bank capital regulation model

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Bank Capital Regulation (BCR) Model

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Abstract

The motivation of this article is to induce the bank capital management solution for banks and regulation bodies on commercial bank. The goal of the paper is intended to mitigate the risk of banking area and also provide the right incentive for banks to support the real economy.

Key words: Demand Deposit, Risks on the balance sheet and off the balance sheet, Portfolio composition, minimum equity capital regulation. [2014] 12-03

Part I

Introduction

In Europe, After the Basel 1 (1988) capital accord, Basel 2 (1999) and Basel 3 (2010) have been evolved. The Basel Committee on Banking Supervision(BCBS) , advised about credit risk (1988.07) at the Basel 1 and amended about market risk (1996.01) with the Basel 1 Amendment. In the revised framework of Basel 2, operational risk (2004.06) was introduced and enhanced at the Basel 3 (2010.12). Because these Basel Capital Rules have been enhanced up to the Basel 3, for example, the scope of operational risk is enlarged. Banks face the situation to manage the cost to follow banking capital regulation rules. Contrary to banks, the government needs to regulate

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banks to prevent panic from the systemic banking crisis.

It is not big surprising that the government tries to stop the bank run in the early time to prevent a cascading failure. The impact of bank runs on economy is huge. This is the same with the Friedman and Schwartz (1963) observation of large costs imposed on the U.S. economy by bank runs in the 1930s. Upon on much more recent data, in systemically important banking crises in the world from 1970 to 2007, the average net recapitalization cost to the government was 6% of GDP, fiscal costs associated with crisis management averaged 13% for GDP (16% of GDP if expense recoveries are ignored), and economic output losses averaged about 20% of GDP during the first four years of the crisis. Otherwise, if the government decides to adopte the Basel capital regulation framework, the adoption cost will influence the economy of country. Either household or banks, related parties to economy should pay for the Basel capital regulation as the preventive method in the banking business cycle. An OECD study released on 17 February 2011, estimated that the medium term impact of Basel III implementation on GDP growth would be in the range of 0.05% to 0.15% per year. Economic output would be mainly affected by an increase in bank lending spreads, as banks pass a rise in bank funding costs, due to higher capital requirements, to their customers. Therefore, the situation is that banks are struggling to manage the regulation cost and the government wants to defend about the contagion of nationwide economic problem.

Part II

Risks on the balance sheet and off the balance sheet

In the systemic risk, we can measure the risk impacting on other factors like firms, households and federal reserve banks, not on commercial banks. Easily,

monetary policy on banking considers the systemic risk. We need to consider different measures to analyse systemic risk of banks with domino effects, contagions. Systemic risk of banks can be explained in the static model within the general equilibrium. Otherwise, domino effects or contagions should be described as movements having the future tendency. Scope of regulation should be detected by categorization of on balance sheet and off balance sheet factors.

Risks on the balance sheet of bank are divided into credit risk, market risk, liquidity risk and systemic risk. Asset risks faced by a bank are credit risk and market risk. Credit risk is the risk that a borrower will default on any type of debt by failing to make required payments. Market risk is the risk of losses in positions arising from movements in market prices. In case of liquidity risk , there are two major situations. One is emergency capacity of banks. When an illiquidity event takes place, an affected bank typically must borrow funds at interest rates exceeding those paid by other institution. Another is about the stability of the banking system in case of inducing large numbers of depositors to seek withdrawals. I would say liquidity risk closing to the demand deposit matter is on the balance sheet of bank. Credit, market and liquidity risk is on an individual basis but system risk is a negative externality or an adverse spillover effect stemming from transaction in which they were not participants. Distinguished from credit risk containing sovereign risk (government risk), counterparty risk (unincorporated entities risk exposed to financial risk, usually referring to governments, national banks), systemic risk is the risk of collapse of an entire financial system or entire market, as opposed to risk associated with any one individual entity, group or component of a system. George G. Kaufman and Kenneth E. Scott (2003) define "systemic risk" in imprecise terms:

"Systemic risk refers to the risk or probability of breakdowns in an entire system, as opposed to breakdowns in individual parts or components, and is evidenced by comovements (correlation) among most or all the parts."

