new legal and MP setting.

(1.2) The Heterogeneity of Financial Products (Speed and Extent to Adjust)

The second of the two questions deals with the heterogeneity of financial segments and products. Time course analysis must reveal examples of the various interest rates of (A) households and (B) corporations in the euro area. These are further to be unmerged with regard to principal amount and grouped by time of lending (maturity) for a direct comparison. Figure 42 and Figure 43 summarize interest rates for loans and deposits of corporations and consumers and MRO and the (fractional) PT (see Figure 44).

While the PT of interests-receivables of the real economy has much declined the PT to-be-paid by the real economy (non-MFIs) has grown. Especially since the FC and more for households that have less negotiation power than for corporations, which borrow higher volumes per contract. The term 'Fractional PT' is introduced to remind the reader of m_{total}.

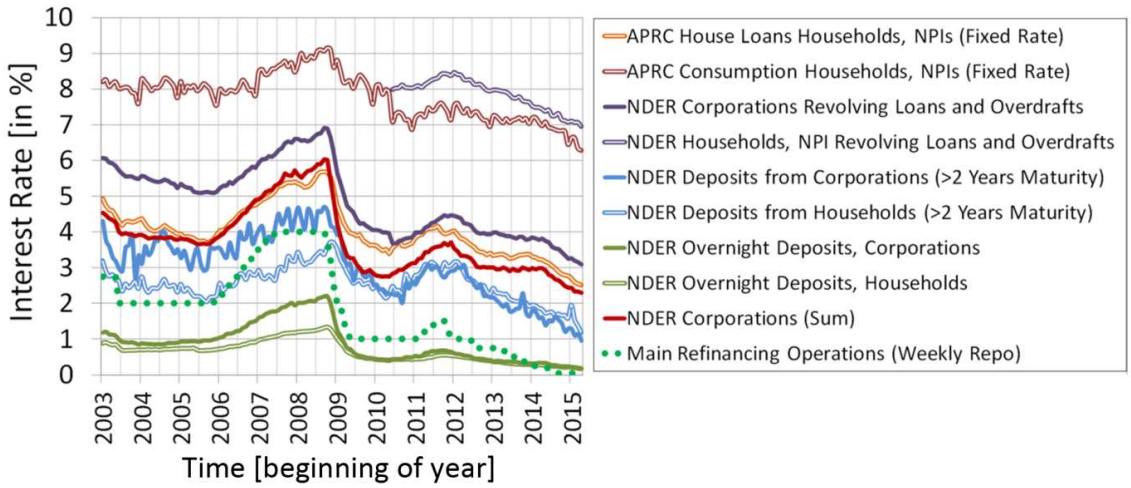


Figure 42 Interest Rate Diversity for Corporations and Consumers in the Euro Area

Although EMU MFIs should have more liquidity and leverage available and a higher m_{total} they still increased their interest returns and diminished competitive market forces. For all that the ROE is still lower than before due to Basel III (BIS 2011), which is a bit misleading.

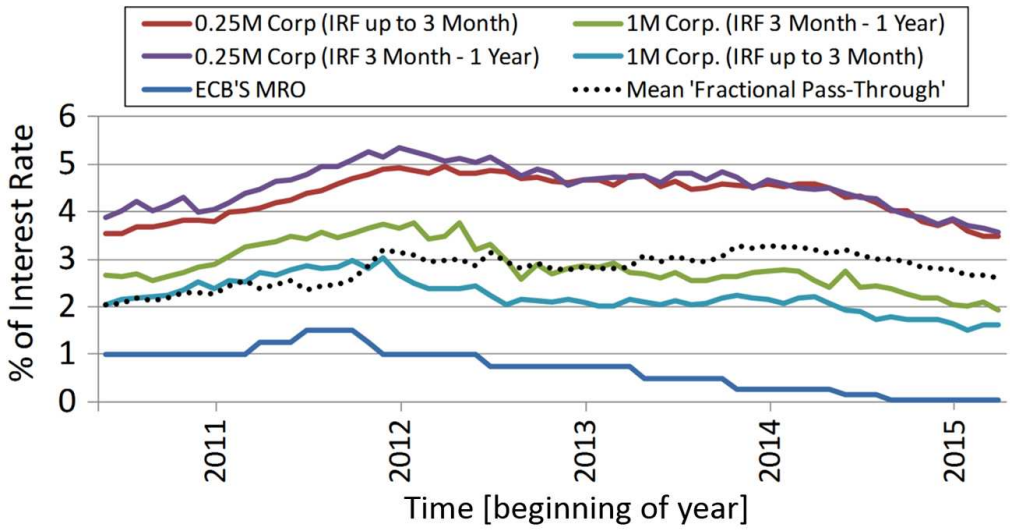


Figure 43 Important Corporate Interest Rates and Mean (Fractional) Pass-Through

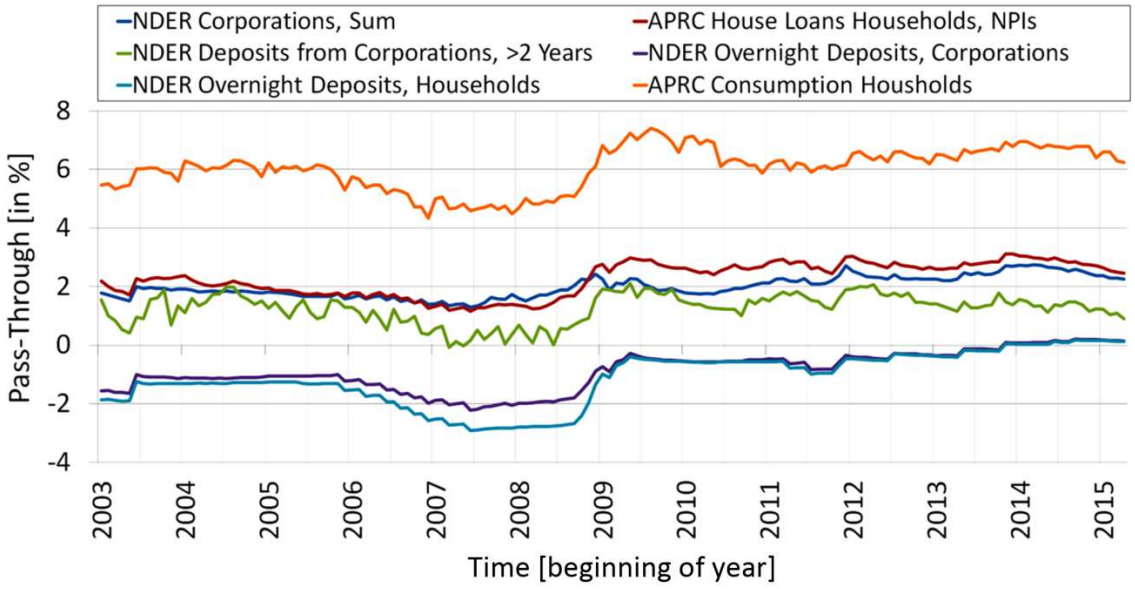


Figure 44 Fractional Pass-Through Trends of Financial Products in the Euro Area

Figure 45 further analyzes these data to find the PT deviation and extend order of PTs for a further comparison with previous scientific studies (Sorensen & Werner 2006; Blot 2013). The pass-through deviation is a measure of the stringency of the market interest rates for specific financial products, and how they follow the central bank rate (e.g. MRO). As before: the higher the pass-through-deviation the less stringent the interrelation. Hence, a sequential order of the individual stringencies for financial products can be derived (see Figure 45).

The highest standard deviation is found for household's overnight deposits (NDER). They are also the most fractionated population of all private customers with the least amount of negotiation power (per deal). They are also only very poorly organized and there is not a

strong political representation. The same holds true for the second highest amount of deviation (= the second least stringently following the ECB rate): the APRC for consumption of households. The APRC of household's mortgage-backed house loans has only a PT stringency comparable with firm's overnight deposits (NDER), reflecting a poor negotiation power, in a 'Financial Sector Structure' model - in the style of Porter's five forces (Porter 2008).

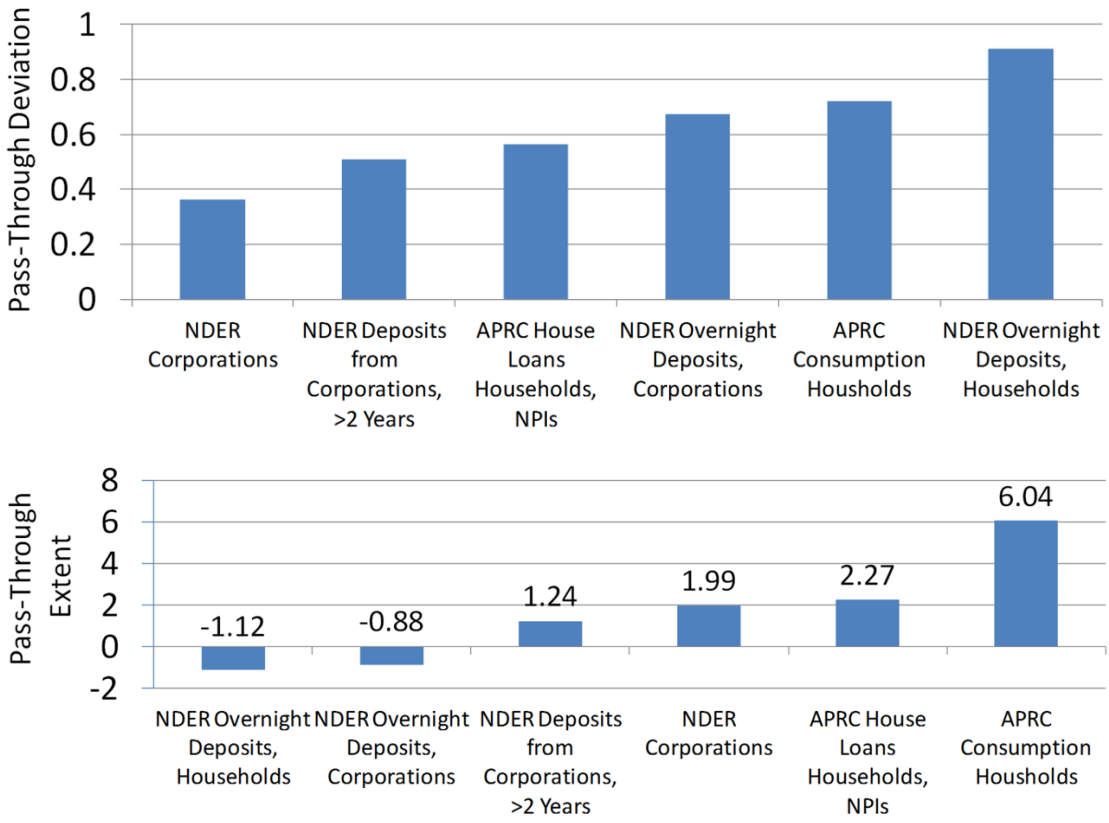


Figure 45 Deviation and Extent Order of Pass-Through Rates

The highest stringency of fractional PT trends is found for corporation's lending and deposits (NDER, >2 years), again, due to higher negotiation power and potential 'bank-firm collaborations', probably also unreported contracts could theoretically exist. Figure 43 shows that the PT is lower for firms borrowing a higher sum, again a result of negotiation power.

The highest PT and thus the lowest retail banking market efficiency can be found for the consumer's APRC of household consumption, in this set of financial products. But customer credit card (revaluation) accounts probably have the highest and most extreme PT: The consumer's credit card credits (ECB 2015b) are unique in the way that they are the only rates that are 'completely non-responsive' to the ECB rates in the euro area. In fact some of them are even inversely correlated, meaning the ECB's rate strongly fall and they move up. With respect to the 'extent of PTs' they equilibrate almost at double the level of the already

high rates for consumer's revolving loans and overdrafts. Market forces are less strong here, and a lack of competition might be found under the disguise of fierce competition. Additionally, consumers are willing to use several credit card systems that do not differ much in terms and conditions, because they only want 'to be able to pay everywhere'. Paying with credit card is creating a short-term debt that is converted into cash flows for MFIs.

In summary, these results reveal the 'fractional pass-through' and its features and dynamics in the markets of financial products. The previous understanding (Sorensen & Werner 2006; Blot 2013)(see Formula 42) could also be advanced in several other aspects: (a) time (including recent years), (b) comparability of data sets (full uniformity, harmonized data), (c) extent and (d) stringency of the pass through, which is summarized in Formula 44 vs. 43.

$$E^{i}_{corp} > E^{i(corp)}_{time\ deposits} > E^{i}_{mortgage} > E^{i\ (corp)}_{account\ deposits} > E^{i}_{cons.\ loans} > E^{i\ (housholds)}_{account\ deposits}$$

Formula 44 New Order of (Fractional) Pass-Through Stringency (based on Figure 45)

Entry: E: Stringency denoted as PT efficiency of interest rates in relation to the ECB's monthly MRO rate, i: nominal interest rate, cons.: consumer, corp: corporation

4.3.3 The Forex-Effect of the ECB's Monetary Policy

The public money supply by the ECB and the private money multiplication by MFI, not only affects the prices in the euro area it also affects the purchasing power (PP) of the EMU's currency in the world, found in exchange rates. According to recent macro-economical theory, there are two effects: (1) an increase in the money supply proportionally lowers the exchange rate (in indirect quotation) and decreases the PP per unit of currency, and causes (2) effects associated with a lowering of the interest rates, e.g. shift in portfolio investment. This plays a key role in monetary transmission (MTC2, MTC16), while the international system generally converges towards purchasing power parity (PPP), due to the 'law of one price' and short to medium-term 'arbitrage equilibria', and since exchange rates (Fx) also have an impact on domestic prices, inflation, imports/exports, investment, and GDP.

(1) Effect of MP on the Foreign Exchange Market in the EMU

Empirically matching the real world data with the theoretical textbook 'monetary Fx model' (Formula 19) uncovers more noisy, less stringent, and more complex trends that is, however, generally still much in line with the theory, also if diverse time delays and 'major shifts' are incorporated (not shown here): Figure 46 pinpoints the development of the three key

important Fx rates/indexes for the EMU: the quarterly US$/€ spot rate, the EER-19 spot index, which reflects the euro area's total exchange rate changes with selected major trading partner in the world, and the Chinese Renminbi, also shown here as a CNY/€ index.

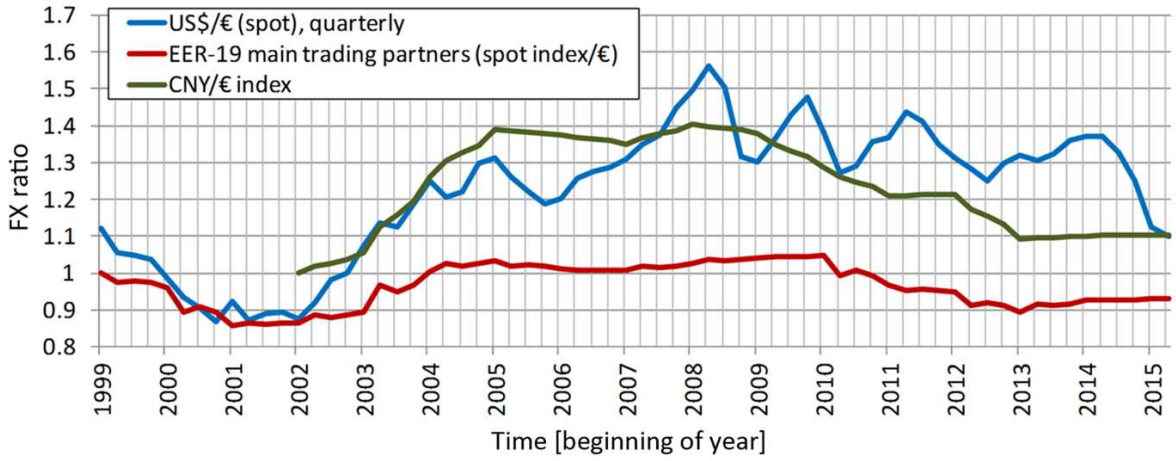


Figure 46 Major Euro Exchange Rate Developments from 1999 till 2015

Upon the Euro's launch in 1999 a slight depreciation period occurred (due to the fixed intra EU rates, economical circumstances and expectations) until it became the common currency in spring 2002. Since then, and until 2010, it was strongly gaining up to 40% (max. 66%, a ca. 6-year-long 2003-2009 high) against the US dollar and the Chinese Renminbi (ca. 40%). The EER-19, a weighted average of all main trading partners of the EMU-19, had a lower amplitude, and was influenced by the CNY and US Dollar (ca. 15% increase), at that time.

This increase in PP of the Euro, from 2002 to 2010 reflects the heightened demand for Euro with respect to the other currencies, since the Euro became the second most traded currency in the world (ca. 40%) in 2010 (BIS 2013). It then started to fall back to 33% 'on one side' of all global daily shares in 2012 (BIS 2013). At the same time the exchange rate of the Euro lost its previous gains. This also stems from global demand for Euro as monetary vehicle (BIS 2013)(ca. 40%, o.c.). The velocities with non euro area residents grew temporarily.

In 2010 Euro dwindling was further globally evoked by the first news releases of an upcoming sovereign debt crisis, which must have shifted also the demand stemming from using the Euro as payment vehicle back towards the older currencies like the US dollar (BIS 2013; Economist 2010). Exporting firms benefited, especially in Germany (place 1, 29% of exports), the Netherlands (2., 9.3%), France (3., 7.9%), as exports became more affordable.

(2) The MP Effects on International Portfolio Investment

A second effect of MP induces shifts in exchange rates that drive interest rates and preferences in portfolio investment. The exchange rate is the co-action of many effects (Giddy 1994; Sperber 2015). Among them: (1) the intermediation of different price levels, domestic and foreign (Fx strives for a general PPP). (2) This also includes financial products as shown in John Maynard Keynes 'Interest Rate Parity Theory', when arbitrage on interest rates mediates Fx market changes (whenever the interest spread > SWAP rate). In general, the higher the interest rate (and its future expectations) the stronger the Fx rate, as the demand for the currency increases, including its usage as monetary vehicle. Both effects, (1) price level (PPP) and (2) interest parity, are thus to be addressed by comparing the euro area with other countries, e.g. the US, which offers the advantage that both economies are of comparable size and interdependency making a comparison more meaningful.

The price levels (CPI, 1998=100, World Bank) in the US and euro area (19 countries), from 1999 until today (2015), have both developed in a very similar fashion: mainly, US inflation is only marginally higher ($\Delta\pi_{EMU,US}$=0.27%). In theory, the MTC-effect of this difference should slightly affect the Fx-rate equilibrium (Giddy 1976; Sperber 2015) (i.e. a very slight depreciation of the dollar) in periods of a higher inflation in the US as compared to the EMU (see 2.4.2). The spread of the CPI index has had a partial effect in 2002-2007, when inflation was higher in the US (with a minor exception in 2003). This seems to have added to depreciation of the Fx rate. When the gap was closed the Fx rate began to return, and after the FC+EC it librated in the Dollar-appreciating direction in 2015 - back to its initial course of 1.10 $/€. Reasons are a stronger economic recovery in the US as compared to Europe and the ongoing bad news about the EC. Since 2010, the US has created more jobs than Europe, Japan, and the top advanced 36 economies of the world in sum: over 13 million people (backed by IMF data, and the White House, still a 0.17m/month) many via new businesses less than five years old, while the labor participation rate has only slightly fallen (according to (WB 2015), ca. -1.4%,- due to aging, learning, and more disabilities).

It is known from several previous studies that the employment level is an indicator for real future GDP growth and can appreciate the Fx rate: announcements of the payroll employment rate have impact on the Fx rate: abbreviated to 'employment stabilizes the US dollar' and also the Euro, and also evokes investment (Harris & Zabka 1995). Previous economic theories saw two main reasons: (1) a higher employment raises expected inflation, and (2)

causes a tightening of the credit market and the probability of a future restrictive MP (Harris & Zabka 1995). Based on the data in this study here, both theories don't fully explain the effect, as expected inflation and expected MP did not always react this way. Hence, a new theory needs to update the old theory: (1) the Fx rate is affected more on the basis of real GDP natural trends and the job market, (2) market data and expectation about money, inflation and financial markets, and (3) global financial yields and rates.

The overlay of US/EMU real GDP-ratio and p.a. Fx-ratio trends are shown in Figure 47: an upward trend of US real GDP (faster than in the EMU) appreciates the Fx rate [drops the $/€]. This correlation becomes stronger over time: after 1 month R=0.38, after 1-2 years R=0.55. Other effects were in play in 2002-2005, and blurring and delaying happens.

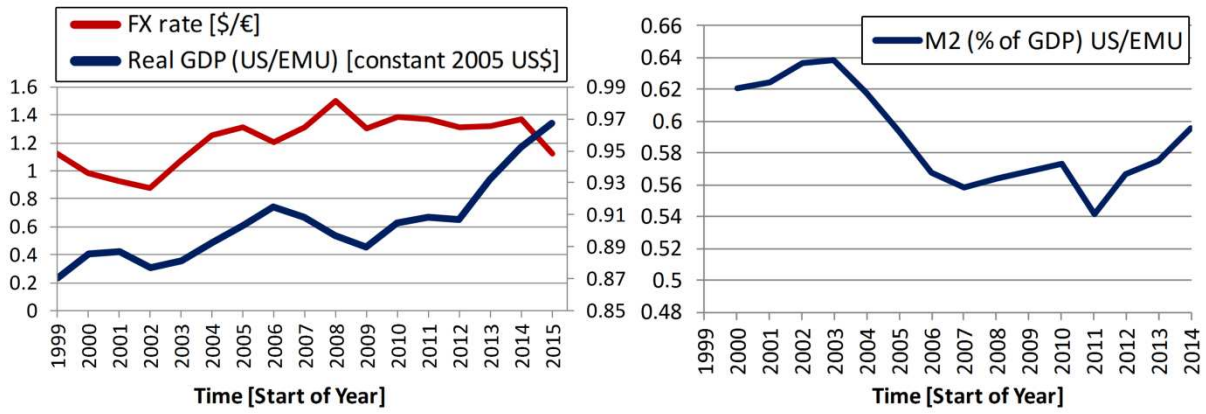


Figure 47 The Fx Rate ($/€) depends on Real GDP but not on M_2 (% of GDP) [US/EMU]

Figure 47 also shows that the money supply, M_2 (money and quasi money), does not seem to pull the Fx-trigger even if the ratio of M_2 as % of GDP between the US and EMU is taken. Comparing this normalized level of M_2 between the US and the EMU seems to break with the monetaristic assumption 'that (mainly) money drives inflation and the Fx market': Even the opposite could be indicated in this figure: the reason for this is FRI (see chapter 4.1.1).

The second effect of the ECB's MPs on the Fx market is portfolio related and return provoked. Figure 48 delineates the margin of 10-year G-Bonds between the US and the EU.

As is claimed by Keynes' Interest Parity Theory (2.3.8) the country-difference in yield correlates with the Fx rate. A higher interest rate in the EMU (green area) coincides with a lower Fx rate [€/$, direct quotation], or with a higher indirect quotation [$/€] (see Figure 48).

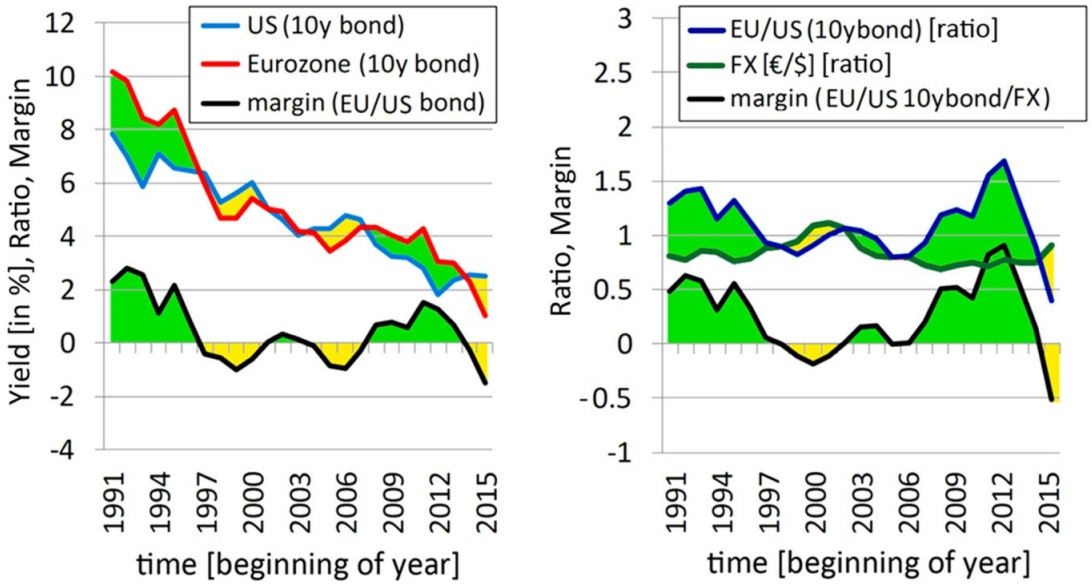


Figure 48 Long-term Interest Rates and Fx Rates in the Euro Zone and the US

Around 2000, the margin turned negative (yellow area) as US bonds became more attractive, and the directly quoted Fx rate [€/$] also surged indicating appreciation of the US Dollar, by the interest rate settings at a regular transmission level (see MTC2). This margin still seems to be predictive and causally relevant for global Fx rates, with only infrequently occurring historic exceptions and shifts. Comparing the EU/US 10-Y-G-Bond interest ratio with the Fx ratio [€/$] highlights this dynamic dependency and the margin of the two is in fact mathematically explicatory for the Fx trend rate (right) (R=0.7, data stationary normalized). Interestingly, both margins (demarcated at horizontal axis) much resemble each other (see left+right), based on which they become predictive for future Fx trends: e.g. the yellow area predicts that the US$ will appreciate to the Euro in 2015, which in also seems to happen.

4.3.4 Timing of the Money Effect - Implications for Monetary Policy

In order to assess, understand and optimize MP, one has to derive the parameters and kinetics of its MTC effects in monetary transmission processes and mechanism. This is essentially important to feed new or the existing predictive MP models with the correctly determined variables, and time or timing plays of course a pivot role here. As anticipated in diverse MP models (see 3.2.3) timing refers to the fact that a MP decision is made at any time along the time scale and each decision point in time has overlapping effect along the time line with all of the effects of the other decision point - leading to a huge overlap of causes and effects over time - that transmit into the real economy via MTCs (see 4.3.8).

Among all model approaches to estimate the impact and timed influence of a change in money supply ($\Delta\%M_0$) on the real economy a correlation model of price stability ($\Delta\%$HICP) and economic growth ($\Delta\%$GDP) was performed to roughly model the key dynamical trends.

Today there is only little knowledge about the precise timing of these complex effects. To solve this complex problem with a new approach - as the VAR analysis models (see 3.2.3) that are widely used by monetary experts and scientists have some draw-backs - an alternative approach was chosen here: 'a Time-Matrix Pearson Correlation Time Lag Test'. This tests, seemingly previously also already known as 'dynamic correlation studies (DC)' (Walsh 2010 and references herein) was performed with the new consolidated ECB data to carve out the respective time windows of effects to a series of MP change-steps. The weighted overlay of all serial effects yields a prediction or description model of MTC effects, here focusing on prices and GDP growth due to a requirement to simplify. Figure 49 provides the result of a 16-year DC study conducted on %ΔM3 on %Δ HICP, real and nominal %ΔGDP.

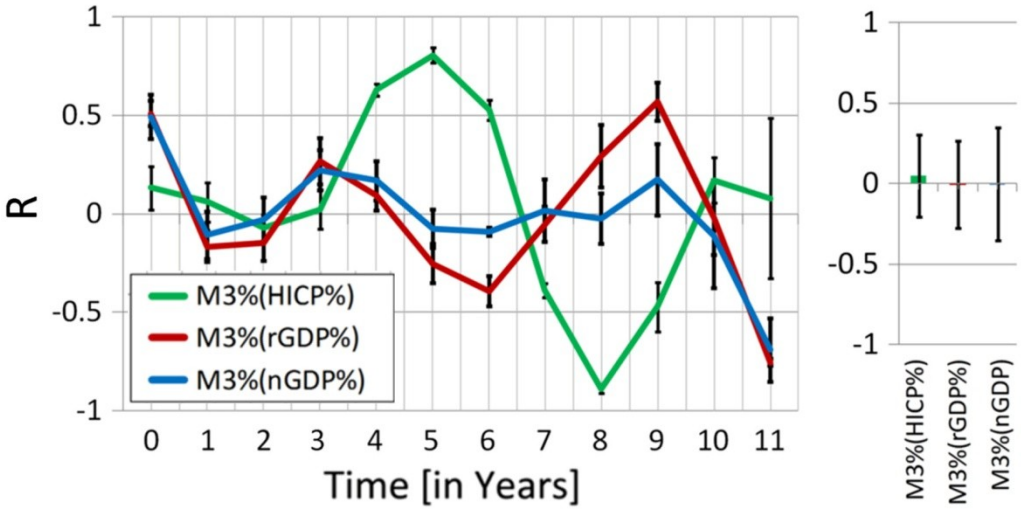


Figure 49 DC Test for EMU M_3, Inflation, real and nominal GDP (1999-2015)

For real GDP (red line), in a 15 year projection, a 'π/4-cosine sinusoidal reminiscent harmonic oscillation effect of R for M_3 on economic growth becomes apparent and is more distinct than the effect of M_0, because M_3 is further downstream of the monetary transmission channel and represents the real economy's 'available liquid assets' for investment and consumption. To some extent this also hold true for nominal GDP (blue line) but the net effect is reduced due to the price channel effects. The timed effect of HICP shows also a sinusoidal reminiscent harmonic oscillation but at a 1.5-fold lower frequency (green line).

Put simply, a punctual monetary stimulus has on average a slight positive impact on GDP and inflation in the very short run, followed by a slight negative in year one and two. After three years it has again a positive effect and the effects decompose later on due to a different frequency see Figure 49. The strongest correlation on prices was seen after four to five years. Signal-to-noise-tests (t-test) reveal that a higher DC correlation also indicates a probable stronger effect: a forecast or impulse response function (IRF) is the sum of all effects.

An increase of M_3 has a direct and immediate effect on GDP, real GDP and nominal GDP, while prices are more rigid until year three after a quantity stimulus (the media MP channel is not included here, only the quantity changes of M_3 - other effects could be modeled in).

The strength of the predictability geometrically declines with the forecasted number of future years and thus also the error based on the correlation and probable strength of the effect. Nevertheless, the model clearly predicts that an inflationary period is followed by a deflationary phase at a high confidence interval ($p<0.05$), e.g. at seven to eight years post-M-stimulus. Simply due to the oscillatory behavior the overall averaged effect cancels out to almost 0: the classical notion that money is neutral in the long-run. However, the effect declines with time geometrically, meaning if MP finds the right 'time windows' to stimulate the economy with new money and then - and only then - it can turn positive and drive GDP.

Compared to a VAR analysis prediction it is likely to be more robust to shocks. VAR analysis are more affected by shocks like the FC+EC, and other runaway values. As a result well-adjusted p-VAR more pessimistically predicts GDP growth in the long-run at steady prices (6 Figure S3), due to the periodic occurrence of shocks [real GDP and price VAR prediction both turn relatively optimistic without the crises, which leads to ambiguous interpretations]. Although it yields too pessimistic prospect for future real GDP it still relinquishes a periodic and oscillatory 'sinusoidal nature' in the future time-line. This was also divulged as a common feature of the DC method, further corroborating that MP decisions (per time intervals) cause sinusoidal aggregate MTC waves of (1) different frequency and (2) amplitude, and (3) depending on output a different shift of the oscillatory behavior.

Thus, MP stimulates the amplitudes of MTC waves and timing is the key to its net benefits.

The Dynamic Time Matrix Pearson Correlation Forecast is probably new: it is less prone to errors and runaway values and based on multiple VAR-chain extensions of R values. It is also more flexible and adaptive. A DC-forecast for the EMU is given in (6 Figure S4). If the

growth of money were knowable, it could provide an even more powerful forecasting tool. It can be also used to extract diverse DC-forecast-coefficient matrixes of MP effects on output variables - also by comparing historic periods: for instance the effect of M_3 on HICP in the Pre-Euro time (1991-2003) has had a significantly different R-matrix (see 6 Figure S5).

With regard to recent ECB €1tnQE program (60bn/m) the new DC results advise a more careful raising of EMU base money due to the four to five year delayed effect on prices.