Darryll Hendricks (2009), who is a practitioner, suggests a more theoretical

definition from the sciences in which the term originated:

"A systemic risk is the risk of a phase transition from one equilibrium to another, much less optimal equilibrium, characterized by multiple self-reinforcing feedback mechanisms making it difficult to reverse."

Banks engage in a number of activities that yield income and entail expenses and risks which are not directly influencing their balance sheets. In particular, banks extend loan commitments, security loans and trade derivative securities. Through extended loan commitments, the borrower has a guarantee of credit at a given interest rate whenever desired during the specific period. The bank receives interest income on the portion of the credit line that the borrower draws upon, and the bank receives non interest fee income on the unused portion. Whereas a loan commitment obligates a bank to bring a loan onto its balance sheet upon a customers request, securitization permits a bank to remove loans from a balance sheet. Trading derivative securities also proved to be significant source of revenues. This claim is supported by the survey of David Van Hoose (2010), by the end of 2008, U.S. banks held a notional amount of derivatives totally more than 190 trillion dollar, of which about 150 trillion dollar of derivatives exposure was comprised of interest rate contracts.

Part III

Model

1. Saving preference of Consumers

Microeconomics theory of banking could not exist before the foundations of the economics of information were laid in the early 1970s. We can start with the simple general equilibrium model containing a banking sector under the complete financial markets. (Arrow 1953)

The two-period model ($t = 0, 1, 2,$) with a unique physical good initially owned by the consumers in the economy in which a continuum of ex-ante identical agents is each endowed with one unit of good at period $t = 0$, and this good is to be consumed at periods $t = 1$ and $t = 2$.

The consumer chooses her consumption profile (C_1, C_2), and the allocation of her savings S between bank deposits D_h and securities $\sum_{s\in\Omega} P_s B_s^h$, in a way that maximize her utility function u under her budget constraints:

Max $u(C_1, C_2)$
$C_1 + \sum_{s\in\Omega} P_s B_s^h + D^h + S_h - \sum_{s\in\Omega} P_s B_s^h - D^h = \omega_1$
$C_2 = \Pi_f + \Pi_b + (1+r)\sum_{s\in\Omega} P_s B_s^h + (1+r_D)D^h + (1+r_h)S_h - (1+r)\sum_{s\in\Omega} P_s B_s^h$
$-(1 + r_D)D^h$

where $\omega 1$ for her initial endowment of the consumption good, $\Pi_f + \Pi_b$ for respectively the profits of the firm and of the bank (distributed to the consumer-stockholder at $t = 2$). B_h denotes for securities, D^h for bank deposits. S_h denotes for savings. r, r_D, r_h are the interest rates paid by securities, deposits and savings. For each future state of the world s ($s \in \omega$) one can determine the price P_s of the contingent claim that pays one unit of account in state s and nothing otherwise.

The consumer has a well-defined set of desires ("preference"), which can be represented by a numerical utility function. In addition, we assume that the consumer chooses optimally, in the sense that they choose the option with the highest utility of those available to them. It implies that a consumer is solving an optimization problem. An optimization problem has three key components.

a. The Objects of Choice The consumer chooses her consumption profile (C_1, C_2) and allocation of her savings S_h between bank deposits D_h and securities B_s^h. If the real asset $S_h - D_h - B_s^h$ is non-negative, it implies the real asset is sufficient to support the operation of household.

b. The Objective function The consumer maximizes her utility function u. u is assumed to be increasing and concave. Notice that preferences are state contingent and do not fit the standard Von Neumann-Morgenstern representation.

c. Constraints

Cash-in-advance $0 < D_h \leq \omega_1$, The paper will be based on the *Cash-in-advance constraint*. This approach which was introduced by Clower (1967) is the requirement that each consumer or firm must have sufficient cash available before they can buy goods.