4.3.5 Decomposition and Quantification of ECB's Monetary Policy

Using multivariate regression models it is also possible to quantify these individual effects of a money supply on GDP and inflation: Growth of n+rGDP (in %) and $M_{0\text{-}3}$ (in %) yields regression at a confidence interval of up to R=0.82 (adjusted R=0.8): in very short summary and only very roughly MP should homogenously disperse more money in 2015 (Figure 50 3D Graph Indicating a 'Recommendable Direction' for the ECB's MPs in 2015).

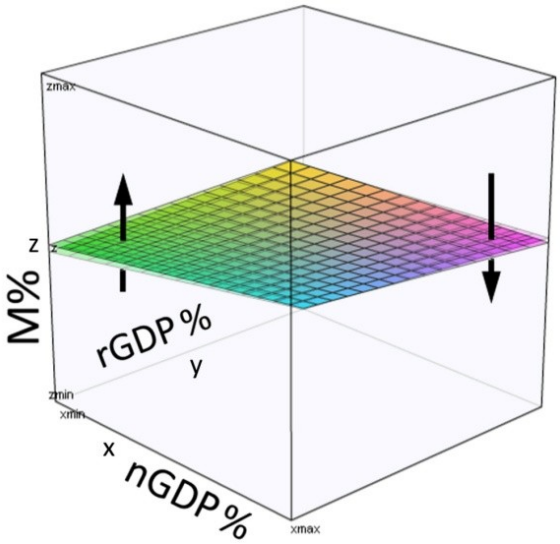


Figure 50 3D Graph Indicating a 'Recommendable Direction' for the ECB's MPs in 2015

Using the existing dataset it is also possible to find the multivariate regression using most indicative and significant parameters only. This enables the derivation of a new GDP growth formula, with the proviso that all variables used are significant ($p<0.05$) for a more accurate and quantitative prediction of GDP is given as result in Formula 45.

$$GDP = -2648.415 - 0.0773M_0 - 0.4404M_2 + 0.5484M_3$$
$$-1084.937v_1 + 7709.268v_3 + 20.491\pi$$

Formula 45 GDP Predictive Regression Function Based on Monetary Variables

Entry GDP: gross domestic product (bn, quarterly, EMU19, chain-linked 2010, Eurostat), M_0: monetary base (bn), $M_{2,3}$: monetary aggregates (bn), π: inflation (7-2005=100), $v_{1,3}$: real velocity of money ($rGDP/M_{1,3}$) (ECB, 2015)

Significance (p, t-test): intersection: p<3.5E-11, M_0:2E-4, M_2: 1E-27, M_3: 2.3E-24, π: 2.4E-10, v_1:6.4E-14, v_3: 1.4E-21; R confidence: 0.9763, Adjusted R: 0.9738

Unexpectedly, M_0 and M_3 show a positive function, while M_2 is negative. This shows that M_3 might have a more beneficial effect on output compared to M_2, in line with other results of this study, evidenced earlier (e.g. chapter 4.1): hence this has uncovered that 'marketable instruments' of M_3 (representing the difference of M_3-M_2) have a special key role for short-term real GDP growth, that was previously unknown, that were further analyzed here:

The growth rate of three exclusive M_3 components, known as 'marketable instruments', is indeed strongly correlated with real GDP growth (chain-linked, rebased) in the EMU (R=0.43). A analytical examination of its components provides evidence that the exclusive M_3 component 'debt securities issued (up to 2 year maturity)' strongly correlate with real GDP growth in the EMU (R=0.61), but volumes are only around €100bn. The MTC-efficiency seems to be higher than in most M_2 components. A second exclusive M3 component 'MMF fund shares' and repurchase agreements are only poorly correlated (R<0.15).

Additionally, velocity of v_1 has a negative impact, while v_3 is positive indicating that the transactional efficiency of M_3 is indeed more important for GDP and output. It is thus better if v_3 is higher in relative terms to improve GDP - theoretically (while v_1 has a counter effect)). Inflation (π), has a very slight positive but relatively fully negligible impact.

Multivariate Formula 45 was tested for its capability to predict the first quarter of 2015:

Formula Entry (rational expectations model): M_0=1275, M_2=9850, M_3=10500, v_1=0.41, v_3=0.23, π(HICP)=117.7 (note: this test was conducted at the end of Q1 2015)

Formula Output: 2413.4€ bn real GDP (not adjusted, chain-linked 2010) = 1% growth of the 1Q (first quarter) of 2015 compared to the 1Q of 2014

This result validates the formula and corresponds to ca. 1% real GDP growth in the EMU or a rate of 0.3 seasonally adjusted real GDP growth in the euro area (Eurostat measure).

Although the formula is very precise it requires highly accurate estimates of the monetary aggregates and all other variables, which is often not feasible in advance - only for the ECB.

In summary, multivariate regression analysis can be used to decompose the variables that affect GDP growth, and a predictive formula can be derived that requires precise data sets for accurate predictions, and helps identifying GDP-profiting monetary factor components.

4.3.6 The Labor Effect of the ECB's Monetary Policy

Previous chapters gave a new overview that also further substantiate a direct role for MP on output (GDP growth) in the euro area (4.1.1, 4.1.2, 4.3.4): monetary growth, velocity, low interest rates, and the right timing and amplitude of MP seem to be crucial, as well as the efficiency of the total monetary transmission that cannot be altered much by the ECB.

The modified, the modern, and the standard Phillips Curves do not show a very striking dependency as a rule of the employment level and inflation in the EMU from 1999-2015 (e.g. 6 Figure S16). Only if only non-crisis years are considered (e.g. 2003-2007) it shows such a Fisher-Phillips dependency (6 Figure S16). Having established a link between monetary aggregate growth and GDP, and having uncovered an effect of velocities on output that occurs in approximately a 'one-quarter-tow-bar' (see 4.1.2) the research can now ask the question if the overall employment level (job creation) depends on the velocity too.

The employment rate is one of the most important political and economic factors and indicators and serves as a suitable read-out of high relevance for MP, fiscal and economic policy, and indicates both 'health and stability of an economy' and economic growth potential.

Figure 51 co-depicts and correlates for the first time (in 7-2015) the growth rate of the income velocity of real money (v_0) and the growth of the unemployment rate (in %) in an overlay chart analysis, for the EMU. An inverse correlation between both growth rates can be shown (R=-0.22) even in the noisy, quarterly unadjusted, raw data set. This further confirms that the velocity of money is indicative for job creation as well as output (4.1.2). It lays down a new inverse coherency of the velocity of money and the short-term employment and economic growth trends in their respective 'mirror-inverted natural mean function'. This finding can be used by MP strategists to prevent unnecessary 'frictional' unemployment by better adjusting the velocity's growth rate in real-time to stay within an optimal corridor, and for short-term employment forecasts (related research was still missing).

In summary, a rising velocity benefits the economy, job creation and acts anti-deflationary. The rising debt level (see 4.1.5) depresses natural velocities, the economy, jobs, and prices.

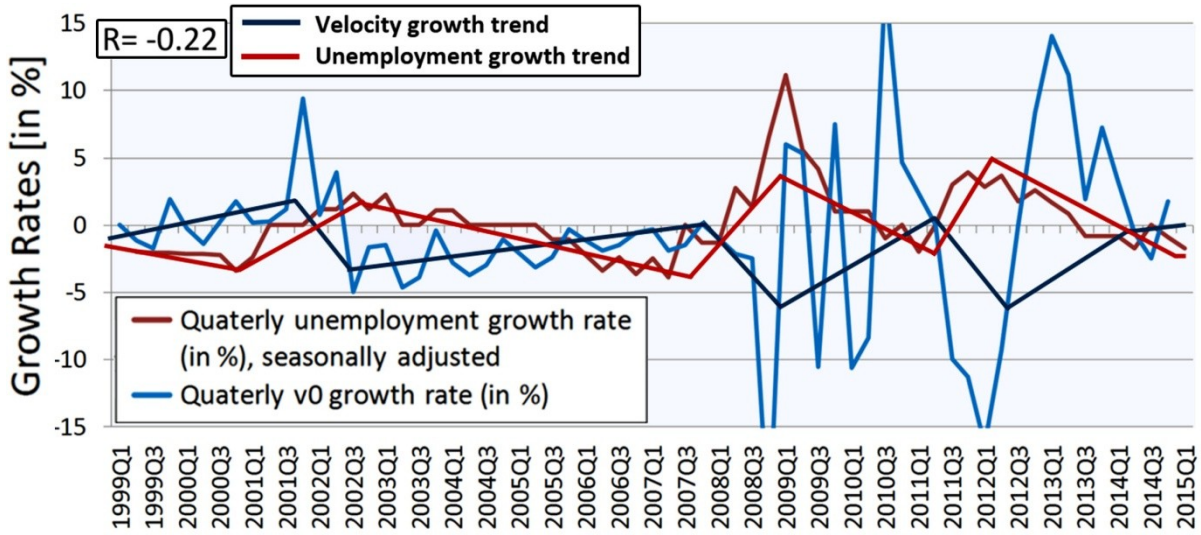


Figure 51 Reciprocity between the Growth Rate of the Velocity of the Monetary Base (v_0) and the Seasonal Adjusted Unemployment Rate in the EMU from 1999-2015

Until 2009-Q1 wages were growing in accordance of domestic growth policies that could have led to much more future growth and millions of new jobs (EU calculations) (EC 2008).

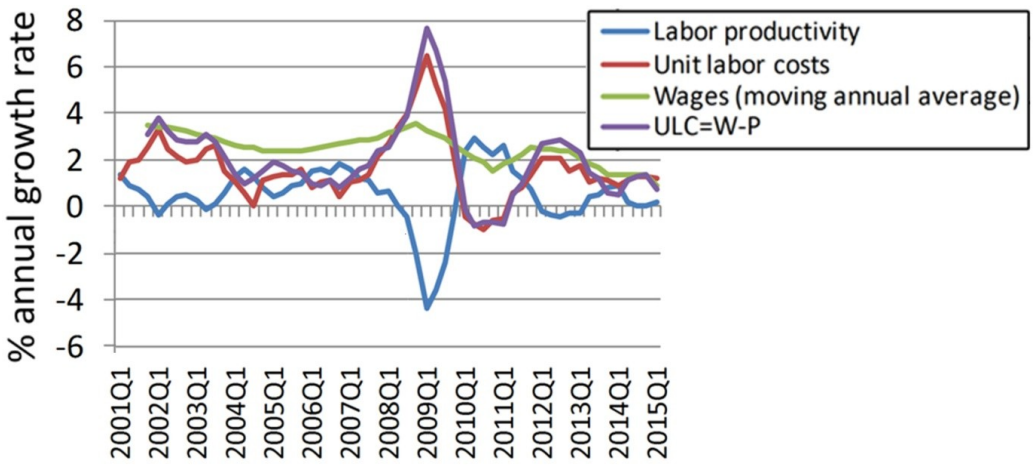


Figure 52 Unit Labor Costs and its Deviation from Wages and Labor Productivity

After the FC, indicators and velocities dropped sharply, and employment and wages begun to slow down. Labor productivity growth rates started falling and unit labor cost (ULC) were soaring, like local factor competitiveness. Labor productivity and wages, ULC, and so on, trended more suitably before the FC in 2009. The ULC trend resembles the quarterly deviation of wages (as moving average) and labor productivity from 2001-2015 (see Formula 46).

$$\Delta ULC\ (in\ \%) = \Delta Wages\ (in\ \%) - \ Labor\ Productivity\ (in\ \%)$$

Formula 46 Unit Labor Cost Dependence on Wages and Labor Productivity in the EMU

Entry: ULC: unit labor costs, based on quarterly ECB data (in line with economic theory)

M_1 and thus v_1 has a relevant role with high monetary dimensions effective for the labor market: thus, the effect of a second grade velocity v_1 shall be tested with respect to its dependency (Pearson's correlation) on labor market stats: including the employment growth rate (in % p.a.), the labor productivity growth rate (in % p.a.), the unit labor cost growth rate (in % p.a.), and the wage growth rate (also in % rate p.a.). Table 7 shows the results:

R (Dependency)	v1 (rGDP/M1)	Employment rate	Labor productivity	Unit labor costs	Wages
v1 (rGDP/M1)	1.00				
Employment rate	0.42	1.00			
Labor productivity	0.64	0.76	1.00		
Unit labor costs	-0.52	-0.68	-0.92	1.00	
Wages	-0.11	-0.35	-0.32	0.63	1.00

Table 7 Correlation of Velocity, Employment, Labor Productivity and Wages Growth

The highest correlation is an inverse relationship between labor productivity and unit labor costs (see Figure 52), also due to the relationship given in Formula 46. The second highest dependency was found for the labor productivity rate and the employment rate. The correlation is strongly positive as it is leveraged by capital and technology. A negative shock to consumer demand and investment contributed to the negative effect in the FC. The third highest correlation level is found between unit labor costs growth rate (in %) and the employment rate (% reduction of unemployment) - a quantitative measure of how much the unit labor costs influence the employment function in the euro area. This correlation of -0.68 indicates a strong inverse dependency also due to the relatively high costs of living in the EMU. The fourth highest correlation, still R=0.64, is a positive dependency of v_1 (real velocity of M_1, see 4.1.2) and labor productivity: the velocity of M_1, v_1, grows with labor productivity. There is also a dependency (R=-0.52) between v_1 and unit labor cost, and v_1 and employment (R=0.42). If v_1 increases (it doesn't in the long run) then labor productivity increase too, labor costs would fall - same as unemployment. However, all predictions of today convey that v_1 is still about to slightly fall throughout the next decades (see Figure 9).

This might cast a cloud over future labor productivity trends as the ECB's MP is very consistently planning, or can't circumvent, slightly lower v_1 growth rates in the future. Velocities are declining due to a higher debt burden, lower marginal propensity to consume multiplier effect for output, less job growth, and lower wages and ULC. This strongly urges political decision makers to withstand the trends: basically with less debt and MS reform.

The fifths highest dependency (R=0.63) could be revealed for wages and unit labor costs. This only indicates that wages significantly contribute to production and factor costs. Wages are only slightly negatively correlated with employment and labor productivity (R=-0.3), due to the effect of outsourcing of mass production into cheap labor countries. Finally it is also important to have a brief look at the price-wage ratio. This indicator tells something about the real purchasing power (PP) of the working population: this ratio is slightly declining at -0.61% per annum, meaning: PP of wages is marginally accretive. Firms that optimize their profits hire until the MPL (marginal product of labor) equals the real wage (Mankiw 2014). This means the real wage must fall or the MPL must rise in the EMU. High debt levels cause deflation that drives the real wage (via P) and lowers the MPL.

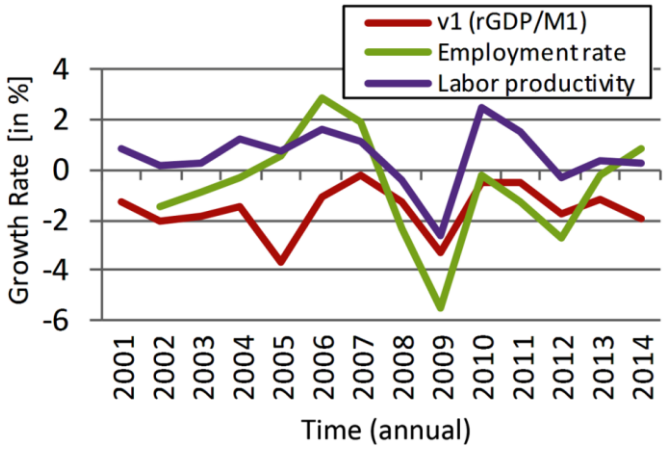


Figure 53 Correlation of v1, labor Productivity and Employment Rate

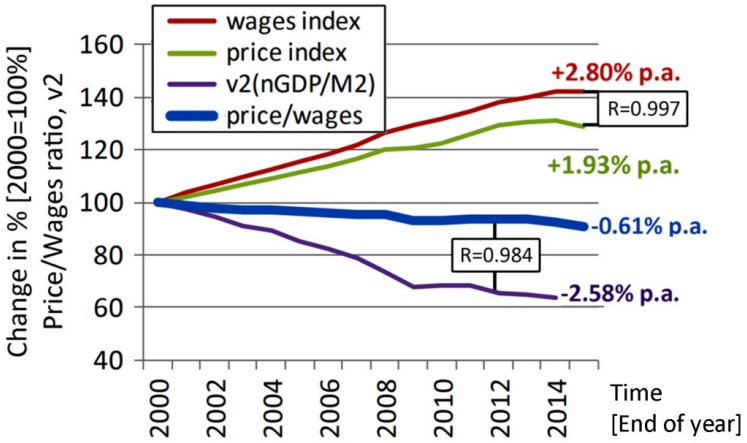


Figure 54 Price-to-Wage Ratios and the Velocity of Money

The trend of prices correlates with wages resembling a referencing of price and wage policy. Price/wages ratio also correlates with the velocity of money (v_1, v_2, v_3, v_0) but the income velocities of money fade faster, e.g. v2: 2.58% p.a. (Figure 54). Even though the population benefits from these economic trends effectively by ca. 10% higher purchasing power

per 15 years, homogeneity of purchasing power dispersion falls, and a growing pool of money is not used real TA purposes and GDP, as income velocities keeps falling: slightly but continuously lowering some strength of the potentially starching domestic markets.

4.3.7 Main Output Trends of the Eurosystem: the EMU's Economy

'The Big Ratios' are the chain-linked ratios of GDP components over GDP that establish the main story of monetary transmission output in the EMU at a glance (see Figure 55). GDP fell during the FC across-the-board and across all euro area countries, EU countries like Poland and Malta being the only exception, in Q1-2009, and EMU growth rates have not recovered yet to its pre-crisis levels, almost six years later. This does also apply for the investment-to-output ratio that has also dropped in the FC and has not recovered yet, and can also be seen in export and import volumes and ratios.

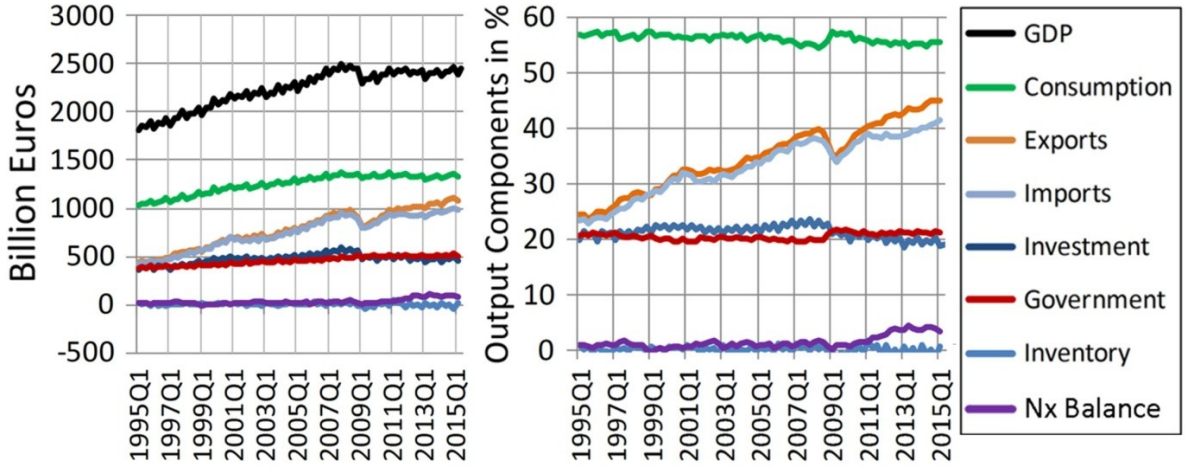


Figure 55 Chain-linked Development of Output Components and 'The Big Ratios'

Consumption and government spending compensated for the ditch in productivity and related trends - in relative but not in real terms (excepting the growth of government expenditure; which also slows now). Major real growth rates are found for exports and imports - also in relative terms (from 23% to >40% of GDP in two decades): this illustrates the soaring importance of international trade and international management for Europe's Euro currency block - and worldwide. Among huge economies Europe has become a prime location and the most open for international trade (as measured by the ratio of combined exports and imports divided by GDP, in 2012). The Nx balance turned back into the black after the FC and today has reached €100bn of goods and services in the first quarter of 2015. This is mainly the result of a recent Euro Fx rate depreciation, which made exports more

affordable on the world's markets. Finally, inventory investment only makes a very small part of GDP (annual changes of only ca. 1%). Correlation studies performed reveal that it serves as an interesting early indicator of output that is responsive to MP and $M_{2,3}$ (see 6 Figure S6) again exemplifying that monetary transmission is of high relevance.

4.3.8 The Eurosystem's Monetary Transmission Channels

Monetary transmission must be dissected into a categorical list of monetary transmission channels (MTCs) in order to be researched and understood (see Table 5). Main analytical findings of empirical MTC research of this study and others is review subsequently.

4.3.8.1 MTC_1: Real Interest Rate Channel (Traditional Effect)

MTC_1 transmits the real interest rates (r) and money effectiveness (e.g. PT, $1/m_{total}$). The ECB's MP effects on interest rates were dealt with in chapter 4.3.1., the PT was dealt with in chapter 4.3.2, both integrate in MTC_1 - which is in the primary focus MP as it directly affects the ROI, ROE, NPB, WACC, and so on bearing calculations of investment decisions. Other EMU reviews also came to a wrong conclusion about this important MTC (Görgens et al. 2014): the real interest rate in fact drives investment decisions as the aggregate private sector passes on Fisher's (relative) nominal interest inflation component to consumers. This has led to confusions of today's macroeconomics understanding and of MTC_1: comprising important effects of r on investment, residential housing and durable expenditure.

The idea behind the focus on the real interest rate is in fact that industries and entities that invest can pass on core inflation premiums to the charges for their products and services. Also, the prices of housing and durable goods will not lose much of their value because inflation is part of their market prices and usually only depreciation reduces their value. Hence, the more endurable they are the more the play a role in MTC_1 (see 4.3.8).

The real interest rate has to be calculated separately for each individual financial product, or a weighted annualized average needs to be found. In Fisher's Equation the yield beyond expected inflation is approximately the real interest rate (Formula 12). The outcome of this formula varies with investor's expectations of future inflation (Levinson 2005).

The nominal PT rates, i.e. AAR, NDER or the consumers APRC were used for weighted calculations (see 4.3.2Pass-Through and Interest Heterogeneity in the Euro Area). However, for MTC_1 the real interest rate PT is to be found. The analysis uses the 'country-unweighted'-

'financial product weighted' annualized NDER (see Figure 39) and subtracts the annualized monthly HIPC rate for EMU's households and corporation. This transforms Fisher's *ex ante* real interest rate into an annualized *ex post* real rate: the results are depicted in Figure 56. Inflation rates have been included until June 2015.

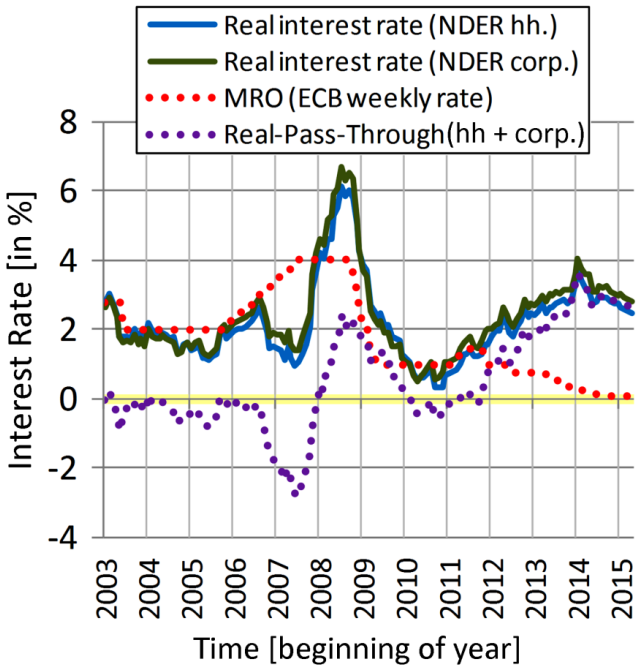


Figure 56 Real Interest Rate and Pass-Through of all EMU Countries

The MRO and the respective 'real PT is shown (as average real interest rate of corporations [corp.] and households [hh]) to illustrate the main MP effects on r and MTC_1, which differ from the nominal PT. The 'real PT' is a trigger for industry investment and how much MFIs charge in real terms, multiplied by m_{total} for the effect on the entire real economy. The real PT, a highly important indicator-factor, has significantly increased again back to FC levels. Figure 56 for the first time unravels a new correlation between the real-PT and the GDP growth rate: an inverse dependency (Pearson's test) was found (R=0.51) for the real-NDER-PT and GDP growth rate that needs a low real-PT. This is also often much confused by economists today maybe because of the above reason. The higher the real PT, the lower the efficiency ($E=1/m_{total}$) of MTC_1, the more money is 'lost in transmission' in the EMU. The lower the short-term spending stimulus, the lower the growth rate of GDP. These coherencies help explain the malaise of the EMU economic recovery and stagflations in the world: E.g. the same coherency and indebtedness (US$ 10tn) hold Japan down in a deflation.

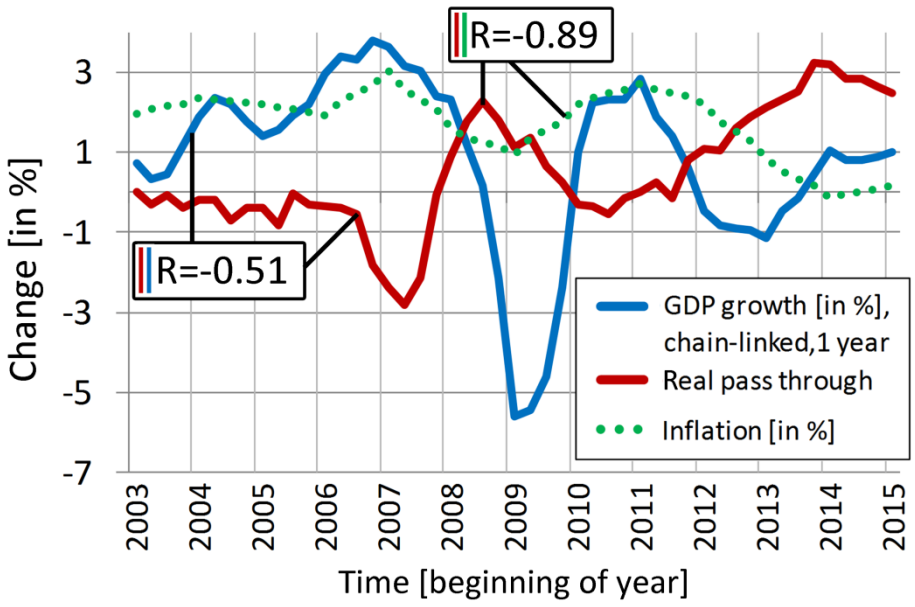


Figure 57 The Effect Real Pass Through on GDP and Inflation

4.3.8.2 MTC₂: International Account, Fx-Trade-Capital Effects

In theory, both, demand and supply for a currency determine its exchange rate in 'free-market equilibria'. In the real world there is a multiplicity of factors that influence both. The demand for foreign currency is given by (a) the demand for foreign exports, (b) demand for foreign assets, (c) domestic price level in relation to foreign price level, (d) future expectations (of prices, Fx rates, ROI, economic trends), world and media events, among others. The currency supply is regulated by the central bank and all money holders in the economy.

The domestic real interest rate has a pivot role: it has profound effects on nominal interest rates of course, and on the Fx rate mediated by 'covered interest arbitrage' (Levinson 2005; Giddy 1994; Sperber 2015). International realization of covered interest arbitrage leads to covered interest arbitrage parity (see 2.4.2). There are net capital inflows into the economy if risk-free arbitrage is possible - also due to SWAP rates etc. - and changes the global demand for the currency, and thus the exchange rate (Fx rate). The ECB's MP effects on the Fx rates were already described in chapter 4.3.3, involving the core mechanisms of MTC2.

Another important element of MTC_2 is the 'International Account' that comprises: (I) the International Investment Position (IIP), (II) the Balance of Payments, (III) other changes in financial assets (IMF 1993; IMF 2009; ECB 2015a: ECB/2011/23&24, /2013/25, /2014/2).

(I) The IIP records an economy's financial assets (and 'liquid' gold reserves) and financial liabilities of non-MFIs, and represent a net claim or net liability to the rest of the world

(RoW). The IIP represents a subset of assets and liabilities in the national balance sheet that includes non-financial assets, and positions between residents (IMF 2009): its changes are explained by the financial account (BoP) plus (III) accumulation account.

(II) The balance of payment (BOP) reflects a record of the forces of supply and demand that determines the Fx rate (Burton & Lombra 2000). It is the record of all transaction between a country and the rest of the world (not only payments as the name implies). The BOP is a double bookkeeping system and contains: (1) the 'current account' with all international gross transactions of currently produced goods and services, gross primary (income for providing temporary use: investment income, direct investment, portfolio investment, other investments, interests, dividends, rent, subsidies, etc.) and gross secondary income (redistribution of income: e.g. personal transfers, international assistance, current taxes, social contributions and benefits, current international cooperation, etc.). The current account's difference between gross exports and gross income equals the 'investment-savings gap' of the economy (IMF 2009, chapter 14):
And (2) the (gross) capital account (narrow definition) that comprises ('netted') acquisitions and disposals of non-financial/non-produced assets (sales of leases and licenses, land sold to embassies, unilateral capital transfers). (1+2) The sum of current and capital account makes the (net) total lending/borrowing to/from RoW (IMF 2009). As visualized in Formula 47, the sum of current and capital account equals the financial account in the new BPM5/6 system of national accounts (SNA) definitions (IMF 2009), which is often heavily confused also in the scientific literature and most economics text book that still use the old definitions. This financial account (3) records the net (not gross like the current and capital account) acquisition and disposal of financial assets and liabilities. This account resembles the liabilities side of a balance sheet as it reveals how the net borrowing or net lending of an economy is financed. (Also: the financial account plus the 'other changes' accounts explain the change in the IIP between beginning- and end-periods). A BoP has to hold the balance like a balance sheet and a central bank eventually has to manage the financing side (if required), for example via transfers of its reserve assets (e.g. currencies and 'controllable' and 'liquid assets' like gold reserves) (to see the Eurosystem's balance sheet see 4.2.1: reserve assets are stable and increase slightly). The ECB's balance sheet is only rarely affected by these changes. Roughly drafted, the reason for this is found in losses in portfolio investment and followed by gains in other investment until 2014 that became neutral in 2015 and

a medium increase in direct and portfolio investment in 2015 (ca. €100bn and €120bn in a 12-month aggregate of may 2015). In the EMU, TARGET2 serves as a quick BoP equilibrating mechanism in the EMU (Cecchetti et al. 2012), but bears some hidden dysfunctions, e.g. rising 'unmatched' or 'non-netted' claims, and a related hidden crisis of underlying fixed Fx rates (Mayer 2011). Unmatched claims could cost donor countries like Germany €0.5tn in a case of a default of the Eurosystem (Kaiser 2012).

(III) Accumulation accounts: capital account, financial account, and other changes in financial assets and liabilities (IMF 2009): they record the accumulation of assets and liabilities from 'other flows' (than transactions of the BoP), their financing and other changes that affect them (IMF 2009). E.g. unilateral cancelation of debt by creditor, holding gains and losses, reclassifications, only of external financial assets and liabilities.

$$current\ account + capital\ account + official\ settlements\ ballance \equiv 0$$

Formula 47 Balance of Payments (BoP) Identity, BPM6 Codification

The BOP is balanced but its components, mainly the current account, is known to directly effectuate the Fx rate and MTC_2 over time - and is interdependently affected by the Fx rate over time too. This leads to a balanced equilibrium in theory - e.g. if export rise due to a depreciated Fx rate it stabilizes demand for the currency and the Fx rate again. Like many other markets the Fx market is not free of government or monopolistic intervention: central banks may exert (sterilized and unsterilized) foreign exchange interventions to influence Fx rates in a 'managed, or dirty float regime' (Mishkin 2007), or via standing facilities (not planed, officially). If the ECB sells foreign assets for domestic currency it lowers M_0. The actions and capacities are reflected in the ECB's balance sheet (see 4.2.1). Figure 57 depicts key items of the BoP account as trends: the current account, the capital as well as the financial account using the SNA compatible accounting method (IMF 1993; IMF 2009). EMU's net lending/borrowing from the RoW highly overlaps with the goods transaction balance (Figure 57). This reveals that the capital account roughly approximates the negative value of services, primary and secondary income, in a strict tendency since many years. Goods are still much more important than services for international accounts, and the BoP current account, which is technically offset by a deficit in secondary income (transfer payments without a *quid pro quo*). This negative flow has doubled since the launch of the Euro.