Price of security h under Uncertainty $\sum P_s B_s^h$ (resp. $\sum_{s\in\Omega} P_s B_s^f$, $\sum_{s\in\Omega} P_s B_s^b$) implies the price of securities by the absence of arbitrage opportunities. A bank issues (or buys) a security h (interpreted as a deposit or a loan) characterized by the array B_s^h $(s \in \Omega)$ (resp.B_s^f, B_s^b) of each payoff in all future states of world ω

Interior Solution The consumer's program (P_h) has an interior solution only when the interest rates are equal: r=r_D

Preference of Savings In the Arrow-Debreu model, money is redundant in the market. Households are indifferent about the composition of savings. In the paper, the household has preference to increase the budget to collect savings S_h and affected by risk level of securities, deposit and real asset. Savings S_h is the sum of Securities $\sum P_s B_s^h$, Deposits D_h, Real Asset $S_h - (\sum P_s B_s^h + D_h)$

There are concerns about savings which is substituted into consumption by the household like Covas-Fujuta (2010). Diaz (2005) adds no capital requirement at the basics to reduce consumption and increase savings by the household. Haslag (2001) assumed that return to money is positively related to the money growth rate which is random variable, the gross real returns to savings is random. His realized gross real return to savings indicates that the

gross real return to savings is a weighted sum of capital and flat money (which derives its value from government regulation or law, so called as 'flat currency'). The weight is the share of the agent's asset shares.

In the Waller model (2004), Saving is very passively selected by the household depending upon decision at the previous period. The middle-aged agents have already earned their wage income, as the wage during period t was determined by the previous period's interest rates (level of the capital stock). They have also already decided how much to consume and save (since savings is a fixed fraction of wage income), but they have not yet decided how to allocate their savings between capital and flat currency. what these middle aged agents want at this point is just the highest possible interest rate between period t and $t+1$, so that they can obtain the best possible return on their savings and can thus consume as much as possible during their period of old age. In the third period of life, the agents retire, consume their savings and exit the model.

Practically, Christensen-Meh-Moran (2011, Bank of Canada) mentioned, at the timing of events, households deposit savings in banks, who use these funds as well as their own net worth to finance entrepreneur projects. In the investment frame, exiting (failing to return from the project) agents sell their capital for consumption goods, surviving agents buy this capital as part of their consumption-savings decision.

However, in reality, even though the agent has the housing, they need to spend expenditure for renting, maintenance, extension of housing. Savings and real asset portion are large enough to make the loan from banks. It is hard to explain price fluctuation of housing and savings on the economy is just depending upon the interest rate of capital stock and deposit or perfect substitution of consumption. For households, the preference of savings is concerns about existence of household economy making future benefits and directly affecting to the welfare of each individual.

House price appreciation by the model of Goodhart-Kashrap-Tsomocos (2012)

is impressive. Reducing the deposit defaults induces more savings circulated by the bank and less self-insurance and by the end, the reduction in self-insurance reduces the housing for sale in the good state, which means that house price appreciation in the boom is higher than otherwise. Most of all, the market incompleteness with the deadweight costs of default distort the housing market. Wealthy agents endowed with houses make their savings decisions accounting for the possibility that deposit will not be fully repaid. When default penalties for banks are low, then the households internalize that risk putting less wealth into the banking system and hold more in the form of housing. This choice increases the supply of housing that is available in boom, which lowers house prices and raise welfare for the agents entering the housing market at that time. To insure that house prices fall in the bad state of the world, house holds P and F are also presumed to have lower wealth. Likewise, the non-bank is endowed with lower capital in period 1 as well as in the bad state of the world. This model describes the housing bubble phenomenon interestingly.

In the model of Lucas (1995), to support the incompleteness of market, he pointed out savings that the young split their savings between bank deposits, which promise a fixed nominal return, and bank equity, which yields an uncertain real dividend. In addition, because a constant fraction of initial wealth is saved, there is no distortion due to fixed nominal interest payments on deposits; Hence regardless of deposits, bank equity is related to the real effect of monetary policy.

In the paper, at the frame work of securities, deposits and real assets with savings, Firstly, the relation between savings and real asset (especially housing) can be much more attached. Secondly, deposit included in the total saving amount which is escaped from the one-sided thinking that deposit is equal to savings and can be perfectly substituted to consumption. Thirdly, Securities at uncertainty is affecting to the investment portfolio of household. These dynamics are supported by the following empirical data.

The deposit amount traded is different depending upon factor composition of economic models. For example, the European Central Bank announces the Euro areas' deposit amounts for the 4th quarter in 2013 in the Euro areas. Gross saving amount of households is 2521.3 billion euros (growth rate: 2.4). Deposits by non-financial corporations are 1870.7 billion euros. (growth rate: 6.7). Deposits by Insurance corporations and pension funds (financial intermediaries) are 653.2 billion euros. (growth rate: -5.3). Deposits by other financial intermediaries are 1854.1 billion euros (growth rate -3.1). Deposits by government are 440.8 billion euros (growth rate: -1.8). Deposits by non-euro area residents are 2522.9 billion euros (growth rate: -11.2). Therefore, Without consideration about deposits by non-financial corporations (1870.7), the comparison between deposits by household (2521.3) and deposits by financial intermediaries (653.2+1854.1=2507.3) is naive explanation.

Loans for house purchase is 3858.1 billion euros. (growth rate: 0.7). It is Long-term liability affecting the existence of household economy. and the total (7341.7) of deposits by insurance corporations and pension funds (653.2, -5.3), other financial intermediaries (1854.1, -3.1), non-financial corporations are (1870.7), government (440.8) and non-euro area residents (2522.9) and total (7752.2) of deposits by household (2521.3, 2.4) and Loans for house purchase (3858.1, 0.7) and other loans (796.7, -1.6), consumer credit (576.1, -3.0).

	(billion euros, growth rate)
Loans for house purchase	insurance corporations and pension funds
(3858.1, 0.7)	(653.2, -5.3)
other loans (796.7, -1.6)	other financial intermediaries (1854.1, -3.1)
consumer credit	non-financial corporations are (1870.7, 6.7)
(576.1, -3.0)	government (440.8, -1.8)
	non-euro area residents (2522.9, -11.2)
7341.7	7752.2

Savings S_h is the sum of Securities $\sum P_s B_s^h$, Deposits D_h, Real Asset $S_h - (\sum P_s B_s^h + D_h)$. Households try to control the balance of asset and liability because in the situation of uncertainty, to maintain enough Deposits D_h for the economic existence of household, household needs to invest on securities as of $\sum P_s B_s^h$ posed on uncertainty conditions. Mainly, Real Asset implies the budget for housing which can afford to manage the residence and invested real asset. For example, if the household has an apartment and there is the redundancy after spending the investment on securities and deposits, it can be the maintenance fee for house decoration or big furniture.

The importance of portion for housing is considerable. Otherwise, if Real asset is negative, hence, the savings of household is less than the amount of securities and deposits. Even though, the amount of operation in the household is enough with the securities and deposits. In the conservatism on the housing budget, we can consider the effect on the housing. In the paper, Housing in the household is considered as the future economic asset which supports each member of household to make productions.

2. Borrowing composition of Firms

The firm chooses its investment level I and its financing (through real asset $D_h + \sum_{s\in\Omega} P_s B_h$, liabilities to bank $D_h + \sum_{s\in\Omega} P_s B_h - L_{fr}$ (or Liabilities to central bank L_{fr}) in a way that maximizes its profit:

Max Π_f (P_f)
Π_f=$f(I) + r_f(D_h + \sum_{s\in\Omega} P_s B_s^h) - r_{L^{Bank}}(D_h + \sum_{s\in\Omega} P_s B_s^h - L_{fr}) - r_{L^{fr}} L_{fr}$
$I = S_h$=$D_h + \sum_{s\in\Omega} P_s B_s^h$

Where f denotes the production function of the representative firm. r_f is the premium of firm real asset. $r_{L^{Bank}}$, $r_{L^{fr}}$ is the interest rate on bank loans and

federal reserve bank loan. D_h denotes for bank deposits. B_h denotes for securities. Especially B_{fr} denotes for securities of federal reserve banks. L_{fr} is loan claimed by the firm to the federal reserve bank. For each future state of the world s ($s \in \omega$) one can determine the price P_s of the contingent claim that pays one unit of account in state s and nothing otherwise. I is the investment level and S_h denotes for savings.

Interior Solution P_f has an interior solution only when: $r_f = r_{L^{Bank}} = r_{L^{fr}}$

In the Modigliani-Miller theorem, firms are indifferent about the composition of borrowings. In the paper, firms have preference to maintain the Real Asset $D_h + \sum_{s\in\Omega} P_s B_s^h$. Regardless of equilibrium, firms prefer to loan from central bank (so called as bond) than commercial banks because it's kinds of investment and borrowing. Among the D_h and $\sum_{s\in\Omega} P_s B_s^h$, firms prefer to have D_h because of financial stability and certainty preference.