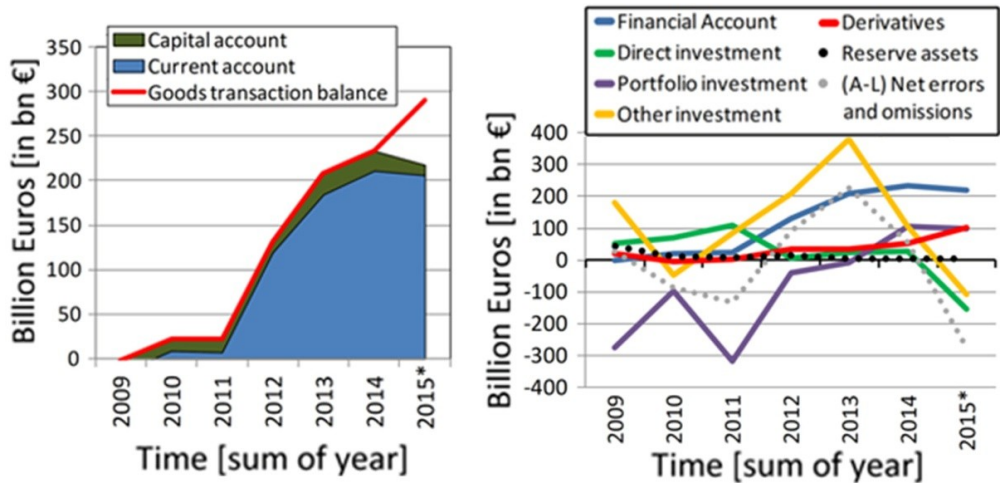


Figure 58 BOP Account Trends in the Euro Area (*estimation)

$$Current\ Account + Capital\ Account = Financial\ Account - Errors\&Ommissions$$

$$= Net\ Lending/Borrowing$$

Formula 48 BOP Accounting of the EMU (New SNA - IMF Standard of 2009)

The financial account equals the current and capital account and recent errors are omitted. Both have grown to over €200bn in 2015: derivatives and portfolio investment on the rise. Both, the ECB's balance sheet (see 4.2.1) like the BoP financial accounts reveal only little changes in the ECB's foreign currency reserves: Claims on non-euro area residents in foreign currency remain steady at around €200bn form 1999-2015, minor yearly changes in the reserve assets of the BoP's financial account (ECB 2015b, Statistical Bulletin 7.1). The exchange rate, supply and demand for currency due to transactions has much balanced it. As a result the Euro currency in international circulation seems to be relatively free floating unaffected by central banks although the shape of a few shifts remind on the Plaza Accords.

Figure 46 shows the EER-19 pool of spot index exchange rates [Fx/€] of the top 19 trading partners of the EU over time. Fx changes obviously had a major impact on the trade balance recent current account surplus. An oscillation pattern of Fx rates, as expectable from a feed-forward loop of Fx rate and exports: a depreciated Fx rate auto-regulates the export/import balance that has a stabilizing effect on the next future 'Fx rate macro-wave'.

The timing of this effect can be estimated using indexes: the EMU's current account and goods transaction surplus starts in the first quarter of 2012 at the same time when the Fx ratio with the average of major trading partner fell below its '16-year natural-average'. This indicates an immediate effect when the tipping point of the EER-19 average (TP_{Fx}=0.95) is

surpassed triggering a boost in exports. Exports in turn directly feed into GDP and also 'a less of imports' - now more expensive - are deducted from it (IMF 2009; Mankiw 2014).

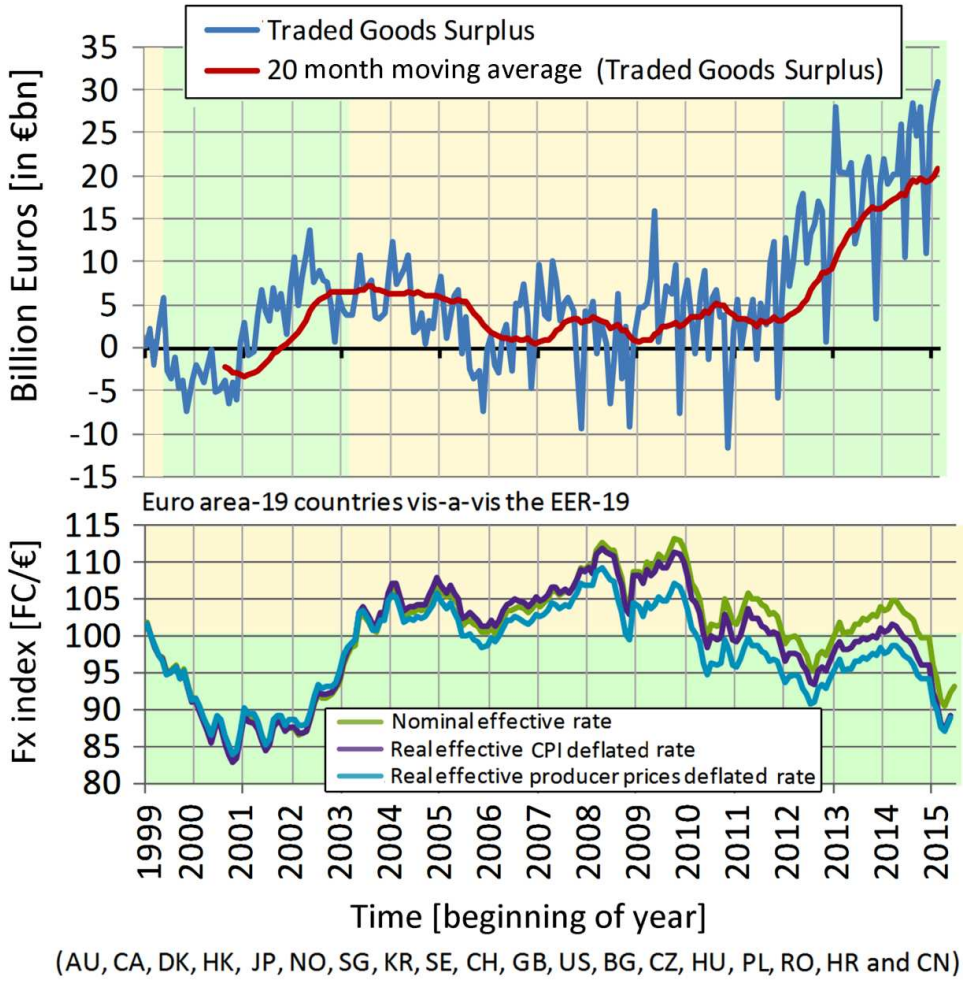


Figure 59 The EER-19 Fx Index and the Trade Balance

To get a better measure of this transmission channel coherency Pearson's correlation was conducted using the traded goods account monthly moving average (13 month, current value +/- 6 month) from 2003 till 2015 (after the Euro was fully introduced) and the monthly moving average (7 month, current value +/- 3 month) of the relevant EER-19 Forex index (the CPI deflated rate) from the same period of time. The result illustrates the economic power behind MTC_2: the current account's trade balance strongly depends on the exchange rate of the EU's main trading partners (R=-0.77): a depreciation of the Euro in the world increases trade balance, and current account, mainly via a higher export surplus. This is in fully in line with current theory, previous empirical findings, and all macroeconomic stylized facts. However, in early EMU years after 1999 a strong correlation could not and cannot be found. This strong correlation is measured today and was not published or reviewed earlier.

Multivariate regression analysis substantiates the result and unveils its key variables: the EMU's capital account is lessened by -1.5 Billion Euros per Fx index point (EER) each month. This is €18bn per year per index point. The Nx-beneficial tipping point corridor of the index is at 12 points that correspond to €216bn (12 points x 12 month x €1.5bn). This variable corresponds with net lending/borrowing in 2015 at the lower end of the Forex EER-19 index (green). Thereby, a significant quantitative variable also for MTC_2 could be derived.

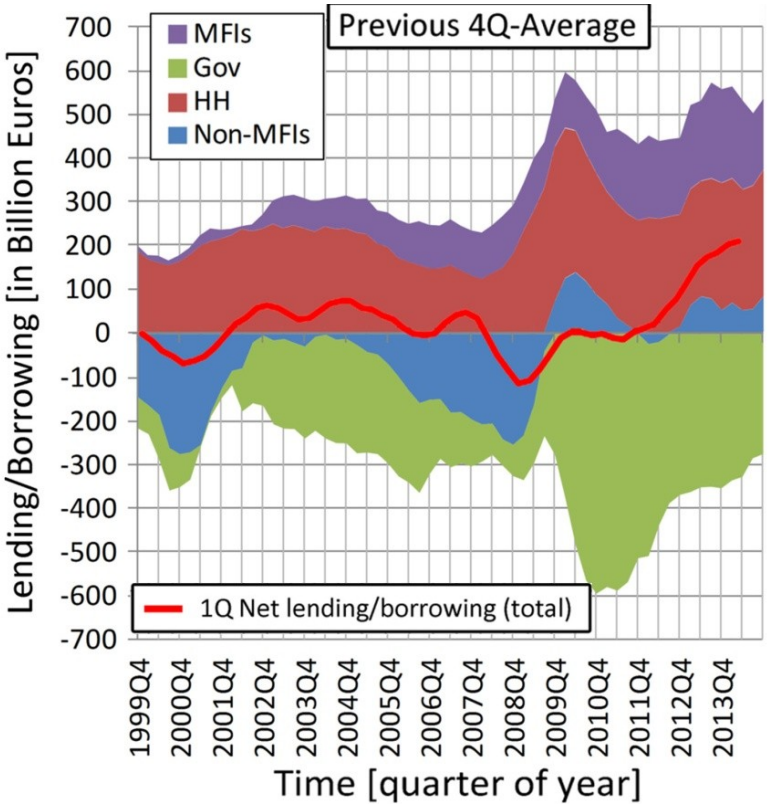


Figure 60 Net Lending/Borrowing of Households, Government, MFIs, and Non-MFIs

Once a monetary stimulus is transmitted via MTC_2 it profits the current account through a higher export surplus. It has a positive consequence for the euro zone's current account (Figure 59), GDP and employment. This scenario happened in Q4 of 2011: when the net lending of the Eurozone turned positive and only the Government sector remained with a net debt, while the sum of households and firms were 'self-financing'. Although Keynes savings are not 'savings' (Booncharoenpol 2005), domestically, the world bank reveals: EMU Debt>Saving>Investment (D>S>I, ca.€22tn+x > €10tn > €2.3tn). Thus EMU real savings don't equal real investment. But 'savings' still equal investment on the international level (Figure 59), due to global net lending and borrowing accounts (with errors and omissions). The international investment-savings gap is found in the current account's €200bn, which is considered as theory-conform here as opposed to a ca. €10tn domestic 'savings' gap.

$$S - I = (S_P - I_P) + (S_G - I_G) = Current\ Account\ Balance$$

Formula 49 The International Savings-Investment Gap is the Current Account Balance

Entry: S: gross savings, I: investment, P: private, G: government

Finally, Figure 60 depicts how cumulative lending/borrowing (sum of capital and current account) affects the net external debt and net external assets at end of period. Since the current account started to turn positive in 2012 net external debt started to shrink while net eternal assets continued to pick up. In turn it affects the Fx rate, exports, jobs and GDP. This is complemented by Figure 61 that summarizes and reviews the net external debt and assets and the cumulative change of the net lending borrowing of the EMU BoP account.

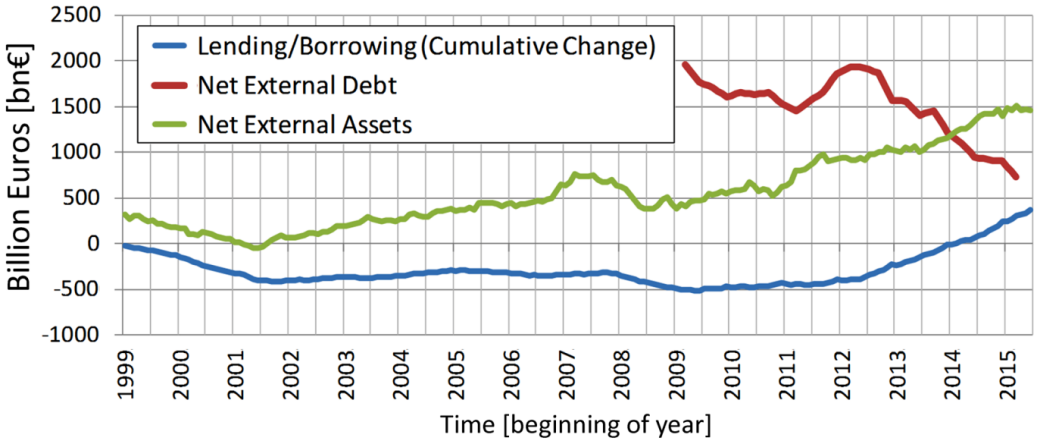


Figure 61 Cumulative Lending/Borrowing Affects Net External Debt and Assets

4.3.8.3 MTC$_3$: Keynes' and Tobin's Stock Market Channel

MTC$_3$ summarizes effects of MP on the real economy via revaluation of equity (stocks), described by Tobin (Tobin 1969) and Keynes (Keynes 1936). Briefly, Tobin's q ratio equals the asset market value divided by its replacement value (see MTC3). In practice, there are many subtypes of this formula in regular use: e.g. the market value of equity and liabilities to their book value, or the value of the stock market (market capitalization) divided by the corporate net worth, also in several different modalities of operating capital. In macroeconomic terms these differences are less important and canceled out. Tobin's q is found in the market capitalization of listed companies and gross fixed capital formation (in US$).

Although, this is only an approximation, as not all companies are listed and not all market values of companies can be estimated, as well as not all replacement costs can be determined, it still is a suitable indicator of the global trends and can be derived from World Bank data (WB 2015). The results of relative Tobin's q trends are given in Figure 62.

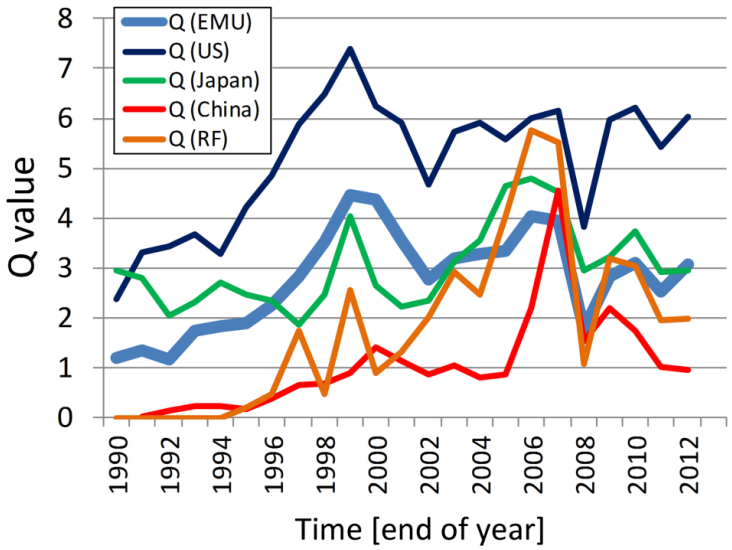


Figure 62 Tobin's Q Market-Cap of Listed Companies to Gross Fixed Capital Formation

Since several years a Tobin q indicator chart is rampant published only for the US economy. Other formula's of Tobin's q existed in the 80s and 90s but were 'discontinued' and their formulas are much less used. The US q calculation method also provides only a relative measure and no nominal values, because of the same reasons and is published on many platforms (Vectorgrader, YCharts, academic publications, etc.). It is reckoned from the Fed' Flow of Funds release: the ratio is calculated by dividing line 39 'market value of equities outstanding' by line 36 net worth market value of Z.1's table B.102 (Balance Sheet of Non-Financial Businesses) of Non-Farm Non-Financial Corporate Business [the line number differs in previous decades]. A comparison of the US q-value with the q-value of this study (based on World Bank data), finds the same relative effect on q: Tobin's q has almost doubled in the US from 2009 to 2013 (=1.75 fold), as is shown in Figure 62, as much as it has in the US version of Tobin's q (also 1.75 fold). An advantageous of the new method is that it provides comparable results over time and is based on freely accessible country data.

Q of high GDP OECD countries like the EMU, US and Japan can be grouped into a co-developing cluster, and the BRICs nation's development of q is also more coherent with its own group. The new q ratio also reveals that the US has the highest values because the capitalization rate is higher in this nation in comparison to all other nations shown here. The global shock of the FC has dramatically affected all nations' q values, even in China.

In the MTC_3 channel expansionary MP lifts stock prices and q and thus investment and GDP. The question thus arises 'how did investment develop with q', answered in Figure 63.

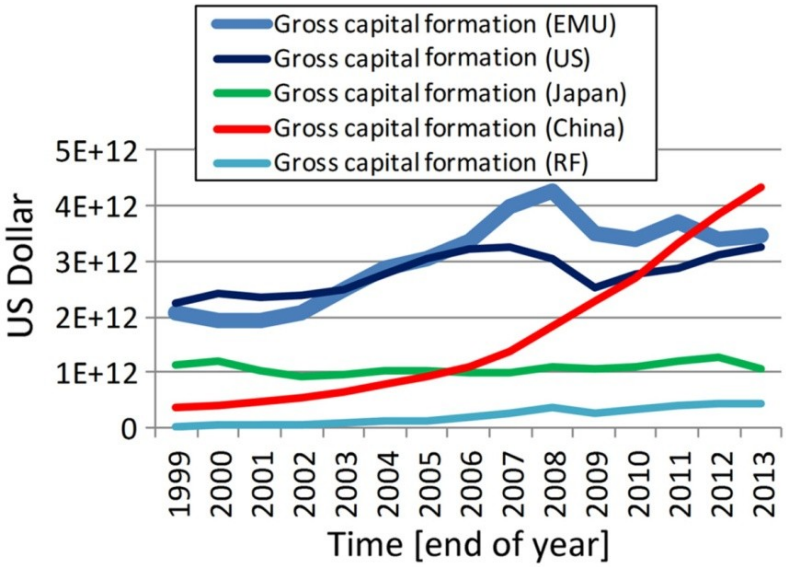


Figure 63 Gross Fixed Capital Formation in Selected Countries

Only investment in China is robust to the FC, growth aberrations of q can be seen for the US, EMU, Japan, and the Russian Federation (RF). This is also substantiated by correlation coefficients of GDP on investment (as gross capital formation), from 1989 till 2013: R(EMU)=0.987, R(US)=0.955, R(US, from 2006-2009)=-0.26, R(Japan)=0.52, R(China)=0.999, and RF=0.991. It seems that the EMU, Japan and US lag at the benefit of BRICs nations. EMU and US investment stays below or close to its pre-crisis level: a post-FC-syndrome. The ECB exerts some impact on MTC_3's Tobin's q channel via the high powered quantity of money: i.e. in the EMU from 2002-2007 and after the crisis 2010-2015 (Figure 64, R=-0.54). Additionally, a reciprocal relationship of Tobin's q (based on world bank data) and the ECB's MRO rate (central European rate) can be found with a 1-year transmission (R=-0.3, 1a-lag). Looking at adjusted stationary data a higher correlation can be found (R=-0.43, right). In summary, the ECB's MP has had a strong impact on Tobin's q and MTC_3. A multivariate regression analysis reveals that a 1% decrease in MRO increases q by 35% on average, but only at a low significance of $p<0.16$ (t-test). Chart analyses reveal generally the same result.

Despite these relevant effects of MP on the real economy, one major scientific assumption of Tobin's q MTC theory can be indeed questioned: as q is defined by corporations' market value divided by its replacement value that represents the net worth of investment, it provides a clear inverse (reciprocal) relationship of q in relation to investment. Tobin argues that a higher q results in more investment via equity. This would immediately have an impact on equity and market capitalization and q would thus not increase if counterbalanced. Q only increases if investment is less than equity value - forming a 'short-term feedback'.

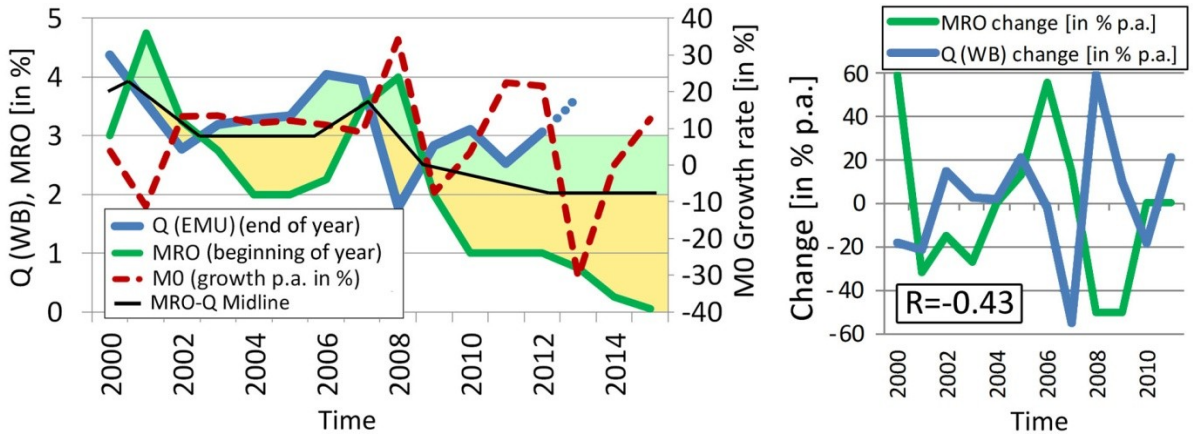


Figure 64 Dependency of Q (WB derived) and MRO Central European Rate

In fact a negative relationship in the EMU can be observed for net investment and q (R=-0.32). This is because most stocks are traded on the secondary market and if prices of these stocks increase it does not much impact investment but more profits portfolios.

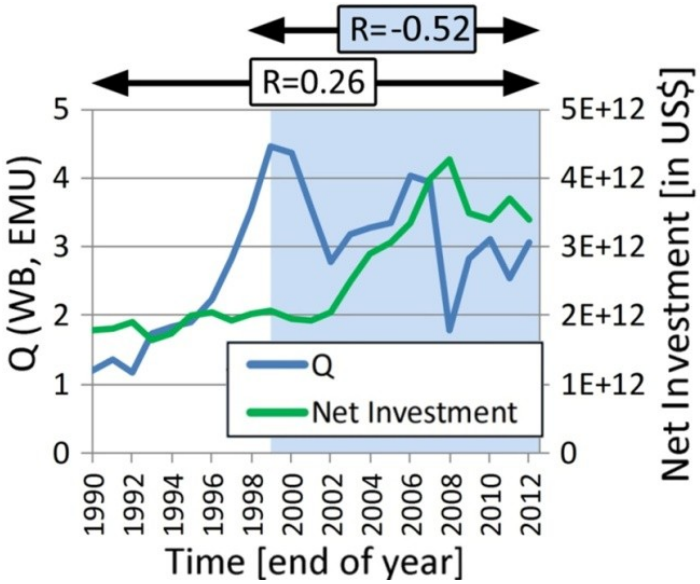


Figure 65 Tobin's Q Theory of Investment in the Eurozone

Only if firms issue new equity, or equity investment, MTC_3 has an effect, which is thus 'less strong'. Figure 65 in fact divulges a clear negative dependency of q and net investment from 1999-2013 (R=-0.52), and only a very weak positive from 1990-2013 (R=0.26). If only the time period of the European monetary union is considered, we have to consider a falsification of Tobin's q MTC theory for the euro area so far, due to the above mentioned argumentation. In summary, the ECB's MP has a bug effect on Tobin's q, but q's effect on investment, and GDP, is only temporary (2002-2006). A feedback must to be considered.

4.3.8.4 MTC_4: Financial Wealth Channel (Asset View)

The effect of wealth (Modigliani's 'lifetime resources') stems from beneficial changes in balance sheets, for instance due to a stock market boom (Modigliani 1971): affecting consumers' and businesses' (included here) balance sheets (Mathews et al. 2013).

If stock prices are stimulated by MP (as was shown in Figure 64), and the wealth on balance sheets bolsters consumption (for non-durable goods and services, including investment) investment and GDP growth are augmented, as MTC_4 is at work. The chart in Figure 66 quantifies final consumption expenditures (households and government) that resemble gross capital formation (net investment) and the externally assessed effect on the stock market (Dow Jones Euro Stoxx 50). As was shown for q and investment (see Figure 62-64), again only in years of sound macroeconomic conditions (i.e. 2002-2006), a very high correlation can be measured (R=0.94). However, if all years, containing sub-optimal macroeconomic conditions and crisis are included the correlation turns even negative (R=-0.48).Thus, MTC_{3+4} are only active if sound macroeconomic conditions and such expectations are given.

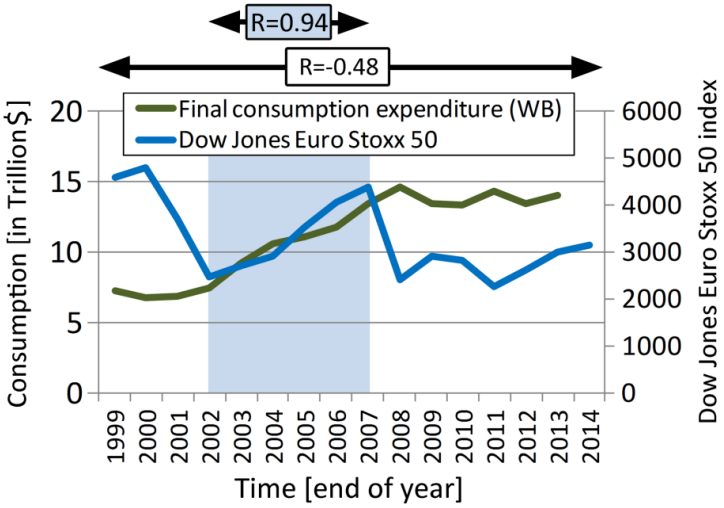


Figure 66 The Equity Effect (Euro Stoxx50) on Consumption Expenditure in the EMU

4.3.8.5 $MTC_{5\text{-}9}$: Traditional Credit View

The five credit view channels ($MTC_{5\text{-}9}$) comprise the bank lending channel (MTC_5), the balance sheet moral hazard channel (MTC_6), the cash flow and nominal interest rate channel (MTC_7), the unanticipated price level channel (MTC_8), and the household liquidity distress channel (MTC_9). These five channels have a direct effect on investment, residential housing, and consumer durable expenditure and hereby feed into GDP, output, productivity and the standard of living. They all have in common to benefit the real economy by bettering (1) the lending activity and (2) cash flow and liquidity that also reduce risks and moral hazards.

(1) The Lending Activity Effects

The lending activity is illustrated here by plotting the lending volume of relevant representative financial product categories (see Figure 67): loans ranging from three month to one year, from a quarter of a million to one million and above (IRF, initial fixed rate).

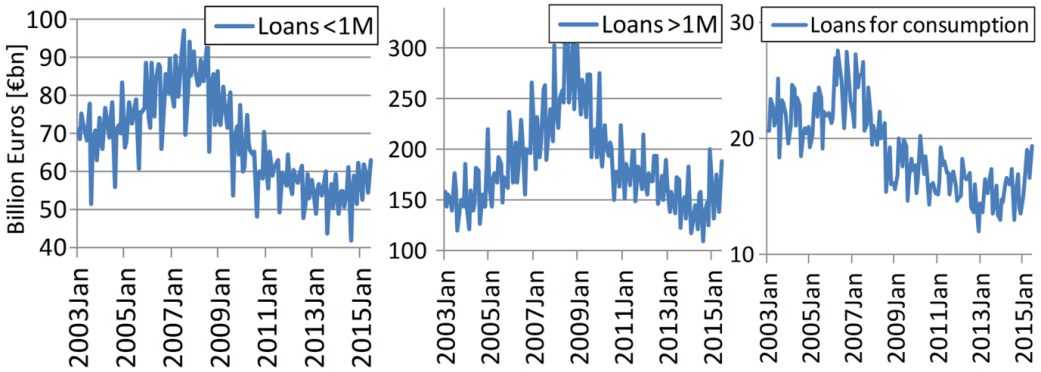


Figure 67 Lending Activity to Corporations and Consumers Across the Euro Area

As before, the most typical development of MTC_{1-4} is solely found from 2002-2008, and ended with the FC. From 2003-2009 the lending of the loan volume for corporations has increased which coincides and correlates with net investment (see Figure 63). Post-FC in 2009 investment has not recovered coinciding with subsiding lending activity (volume). At the same time the total debt of the euro area approaches heightened figures (Figure 23), of more than €20 trillion without accounted external, and externalized debt, and externalities: is summary indicating that debt is used less efficiently. Figure 68 uses world bank data to illustrate corporate, household and public debt (WB 2015). The ratio of corporate lending (driving investment) and government is declining, as much as the ratio of corporate lending to household lending. This is a new type of 'crowding out' that also includes household's debt here. Importantly, MFIs also 'crowd out' EU GDP growth (Cecchetti & Kharroubi 2013).

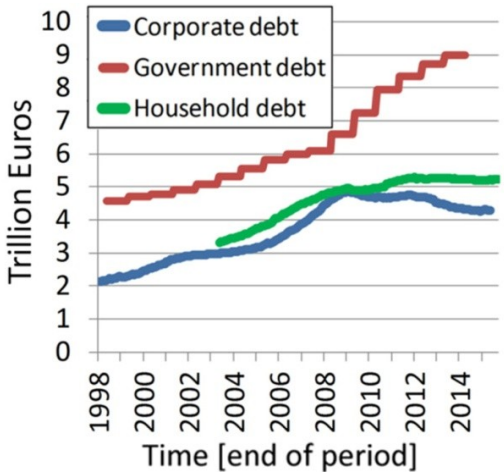


Figure 68 MFI Lending Activity with Corporations, Households, and Government

The cause of these MTC inefficiencies is m_{total} (see 4.1.3) and domestic real savings to investment gap (see 4.3.8.2), the general trends of debt Figure 60 and MFI-B/S (Figure 75). More savings are used fiscally but affordable loans are generally available to businesses, since 2012 - corporate debt is on the fall but investment doesn't soar - consumption is stable, but only slightly positive and still holds potential. The high level of indebtedness might block EMU investment and lower the effect of $MTC_{5\text{-}9}$ and it lowers the velocity of money.

(2) Cash Flow, Liquidity and Risk Effects

One way to indirectly measure the cash flow and liquidity situation in the economy is to assess the default risk and moral hazards that is considered by MFIs/CBs on the lending market. This reflects the liquidity and cash situation of households, firms, and also the government, depending on the financial product that is investigated. In theory, if the risk is high then liquidity and cash flows are estimated by MFIs as less stable, less robust, or less enduring, and the MTC is less strong. The risk is calculated using market data that resemble the change of this risk in real time. This was done through the CAPM method (capital asset pricing model) where the risk premium of lending (credit view channel) is derived by subtracting the (risk-free) government bond rate form the (risk-bearing) average lending rate. The percentage reveals the intrinsic market risk and serves as relative indicator.

Figure 69 discloses the risk premium for firms and households across the euro area of 19 countries. Once more, after 2007 a beneficial trend ended with the FC and the mean risk premium (NDER - 1YG-bond yield in %) snowballed from 1.5% to 3%. The nominal interest rates (see 4.3.1, 4.3.2) and stock market exposure pathways (4.3.8.3) network here too. In summary, the efficiency and effectiveness of $MTC_{5\text{-}9}$ has been enervated: both the heightened level of indebtedness and risk premiums indicates a loss of ca. 50-65% since 2007.

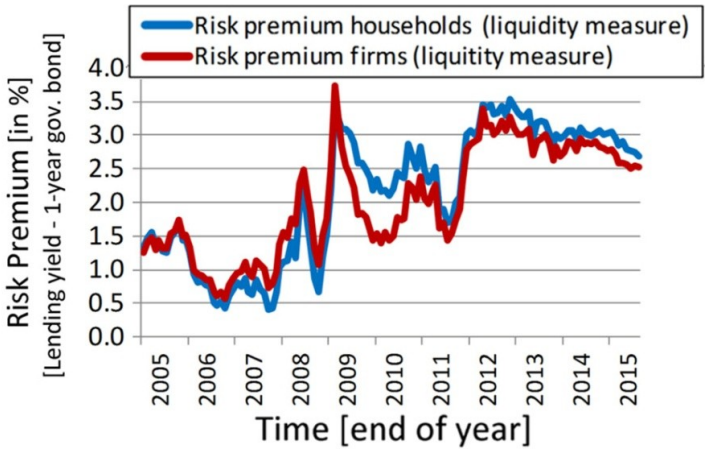


Figure 69 CAPM-derived Risk Premium in the EMU: NDER Yield Minus 1YG-Bond Rate

4.3.8.6 MTC_{10}: Prospect View - Expectation Channel

In the prospect view - the expectations channel MTC10 - several macroeconomic models are included such as the Fisher and Cagan model (see 2.3.6), and other models of rational and irrational expectation, behavioral economics, and asymmetric information.

MTC_{10} includes all MP effects that are triggered by expectations and forecasts and comprise political, economical, business, and monetary developments. Announcements of the ECB and other major central banks have huge impact before any MP operation is taken, which has lead to a forward guidance media-strategy. Most MTC_{10} expectations in the EMU are most influenced by the ECB's MP announcements and forecasts, and other economic conditions. In line with the traditional models of Cagan and Fisher (see 2.3.6) the expectations of price levels play a fundamental role, for nominal interest rates and planning of future investment due to ROI, cost of capital employed, internal cash flow benchmarks, WACC (weighted average cost of capital), and other variables crucial for decisions and output.

Economic sentiment indexes can be used to quantify MTC_{10} expectation changes in response to MP. Figure 70 overlays major sentiment indicators for industrial, service, consumption, retail, building, the economic sentiment indicator (ESI), as well as the monetary condition index (MCI) that allow for comparative combinations (Eurostat 2015). It shows a dependency of monetary conditions, and expectations, with nearly all sentiments (Table 8).

$R_{1999-2015}$	0.20	0.33	0.22	0.21	0.56	0.25	1.00
R_{TIME}	INDU	SERV	CONS	RETA	BUIL	ESI	MCI
$R_{1999-2015-FC}$	0.43	0.64	0.49	0.19	0.76	0.59	1.00

Table 8 Dependency of Sectoral Sentiments with the Monetary Conditions Index (MCI)

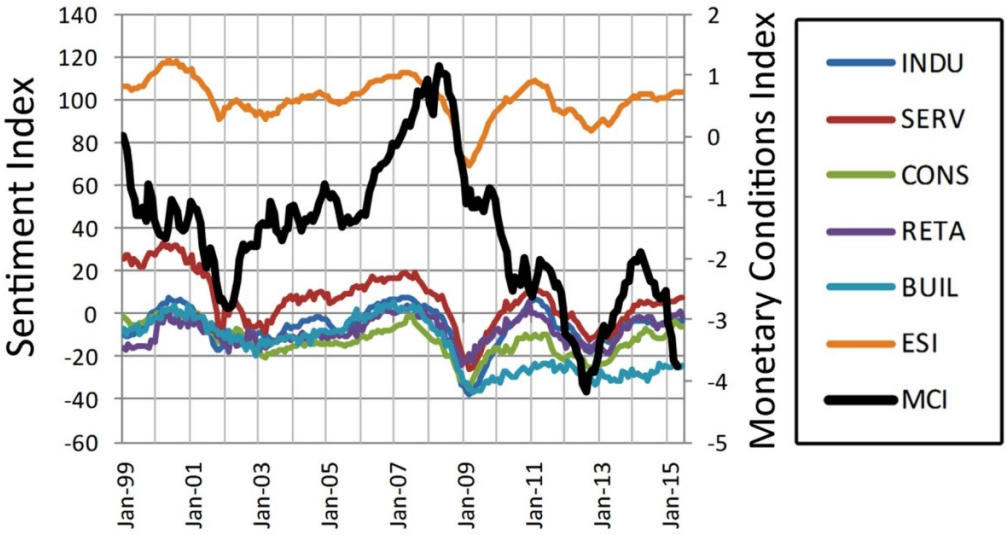


Figure 70 Economic Sentiment (ESI) and Confidence Indicators in EMU Countries

Key to Figure 70: INDU: industrial confidence indicator (40%), SERV: service confidence indicator (30%), CONS: consumer confidence indicator (20%), RETA: retail trade confidence indicator (20%), BUIL: construction confidence indicator (5%), ESI: economic sentiment indicator, MCI: monetary condition index (based on a r-to-Fx, 6:1 weighted average ratio to 1999 base year values)

The building sector's construction sentiment index is slightly more correlated with the MP and monetary condition index (MCI) than other sectors - in both time series with or without the FC (an omitted span of 2 years of FC). High MCI values indicate monetary tightening, which became predominant before the FC and contributed to a drop in all economic sentiment indexes already before the FC unfolded (i.e. before 2008). Hence, the ECB might have reacted to slow with respect to the foretelling economic sentiments and economic conditions: unexpectedly, money and MCI might have been too tight in 2008. In 2007, the MCI correlates with a massive decline in ESI and all sectoral sub-indexes (R=-0.77) in an inverse fashion: Astoundingly, the monetary aggregate grew at a high level of around 10%, so the ECB thought they were easing enough. But the MCI in fact tells another story: Sectors temporarily dried out of money and plumbed in 2008 due to overall MP/financial conditions. Once the ECB realized this issue, it started to relax MP as the Fed did almost a year earlier (see Figure 35). In 1Q of 2009 almost all major central banks had flat key rates and were easing the money supply but again something unexpected happened that was not foreseen in the dynamic models: inflation halted at almost 0%, with an even slight deflation (-0.6%, 2009-7) contrary to monetarism's claims and contrary to an element of MTC_{10} that predicts a future higher inflation if the quantity of money is about to increase. This is explainable with the oscillatory behavior found in this study (see Figure 49): inflation is sticky and follows years later and not immediately (Mankiw 2014) not even to announcements: a 4-5 year peak is proposed here in DC-tests. Thus, MTC_{10} also has a 'delayed-wave-response'.

Friedman's modern QTM formula (see Formula 10) claims that durable goods (i.e. buildings) and assets may increasingly substitute for money in an expected inflation scenario: e.g. if expected return on buildings is higher than the expected return on money (π_{buil}-r_{money}). This balances the total demand for money, which falls, bearing a risk of inflation. Sectoral indexes were recovering, building and construction index at a lower level - but responsive to the MCI. Like all previous MTCs, also the 'prospect view channel' reveals good conditions for the time period between 2002 and 2008 (see Figure 70) - a time characterized by 'sound macroeconomic and monetary conditions': The optimum of the MCI could

be somewhere around 45-55 MCI index points. Thus, the Euro might have started with a too high MCI_0 level. In summary, the MCI is a here gauged meaningful measure for MP.

In line with most if not all MTC channels, key economic sentiments have not yet fully recovered after the FC+EC, which is another characteristic condition of the 'post-FC syndrome'. Due to the tremendous importance of future expectations of prices and power of MTC_{10} for MP, the ECB's has to credibly predict the future price levels of the next month and years (1-month, 1-year, 2-years) - some of them were slightly corrected. Figure 71 depicts this ECB predicated inflation forecast and reveals its deviations from the real figures.

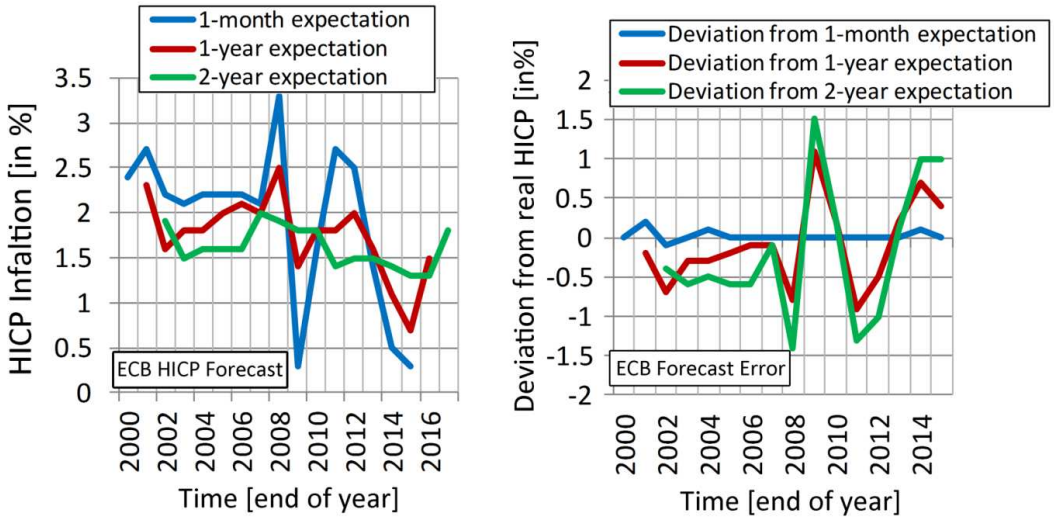


Figure 71 ECB's Expected Inflation Announcements for the Euro Area

Expectations can be subdivided into (1) overrating expectations, if the real inflation is lower than expected (positive deviation value), and (2) underrating expectations, if the inflation is higher than expected (negative deviation value). From 2000-2008, and from 2011-2012 the real inflation turned out to be higher than predicted by the ECB's in its 1- and 2-year forecast official statements. Envisioning the previous figure (see Figure 70) reveals a new and astounding coherency: economic sentiments (ESI) and its confidence components are frequently higher in those years of an officially announced underrated expected inflation, and *vice versa*, lower in years of overrated inflation. Comparing the two types of expected inflation periods (see Figure 71) with the annual GDP growth rates (see Figure 7) the same becomes apparent: in years of underrated expectation the real economy's output grew better or stronger as compared to years of ECB-overrated expectations of its HICP inflation rate. This strong dependency is summarized in Pearson's correlation coefficient of R=-0.61 (see Figure 72). A strong laterally inversed trend of GDP growth and deviation from ECBs forecast can be demonstrated, also visually, and graphically as scatter plot (see Figure 72).

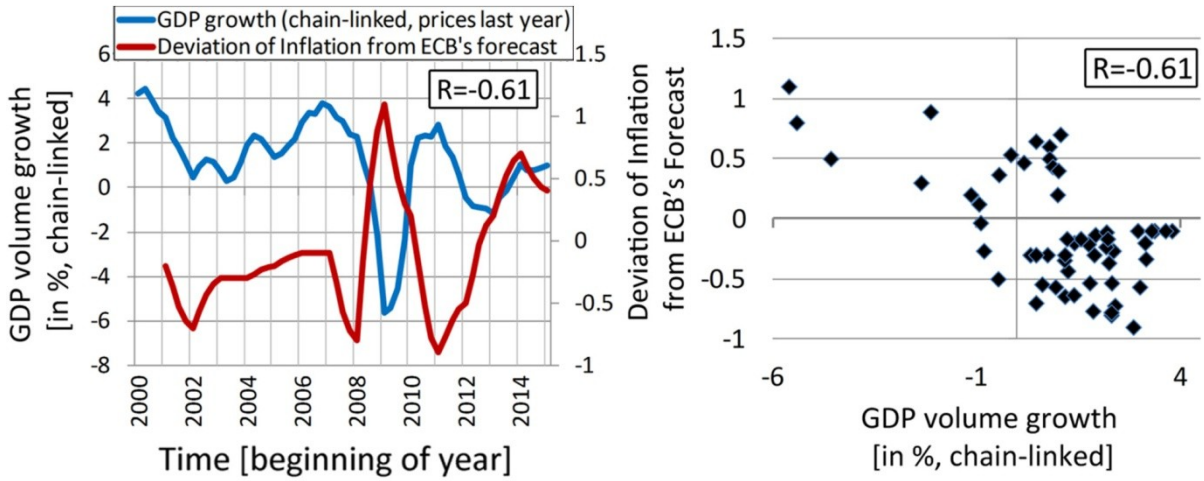


Figure 72 Correlation of Deviation from Price Expectation and GDP Growth

The cause and explanation for this effect is of note: many or probably most financial products, relevant to the real economy, are fixed to a nominal interest rate at the time of offering (or are bound by an IRF). According to the Fisher Effect (Formula 12), consequentially, an 'overrated inflation rate' would lead to a higher nominal interest rate than the market 'could take' as real interest rates grows that is relevant for the entire industry. Contrariwise, if the inflation rate was underrated by the ECB, all producers and consumers would make a slight aggregate surplus (as much as found in Figure 72 from which it can be calculated). In fact this slight surplus seems to be economically relevant (€40-50 billion) and most likely pulls the trigger in the real economy also via MP_{ICS}, due to its highly transactional features and velocity, profiting employment, r, output, investment, and GDP - indeed a beneficial side effect of the ECB's (deliberate?) miscalculation. But it is also true *vice versa*, if the ECB overrates the expected inflation it could have negative side effects on r and GDP.

4.3.8.7 MTC_{11}: Money Multiplier Pre-Transmission Channel

The properties of the money multiplier (see 2.3.7) represent a 'pre-transmission channel' of CBs/MFIs because the legal frameworks strongly affect the ultimate money supply in the economy: MTC_{11} hyper-inefficiency is already 'enough discussed' in chapter 4.1.3, MTC_{11}.

4.3.8.8 MTC_{12}: Monetarism Channel

The Monetarism channel (MTC_{12}) includes the Cambridge Effect decomposing into a short-term effect on GDP and a long-term effect on prices: involving timing and amplitude of MP. Previous results of this research study (see Figure 49) suggest a Cambridge Effect on nominal and real GDP for approximately half a year and a second wave with about three years of

delay. This nominal positive effect turns into a real net positive effect only if the long-term 'inflation effect' in year 4-5 is neutralized. The steady overlaying of trends - overshadowed by the FC/EC and its aftermath makes its study more complex but generally feasible. Models like the DC model, New-Keynesian models (Clarida et al. 1999), VAR analysis predictions, and many more models found in the literature (for references: 2.4.2) can help to improve the efficiency of MP by estimating the right time, measure, and amplitude of operations.

4.3.8.9 MTC_{13}: Governmental Channels

The complex response of the real economy to MP operations also partly originates from interdependencies of all monetary (Friedman & Woodford 2010), economic and also fiscal parameters and their network effects (Mathews et al. 2013). The control over the fiscal and monetary parameters is legally and structurally divided, due to the relatively high autonomy of central banks, like the ECB (see 2.1.5), or Fed. New and Post Keynesian models and theories send a reminder about the relevance of a concerted and coordinated co-action (Keynes 1936; Keynes 1923; Mathews et al. 2013; Mankiw 2014; Clarida et al. 1999) - that might be missing to some extent in the EMU. Additionally, MTC13 is an indirect and relatively efficient and effective (compared to $MTC_{10\text{-}12}$) money supply channel for the real economy, especially in the case of deficit spending when a positive net effect takes place. The use of this channel is recommendable if the economy doesn't meet its potential, i.e. is below its full employment. It profits short-term and long-term output if deficit spending doesn't lead to all kinds of 'crowding out' phenomena but stabilizes the economy via 'crowding in' (as discussed in 2.4.8). EMU funding via government bond purchase programs is needed but only prolongs the inevitable: MS reform. A look at the US and EMU clarifies that since the introduction of 'fractional reserve banking' both major economies systematically ran into a vicious cycle of 'systemic indebtedness', the US in 90 or less years. Before 1913's leveraged fractional reserve banking the US was always able to pay back its debts in times of peace. The Federal Reserve Act from 1913 has seemingly diminished this ability; the EMU ran into this problem in 16 years by with a fractional reserve resuming head-start.

Today, governments still find themselves in a wicked quandary: if they reduce the budget deficit their austerity harms the real economy in the short-run, and if they decide to keep up with the deficit spending they worsen the long-run perspective and indebtedness. Figure 73 illustrates the systemic problem of euro area indebtedness that is exemplary in the world. This partially unnecessary dilemma is also faced by most countries in the world.

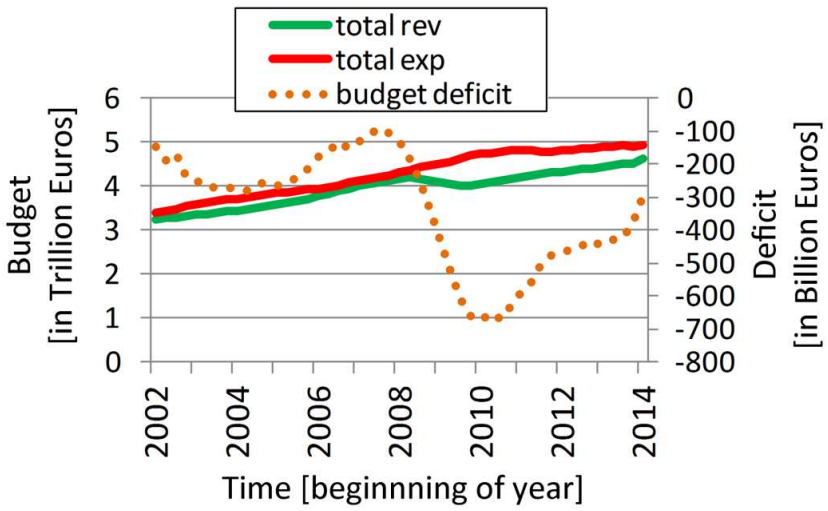


Figure 73 Government Revenue and Expenditures in the Euro Area

Additionally, each Euro spend has a positive multiplier-effect on income, as it also stimulate consumption. The government purchase multiplier benefits the real economy by 1/(1-MPC) for each unit cash spent. Assuming that the MPC (marginal propensity to consume) is constant a tax increase as high as a new expenditure has a 100% positive effect (Mankiw 2014):

$$\Delta Y = \frac{\Delta G}{1 - MPC} - \frac{MPC * \Delta T}{1 - MPC}; \quad \Delta T = \Delta G$$

$$\boldsymbol{\Delta Y} = \frac{\Delta G}{1 - MPC} - \frac{MPC * \Delta G}{1 - MPC} = \frac{\Delta G - MPC * \Delta G}{1 - MPC} = \frac{\Delta G(1 - MPC)}{1 - MPC} = \boldsymbol{\Delta G}$$

$$MTC_{13(\Delta G = \Delta T)} = \Delta G + economic\ value\ added - local\ factor\ costs$$

$$NPV_{MTC13(\Delta G = \Delta T)} = \int_{0}^{+\infty} (NPV_{\Delta G} + NPV_{economic\ value\ added} - NPV_{local\ factor\ costs})$$

Formula 50 The Fiscal Effect of Neutral Tax Spending

Entry: NPV: net present value (see Net Present Value (NPV), ΔG/ΔT: change in government spending or taxes, top formula: based on (Mankiw 2014) and an exercise of HfWU Macroeconomics, 2015

This disentangles the macro-economical logic behind MTC_{13}'s quandary: although tax backed government spending would be 100% benefit GDP it inherits a downside that it could mainly stabilizes the aggregate demand side, lack economic incentive schemes, and active market forces, and could favor consumption over private investment. Still, governmental programs are a very powerful and GDP-stimulating MTC. They are only as good as the extra total value they generate plus the amount of governmental spending minus 'all local factor costs' (including all additional costs and e.g. crowding out, resource usage, etc.).

The better (the more efficient and effective) the money is invested, and contributes to the local factor as productivity add-on (including everything that benefits the economy over time, e.g. attractiveness to invest, factor conditions, etc.) the more beneficial for GDP (now and in the future) - especially by optimizing multilateral cost benefit ratios. Economic incentives and a fair private competition is the key to this pursuit. Due to the complexities and interdependencies it is not trivial to calculate the best government's involvement level, but it is required to best estimate it. A simple analysis of the government spending multiplier basically comes to the same conclusion (Woodford 2011) and can help estimate.

New money enters the economy in the form of debt, and principal and interest need to be paid back sooner or later. This constantly diminishes the liquidity of the economy and accumulates in the commercial banks and MFIs and their owners. This money tends to escape the monetary transmission channels $MTC_{1\text{-}15}$ and the economy slows down. Hence, the government finds itself in the dilemma to use MTC_{13} to compensate for the detrimental effects. Based on Keynesian Theory (Walters 1998), marginal output dependency can be also given more general, as autonomous expenditures plus marginal propensity product:

$$Y = G + I + C + A; \qquad I = MPI * Y; \qquad C = MPC * Y; \qquad G = MPS * Y$$
$$Y = (MPC + MPI + MPS) * Y + A; \qquad Y = \frac{A}{1 - (MPC + MPI + MPS)}$$

Formula 51 Marginal Propensity to Consume Triggers Fiscal Money Supply and Output

Entry: MPC: marginal propensity to consume, MPI: MP to invest, MPS: MP to spend, Y; output, C: consumptions, A: autonomous investment, G=expenditures-taxes-balance

The higher MPC and A (investment, autonomous expenditure) the better the supply of 'transactional money' and its velocity and the faster the economy can grow (Figure 74). It is thus recommendable for any government to provide legal frameworks that betters both: A and the MPC, e.g. via realizing sustainable business and monetary-economic circuits, or more fair-paid true-value-adding jobs that would profit both (A+MPC) at the same time.

Arithmetically, there are different theoretical optima for MTC_{13}: (1) the profit and loss optimum of a country is optimizes when the marginal propensity exactly equals the expenditure revenue ratio ($MTC_{13,max,\ P+L}$: when MP_{SCI}=G/T); (2) the nominal GDP or output optimum without a budget deficit is given when G/T=1 if Formula 50 is considered. (3) nominal GDP can be further increased at different rates with deficit spending, the higher the MP the higher the gains and the lower the saturation equilibrium level of debt, shown as % of GDP.

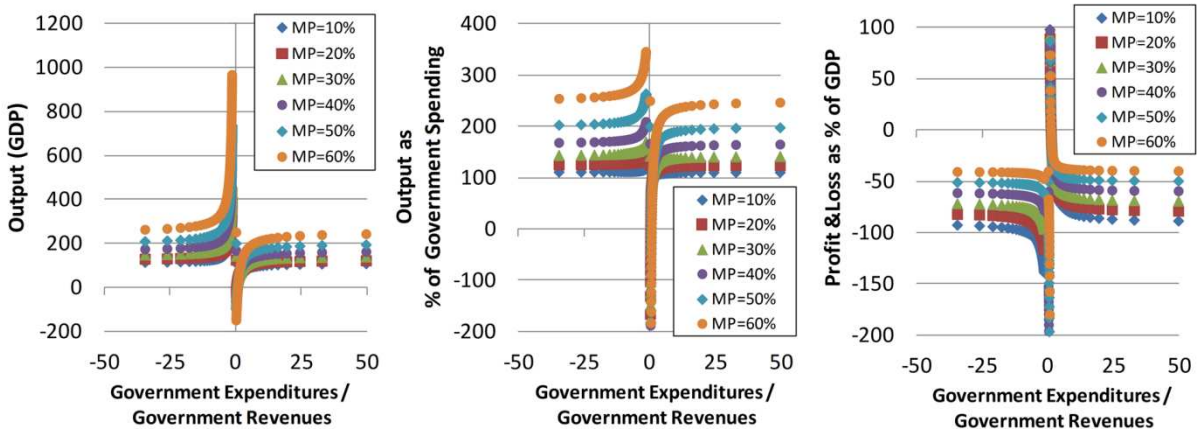


Figure 74 The Marginal Propensity (MP_{CIS}: MPC+MPI+MPS) Determines Output

Thus, a pure Reaganomics 'profit maximization' would lower short-run GDP and bears factor risks. A balanced budget and a circuit that drives MP_{CIS} and A is recommendable, and deficit spending only if its gains cover the costs also of all secondary effects like crowding out. Also, too much public/private debt lowers the income velocities, which lowers MP_{SCI}.

4.3.8.10 MTC_{14}: Behavioral View

MTC14 comprises the behavioral view channels. It bears all psychological and socio-cultural components of economic decision-makers and studies their cognitive vectors as response to MP. Psychological and behavioral elements may significantly differ from all assumptions of efficient market hypothesis and may be at odds with the assumptions of standard economic theory. MP and its economically grounded monetary effects are modeled in MTC_{14} in rational and irrational choice theory, in prospect theory (PT), bounded rationality theory, limited information, information-asymmetry and principal agent (PA) behavior models (Ross 1973), dual system theory (DST), using temporal, social dimensions, psychology of individuals, groups, and masses, using many different concepts and theories (Samson 2014). There are various concepts about behavioral channels, heuristic, framing/cognitive mappings, and market inefficiencies. Empirical work exists about on the Phillips curve, behavioral asset pricing models, behavioral research about the elements of aggregate demand (Yellen 2007) and liquidity preference, market volatility phenomena, behavior of risk aversion and resource allocation dynamics, speculation psychology, psycho-mechanics of shocks and scenarios modeling (e.g. bank runs). More than 1000 publications are available since the seminal work of Akerlof (Akerlof & Dickens 1982). The topic is also extensively reviewed (Favaretto & Masciandaro 2012; Foote et al. 2009; Hyde et al. 2007; Camerer et al. 2008). Empirical perceptions are covered in the expectation channels (MTC_{10}).

4.3.8.11 MTC_{15}: Commercial Bank's Channel

MTC15 integrates all commercial strategies of MFIs and institutions trading financial products, like equity firms, insurance companies that play role in monetary transmission and also includes idiosyncratic decisions or collective 'market strategies' that affect output.

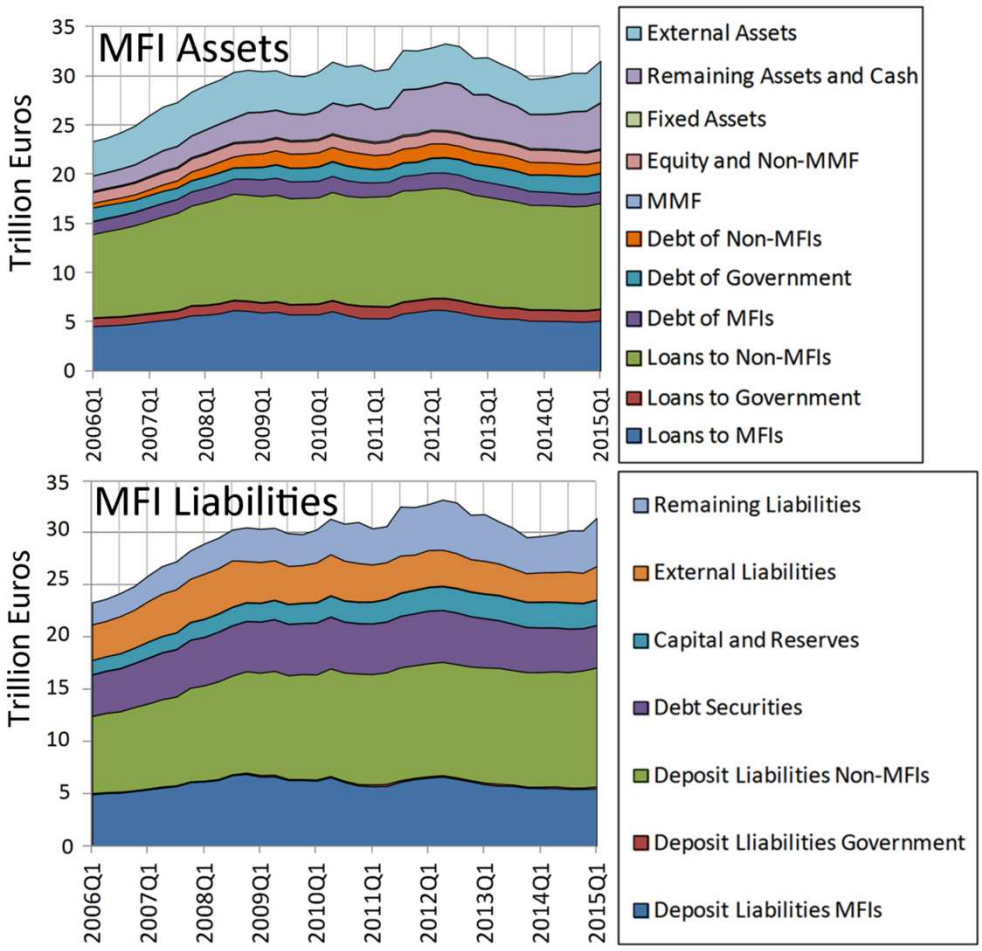


Figure 75 Balance Sheet of Euro Area MFIs: 30 Trillion in Assets and Liabilities

Special cases of this channel may be the formation of 'behind doors' MFI-non-MFI collaborations and cooperation, or 'CF-seeking' MFI hybrid deals within a 'bank-industry networks or clusters' with different legal economic entities to create profit and CF via mutual interaction. Hereby MTC_{15} has can distort plain level competition, theoretically very much, but very difficult to prove. Monetary transmission has also traditionally excluded the banking sector's resources, such as monetary assets, equity, debt, reserves, refilling liquidity, or any checkpoint and MFI vault cash. All of the bank's cash, monetary assets and liquidity, or its potential leverage (it could exert any time), and discount to buy in the real economy ($1/m_{total}$) is not researched or reported, and escapes the monetary aggregates (see 2.2.3). As a result traditional MT theory has also largely ignored the role of bank property, debt, its

leverage and methods to increase $m_{total,}$ or the role of capital/equity in the lending channel of monetary transmission (Van den Heuvel 2002). Oddly, the most important MP research is thus totally missing. In fact, MFI's assets have shot up by seven trillion in less than a decade to €31 trillion in 2015. Today, total EMU investment (capital formation) is 60 times less than all of these assets (see Figure 75) - again revealing $MTC_{1\text{-}16}$ inefficiency. Rising loans, liquidity, and reserves has endowed MFIs with more financial power at the expense of GDP.

4.3.8.12 MTC_{16}: Portfolio Channel

MTC16 is the last of the new list of MTCs (advanced from Mathews et al. 2013) and is based on liquidity preference models of Monetarism (2.3.4) and Keynesianism (2.3.3) combined with CAPM-derived preference models and other models based on return on assets. It comprises all real economy effects that arise from portfolio changes. Mario Draghi, the current ECB President, has recently termed the channel 'broad portfolio balance channel' (Draghi 2014), indicating that its relevance is in fact also much recognized by the ECB.

The 'broad portfolio balance channel' can activate monetary transmission in many different ways while being guided by dynamic demand and supply of assets. MP plays a key role here by providing an initial nucleus and structure to asset market's return expectations, again via modulations of the interest rate and quantity of money and the timing and amount of sterilized and non-sterilized, cash-effective and non-cash-effective, operations. For example, if 'low risk' assets are purchased by the ECB from investors (e.g. OMO, non-sterilized QE) who subsequently substitute their portfolios with new financial products with a higher risk accompanied by a prospect of better returns (Draghi 2014) it can have significant impact on aggregate economic decision making. Operation of the ECB may shift demand for liquidity, holding money, and all financial products comprising equity in many ways. Lateral MTC branches are given: e.g. for $MTC_{3,4,6,9}$ due to shared equity and stock market mechanisms.

Major portfolio decisions comprise whether to engage in (1) monetary assets (lending/borrowing market) (2) equity (stocks, other shares), (3) bonds (corporate and government), (4) derivatives, options, forwards, and other financial hedging instruments; these can be subdivided into (a) decisions to invest domestically in the EMU or (b) abroad.

MTC_{16} research describes and models the influence of MP on all combinations of relative shifts of above portfolio items and their respective monetary transmission in the economy.

Indicators for MTC_{16} are volumes and yield curves of MTC-effective financial instruments.

Yields of bonds, monetary assets, and debt securities tend to decline at a low MRO while equity is on the rise, empirically validated: EMU yields of bonds and money are falling at low MRO rates (6 Figure S15), equity prices (Figure 77) and volumes (Figure 76+78) soar.

Equity funds balance sheets act as an economic-sensor of core trends (see Figure 76): e.g. the volumes of 'shares and other equity' reveal and predicted the trends of the stock markets. After the FC's plunge of market capitalization (see Figure 78) stocks could regain and eventually reached all time highs in 2014-2015, expectable from funds balance sheets, also found in the OECD's index quantification of main stock market trends (see Figure 77).

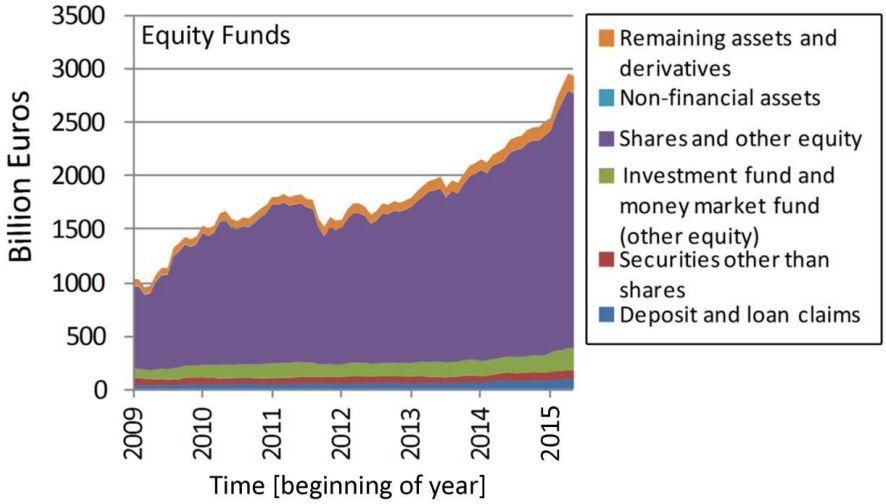


Figure 76 Equity Funds Asset Portfolio Time-line

Times of low interest yields on monetary assets (see Figure 34 and Figure 39) made stock prices climb (see Figure 77). Simultaneously, EMU resident equity funds had higher stock volumes in assets (see Figure 76), in line with current asset market theory and quantifiable.

One can discern: (1) inter-product and (2) intra-product market forces. Inter-product market forces seem to be high but not adjusting as quick as anticipated in the efficient market hypothesis. It has been a long matter of debate if stock prices reflect market value in real-time or not. The slow adjustment of all MTC_{16} derived inter-product effects reveals: not fully. Intra-financial product market forces on the other side are obviously not so much affected and equilibria form fast and in real-time, but are imperfect-information-hyper-sensitive, and as a result may overshoot (see also 4.3.8.6).

Taken together, stock prices do not only reflect a corporation's market value but also include the relative market value of the 'financial vehicle' involved, affected by MP. How realistic these 'doubled demand and supply' derived stock prices are, remains questionable.

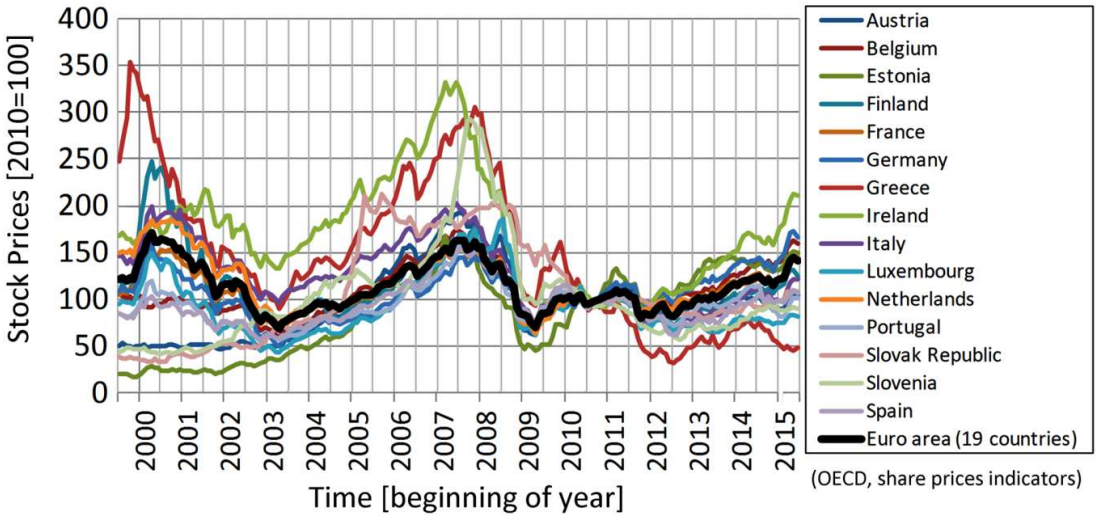


Figure 77 Euro Area Share Price Development as Portfolio Indicator

Figure 77 provides empirical evidence that links a country's finance to its stock prices. The dynamic trends reveal that the first step in the monetary transmission of MTC_{16} and $MTC_{3,4,6,9}$ is efficient. How much of this upstream cascade necessarily results in a down-stream effect on GDP and 'jobs' seems context-dependent. Previous research results mainly support a downstream-inefficiency view as investment was poorly responsive (4.3.8.3). In years of low interest rates, from 2003-2007 the stock prices had soared until the MOC rate upswinged unexpectedly by a total of two points until 2008 - weakening European stock markets. The recent ZNLB (2.4.5) has shifted the preference of portfolios much towards non-monetary assets, as MP actions mainly exalt here stock prices. The ECB's 2013 an-nouncement (flat MRO plus QE) made a 40% stock market growth predictable (via 2).These aggregated trends on the stock exchange markets originate from in equity invested 'house-holds', pension and insurance corporations (€9tn) and investment funds (ca. €3tn). Only MFI's equity is constant over time (see Figure 78), as if it were a 'tacit consent'.

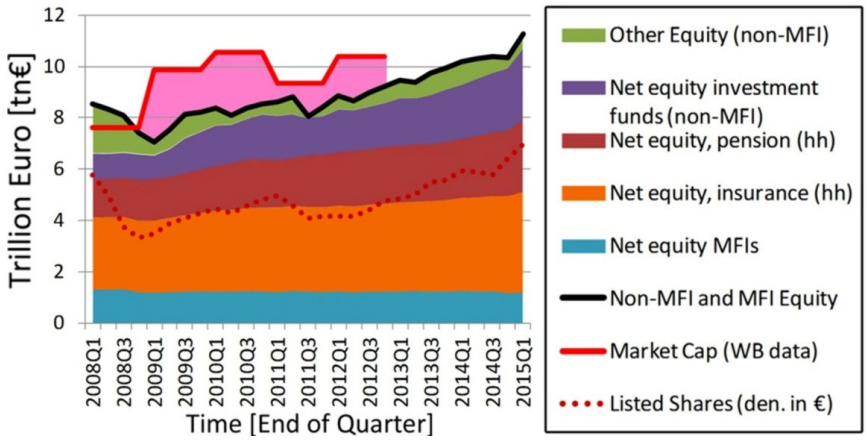


Figure 78 Total Market Capitalization (TMC) Portfolio Trend

The sum is the EMU's market capitalization; ca. 50% of shares held by residents are denominated in Euro. International Management has accelerated trade and a 'Financial Globalization' that has changed many markets, also the EU's real and financial markets (Caprio 2013). *Inter alia* this has resulted in a stronger European corporate bond market in addition to the expanding G-bond market, known in the EU as 'sovereign debt securities market'. Debt and bond securities have gained 266% since the introduction of the Euro in 1999 (see Figure 79) at the expense of cash securities that have lost in volume since the FC/EC. An inverse kinetic is found for shares and cash securities (green vs. blue, right).

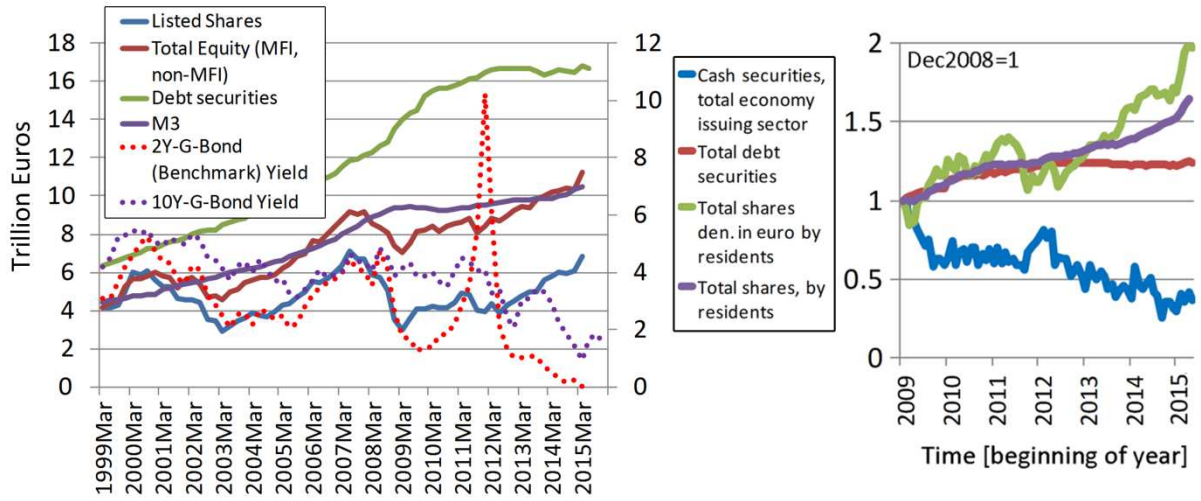


Figure 79 EMU Monetary versus Equity Portfolio Trends

In consideration of Eonia, Euribor, and NDER developments for households and corporations (Figure 33 and Figure 39), the natural portfolio shifts should be predictable. $MTC_{16(+3)}$ is another channel with a normal upstream functionality and a low transmission downstream into the real economy due to legal system based downstream inefficiencies.

All of these trends reviewed provide a more realistic and comprehensive big picture and utility to better predict future investment, consumption, MFIs and financial forces that sustain directions of business evolution, private equity firms, overall financial stability, and future portfolio decision, which are all still the key to Corporate Finance and Management.

5 Conclusion and Discussion

First and foremost this review reassures that a true understanding of the Euro area's economy absolutely necessitates a comprehensive empirically founded knowledge of its MS. As money is the basic core of an economy the economics can be better understood from research of its MS and MP. Sometimes it is even viewed negligible, but in fact it plays the most important macroeconomic role, also for all businesses. This research insight is not as prevalent as one might expect - due to the common preconception of an efficient MS that works in the background only to maintain prices, liquidity, cash supply, and lending. In fact, if the MS would be efficient, its role in the economy would be more regular and MP research would be less important. Thus, all misconceptions usually start with a 'misbelieve in an efficient MS'. It is effective not efficient, as it enables high volumes for a minimal output.

The new hybrid strategy of this study thesis, to research and review the monetary developments and transmission in the euro area, has proven to be suitable, as it allows to provide an informative overview, all of a piece to unravel the big picture and what really matters. Gaps of missing or to be updated research findings (with new data until 7-2015) were begun to be closed - including the lack of efficiency of the MS whose details still much escapes our knowledge (Görgens et al. 2014; Lee & Crowley 2010; Haan & Berger 2010). For the first time in MP research a systematic assessment of all 16 MTC was given here in one review and new core routines for data integration and research are proposed. The hybrid strategy was successful in uncovering major coherencies that were clearly forgotten by MP research - maybe due to the rigid formats of scientific publishing - including today's censorship of peer-reviewing. Thus, the hybrid research strategy is recommendable for future review approaches also in other fields of research. Old research standards, including 'scientific journals' need to be replaced by open science with free access (to publish and to access publications) and more flexible and transparent formats and structures (David 2004).

Subtopic-specific conclusions were already given in the respective chapters about MP and MTC research results, to which is referred here for all specific interpretations (see Content).

An integrated and summarizing overview of all 16 MTC channels is given with a clear-cut recommendation toward MS reform to benefit EMU businesses, investment, employment and GDP growth. Future MP research should follow the strategy of this research approach to relentlessly get to the bottom of the monetary transmission efficiency to better under-

stand the game-theoretical dilemma of the current MS, which is naturally hampered by the complexity and MFI-CF-opacity to protect a true private money-creation business model.

All published MP models of today are general and preliminary (2.4.2), and hence also very incomplete. A $MTC_{1\text{-}16}$ based empirical, adjustable and extendable, model is provided here that also provides an overview of main findings of all chapters (6.1 Figure S18). It is a summarizing and conclusive weighting chimera-model based on a VAR/DC/ISLM-ADAS derived parameters and standard probability Markov-Chain-Matrix models. This prototype model further substantiates 'oscillatory transmission' (amplitude and frequency effect on MTCs) of a MP decisions over time. It shall also serve as a final informative overview of this study. Although semi-quantification remains relative and preliminary as MP-efficiency models are still in unchartered waters it clearly corroborates a big lack of efficiency in the MS.

Put simple: newly created money can be channeled out of the Eurosystem's MTCs via MFI 'book keeping entry and accounting methods' (Werner 2014). Money creation is not limited by the money multiplier as money can be recycled into PP by MFI while keeping the overall debt level (and their balance sheets) even beneficial for MFIs (=DT), which causes FRI.

Albeit hard to quantify, due to the dynamical nature of cash flows, 'there can be no scientific doubt' about this high level of MTC-inefficiency caused by fractional reserve banking.

The related MTC-loss is the reason for lower investment, higher unemployment rates, less GDP growth rates, more debt, and deep disincentives for 'economic evolution': economically acting banks of firms are fundamentally disadvantaged against illegitimate leverages.

Hence, first of all, the Eurosystem has to be evaluated to answer the questions: How well did the ECB strategy achieve a 'monetary fit' with the real economy? (see Table 3 (Sperber & Sprink 1990)), but also (I) how well were MP options taken with respect to the ECB's scope, and (II) how well is the EMU's MS functioning and permitting suitable MP options?

5.1 Evaluation of the ECB's MP: Towards a Stewardship of the Eurosystem

5.1.1 Price and Economic Growth Stabilization Policy

The ECB's price policy has achieved to be on target in the medium term with inflation below, but close to, 2%. Only temporary fluctuations of inflation were higher than 2% or below 0% (Figure 3) and occurred momentarily during crises or shocks, and were generally avoided. But the definition of medium-term still has to be specified: e.g. four to five years. The interpretation of the ECB's legal mandate to foster EMU and EU wide economic growth

could have received an earlier and higher level of emphasis and prioritization - in the ECBs scope. The general MP's assessed were often found to be relatively appropriate given its legal scope. And that is exactly the problem: the ECB doesn't have the scope to solve the dilemmas and MP problems - only a MS change could. However, some empirically founded points of critique can generally be established (see Table 9). In summary, the EU Great Moderation, independence, Bundesbank-like MP 'inflation targeting' and Maastricht criteria have stabilized prices, and today the ECB assumes its role for growth more than before.

5.1.2 Empirically Founded Critique of the ECB's Monetary Policy

Table 9 Evaluation of the ECB's MP: empirically founded critique

(1) Crisis Management (CM) of the ECB's MPs during shocks and crises:

(1.1) A delay of CM in the FC: a too high MRO rate (Figure 35), early contractive MP

(1.2) A delay of CM in the EC: a lack of bond stability (Figure 40); a fiscal-monetary framework could have prevented many secondary, and panic-driven, costs of the EC, the Councils technical decisions on the EFSF/ESM and the OMTs (Castells et al. 2014) of 8-2012 could have been more preventive, as well as cost-effective and just-in-time (e.g. GPIIS): MP was effective but not efficient.

(1.3) Permeating liquidity and cumulative CFs were too low for job creation or GDP growth, especially during the FC and EC (e.g. Greece, 4.1.1.1) indicating ECB-involvement, overall debt level is too high, non-absorbed penetrance of three crises on the job market (2002, 2008, 2012, Figure 51) and output (Figure 13).

(2) Economic growth policy of the ECB:

(2.1) Lack of a transparent systematic orderly open market purchase program: EMU wide Euro bonds or G-bond purchases program with automatic stability mechanism.

(2.2) No solution developed for all MTC inefficiencies, first detected here (see 4.3.8).

(2.3) Less supply of 'transactional money' circulating in the real economy (see 4.1.2).

(2.4) Lack of effective monetary incentives driving investment (see Figure 63).

(2.5) Sub-optimal fine-tuning of velocities for output (Figure 13, Figure 51).

(2.6) Sub-optimal Keynesian anti-cyclic stabilization MP.

(2.7) Lending Benchmark Calculations (e.g. for TLTROs, etc.) are the first step in the right direction but do not go far enough: Lending margins and deleveraging must be a pre-requisite for all MP operations. All ECB lending and allowances must be better coupled to MTC function. All MFI cash and lending margins must be ECB specified.

(3) Efficiency and Effectiveness of the ECB's MP:

(3.1) The effectiveness of the ECB's MP can still be achieved, in full agreement with the ECB president Mario Draghi (Black & Speciale 2015), but at very high costs and low efficiency, owing to the MS: i.e. most of the new money doesn't benefit MTCs. Effectiveness if only achievable at low efficiency represents a high risk for the EMU.

(3.2) Efficiency is minimized by 'MP dilemma' causing excess reserves, high PTs, un-coupled leverage, illegitimate money multiplication with no allowance demarcation.

(3.3) Inefficiency prevails if MFIs may hoard, recycle and privatize liquidity/money.

(3.4) Inefficiency from accommodative MP during expansion (Lee & Crowley 2010).

(4) ECB's Integration Policy for Heterogeneities in the Eurozone:

(4.1) A better weighting that fully includes all country risks and benefits is needed: a single MP has to form a better compromise for the differing demands and conditions of the economies of all members. The ECB/EU has not developed customized MP tools, which are required as countries face differing challenges. The degree of austerity imposed on debtor countries (Greece 4.1.1.1, etc.) controverts an inevitably needed Keynesian stimulus (see 4.3.8.6) and monolithic normative fiscal-MP package; the reversed MRO rate and PT in 2011 were disadvantageous (4.3.1, 4.3.2).

(4.2) EMU financial sector heterogeneity and lack of competition still persist (4.3.2 and (Lee & Crowley 2010; Blot 2013; Peersman 2004)); also: financial heterogeneity.

(5) The ECB's Performance in Monetary Transmission (see 4.3):

MTCs are effective not efficient and several lack down-stream responsiveness: For example, loss of transmission in $MTC_{3,4}$ occurs post-stock market price increases - which is not the 'ECB's fault' but an empirical factor that lowers MTC performance. By far too much new money is needed to stimulate new investment and GDP.

(6) Ability to plan and control the money supply: M_0: high, M_1: medium $M_{2\text{-}4}$: low (4.1.1)

(7) Target accuracy: inflation: medium-high, output: low, employment rate: low

(8) Decomposition of transmission on output and prices: low-medium

(9) Liquidity supply for real economy: (4.1.1), ECB 15.2% vs. Fed: 22.7% of GDP (M_0)

(10) Wrong use of the Taylor model in 2007-2009, which might have worsened the FC. 2008: the Taylor model recommended lowering the MRO rate but it was increased; it implies a bigger gap in output in 2009. During crisis, ZNLB, or steadily increasing market interest rates the Taylor model is partially disproved here: as the dependency of market rates on key rates is 'not counterbalanced' (6 Fig. S16): if market rates

stepwise grow with a MRO a feedback drops GDP and investment (e.g. pre-FC). Evaluation of MP via models (DSGE-VAR, Taylor, etc.) is hampered by a lack of integrity (2.4.2), data, parameters, or output gap estimates (Orphanides & Norden 2002).

(11) Democratic mandate: independence historically profited price stability due to less idiosyncratic MP, but lacks a democratic mandate for always effective economic MP.

(12) Social Disparity Dilemma: Less liquidity is more efficient but less effective. Tight money provides less leeway for MFI to deprive money (ca. >€250bn p.a.), but efficient MP harms the economy by causing high real interest rates. New money mainly profits MFIs and the wealthy, not the economy/customers, due to MTC inefficiency. MP diminishes the relative return for high savings volumes of the general public.

Most of all MTCs assayed reveal a 'better' monetary fit to economic condition from 2002-2007. This time was characterized by low interest rate expectations (see 4.3.1, Figure 34), a heightened global usage and demand of Euro also as international currency vehicle (BIS 2013), and inter-crisis economic growth and investment. Aligning the liquidity preference, money balances (Figure 21), and the BoP (see Figure 58) reveals a generally suitable exchange rate policy but the EC has unnecessarily damaged the Euros reputation and demand as vehicle: faster, concerted policy actions would have prevented a big loss.In spite of everything listed in Table 9, although with delay, the ECB's CM helped stabilize prices, consumption and GDP to some extent. But it lacks a mandate to shrink the debt EU debt overload. Today's MP limitations fully hinder the ECB to solve most of the very important MTC 'inefficiency issues'. Through this, the ECB is 'condemned to be effective' although at the 'second highest costs' for the economy (the highest cost would be ineffectiveness). Money is at the very core of all nations. It still escapes democratic control. Typified, the FC+EC are only forerunner tips of 'fractional' ice bergs to market economies.

5.2 Evaluations of the MS: Towards a Digital Full-Reserve System

5.2.1 The Requirement and Imperative of Monetary Reform

Due to all empirical reasons found here and many others elsewhere, monetary reform is highly urged for, in this research review, and also since more than a century by a majority of experts, including top MP researcher all around the world to (1) overcome the fraud of fractional reserve banking, and (2) the crisis caused by the gold standard, until today. While fiat money has replaced the gold standard, fractional reserve banking has still not been removed, although there is scientifically 'no need for it at all' in fiat money based MS.

For instance, producing legal tender or digital money can be done at almost zero, or very low, marginal costs - relative to money's PP. Only in the past, when precious metal and gold was coupled to money fractional reserve banking helped to deal with its scarcity (e.g. gold).

Today, fractional reserve banking is not required and poses high financial risks to the economy. This empirical EMU research further substantiates the need for MS reform (Table 10):

Table 10 Ten Substantiations of the Imperative to Terminate Fractional Reserve Banking

(I) DT could be further substantiated in several chapters. Also, credit and money are interfused by MFIs and cannot be fully separated leading to very strong PAP; risk of different types of 'bank-runs'; MFI liquidity not assignable PAP: e.g. MFIs can freely benefit private non-MFIs with created money and leverage. As a result of fractional reserves kinetics of all velocities of money (see 4.1.2) and money multipliers (see 4.1.3) negatively progress, notwithstanding the fact of a constancy of Friedman's technical and procedural velocity parameters. Delivering evidence that the real quantity and/or velocity of money must be much higher.

(II) The strong shift from a 'transactional to a storage function of money' (see Table 1) further maintains this view and DT (see 4.1.2; see 4.3.8.12): this is further corroborated by comparing trends of income and TA velocity (as difference index).

(III) Additionally, fractional reserve banking is detrimental to all procedures and evolution of 'good-bank competition': liquidity recycling, deprivation, and multiplication abolish a real and fair competition and a suitable evolution of the real economy and financial sector. This can be also seen in the ongoing development of an increased pass through (PT) in the Euro zone (see 4.3.2). The real interest rates even grew (4.3.8.1) in response to the ECB's MP and a minimal MRO rate.

(IV) The overall lack of efficiency indicates a CB/MFI market failure, monopolization and networking, and is based on illegitimate reuse of extrinsic MFI liquidity (DT). Concerted MFI-network actions might be also seen in equity markets (4.3.8.12).

(V) Statistical analysis (multivariate regression functions, and VAR coefficient matrices) reveals (a previously undescribed) 'EMU background inflation' (FRI) that is fully independent of GDP and money (M_0) growth, and other macro-parameters. EMU background inflation contributes to more than half of aggregate inflation of normal other types of inflation (see 2.2.2). Positive supply or demand shocks cannot explain FRI, as global pricing has stabilized EMU prices. This new type of

inflation is termed 'fractional reserve inflation' (FRI) as it is based on MFI's repeated reuse of extrinsic money and book money re-creation (DT). While the real economy has to bear the full costs of FRI, MFIs benefit from it multiple times. FRI or 'background inflation' is not caused by the quantity of money released by the ECB (see 4.1.1) but stems from private money creation: A new interpretation of the Phillips Curve arises: in normal years FRI ('stolen liquidity') of MFIs drives jobs and prices as MTC-active money is created/spent, which is usually scarcer.

In summary: EMU FRI or background inflation (see 4.1.1) endorses the recently upcoming 'deprivation of money and property deprivation theory' (see 2.2.3).

(VI) Crowding out (Cecchetti & Kharroubi 2013) stems from money deprivation (DT).

(VII) The money multipliers reveal that CBs and MFIs have gained a cryptic, tucked away, extra-leverage (see 4.1.3): a potential to secretly privatize created money.

(VIII) Huge amounts of excess reserves evidence a lack of competition, a lending market and MTC failure, but also MFI networks: a typified inefficiency of monetary transmission. Excess reserves accumulated post FC/EC, since 2013, and much overshoot again today (2015-7) despite all ECB's operations including negative interest rates for all deposits held in its vault (since June 2014, see 4.2.2.3): an emergency measure that no other central bank in the world had to implement before to cope with the market inefficiency caused by MFIs (most 'Economists' said it could not happen). Banks are reluctant to pass negative interest rates to customers halting monetary transmission. In fractional reserve banking legal tender is hoarded by MFIs/CBs and overall debt is artificially increased. As a result, adequate MTC function is lacking necessitating 'helicopter money'.

(IX) Liquidity is systematically soaked out of the real economy of transactions by banks (MFIs). As liquidity (cash), always ends up at a bank again it can be reused multiple times per year precious property assets can be bought by banks for no real countervalue (for free). This not only hinders business evolution, and opposes good economic incentives - it also represents an element of a crime that sooner or later will be termed the 'biggest financial crime in human history' by a free press. The MFI extra leverage of also drives speculation and financial crises.

(X) In fractional reserve banking the central bank, the ECB, lost and steadily loses its natural and legitimate control over the money supply and money creation see

(see 4.1). Even a perfect MP could not solve such issues of a monetary system, as much as Basel I-III and the 'Single Supervisory Mechanism' (4-11-2014) can't.

All of these urging arguments of Table 10 add to a very old hard-fought debate about the right MS - and straightforwardly, it takes much prowess of any job-depending scientist to take an independent stance on this obviously dangerous topic: since hundreds of years important opponents of fractional reserve banking have been endangered and attacked, or ignored: e.g. Abraham Lincoln (assassinated for fighting human but also financial slavery), Irving Fisher and the majority of US Economists were systematically ignored and muted for urging a full-reserve system (Douglas et al. 1939), US Senator Bronson M Cutting was potentially assassinated in a plane crash, which then reversed the momentum of a US Federal Full-Reserve Bill in 1934 and changed the history of the US from then on), or the US President Woodrow Willson who was manipulated, who later admitted that he was fooled [in the complex details] to sign the Federal Reserve Act, saying a few years later: 'I have unwittingly ruined my country', and 'banking system is to be public not private, must be vested in the government itself so that the banks must be the instruments, not the masters, of the [money creation] business', and many more, maybe discovering an old hidden network that uses crime and manipulation to enforce fractional reserve banking, to gain money for free.

Scientific pressure to quit fractional reserve banking was advocated by the world's top MP experts, including: Irving Fisher (Father of MP and Monetarism, key macroeconomist like Schumpeter called him 'the Greatest Economist the US has ever produced' [Schumpeter himself was 'born' in Moravia])(Fisher 1936), Post-Keynesian Economics that is build on full-reserve only (and doesn't apply to fractional reserve banking), Milton Friedman (Father of Monetarism, and modern central bank MPs) (Goodhart & Illing 2003; Friedman 1948), also 'the last evaluated majority of top US MP researchers' (Douglas et al. 1939), F. Graham, Henry Simons, Frank Knight, and many more of the world's very top MP researcher of the past and today. Nowadays, the list proceeds with top MP researchers like Laurence Kotlikoff (Kotlikoff 2009), Murray Rothbard (Rothbard 2010), John Cochrane (Cochrane 2014), Jesús Huerta de Soto (Soto 1995), Martin Wolf (Wolf 2014), David Stockman (MI 2015) and many more top-experts of the matter: Mervyn King (Bank of England Chief)(Reiss 2015), James Tobin (world prominent macroeconomist professor, nobel laureate, Board of Governors of the Fed), Herman Daly (former Senior Economist of the World Bank), Murray Rothbart (economist, historian, political theorist, identified that fractional reserve banking

as fraud) (MI 2015), John Kay (Founder of Economics at London School of Economics, council of economic advisors Scotland), Thorsten Pollite (Frankfurt School of Finance and Management), the entire Austrian School of Economics (MI 2015), Jörg Guido Hülsman, Mathew C Klein (Bloomberg, Financial Times publisher) and many more (IMMR 2015; Kumhof & Benes 2012; Douglas et al. 1939; Keynes 1923; MM 2015; Goodhart & Illing 2003; MI 2015; and references within these publications and based on Washington'sBlog).

Many international political grass root organizations with millions of followers still grow further and lobby a bill of debt-free 'positive money' to also enable a 'democratic free market economy', and distinct proposals and draft laws exist to strictly prohibit any type of fractional reserve banking (PM 2014; MM 2015; IMMR 2015; MI 2015; Reiss 2015 and references of proposals herein), some are dealt with in government circles. Legislative proposals exist, which only need to be signed. As Irving Fisher and others have also claimed: fractional reserve banking (1) worsens the business cycle, (2) boosts public/private debt, (3) leads to unhealthy accumulation of debt and wealth, harming the economy and its evolution, (4) allows banks to withdraw high volumes of purchasing power, of money, out of nothing, a full-reserve is highly urged for by a majority of true experts, and is even now supported and backed by a new IMF study (Kumhof & Benes 2012). To circumvent the inefficiencies and ineffectiveness, accounting fraud, unfair competition, financial market failure and 'business evolution' failure due to free-money loopholes, MS reform is in fact absolutely required (IMMR 2015; Kumhof & Benes 2012; Douglas et al. 1939; MI 2015; Soto 1995).

5.2.2 Proposition of Key Core Elements for Monetary Reform

When a fractional reserve is replaced by a full-reserve banking system, additional means are much needed: these have to compensate for the lack of private money recycled by MFI, which has a positive side effect: billions of liquidity are freed in an efficient MS that can be used to pay back debt balance budget, invest in the local factor (infrastructure, education, and to finance reforms and modernization, etc. or e.g. to provide better tax incentives), and also for the private sector investment (to profit investment and investing firms). New money would stop being neutral, but could turn positive, for output. Positive in two ways: (1) Ending the classical neutrality of money, and (2) excess indebtedness, both drives GDP, by stabilizing velocities (see 4.1.2), the debt burden (4.1.5), firm evolution and investment. New secure information technologies (IT) make the prospect of a widely cash-less monetary system (MS) and society based on a 'digital full-reserve' (for references see 5.2.1) al-

ready feasible today. Today, most of all money (ca. 90%) is already digitalized (book-money and reserves). A digital full-reserve system is the next most logical step: it is a technological and monetary-economical progress. A fractional reserve is like a gold standard a regression.

Digital countable money offers economic growth and a much better security at once: as money would be fully trackable (every unit is electronically registered), all money related crimes would become 'entirely visible' to authorities. This could be the end of nearly all financial crime, of any kind. A tax software add-on (both is already feasible to program today) could also diminish most tax and accounting crimes and optimize and automatized all financial processes in the EMU, but new legislation would be also required. A new fairness of competition would prevail due to electronically assured neutrality of treatment, non-discrimination, most-favored-entity treatment (MFE), closed MFI money-loopholes, in a most convenient, transparent and testable way. Fiscal-financial-economic crises would end.

Besides technical-methodological, logical, ethical, economical, and population's demand for MS reform, demand also arises due to a wanted comfort and convenience in payment: customers increasingly prefer cash-less payments in many forms and new devices: Since the FC also the image of MFIs and CBs, and the MS, has 'crashed'. In digital full-reserve banking MFIs would not need to have more cash in their vaults (the often heard but wrong counter-argument), as legal tender is easily and comfortably transferred electronically to MFIs and everybody's account. Higher elasticity of money found in fractional reserve banking is given via the central bank's electronic (automated) money supply to MFIs, ending interbank lending. As money is created and supplied only by the ECB it much improves all MPs at once.

A remaining 'need' of cash money could be tracked with RFID (radio frequency identification), or a technology alike, so that every circulating monetary unit can be monitored.

Demand for 'consuming electronic money' is also on the rise in the EMU: preliminary electronic money institutions have doubled in the last four years to 6500. €875m in E-money have been issued by non-MFIs, and €6bn by MFIs (ECB 2015c) in various ways and for many different electronic devices (but still with 'bad fractional-reserve banking money'). But E-money can only be efficient and effective in a full-reserve system with a strictly and invariable prohibition of all private money creation, including book money. As a result only legally allowed and efficient money would be used (Art. 128 of the Treaty): digitally and as cash.The higher efficiency would also profit the economy via heightening velocities and the marginal propensity to spend (Formula 50, Formula 51, Figure 74): the economy's output

would boom again until enough jobs, prosperity, goods and services are reached for everybody, and a basic free market economy can finally emerge, without loophole of PP deprivation. This new MS would bear extreme benefits and chances but also new risks due to a new level of control and power over the money supply and economy that must be well surveyed and orderly managed, IT logistics needs to be safe and compatible with interfaces.

5.3 Recommendations for Economic Actors and Traders

5.3.1 Understanding Monetary Transmission for a Better Forecasting

Understanding monetary developments and transmission mechanisms that are described in this research will help economic actors and traders to better orient and embed their decision in the context of dynamically changing macroeconomic frameworks. MTC research helps to better forecast and predict the future of macro trends for businesses and traders.

VAR forecasts provided here predict a slight future economic recovery for the Eurozone (see Figure 5). Due to the final-value-problem of forecast chain models, VAR forecasts - widely used should be interpreted carefully in economics - they may only provide some basic but helpful information about potential tendencies (6.1 Figure S3). To circumvent this drawback VAR models can be extended and combined with Pearson's Time Matrix models, also known as dynamic correlations (6.1 Figure S4, 4.3.4) and ISLM-ADAS models (see 6.1 Figure S7-12), New-Keynesian, and all other available models. The newly developed ISLM-ADAS dynamical semi-quantitative model framework predicts a very low inflation this year and a rise in HICP starting in 2017 (see 6.1 Figure S13), in line with the Pearson's Time Matrix Model (6.1 Figure S4, 4.3.4). A reliability-weighted overlap of models is recommended.

Once - or whenever - firms depend on profitability they need to find a strategic fit between the environment and its resources and competencies. Globalization and MP have had tremendous effects on the real economy. More than ever, strategists have to include the international and macroeconomic monetary, economic and fiscal developments into their calculations. Many investment decisions depend on NPV and internal cash flow (ICF) calculations and include WACC and other financial parameters to dynamically estimate profitability and return on investment (ROI). Hence, slight changes in interest rates, nominal and real, or Fx rates, or the business cycle, consumption and investment, all have big implications for aggregate microeconomic decision making. Understanding past macroeconomic and monetary trend in the Euro are is helpful for future planning (a) of financial manage-

ment (b) of supply and value chain management, (c) planning of marketing, consumption, and sales forecasts, (d) international management, and (e) a political recommendation for economic entities is given to support full-reserve banking that would profit all businesses.

5.3.2 Updated Understanding of Monetary Transmission

Although mainly basic but most important topics were covered, more sophisticated in depth research is needed but should be based on the given core framework of this study, as it provides the right perspective on the monetary system and its MP for applied research: with the key focus of how to improve efficiency and effectiveness of money the one and only key topic of economics - that was, beyond believe, forgotten by MP research. Economic decision makers need to be aware that an updated view is as important as a comprehensive one. To enable the reader to update all figures in the main text all accession numbers of the figures in the result part and electronic references and internet pages are provided to get an own fast overview of the latest trends and developments in just a view clicks. The review may serve as a manual or work of reference for a quick review of the main trends.

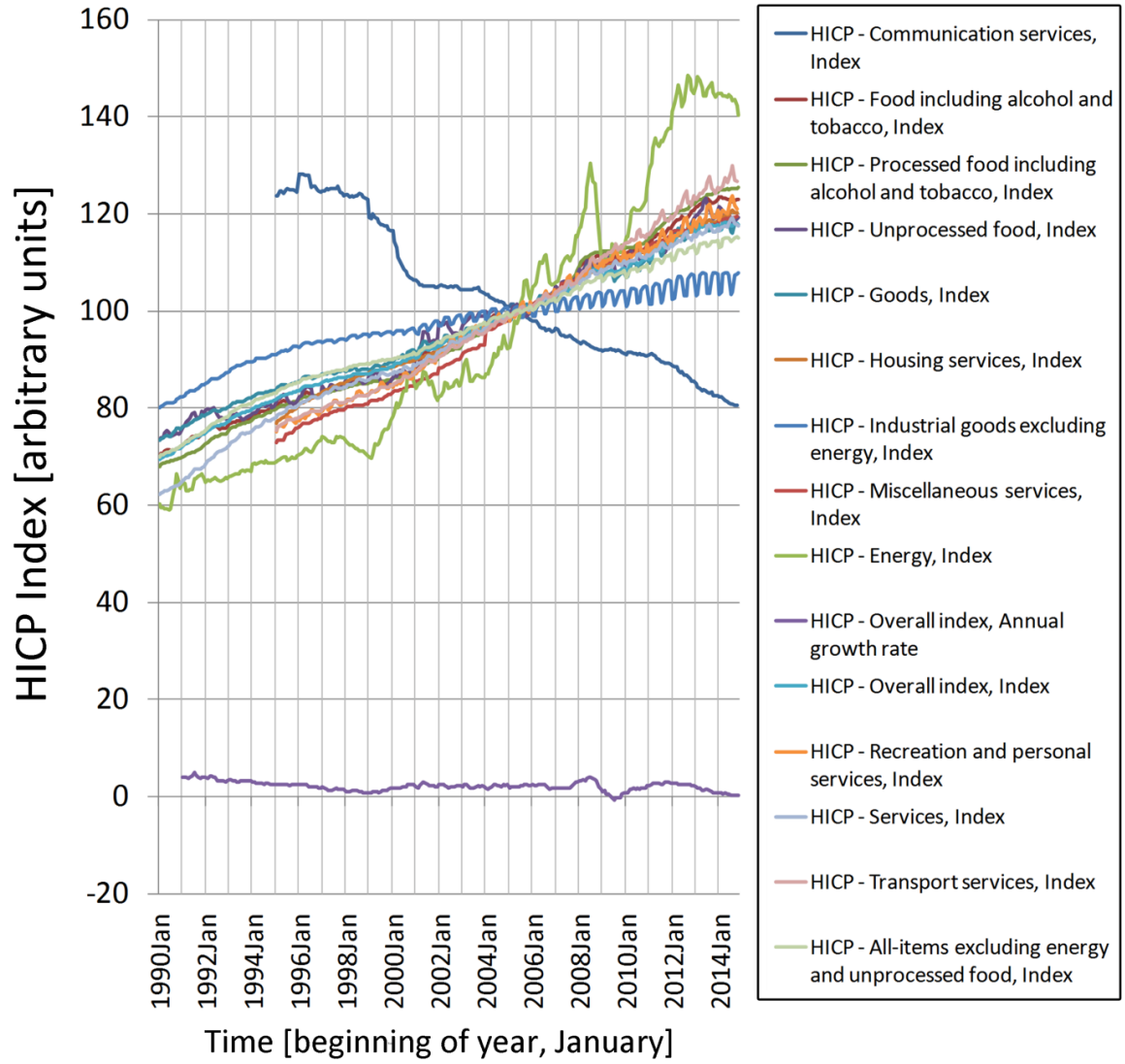
5.4 Concluding Remarks

The Eurosystem has been established successfully, despite of many initial doubts in 1999, and has robustly protruded throughout three severe financial crises: the dotcom bubble, the FC and EC, and the ECB could manage to be on its main targets. But for all that, the international reputation of the euro - as global monetary vehicle - has slightly and unnecessarily tapered off - mainly due to the EC and the malaise of the slow EU recovery also in comparison to the US or the EMU's growth prospects of 2008 (EC 2008). This research argues that a primary cause is the fractional reserve system but this is also found in the US, which generate 175.000 new jobs per month in the last years (WB 2015). The reason for this difference is believed to be a higher entrepreneurial activity in the US (Bosma et al. 2013), in fact most new US jobs are created by new businesses, a lack if a EC (but reoccurring fiscal cliffs), a 1-year faster reaction of the Fed, more efficient and effective bail-outs after the FC, as the US got the big detail a bit more right (better for tax-payers, less good for non-banks), and because US regulators have more control and coordination over MFIs. Still the US also suffers from high losses due to fractional reserve banking and the fiscal cliffs are the direct consequence of it. Thus, this study in fact stresses the global need for more unbiased MP reviews about the MS, also for a very broad group of people - and a MS change.

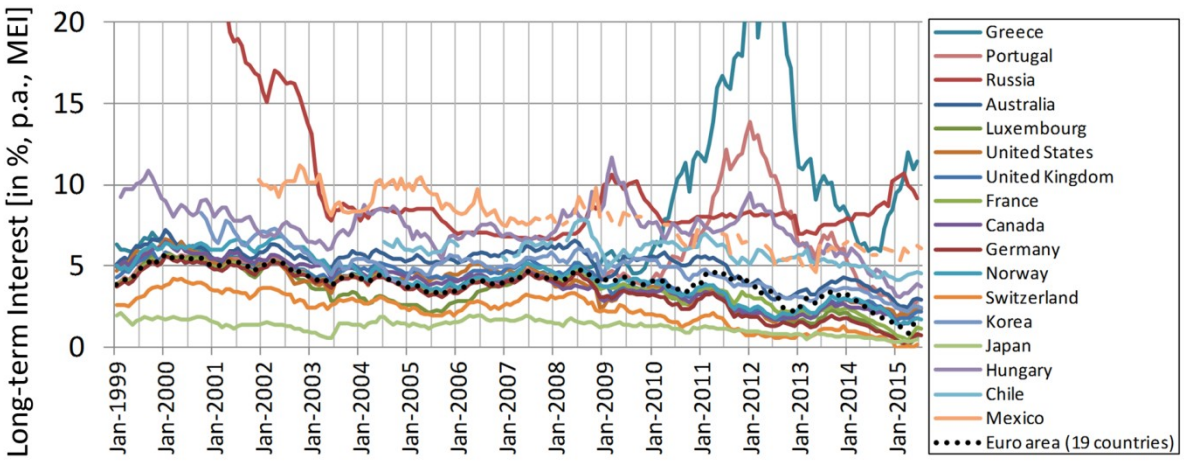
6 Appendix

- A hyperlink to Table of **Supplementary Figures**, chapter **6.1**, page 175.
- A hyperlink to **References - Bibliography**, chapter **6.2**, page 187.
- A hyperlink to **Sources, Data Retrieval and Processing**, chapter **6.3**, page 201.

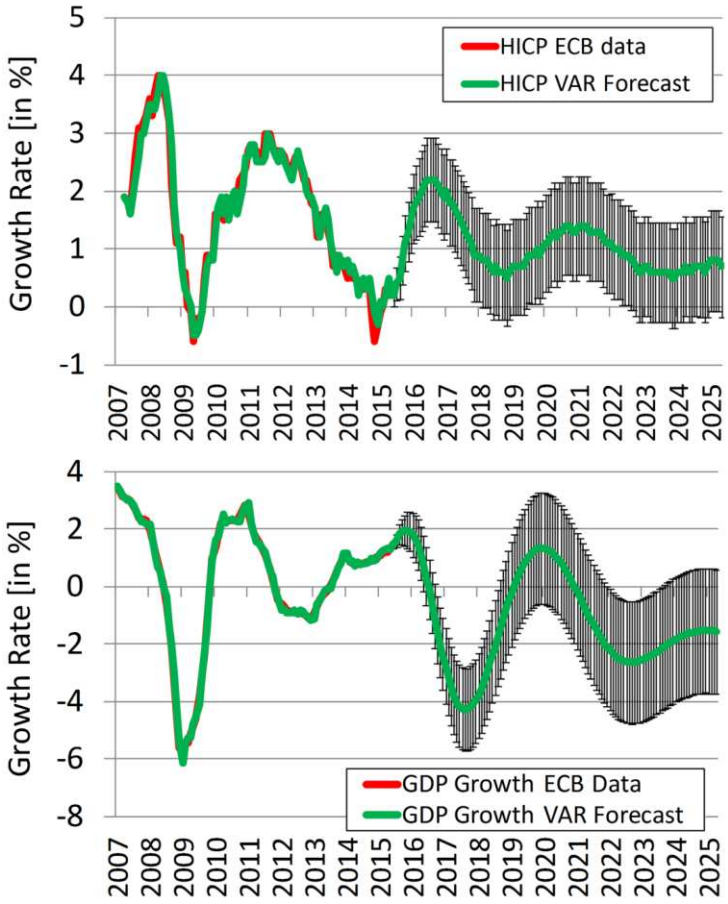
6.1 Supplementary Figures



Supplementary Figure S1 Inflation Sub-index: Composition of the HICP Index

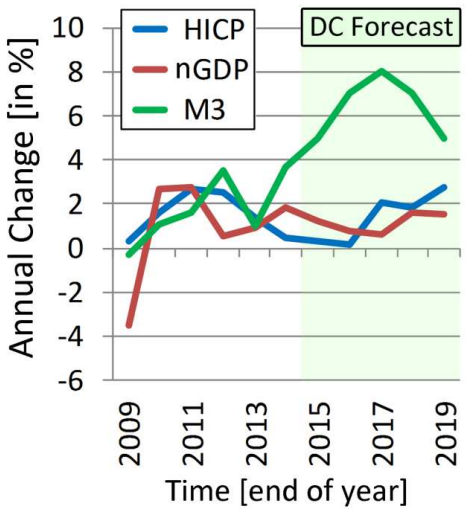


Supplementary Figure S2 Converging Global Long-Term Interest Rates (MEI,OECD stats)

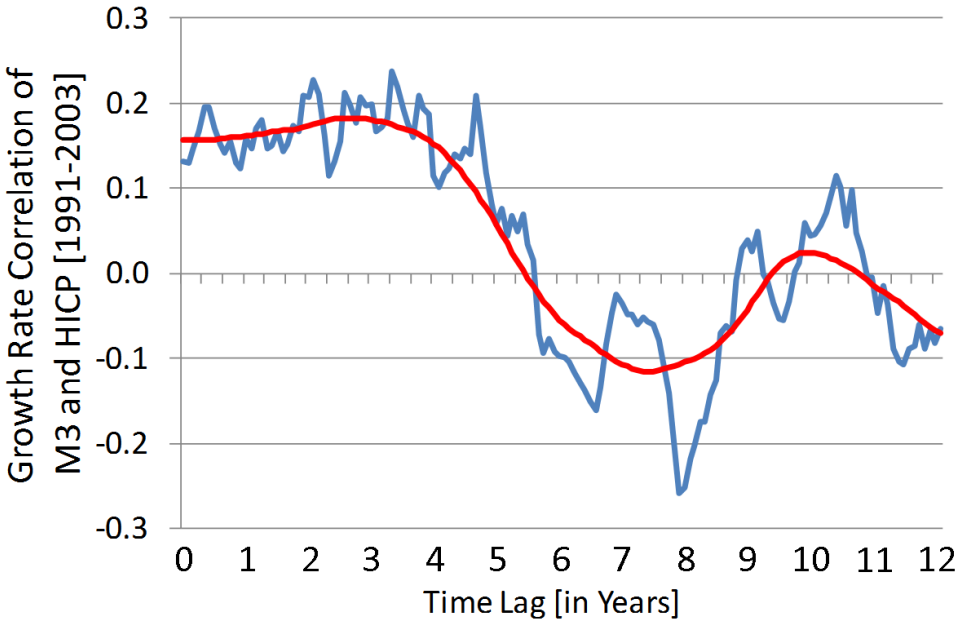


Supplementary Figure S3 Long-Run VAR(p-lag:12) Monthly Forecast (HICP, rGDP)

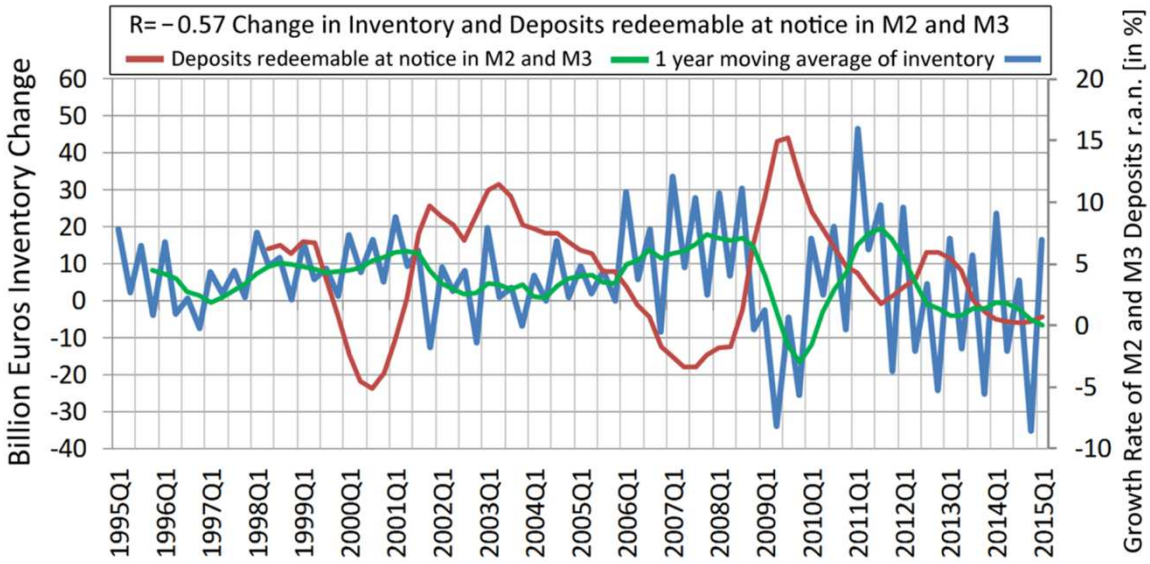
Explanation Figure S3 The pessimistic GDP growth rate illustrates a technical issue of VAR analysis tools if crisis outliers (FC+EC) are fully considered. This low growth pattern is overrepresented in future forecast models. Hence, yearly data must be weighted by probability of reoccurrence (these models are more realistic in quantitative terms, but not shown here). This shows that maybe all VAR models that are in use by ECB and other MP research are questionable as they are all not corrected.



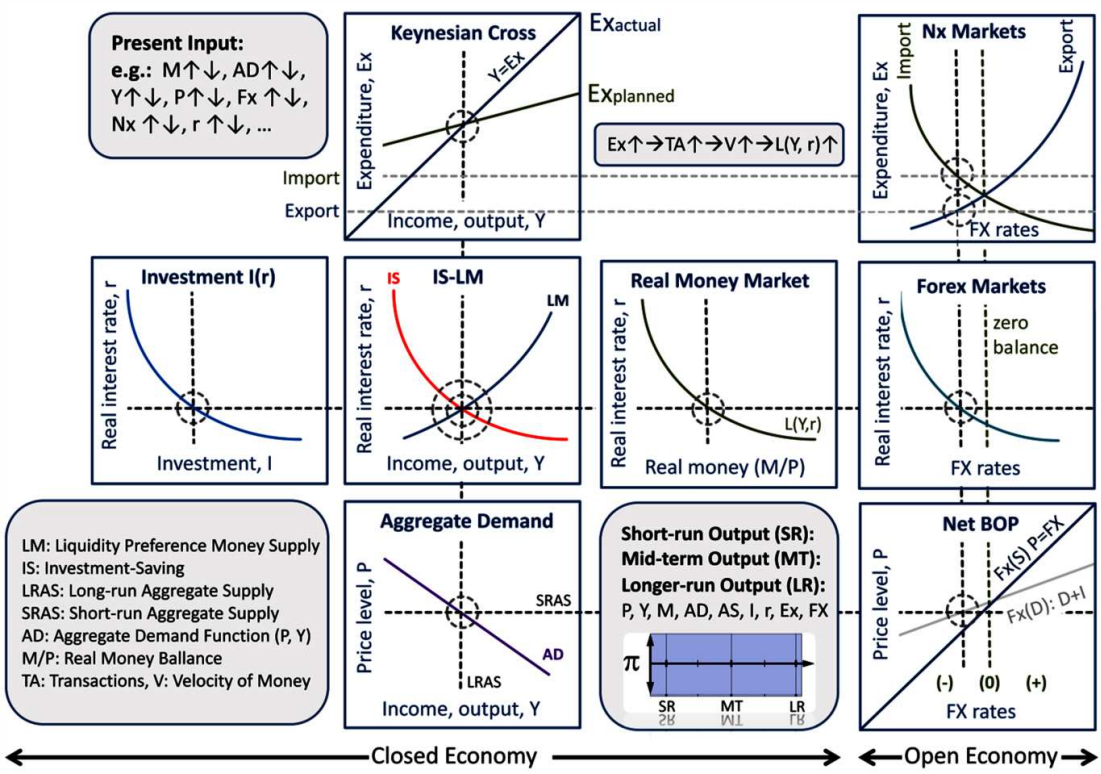
Supplementary Figure S4 Pearson's DC (p-lag: 4) Forecast (Annual Data, EMU, nGDP)



Supplementary Figure S5 Pearson's DC Test of the Pre-EMU's M_3/HICP Effects

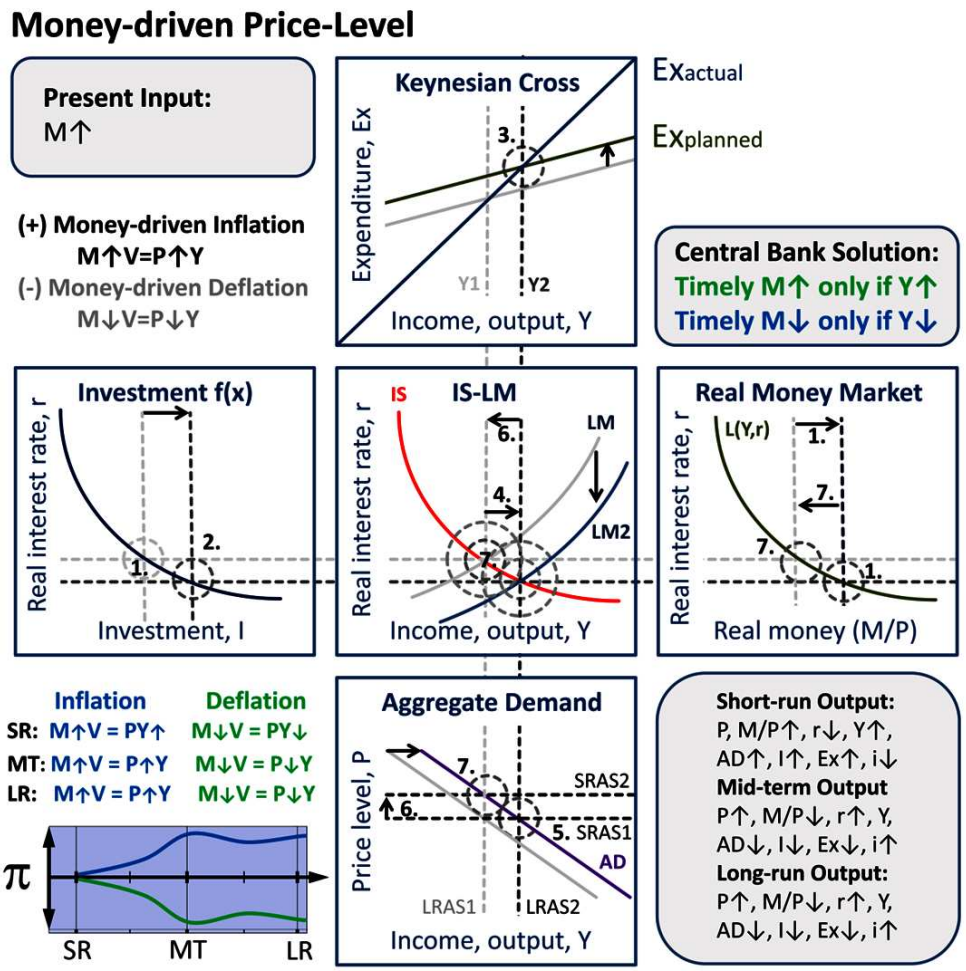


Supplementary Figure S6 Inventory Early-Indicator Dependence on M_2 and M_3



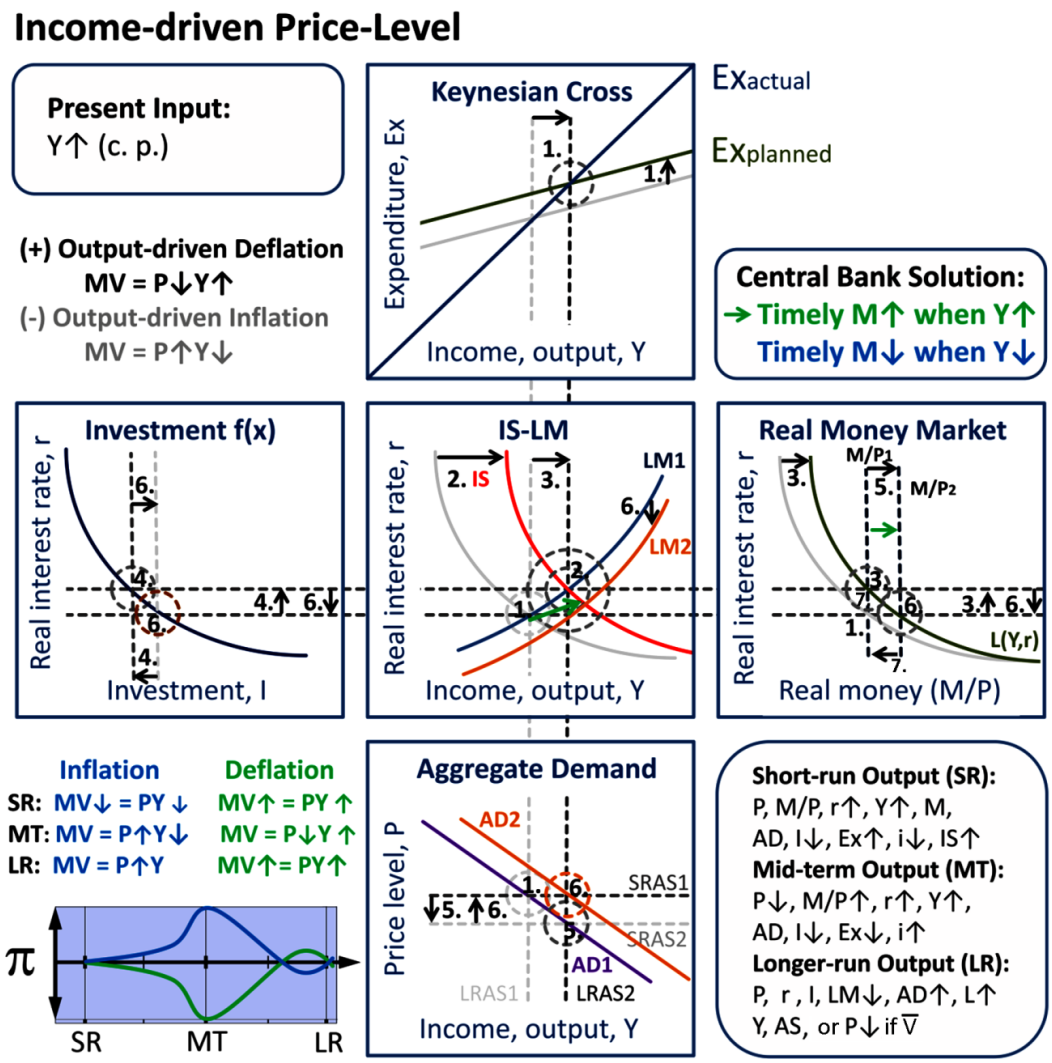
Supplementary Figure S7 Dynamic IS-LM-ADAS Model for Closed and Open Economies

Explanation Figure S7 Keynesian models still form the very core of all relevant MP simulations. They are based on the Keynesian-Hicks IS-LM and ADAS framework (see The Keynesian IS-LM Model and the AD-AS Model) and are further adjusted in various ways for real world scenarios. This IS-LM model was advanced by integrating the Aggregate-Demand-Aggregated Supply (ADAS) model into a monolithic graphical and arithmetically dynamic and semi-quantitative solution. The newly created core model consist of all known elements of Keynesian Economics and the Hicks model (Keynes 1936; Mankiw 2014; Hicks 1939) and integrates them into a common system of 'eight macro models' by adding some new features to the traditional model: The model incorporates eight widely used time-parametric inter-acting sub-models: (1) the Keynesian Cross, (2) investment, (3) real money market, (4) IS-IM, (5) ADAS, (6) single and multiple Nx rates (7) single or multiple Fx rates (exchange rate), and optionally also (8) Net BOP-current account (balance of the BoP current account) models. This 8-fold co-model provides for a timed coordination of (1) a horizontal and (2) two vertical axes that are spanning throughout the sub-models, since they are arranged to represent the same variable: (a) the interest rate (to be assayed), (b) output, GDP, income and (c) Fx rates. Additional building blocks and adjustments are feasible. It integrates key ISLM/ADAS/Fx/NX-related and accepted textbook knowledge (Mankiw 2014; Mathews et al. 2013; Giddy 1994; Giddy 1976). MPs to maintain the objective price stability (see 2.1.3) during shocks can be modeled: as (1) money driven price level, (2) income-driven price level, and (3) demand-driven price level scenarios: they are exemplarily modeled in Appendix S8-S13. Key theoretical MP-mechanics can be derived.



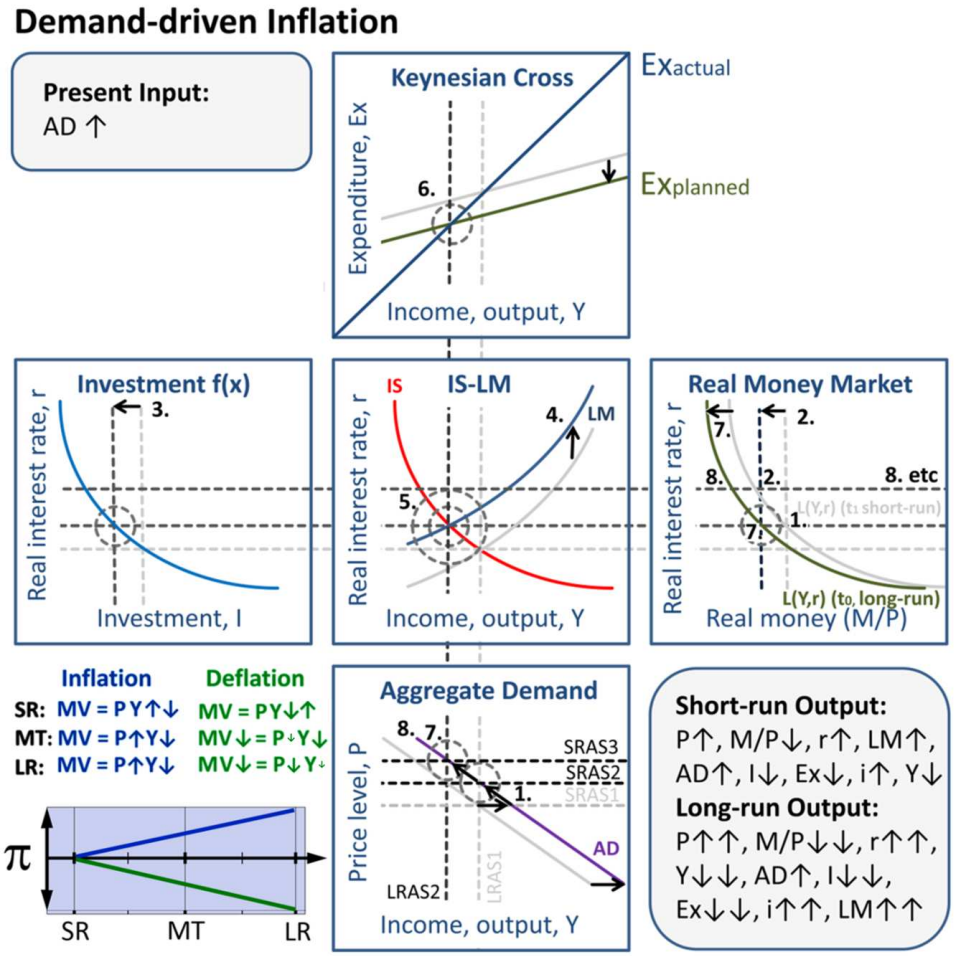
Supplementary Figure S8 A Positive Money Shock on Prices in the IS-LM-ADAS Model

Explanation Figure S8 In this shock scenario various monetary stimuli (M) shift the real money balances (M/P) as supply (stroked line) moves to the right, thereby flattening the liquidity preference equilibrium, leading to lower interest rates (real, nominal, effective; multiple assays). A timed response benefits (a) investment [which also shifts the AD curve over time and thus also output, later prices], (b) it changes the IS-LM equilibrium and (c) it depreciates the Fx rate (in the short, medium and long-run: i.e. SR, MT, and LR). A change in the IS-LM equilibrium (shift of the LM curve) has an effect on the output axis. As a consequence, aggregate demand's LRAS function increases (shift to the right) and drives the short-run aggregate supply (SRAS) and AD curve to the right, in turn leading to higher prices in the mid-term and long-term and sticky price in the short run and immediately. The third key variable is the Fx rate (the foreign exchange rate) that is also implemented as an axis that integrates with three fields. If the interest rate falls as real money balances increase money also becomes less scarce. In an open economy (not shown): a lower interest rate effectuates a lower capital inflow/outflow ratio and short-term demand for the currency weakens (shift to the right). Following, a depreciated Fx rate shifts the export import ratio (Nx) towards less import and more export. This changes the Keynesian cross in feed-forward loop and benefits output and employment. Note: due to a fractional reserve banking system all Keynesian models have to be adjusted.



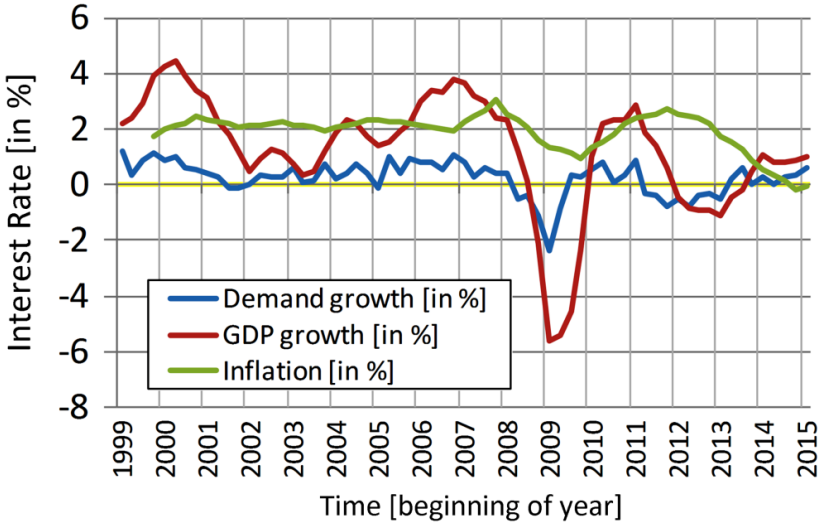
Supplementary Figure S9 A Positive Output Shock on Prices in the IS-LM-ADAS Model

Explanation Figure S9 A second quintessential factor of economics for price developments and MP is the income dependency of the price level over time. If income (Y, output) is growing it is known to have a negative effect on inflation: one can speak of 'real output-driven deflation'. If there are more goods and services in the economy, and money stays constant, the effect is going to be that money becomes relatively more precious. If income increases, it shifts the IS curve to the right and finds a new IS-LM equilibrium at a higher interest rate, which lowers investment, and increases liquidity preference. It hereby deflates prices in the mid-term and in between the mid-term and the long-run, and prices first become stable in the long run. Interestingly, the SRAS, real money balance, price level and interest rate fluctuate simultaneously, resulting in a temporary dynamic volatility which can be prevented by coevally adjusting the money supply. Hereby MP can easily achieve a non-deflationary growth and positive expectations if the timing derived from such a model - further specialized and adapted - is considered. The variety of scenarios also depends on the individual velocities of money which are included as parametric variables - as many other factors can be included. If they remain unchanged a deflationary change would function-proportionally solidify.

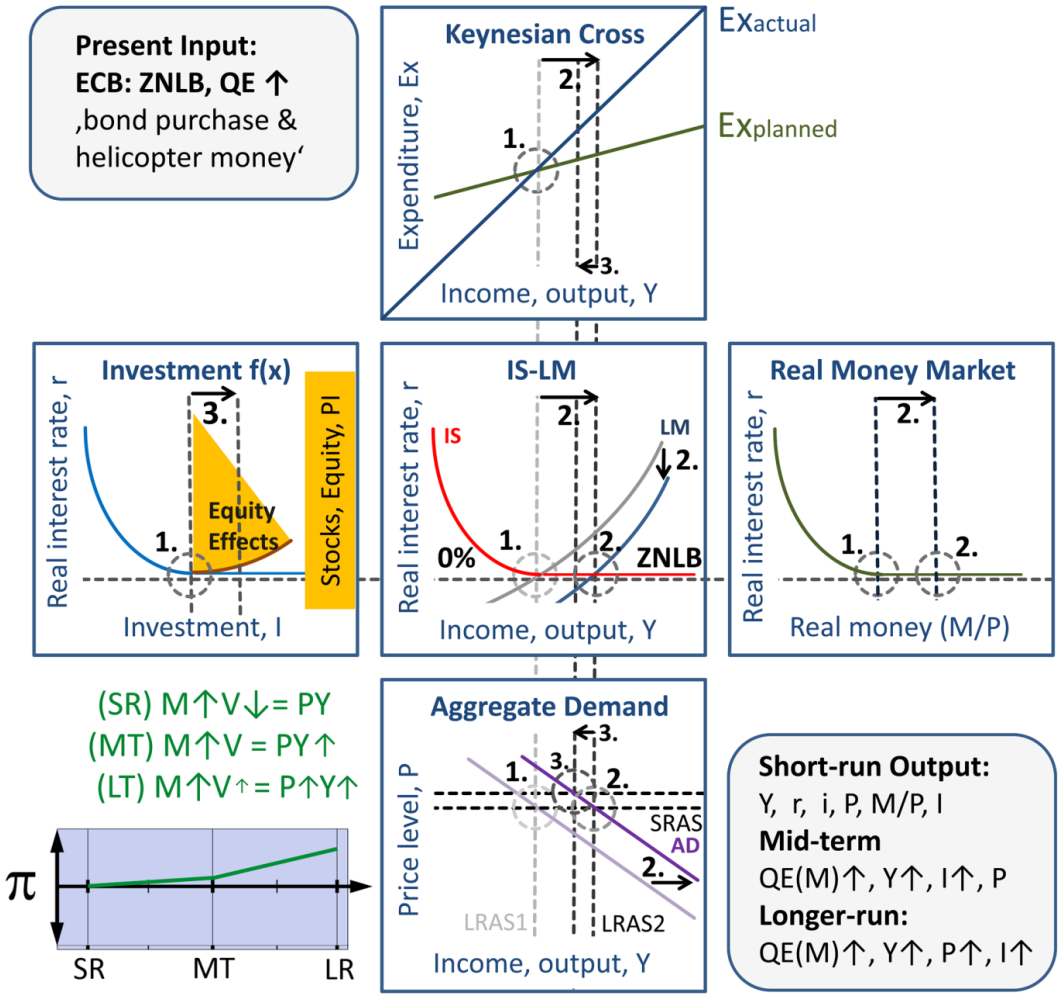


Supplementary Figure S10 A Positive Demand Shock on Prices in the IS-LM-ADAS Model

Explanation Figure S10 A special case within the Keynesian IS-LM models is the unique but long described 'demand-driven inflation'. The IS-LM-ADAS model can verify the effect and add some new insights. The effect of demand on prices has been referred to in the Dynamic Aggregate Demand model (DAD) and to some extend in a demand Taylor model (Mankiw 2014), and also originally in Keynesian Theory (Keynes 1936). It is also known as demand-pull inflation, in contrasts cost-push inflation. The effect is a result of a gap between aggregate demand (AD) and aggregate supply in the short-run (see SRAS): if AD is higher than SRAS an inflationary constellation and potential develops (Keynes 1936), especially if demand increases suddenly, and marginal supply becomes more inelastic, both can make prices rise faster. Generally, this could also drive wages and income but usually to a lesser extent than is needed for a robust demand driven growth addition without price distortions. An anteceding sudden shift of AD to the right benefits output and has a faster effect on prices. It early shifts the money balance, interest rates rise, and investment falls. The higher price level successively shifts the LM curve upward into a new equilibrium with a lower output. Planned expenditure falls and the SRAS moves upwards, as prices. The LTAS de-stabilizes and a vicious cycle of inflation gains momentum with substantial risks to price stability, but with a lower probability in the real economy. Real world demand, GDP and inflation trends are shown in Appendix Figure S11.



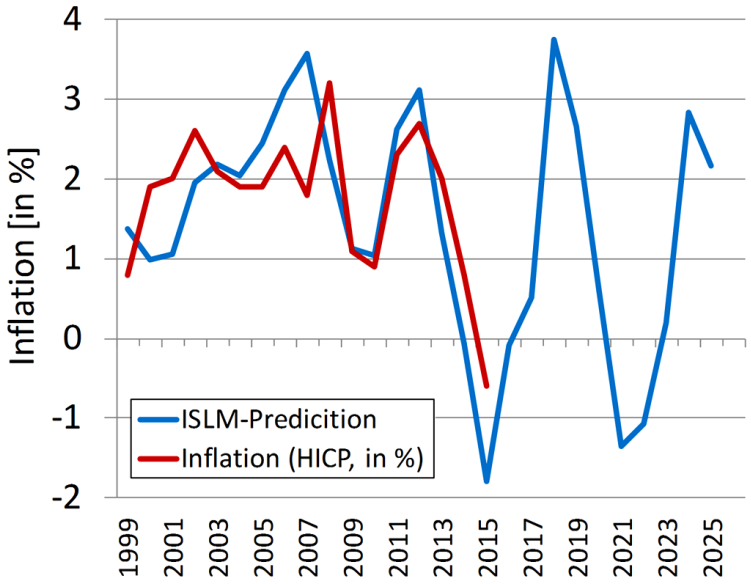
Supplementary Figure S11 Overlay-Chart-Analysis of Demand, GDP Rate and Inflation



Supplementary Figure S12 Modeling the ECBs recent QE Strategy in a ZNLB Scenario

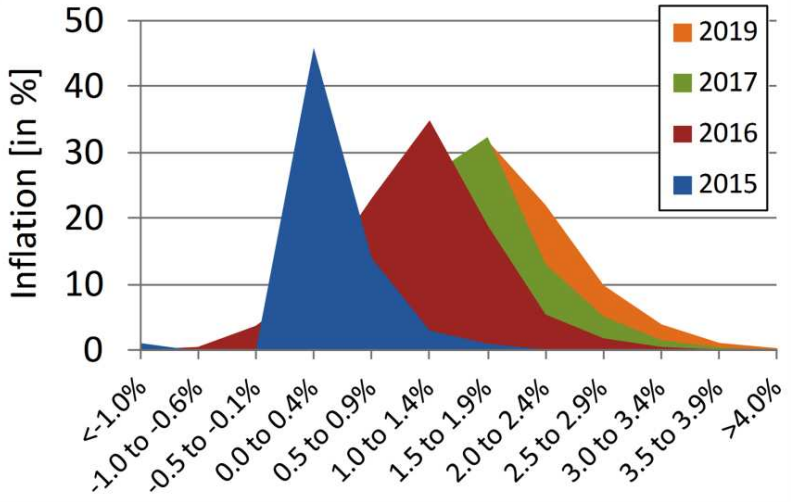
Explanation Figure S12 After the Financial and Euro crises the ECB 'had to' decrease the key interest rates (especially the MRO) and thereby the nominal interest rates in the euro area, which has happened with some delay and pass-through inefficiency (see 4.3.1 and 4.3.2). Having these measures

implemented the ECB has exhausted its capacity to decrease the European central rates, and money market and nominal market rates. This phenomenon is called the zero nominal lower-bound or ZNLB (see 2.4.5). The model also predicts a liquidity trap as suggested by Keynesian Theory but amends the model by all additional MTCs (e.g. equity effect on investment, among all other effects). QE are thus the extension of regular MP and the ZNLB is of course not the end of regulation of interest rates. Approaches include buying government bonds from the market or 'helicopter money' for all people (e.g. via QE based tax or insurance deductions as MP instrument; only those that can benefit the local factor; regulated by an independent authority). Even if lending doesn't respond to the ECB's QE strategy there are still many other MTCs, that drive investment, but several suffer from low downstream efficiency, and much effectiveness is lost due to fractional reserve banking. It diminishes good incentives for investors and money holders - as money is created out of nothing by private MFIs and even publicly controlled MFI could potentially misuse private money creation. As long as there are free money loopholes there is no need to take the risk of value-adding investment.

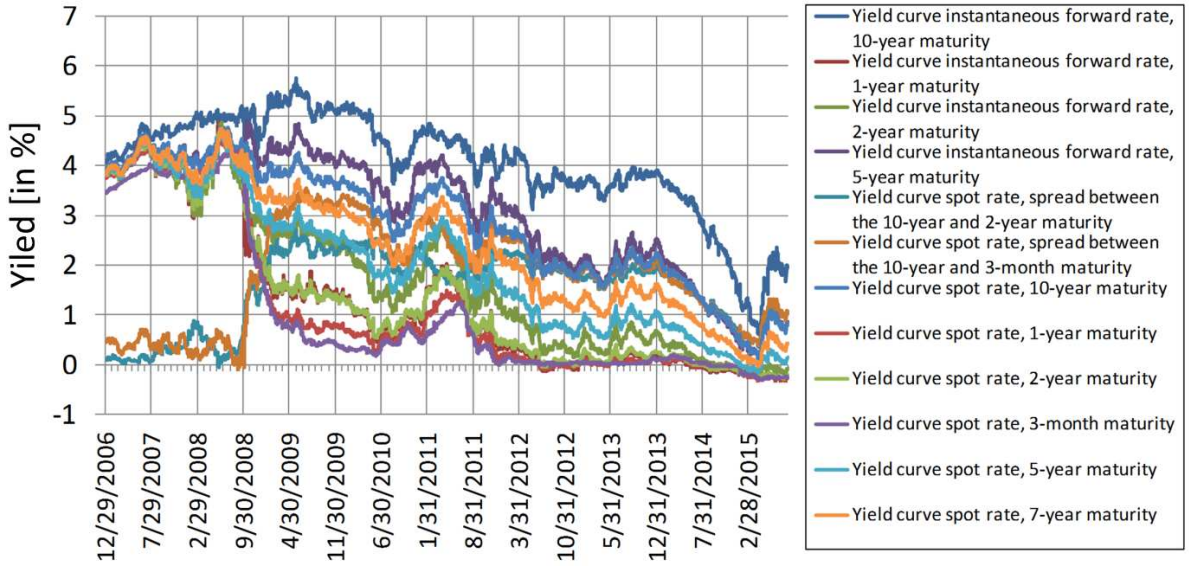


Supplementary Figure S13 Semi-Quantitative IS-LM-ADAS/DC Prediction of Inflation

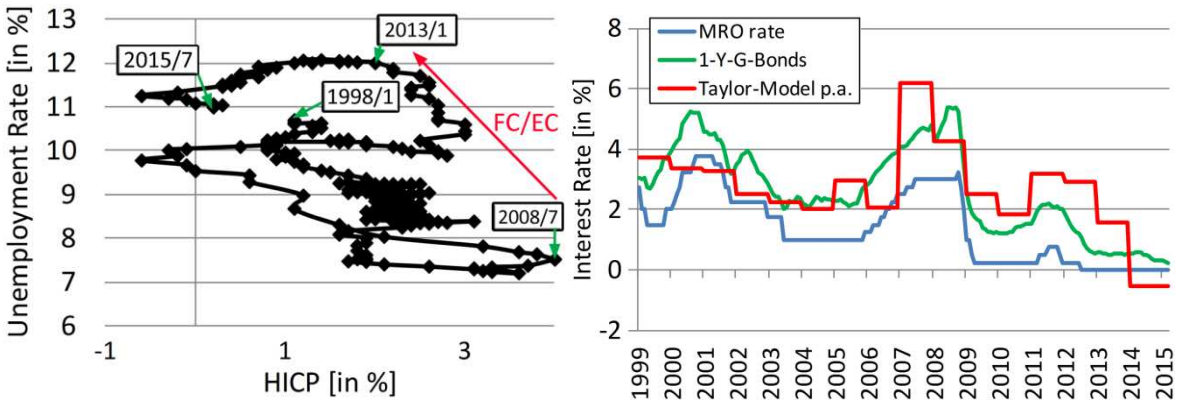
Explanation Figure S13 (ST) The IS-LM-ADAS model predicts that prices stay the same in the short-run - this also corresponds with the correlation of M_3 and inflation of year 0-3 after the monetary stimulus (Figure 49). (MT) The IS-LM-ADAS model predicts that prices go up in the medium term - this corresponds to year 4-6 after the monetary stimulus, showing a strong correlation (Figure 49). (LT) The IS-LM-ADAS model predicts a decline between the medium-term and long-term - and correlation in inverse in between year 7-9 after the monetary stimulus. Due to the semi-quantitative nature of the model it can only predict a general trend and not a clear quantification of future HICP. The ECB's official inflation forecast is given in Appendix S14.



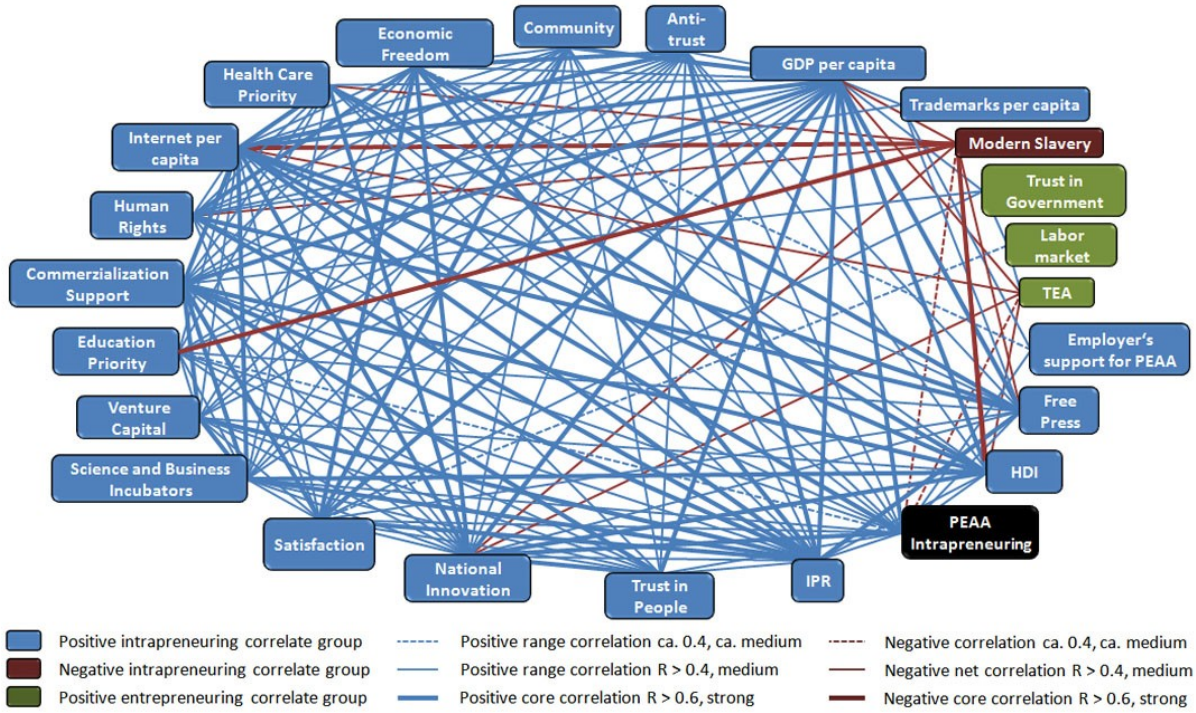
Supplementary Figure S14 ECB's 2015 Official Inflation Forecast



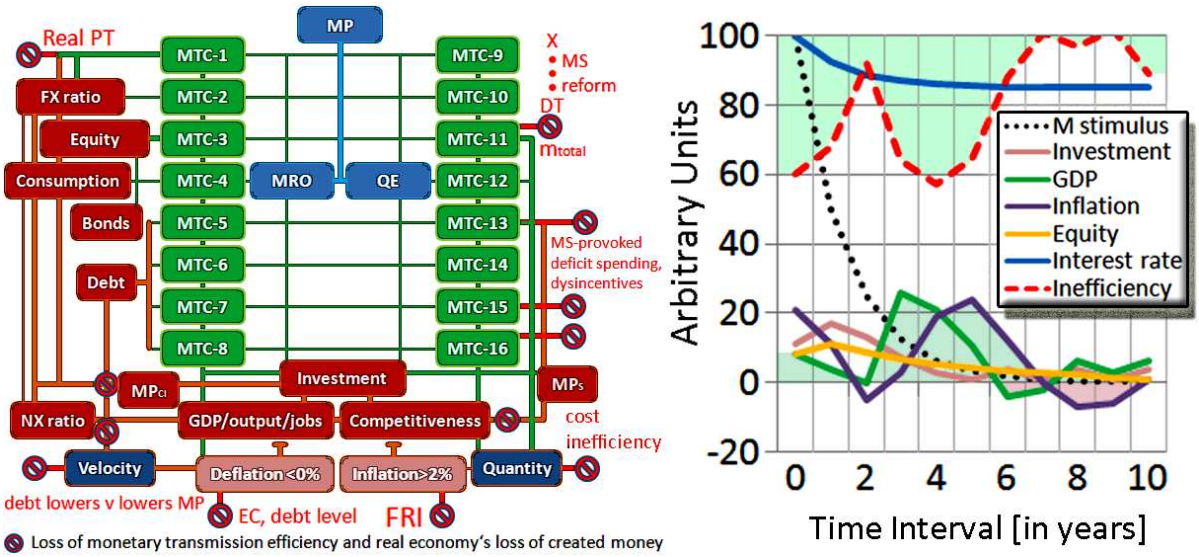
Supplementary Figure S15 Euro Area Bond Yields



Supplementary Figure S16 Phillips Curve and Taylor Model for the EMU



Supplementary Figure S17 GDP and Innovation Correlation Interactomics Network



Supplementary Figure S18 MS Model Based on Markov Chain Probability Matrix using Parameters of all Empirical MTC1-16 Estimates and DC/VAR/ISLM-ASAD Time Dynamics

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6.3 Sources, Data Retrieval and Processing

Figure 1 Schematic Representation of the Three Dimensions

A non-quantitative representation to only illustrates the concept of money definitions.

Figure 2 Schematic Overview of Central Bank's Definition of Monetary Aggregates

Based on (ECB 2012; ECB 2015c; ECB 2015b; DB 2015).

Figure 3 Monthly Annual Growth Rate of HICP, M3, and of GDP (Moving Average)

HICP index (monthly): ICP.M.U2.N.000000.4.ANR (ECB 2015c),
M_3 (monthly): BSI.M.U2.Y.V.M30.X.I.U2.2300.Z01.A (ECB 2015c), chain-linked GDP volume growth (quarterly): MNA.Q.Y.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.GY, quarterly data were represented as monthly annual moving average, non-adjusted (ECB 2015c).

Figure 4 Money Aggregates M1, M2, M3, and Monetary Base M0 in the Euro Area

M_0 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c)
M_1 (changing comp., non-MFI, NG): BSI.M.U2.N.V.M10.X.1.U2.2300.Z01.E (ECB 2015c)
M_2 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M20.X.1.U2.2300.Z01.E (ECB 2015c)
M_3 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M30.X.1.U2.2300.Z01.E (ECB 2015c)

Figure 5 Vector Autoregression (VAR) Analysis of M3, GDP, and HICP Growth Rate

VAR forecast analysis (Sims 1980), 12 monthly lags (1996-2015 monthly data);
Autocorrelation was assayed for of the data sets: residua autocorrelation of GDP: $p<0.0105$, autocorrelation of M_3: $p<0.00721$, and autocorrelation of HICP: 0.0517 (unadjusted monthly data set; cross-correlation of signal with itself, business cycle). The null-hypothesis of no autocorrelation can be rejected at the respective p values close and below to the standard threshold value of 0.01 indicates that the monthly unadjusted data is not fully independently distributed, as anticipated. The null-hypothesis for no arch effect (autoregressive conditional heteroskedasticity) was tested: P-value of ARCH (GDP-equation): $2.59*10^{-6}$, (M_3-equation): 0.66, (HICP-equation): 0.277. Thus, the p-values indicate that the null-hypothesis for ARCH is to be rejected for the GDP-equation. The GDP equation must exhibit

autocorrelation in the squared series due to a dynamic conditional variance process on annualized monthly data that is expected to be seasonally dependent; ARCH null hypothesis for HICP and M_3 is rejected implying conditional homoskedasticity.

HICP index (monthly): ICP.M.U2.N.000000.4.ANR (ECB 2015c);

M_3 (monthly): BSI.M.U2.Y.V.M30.X.I.U2.2300.Z01.A (ECB 2015c);

GDP volume growth (quarterly): MNA.Q.Y.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.GY, quarterly data were represented as monthly annual moving average, non-adjusted (ECB 2015c).

Figure 6 Quarterly Growth Rates of HICP, GDP and M3 in the Eurosystem, 1995-2015, and

Figure 7 Yearly Growth Rates of HICP, GDP and M3 in the Eurosystem, 1995-2015

HICP index (quarterly, annually): ICP.M.U2.N.000000.4.ANR (ECB 2015c).

M_3 (quarterly, annually): BSI.M.U2.Y.V.M30.X.I.U2.2300.Z01.A (ECB 2015c),

GDP growth (quarterly, annually): MNA.Q.Y.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.GY.

Figure 8 Money (M0-M3) Grows Faster than Inflation plus rGDP in the EMU

Normalized data on equalization at 1999 level to illustrate factor development over time:

Based on M_0: ILM.M.U2.C.LT01.Z5.EUR, M_1: BSI.M.U2.N.V.M10.X.1.U2.2300.Z01.E,

M_2: BSI.M.U2.Y.V.M20.X.1.U2.2300.Z01.E, M_3: BSI.M.U2.Y.V.M30.X.1.U2.2300.Z01.E,

and based on HICP index (quarterly, annually): ICP.M.U2.N.000000.4.INX (ECB 2015c),

based on real GDP at 2010 market prices, p.a.: AME.A.EA19.1.0.0.0.OVGD, moving average.

Figure 9 Income Velocities of Monetary Aggregates (M0-M3) and Real Income Velocities

Simple ratio of real GDP and monetary aggregate; or nominal GDP and monetary aggregate

M_0 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c)

M_1 (changing comp., non-MFI, NG): BSI.M.U2.N.V.M10.X.1.U2.2300.Z01.E (ECB 2015c)

M_2 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M20.X.1.U2.2300.Z01.E (ECB 2015c)

M_3 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M30.X.1.U2.2300.Z01.E (ECB 2015c)

Real GDP at 2010 market prices, quarterly values, moving average, [M], Euro area, GDP and main components (output, expenditure and income) [nama_10_gdp], chain-linked real GDP at 2010 market prices (base) (Eurostat 2015), Nominal GDP (EU-19), at current prices, quarterly values, moving average, [M], Euro area (EA11-2000, EA12-2006, EA13-2007, EA15-2008, EA16-2010, EA17-2013, EA18-2014, EA19)(Eurostat 2015).

Figure 10 Transactions Velocity of Monetary Aggregates in the EMU

The volume of total transaction is used instead of GDP (ECB 2015b),
average observations across period, [2011=100] CPP.Q.I8.N.TH.TVAL.TP.3.INX,
Euro area 19 (fixed composition); transaction value; hybrid/transaction linked; all property types; ECB; neither seasonally nor working day adjusted; arbitrary index values.

Figure 11 Co-development of Income Velocity and Quantity of Monetary Aggregate

Normalized data on equalization at 1999 level to illustrate factor development over time: Based on Figure 9 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c).

Figure 12 Velocity of the Monetary Base and Inflation (HICP index)

HICP index (monthly): ICP.M.U2.N.000000.4.ANR (ECB 2015c), Real GDP at 2010 market prices, quarterly values, moving average, [M], Euro area (EA11-2000, EA12-2006, EA13-2007, EA15-2008, EA16-2010, EA17-2013, EA18-2014, EA19), chain-linked real GDP at 2010 market prices (base) (Eurostat 2015), M_0 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c), M_1 (changing comp., non-MFI, NG): BSI.M.U2.N.V.M10.X.1.U2.2300.Z01.E (ECB 2015c).

Figure 13 Growth Rate of the Velocity of the Monetary Base and Adjusted GDP

Adjusted real GDP growth rate to minimize autocorrelation and seasonal fluctuations, moving average derived growth rate compared to v_0 growth rate derived from M_0 aggregate as M_0 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c),
real GDP at 2010 market prices, quarterly values, moving average, [M], Euro area (EA11-2000, EA12-2006, EA13-2007, EA15-2008, EA16-2010, EA17-2013, EA18-2014, EA19), chain-linked real GDP at 2010 market prices (base) (Eurostat 2015), to indentify if the 'ratio value' *per se* has impact on the short term development irrespective of its QTM and GDP identity.

Figure 14 Quarterly Growth of the Velocity of Money in the Euro Area, 1999-2015

Quarterly frequency transformation of the following data:
M_0 (changing comp., non-MFI, NG): ILM.M.U2.C.LT01.Z5.EUR (ECB 2015c),
M_1 (changing comp., non-MFI, NG): BSI.M.U2.N.V.M10.X.1.U2.2300.Z01.E (ECB 2015c),
M_2 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M20.X.1.U2.2300.Z01.E (ECB 2015c),
M_3 (changing comp., non-MFI, NG): BSI.M.U2.Y.V.M30.X.1.U2.2300.Z01.E (ECB 2015c),
GDP (EU-19), at current prices, quarterly moving average, [M], Euro area (EA11-2000, EA12-2006, EA13-2007, EA15-2008, EA16-2010, EA17-2013, EA18-2014, EA19), (Eurostat 2015).

Figure 15 Chart of EMU Money Multiplier m1, m2, m3 (M1-3/M0), from 1999-2015

Ratio of monetary aggregate M_1-M_3 and the monetary base M_0 using data from Figure 9.

Figure 16 Capacities of the Traditional Money Multipliers and their Utilization

Calculation was performed as described in the main text and in chapter 2.3.7, and based on Formula 14 and Formula 15. A new basic leverage formula was employed Formula 39.

Figure 17 Capacity of Money Multiplication as M0 in the Euro Area

Excess reserves BSI.M.U2.N.R.LRE.X.1.A1.3000.Z01.E (recently increasing again after Q2-2015), and monetary aggregates as in Figure 9, calculation as explained in main text.

Figure 18 Constancy of Mean Share of Money Aggregates (+SEM) from 1999-2015

Monetary aggregates as in Figure 9, calculation of monetary shares as explained.

Figure 19 Trends of Money Aggregate Shares as % Deviation from Mean, 1999-2015

Based on Figure 18 derivation of residuals (deviation) from the average share multipliers.

Figure 20 Aggregate Growth of Monetary Aggregates Derived Money Multipliers

Based on the data of Figure 9 linear regression analysis with zero-base, R-squared.

Figure 21 Money Balances in the Euro Area

Ratio of monetary aggregate data Figure 9 and ICP.M.U2.N.000000.4.INX.

Figure 22 Mean of Monthly Growth Rates of Real Money and its Aggregates

Integrated mean monthly growth rate of real money balances and $M_{0\text{-}4}$ based on Figure 21.

Figure 23 Credit Debt to Euro Area Residents is not Covered by M3

M_3: BSI.M.U2.Y.V.M30.X.1.U2.2300.Z01.E (ECB 2015c) rechecked govern debt higher?
Euro area 18 (fixed composition), reporting institutional sector general government - closing balance sheet/positions/stocks - debt securities - long-term original maturity, QSA.Q.N.I7.W0.S13.S1.N.L.LE.F3.L._Z.XDC._T.S.V.N._T (ECB 2015c),
euro area 18 (fixed composition), reporting institutional sector General government - Closing balance sheet/Positions/Stocks - Debt securities - Short-term original maturity, QSA.Q.N.I7.W0.S13.S1.N.L.LE.F3.S._Z.XDC._T.S.V.N._T (ECB 2015c),
Loans, Non-Banks (non-MFIs): BSI.M.U2.N.U.A20.A.1.U2.2200.Z01.E (ECB 2015c),
Debt, Non-Banks (non-MFIs): BSI.M.U2.N.U.A30.A.1.U2.2200.Z01.E (ECB 2015c),

Equity and non-MMF investment, Non-Banks: BSI.M.U2.N.U.A50.A.1.U2.2200.Z01.E.

Figure 24 Total Credit to Money (M3) Ratio as Macroeconomic and Crisis Indicator

Ratio of total Eurosystem credit/debt and M_3 as macro indicator, based on see Figure 23.

Figure 25 Increasing Private and Public Indebtedness (as % of GDP)

Short-term gov. debt: GFS.A.N.I8.W0.S13.S1.C.L.LE.GD.L._Z.XDC_R_B1GQ._T.F.V.N._T7,
Long-term gov. debt: GFS.A.N.I8.W0.S13.S1.C.L.LE.GD.L._Z.XDC_R_B1GQ._T.F.V.N._T,
Gov. interest exp.: GFS.A.N.I8.W0.S13.S1.C.D.D41._Z._Z._T.XDC_R_B1GQ._Z.S.V.N._T,
and interest non-MFIs: derived from interests of all EMU-19 country (ECB 2015c; WB 2015).

Figure 26 Public and Private Debt (as % of GDP) by Euro Area Countries

EDP.A.N.??.W0.S13.S1.C.L.LE.GD.T._Z.XDC_R_B1GQ._T.F.V.N._T (ECB 2015c),
IEAQ.A.??.N.V.LE.RFPA.S1V.A1.S.2.N.F.Z (ECB 2015c), ?? stand for: AT, BE, CY, DE, EE, ES, FI, FR, GR, IE, IT, LT, LU, LV, MT, NL, PT, SI, SK (ECB 2015c).

Figure 27 Main Economic Indicators Time Series Analysis for Greece

Based on time series and supplemented by recent media information (2013, 2014),
MarketCap of listed companies (Greece) (current US$): CM.MKT.LCAP.GD.ZS (WB 2015),
Domestic credit provided by financial sector (current US$): FD.AST.PRVT.GD.ZS (WB 2015),
Central government debt (converted in current US$): GC.DOD.TOTL.GD.ZS (WB 2015),
Total Tax revenue (in US$): OECD-Stats (extracted Aug-2015) (OECD 2015),
Total expenses (converted in current US$): GC.XPN.TOTL.GD.ZS (WB 2015),
Industry value added (converted in current US$): NV.IND.TOTL.ZS (WB 2015),
GDP (at current US$): NY.GDP.MKTP.CD (WB 2015).

Figure 28 Main Economic Indicators Time Series for Luxembourg (LOG)

The same data items were extracted as in Figure 27 but for Luxembourg (WB 2015).

Figure 29 Balance Sheet Assets and Liabilities of the Euro-System

Consolidated balance sheet of the Euro-System: *Asset data:* ILM.W.U2.C.T000.Z5.Z01 total assets/liabilities, world not allocated (geographically), all currencies combined; ILM.W.U2.C.A010.Z5.Z0Z gold and gold receivables, world not allocated (geographically), not applicable (Z0Z); ILM.W.U2.C.A020.U4.Z06 Claims on non-euro area residents denominated in foreign currency, extra euro area, non-euro and non-euro area currencies combined; ILM.W.U2.C.

A030.U2.Z06 Claims on euro area residents denominated in foreign currency, euro area (changing composition), non-euro and non-euro area currencies combined; ILM.W.U2.C.A040.U4.EUR claims on non-euro area residents denominated in euro, extra euro area, Euro; ILM.W.U2.C.A050.U2.EUR Lending to euro area credit institutions related to MPOs denominated in euro, euro area (changing composition), Euro; ILM.W.U2.C.A060.U2.EUR Other claims on euro area credit institutions denominated in euro, Euro area (changing composition), Euro; ILM.W.U2.C.A070.U2.EUR Securities of euro area residents denominated in euro, euro area (changing composition), Euro; ILM.W.U2.C.A080.U2.EUR General government debt denominated in euro, euro area (changing composition), Euro; ILM.W.U2.C.A110.Z5.Z01 Other assets, world not allocated (geographically), all currencies combined; *Liabilities data:* ILM.W.U2.C.L010.Z5.EUR Banknotes in circulation, world not allocated (geographically), Euro; ILM.W.U2.C.L020.U2.EUR Liabilities to euro area credit institutions related to MPOs denominated in euro, Euro area (changing composition), Euro; ILM.W.U2.C.L030.Z5.EUR Other liabilities to euro area credit institutions denominated in euro, world not allocated (geographically), Euro; ILM.W.U2.C.L040.Z5.EUR Debt certificates issued, world not allocated (geographically), Euro; ILM.W.U2.C.L050.U2.EUR Liabilities to other euro area residents denominated in euro, euro area (changing composition), Euro; ILM.W.U2.C.L060.U4.EUR Liabilities to non-euro area residents denominated in euro, extra euro area, Euro; ILM.W.U2.C.L070.U2.Z06 Liabilities to euro area residents denominated in foreign currency, euro area (changing composition), non-euro and non-euro area currencies combined; ILM.W.U2.C.L080.U4.Z06 Liabilities to non-euro area residents denominated in foreign currency, extra euro area, non-euro and non-euro area currencies combined; ILM.W.U2.C.L090.U4.XDR Counterpart of special drawing rights allocated by the IMF, Extra euro area, special drawing rights (SDR); ILM.W.U2.C.L120.Z5.Z01 Other liabilities, world not allocated (geographically), all currencies combined; ILM.W.U2.C.L140.Z5.Z01 revaluation accounts, world not allocated (geographically), all currencies combined; ILM.W.U2.C.L150.Z5.Z01 Capital and reserves, world not allocated (geographically), all currencies combined; ILM.W.U2.C.T000.Z5.Z01 Total assets/liabilities, world not allocated (geographically), all currencies combined (based on ECB items, ECB 2015b).

Figure 30 Open-Market Operations: MRO and LTRO and Outright Operations

LTRO: ILM.M.U2.C.A052.U2.EUR (ECB 2015c),

MRO: ILM.W.U2.C.A051.U2.EUR (ECB 2015c).

Figure 31 Standing Facilities: Marginal Lending and Deposit Facility

Marginal Lending Facility: ILM.W.U2.C.A055.U2.EUR (ECB 2015c),

Deposit Facility: ILM.W.U2.C.L022.U2.EUR (ECB 2015c).

Figure 32 The Eurosystem's Current Account Covers Required and Excess Reserves

Credit institution current accounts: ILM.W.U2.C.L021.U2.EUR (ECB 2015c),

Required Minimum Reserve: BSI.M.U2.N.R.LRR.X.1.A1.3000.Z01.E (ECB 2015c),

Excess Reserve: BSI.M.U2.N.R.LRE.X.1.A1.3000.Z01.E (ECB 2015c).

Figure 33 Interest Rates of the Short-term Money Market: Eonia and Euribor

EONIA rate historical close: FM.Q.U2.EUR.4F.MM.EONIA.HSTA (ECB 2015c),

EURIBOR rate historical close: FM.M.U2.EUR.RT.MM.EURIBOR1MD_.HSTA (ECB 2015c).

Figure 34 Key Central Interest Rates in the Euro Area, 1Y-Euribor and 10Y-G-Bonds

Data derived from: https://www.ecb.europa.eu/stats/monetary/rates/html/index.en.html
Deposit facility: FM.B.U2.EUR.4F.KR.DFR.LEV, Main refinancing: FM.D.U2.EUR.4F.KR.MRR_FR.LEV, EURIBOR-1Year historical close, average observations: FM.M.U2.EUR.RT.MM.EURIBOR1YD_.HSTA, 10-Year G-bond yields: FM.M.U2.EUR.4F.BB.U2_10Y.YLD. (ECB 2015c).
The MROs rates shown here include both fixed rate and variable rate tenders. The MP of MROs has changed during the time course (i.e. 2000-2008: variable rate tenders) and only the 'market effective' relevant key rate is shown. Rate as percentage p.a. from (ECB 2015a).

Figure 35 Key Interest Rates of the Fed, ECB, BoE and BoC

Data was extracted from (BoC 2015; ECB 2015b; FRBSL 2015a; BoE 2015).

Figure 36 Pass-Through Trend Development of 1Y-Euribor and 10Y-G-Bonds

Based on Figure 34 Key Central Interest Rates in the Euro Area, 1Y-Euribor and 10Y-G-Bonds: $i_{PT,t} = i_{EURIBOR,t} - i_{MRO,t}$; $i_{PT,t} = i_{EONIA,t} - i_{MRO,t}$

Note: The pass-through is defined as the difference between the current ECB's MRO rate and the nominal interest rate of 1 year EURIBOR, and 10-year Government Bonds rate (REUTERS) without time delay. The right figure shows the average pass-through rate with standard deviation error bars.

Figure 37 NDER for Households and Moving Weighted Average

MIR.M.??.B.A2C.AM.R.A.2250.EUR.N (ECB 2015c),
(?? stand for: AT, BE, CY, DE, EE, ES, FI, FR, GR, IT, PT, NL, IE, LU, SK, SI, MT, N) (ECB 2015c).

Figure 38 NDER for Corporations Moving Weighted Average

MIR.M.??.B.A2I.AM.R.A.2240.EUR.N,

(?? stand for: AT, BE, CY, DE, EE, ES, FI, FR, GR, IT, PT, NL, IE, LU, SK, SI, MT, N) (ECB 2015c).

Figure 39 Unweighted Average of EMU Member NDER for Households and Corporations

Based on unweighted-country average of Figure 37+Figure 38, convergence/heterogeneity view, and overlain by the ECB's MRO rate to visualize the pass-through (ECB 2015c).

Figure 40 Harmonized Interest Rates on 10-Year Government Bonds

IRS.M.AT.L.L40.CI.0000.EUR.N.Z, IRS.M.BE.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.BG.L.L40.CI.0000.BGN.N.Z, IRS.M.CY.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.CZ.L.L40.CI.0000.CZK.N.Z, IRS.M.DE.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.DK.L.L40.CI.0000.DKK.N.Z, IRS.M.ES.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.FI.L.L40.CI.0000.EUR.N.Z, IRS.M.FR.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.GB.L.L40.CI.0000.GBP.N.Z, IRS.M.GR.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.HR.L.L40.CI.0000.HRK.N.Z, IRS.M.HU.L.L40.CI.0000.HUF.N.Z, (ECB 2015c)
IRS.M.IE.L.L40.CI.0000.EUR.N.Z, IRS.M.IT.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.LT.L.L40.CI.0000.EUR.N.Z, IRS.M.LU.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.LV.L.L40.CI.0000.EUR.N.Z, IRS.M.MT.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.NL.L.L40.CI.0000.EUR.N.Z, IRS.M.PL.L.L40.CI.0000.PLN.N.Z, (ECB 2015c)
IRS.M.PT.L.L40.CI.0000.EUR.N.Z, IRS.M.RO.L.L40.CI.0000.RON.N.Z, (ECB 2015c)
IRS.M.SE.L.L40.CI.0000.SEK.N.Z, IRS.M.SI.L.L40.CI.0000.EUR.N.Z, (ECB 2015c)
IRS.M.SK.L.L40.CI.0000.EUR.N.Z (ECB 2015c).

Figure 41 Further Increasing Pass-Through Inefficiency and MFI's 'Profits' in the EMU

Based on PT (formula of Figure 36 and predicated on the data of Figure 39 (ECB 2015c).

Figure 42 Interest Rate Diversity for Corporations and Consumers in the Euro Area

MIR.M.U2.B.A2I.AM.R.A.2240.EUR.N (APCR, hh), MIR.M.U2.B.A2B.A.C.A.2250.EUR.N (APRC, hh), MIR.M.U2.B.A2B.F.R.A.2250.EUR.N (NDER, cons.), MIR.M.U2.B.A2C.A.C.A.2250.EUR.N (APRC, hh), MIR.M.U2.B.A2B.A.C.A.2250.EUR.N (APRC, hh), MIR.M.U2.B.A2B.F.R.A.2250.EUR.N (NDER, cons.), MIR.M.U2.B.A2C.A.C.A.2250.EUR.N (NDER, hh), MIR.M.U2.B.A2C.AM.R.A.2250.EUR.N (NDER, hh), MIR.M.U2.B.L21.A.R.A.2240.EUR.N (NDER, od), MIR.M.U2.B.L21.A.R.A.2250.EUR.N (NDER, od), MIR.M.U2.B.A2Z.A.R.A.2240.EUR.N (NDER, hhrl),

MIR.M.U2.B.A2Z1.A.R.A.2250.EUR.N (NDER, hhrl), MIR.M.U2.B.A2Z3.A.R.A.2250.EUR.N (NDER, hhc), MIR.M.U2.B.L22.H.R.A.2240.EUR.N (NDER, hhc), MIR.M.U2.B.L22.H.R.A.2250. EUR.N (NDER, hh2a) (ECB 2015c).

Figure 43 Important Corporate Interest Rates and Mean (Fractional) Pass-Through

0.25m Corp (IRF up to 3 month): MIR.M.U2.B.A2A.D.R.2.2240.EUR.N (ECB 2015c),
0.25m Corp (IRF 3 month, 1 year): MIR.M.U2.B.A2A.Q.R.2.2240.EUR.N (ECB 2015c),
1.00m Corp (IRF up to 3 month-1 year): MIR.M.U2.B.A2A.Q.R.1.2240.EUR.N (ECB 2015c),
1.00m Corp (IRF up to 3 month): MIR.M.U2.B.A2A.D.R.1.2240.EUR.N (ECB 2015c),
and mean fraction pass-through, as described previously.

Figure 44 Fractional Pass-Through Trends of Financial Products in the Euro Area

Fractional PTs were calculated using the previous formula Figure 36 and data of Figure 42.

Figure 45 Deviation and Extent Order of Pass-Through Rates

Standard deviation and arithmetic mean (see Arithmetic Mean, Standard Deviation, Standard Error of the Mean (SEM)) based on data of Figure 44 (ECB 2015c).

Figure 46 Major Euro Exchange Rate Developments from 1999 till 2015

Fx rate (US$/€): EXR.D.USD.EUR.SP00.A (ECB 2015c), EER.19: EXR.A.E5.EUR.ERD0.A (ECB 2015c), and the CNY/€ index was calculated base on EXR.A.CNY.EUR.SP00.A (ECB 2015c).

Figure 47 The Fx Rate ($/€) depends on Real GDP but not on M2 (% of GDP) [US/EMU]

World bank data (country data set, USA) (WB 2015) and ECB (ECB 2015c): Figure 46.

Figure 48 Long-term Interest Rates and Fx Rates in the Euro Zone and the US

World bank data (country data set, USA) (WB 2015) and ECB (ECB 2015c), and its ratios.

Figure 49 DC Test for EMU M3, Inflation, real and nominal GDP (1999-2015)

Dynamic (Time-Matrix)correlations (Walsh 2010, chapter 1, and references herein), using the annualized ECB data set of Figure 3, and nominal GDP (see Figure 9) (ECB 2015c).

Figure 50 3D Graph Indicating a 'Recommendable Direction' for the ECB's MPs in 2015

Using 3D Function Blotter, and multivariate regression results, described in the main text.

Figure 51 Reciprocity between the Growth Rate of the Velocity of the Monetary Base (v0) and the Seasonal Adjusted Unemployment Rate in the EMU from 1999-2015 (ECB 2015c).

Unemployment rate (as % of labor force): STS.M.I8.S.UNEH.RTT000.4.000,
velocity (v_0) as in Figure 12, chart analysis and Pearson's correlation coefficient (see Pearson's Correlation Test and Linear Regression Analysis) (ECB 2015c).

Figure 52 Unit Labor Costs and its Deviation from Wages and Labor Productivity

Unit labor cost: MNA.Q.Y.I8.W2.S1.S1._Z.ULC_PS._Z._T._Z.EUR.D.GY (ECB 2015c),

Labor productivity: MNA.Q.Y.I8.W0.S1.S1._Z.LPR_PS._Z._T._Z.EUR.LR.GY (ECB 2015c),
Labor cost index (wages and salaries, 2012=100) (quarterly 12 month moving average): STS.Q.I8.W.LCIW.NS0025.4.000 (ECB 2015c).

Figure 53 Correlation of v1, labor Productivity and Employment Rate

Pearson's correlation coefficient (see Pearson's Correlation Test and Linear Regression Analysis), and data from Figure 51, Figure 52, represented as annualized growth rate (in %), see Figure 9 (ECB 2015c).

Figure 54 Price-to-Wage Ratios and the Velocity of Money

Predicated on Figure 52 change as % starting in 2000 [=100%], price/wages, v2, Pearson's correlation (see Pearson's Correlation Test and Linear Regression Analysis), see Figure 9, wage-index: STS.Q.I8.W.LCIW.NS0025.4.000 (ECB 2015c).

Figure 55 Chain-linked Development of Output Components and 'The Big Ratios'

Euro Area 19 (fixed composition): neither working day nor seasonally adjusted, non-transformed. MNA : National accounts, Main aggregates (Eurostat ESA2010 TP, table 1), Final consumption government (chain-linked): MNA.Q.N.I8.W0.S13.S1.D.P3._Z._Z._T.EUR.LR.N, Gross fixed capital formation (chain-linked): MNA.Q.N.I8.W0.S1.S1.D.P51G.N11G._T._Z.EUR.LR.N, GDP (chain-linked at market prices): MNA.Q.N.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.N, Import (chain-linked): MNA.Q.N.I8.W1.S1.S1.C.P7._Z._Z._Z.EUR.LR.N, Exports (chain-linked): MNA.Q.N.I8.W1.S1.S1.D.P6._Z._Z._Z.EUR.LR.N, Inventory investment: MNA.Q.N.I8.W0.S1.S1.D.P5M.N1MG._T._Z.EUR.V.N that was transformed into a chain-linked data series using a HIPC index (2005=100) with two positions after the decimal point: ICP.M.U2.N.000000.4.INX, re-transformed for unbiased quarterly data chain linking.

Figure 56 Real Interest Rate and Pass-Through of all EMU Countries

ECB MRO, weekly rate (ECB 2015c), Real-Pass-Through based on the difference in Figure 39 of households (hh.) and corporations (corp.), margin of real interest rate NDER - MRO rate.

Figure 57 The Effect Real Pass Through on GDP and Inflation

Real Pass-through (from Figure 55), inflation (HICP, in %) and GDP growth (in %) (see Figure 9) (ECB 2015c), Pearson's correlation coefficient (see Pearson's Correlation Test and Linear Regression Analysis), as indicated in the figure.

Figure 58 BOP Account Trends in the Euro Area (*estimation)

(left) Capital account: (EMU19, fixed composition, non-adjusted data, annualized, aggregated view based on monthly transaction balance, vis-á-vis RoW), 2015 only based on 1Q-2015 and estimated projection, based: BP6.M.N.I8.W1.S1.S1.T.B.KA._Z._Z._Z.EUR._T._X.N, data formatting and normalization as done for capital account: Current account: BP6.M.N.I8.W1.S1.S1.T.B.CA._Z._Z._Z.EUR._T._X.N, goods transaction balance: BP6.M.N.I8.W1.S1.S1.T.B.G._Z._Z._ Z.EUR._T._X.N, (right) Financial account: net lending/borrowing (from rest of world RoW) as aggregate of: direct investment: BP6.M.N.I8.W1.S1.S1.T.N.FA.D.F._Z.EUR ._T._X.N, portfolio investment: BP6.M. N.I8.W1.S1.S1.T.N.FA.P.F._Z.EUR._T.M.N, other investment: BP6.M.N.I8.W1.S1.S1.T.N.FA.O.F._Z.EUR._T._X.N, derivates BP6.M.N.I8.W1.S1.S1.T.N.FA.F. F7.T.EUR ._T.T.N, reserve assets: BP6.M.N.I8.W1.S121.S1.T.A.FA.R.F._Z.EUR .X1._X.N, net errors and omissions: BP6.M.N.I8.W1.S1.S1.T.N.EO._Z._Z._Z.EUR._T._X.N, net lending/borrowing of current and capital account: BP6.M.N.I8.W1.S1.S1.T.B.CKA._Z._Z._Z.EUR._T._X.N. (ECB 2015c).

Figure 59 The EER-19 Fx Index and the Trade Balance

EXR.M.E2.EUR.EN00.A (ECB nominal effective Fx rate EMU-18 vis-à-vis EER-19), EXR.M.E2.EUR.ERC0.A (ECB real effective Fx rate EMU-18 vis-à-vis EER-19), EXR.M.E5.EUR.EN00.A (ECB nominal effective Fx rate EMU-19 vis-à-vis EER-19 till 7-2015),EXR.M.E5.EUR.ERC0.A (ECB real effective Fx rate EMU-19 vis-à-vis EER-19, CPI-deflated), EXR.M.E5.EUR.ERP0.A (ECB real effective Fx rate EMU-19 vis-à-vis EER-19, producer prices deflated), all (1999-Q1=100%), monthly transactions traded goods surplus EA-19 vis-à-vis RoW (BP6.M.N.I8.W1.S1.S1.T.B.G._Z._Z._Z.EUR._T._X.N) and its 20-month moving average. Country names of EER-19 as indicated as abbreviations (ECB 2015c).

Figure 60 Net Lending/Borrowing of Households, Government, MFIs, and Non-MFIs

Moving annualized average based on previous four quarters for MFIs, Gov (Government), HH (households, non-MFIs (all non-banks), (red line) net lending borrowing (ECB 2015c). Non-MFIs: QSA.Q.N.I7.W0.S11.S1._Z.B.B9._Z._Z._Z.XDC._T.S.V.N._T, Households: QSA.Q.N.I7.W0.S1M.S1._Z.B.B9._Z._Z._Z.XDC._T.S.V.N._T, Government: IEAQ.Q.I7.N.V.B9.Z.S13.A1.S.1.X.E.Z, Net lending/borrowing: IEAQ.Q.I7.N.V.B9.Z.S1.A1.S.1.X.E.Z, MFIs: IEAQ.Q.I7.N.V.B9.Z.S12.A1.S.1.X.E.Z.

Figure 61 Cumulative Lending/Borrowing Affects Net External Debt and Assets

Current account: BP6.M.N.I8.W1.S1.S1.T.B.CA._Z._Z._Z.EUR._T._X.N (ECB 2015c),
Capital account: BP6.M.N.I8.W1.S1.S1.T.C.KA._Z._Z._Z.EUR._T._X.N (ECB 2015c),
External Assets: BSI.M.U2.Y.U.A80.A.1.U4.0000.Z01.E (ECB 2015c),
External Debt: BP6.Q.N.I8.W1.S1.S1.LE.NE.FA._T.FNED._Z.EUR._T._X.N (ECB 2015c); (net).

Figure 62 Tobin's Q Market-Cap of Listed Companies to Gross Fixed Capital Formation

Market capitalization and gross fixed capital formation as macro parameters for a relative macro q ratio (WB 2015) for MTC_3 purpose: it reflects the level of market capitalization and investment and includes local factor investment making it meaningful as macro indicator.

Figure 63 Gross Fixed Capital Formation in Selected Countries

Based on World Bank data: Gross fixed capital formation (WB 2015).

Figure 64 Dependency of Q (WB derived) and MRO Central European Rate

Based on World Bank data: Gross fixed capital formation, market capitalization (WB 2015).

Figure 65 Tobin's Q Theory of Investment in the Eurozone

Based on Figure 64 (ECB 2015c), chart analysis and Pearson's correlation coefficient (see Pearson's Correlation Test and Linear Regression Analysis).

Figure 66 The Equity Effect (Euro Stoxx50) on Consumption Expenditure in the EMU

Pearson's correlation coefficient (see Pearson's Correlation Test and Linear Regression Analysis), Dow Jones ^SX5E, consumption (WB 2015),
FM.M.U2.EUR.DS.EI.DJES50I.HSTA (ECB 2015c).

Figure 67 Lending Activity to Corporations and Consumers Across the Euro Area

Loans <1m: MIR.M.U2.B.A2A.A.B.0.2240.EUR.N (ECB 2015c),
Loans >1m: MIR.M.U2.B.A2A.A.B.1.2240.EUR.N (ECB 2015c),
Loans for consumption: MIR.M.U2.B.A2B.A.B.A.2250.EUR.N (ECB 2015c).

Figure 68 MFI Lending Activity with Corporations, Households, and Government

Loans to non-MFIs (mainly firms): BSI.M.U2.N.A.A20.A.1.U2.2240.Z01.E (ECB 2015c),
Loans for households/non-profit org.: BSI.M.U2.N.A.A20.A.1.U2.2250.Z01.E and (WB 2015).

Figure 69 CAPM-derived Risk Premium in the EMU: NDER Yield Minus 1YG-Bond Rate

Lending yield of households and firms (from Figure 39) minus 1-year G-bonds yield (instantaneous nominal forward rate): YC.B.U2.EUR.4F.G_N_A.SV_C_YM.IF_1Y (ECB 2015c).

Figure 70 Economic Sentiment (ESI) and Confidence Indicators in EMU Countries

http://ec.europa.eu/economy_finance/db_indicators/surveys/time_series/index_en.htm
Primary data published by (Eurostat 2015; ECB 2015b). Based on NACE: nomenclature of economic activities, DGECFIN, European Commission)(Eurostat 2015). MCI formula is given in chapter 3.2.8. The ESI (Economic Sentiment Index) is a composite measure of the INDU (40%), SERV (30%), CONS (20%), RETA (5%), and BUIL (5%) sectoral sub-indexes.

Figure 71 ECB's Expected Inflation Announcements for the Euro Area

https://www.ecb.europa.eu/stats/prices/indic/forecast/html/table_hist_hicp.en.html
Primary data published by (ECB 2015b).

Figure 72 Correlation of Deviation from Price Expectation and GDP Growth

Based on: Figure 71, chain-linked GDP: MNA.Q.Y.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.LR.GY

Figure 73 Government Revenue and Expenditures in the Euro Area

Based on the recent Country report (WB 2015), sourced in June 2015.

Figure 74 The Marginal Propensity (MPCIS: MPC+MPI+MPS) Determines Output

Graphical representation of the function of Formula 50 and Formula 51: The marginal propensity to consume/invest/spend is simplified to % in MP_{SCI}; arbitrary value, G+T = const. annual revenue or deficit represented as % of output (GDP), non-aggregated.

Figure 75 Balance Sheet of Euro Area MFIs: 30 Trillion in Assets and Liabilities

Loans to MFIs: BSI.Q.U2.N.R.A20.A.1.U2.1000.Z01.E, (ECB 2015c)
Loans to Government: BSI.Q.U2.N.R.A20.A.1.U2.2100.Z01.E, (ECB 2015c)
Loans to Non-MFIs: BSI.Q.U2.N.R.A20.A.1.U2.2200.Z01.E, (ECB 2015c)
Debt of MFIs: BSI.Q.U2.N.R.A30.A.1.U2.1000.Z01.E, (ECB 2015c)

Debt of Government: BSI.Q.U2.N.R.A30.A.1.U2.2100.Z01.E, (ECB 2015c)

Debt of Non-MFIs: BSI.Q.U2.N.R.A30.A.1.U2.2200.Z01.E, (ECB 2015c)

MMF: BSI.Q.U2.N.R.A42.A.1.U2.1000.Z01.E, (ECB 2015c)

Equity and Non-MMF: BSI.Q.U2.N.R.A50.A.1.U2.0000.Z01.E, (ECB 2015c)

Fixed Assets: BSI.Q.U2.N.R.A60.X.1.Z5.0000.Z01.E, (ECB 2015c)

Remaining Assets and Cash: BSI.Q.U2.N.R.A7C.X.1.Z5.0000.Z01.E, (ECB 2015c)

External Assets: BSI.Q.U2.N.R.AXG.A.1.U4.0000.Z01.E, (ECB 2015c)

Total Assets Liabilities: BSI.Q.U2.N.R.T00.A.1.Z5.0000.Z01.E, (ECB 2015c)

Deposit Liabilities, MFIs: BSI.Q.U2.N.R.L20.A.1.U2.1000.Z01.E, (ECB 2015c)

Deposit Liabilities, Government: BSI.Q.U2.N.R.L20.A.1.U2.2110.Z01.E, (ECB 2015c)

Deposit Liabilities, non-MFIs: BSI.Q.U2.N.R.L20.A.1.U2.2300.Z01.E, (ECB 2015c)

Capital and Reserves: BSI.Q.U2.N.R.L60.X.1.Z5.0000.Z01.E, (ECB 2015c)

Remaining Liabilities: BSI.Q.U2.N.R.L70.X.1.Z5.0000.Z01.E. (ECB 2015c; ECB 2015b)

Figure 76 Equity Funds Asset Portfolio Time-line

Remaining assets and derivatives: IVF.M.U2.N.10.AT1.A.1.Z5.0000.Z01.E, Shares and other equity: IVF.M.U2.N.10.A5A.A.1.Z5.0000.Z01.E, Investment fund and money market fund (other equity): IVF.M.U2.N.10.A52.A.1.Z5.0000.Z01.E, Non-financial assets: IVF.M.U2.N.10 .A60.A.1.Z5.0000.Z01.E, Deposit and loan claims: IVF.M.U2.N.10.A20.A.1.Z5.0000.Z01.E, Securities other than shares: IVF.M.U2.N.10.A30.A.1.Z5.0000.Z01.E. (ECB 2015c).

Figure 77 Euro Area Share Price Development as Portfolio Indicator

OECD stats index of stock prices across the euro area (OECD 2015).

Figure 78 Total Market Capitalization (TMC) Portfolio Trend

Households, corporations, pension funds, insurance corporations (annual moving average): ICPF.Q.U2.N.V.LE.F611.S125.A1.S.2.N.E.Z (equity of households in life insurance reserves), ICPF.Q.U2.N.V.LE.F612.S125.A1.S.2.N.E.Z (equity of households in pension funds reserves), ICPF.Q.U2.N.V.LE.F51.S125.A1.S.1.N.E.Z (shares and other equity) equity investment funds: IVF.M.U2.N.10.L30.A.1.Z5.0000.Z01.E, holding of equity by MFIs: BSI.M.U2.N.A.A50.A.1.U2 .0000.Z01.E, total shares denominated in Euro: SEC.M.I8.1000.F51100.M.1.EUR.E.Z, total market cap world bank method: annual world bank data (WB 2015), till 2013 only, equity and investment funds, non-MFIs: QSA.Q.N.I8.W0.S11.S1.N.A.LE.F5._Z._Z.XDC._T.S.V.N._T, equity of MFIs and non-MFIs is the sum of both above accounts, other equity given as difference.

Figure 79 EMU Monetary versus Equity Portfolio Trends

Total shares denominated in Euro: SEC.M.I8.1000.F51100.M.1.EUR.E.Z, outstanding debt securities issued by EMU residents: SEC.M.I8.1000.F33000.N.1.Z01.E.Z, Gross issues of debt securities against cash flows: SEC.M.I8.1000.F33000.N.2.Z01.E.Z, and respective fold change, incl. debt securities against cash (flows): SEC.M.I8. 1000.F33000.N.2.Z01.E.Z8, 10-Year G-Bond Yield: FM.M.U2.EUR.4F.BB.U2_ 10Y.YLD, 2-Year G-Bond Benchmark Yield: FM.M.U2.EUR.4F.BB.U2_2Y.YLD. (ECB 2015c; ECB 2015b; ECB 2015a).

Appendix : Figure S1

Figure S1 HICP index composition, subcomponents, dataset name: real time database (context of euro area business cycle network); frequency: monthly; reference area: euro area (moving concept in the real time database context); adjustment indicator: neither seasonally nor working day adjusted, D.M.S0.N.P_C_COMM.X, RTD.M.S0.N.P_C_FOOD.X, RTD.M.S0.N.P_C_FOOD PR.X, RTD.M.S0.N.P_C_FOODUN.X, RTD.M.S0.N.P_C_GOOD.X, RTD.M.S0.N.P_C_HOUS.X, RTD.M.S0.N.P_C_IGXE.X, RTD.M.S0.N.P_C_MISC.X, RTD.M.S0.N.P_C_ NRGY.X, RTD.M.S0.N.P_C_OV.A, RTD.M.S0.N.P_C_OV.X, RTD.M.S0.N.P_C_RECR.X, RTD.M.S0.N.P_C_SERV.X, RTD.M.S0.N.P_C_TRAN.X, RTD.M.S0.N.P_C_XEFUN.X, HICP: ICP.M.U2.N.000000.4.ANR, M_0: ILM.M.U2.C.LT01.Z5.EUR, GDP at market prices: MNA.Q.Y.I8.W2.S1.S1.B.B1GQ._Z._Z._Z.EUR.V.N, real GDP at 2010 prices, chain-linked: namq_10_gdp (EA, 4-2014).

Appendix : Figure S2

OECD.Stats MEI (OECD 2015), data extracted on 15 August 2015, 15:08 UTC (GMT)

Appendix : Figure S3

Based on monthly data (reduced from Fig. 5) from 1999-2015, 12 month lag VAR

Appendix : Figure S4

DC (Dynamic Time-Matrix Regression Analysis) (as in Walsh 2010, and references herein), but with standard deviation, moving average, 11 year lag (data: ECB 2015a) as in Figure 3.

Appendix : Figure S5

Performed as in Figure S4 but using different time interval (1991-2003), 11 year lag.

Appendix : Figure S6

4Q (quarter) annual moving average of inventory changes (data from sources as described for Figure 55) Pearson's correlation (see Pearson's Correlation Test and Linear Regression Analysis) with deposit redeemable without notice in M_2 and M_3: BSI.M.U2.Y.V.L23.D.I .U2.2300.Z01.A. (ECB 2015c; ECB 2015b; ECB 2015a)

Appendix : Figure S7-13

The newly compiled graphical-arithmetical semi-quantitative IS-LM ADAS model is based on Keynesian economics (Keynes 1936; Hicks 1939; Mankiw 2014; Mathews et al. 2013; Giddy 1976; Giddy 1994). Forecasts are based on integration of DC-timing and ISLM-ADAS results.

Appendix : Figure S14

The ECB's own forecast data was sourced from (ECB 2015a; ECB 2015b), in July 2015.

Appendix : Figure S15

YC.B.U2.EUR.4F.G_N_A.SV_C_YM.IF_10Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.IF_1Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.IF_2Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.IF_5Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SRS_10Y_1Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_3M, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SRS_10Y_2Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_5Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SRS_10Y_3M, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_10Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_1Y, YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_2Y (ECB 2015c; ECB 2015b; ECB 2015a)

Appendix : Figure S16

Phillips Curve based on Figure 1 Figure 51, Taylor model based on 2.4.4 and 4.3.1.

Appendix : Figure S17

Extensive correlation studies were used as basis for the network model that reveals a key cluster of GDP and innovation dependent macroeconomic indexes/indicators and factors. This figure is available as part of my previous research Intrapreneurship2.0, HfWU-ISR 2014.

Appendix : Figure S18

Markov models were performed using ModelRisk probability distribution functions and VoseMarkovSample excel built in function. Modeling Parameters were derived from previous empirical research and based on estimates of MTC efficiency and weighted impact.