At the firm problem, we have ambiguity about change of firms because of investment or loan status. In the paper, the relation with the commercial banks and central banks is focused. In the general equilibrium, firms choose labor cost and manage the capital for production or business process but labor effect is hard to be analysed with commercial banks and federal banks. Hence, the transaction like loan movement (i.e. liabilities to banks, liabilities to central banks, investment) can be selected to explain in this paper. Additionally, Investment is regarded as Real asset to support existence of business entities. It implies firms want to acquire investment budget to maintain the real asset which can be requisite for existence of firms. Therefore, by having borrowing preference to have much more stability between liabilities to banks and central banks (so called as bonds), firms pursue to obtain stability to acquire the investment up to the stability of Investment which can be equal to the Real Asset. so we can explain the dynamics of investment and loan with the firm's property.

There are many argues to explain the ambiguity of firms with informational

asymmetry, shock absorbed by effective capital, securities, technical shocks, and interest rate on loans and the borrowing constraint.

Boyd-Chang-Smith (2004) points out two informational asymmetry problems of firms: The moral hazard problem arises because any borrower's project choice is not observable. Also, The costly state verification (CSV) problem arises because, for either type of project, the investment return cannot be freely observed by any agent other than the project owner.

In the Nelson-Pinter (2012) model, at the production function of cobb-douglas standard form, there is a shock variable to the quality of physical capital. When we face the unanticipated exogenous declines in the productive capacity of physical capital, "Effective capital" available for use in the production is diminished. This intends to consider effect on banks since banks hold claims on physical capital directly on their balance sheets, this will be losses for banks, which must be absorbed or passed on to outside creditors.

In the Dewartripont-tirole (2012) model, he argues that securities are characterized not only by income rights but also by control rights. Optimal corporate choices are time inconsistent, investors in control of corporate choices must face an incentive that differs from firm-value maximization. so a banking manager has no financial resources to cover an investment cost and turns to investors for financing. The capital structure-that is, the allocation among investors of contingent cash-flow and control rights-is designed at this financial stage.

Covas Fujita (2010) mentioned that the technology shock is distributed as standard normal distribution. Labor and capital rental markets are assumed to be competitive.

Diaz (2005) thinks that since interest rate on loans is greater or equal than the discount rate, firms prefer to use internal sources (i.e. cash flows) rather than external financing. and he induces that capital depreciation is paid out of

firm's cash flow and net investment is entirely financed with debt. In the model of Nuno-Thomas (2013), they assumed that the firm can only borrow from banks located on the same island.

In the static model of general equilibrium, if we know the GDP endowment as the exogenous factor, we can calculate more at the firm's problem Indeed, GDP analysis like Consumption to GDP, Government Expenditure to GDP, Fixed Capital Formation to GDP, Export to GDP, Net Export to GDP, Money to GDP except for inflation rate and nominal interest rate are used with the general equilibrium model.

3. Demand Deposit of Bank

Scope of Bank Domestically chartered commercial banks, country branches and agencies of foreign banks, Edge Act corporation

The bank chooses its supply of loans to firms $D_h + B_{fr} - L_{fr}$, its demand for deposits D_h, and the borrowing $B_{fr} - L_{fr}$ in a way that maximized its profit:

Max Π_b (P_b)
$\Pi_b = r_{L^{Bank}}(D_h + \sum_{s\in\Omega} P_s B_s^h - L_{fr}) - r_{L^{fr}}(\sum_{s\in\Omega} P_s B_s^{fr} - L_{fr}) - r_D D^h$

Where $r_{L^{Bank}}$, $r_{L^{fr}}$ is the interest rate on bank loans and federal reserve bank loan. D_h denotes for bank deposits. r_D is the interest rate paid by deposits B_s^h denotes for securities. Especially B_s^{fr} denotes for securities of federal reserve banks. L_{fr} is loan claimed by the firm to the federal reserve bank.

The bank maximizes the profit by choosing its supply of loans L^+, its demand for deposits D^- and the issuance $\sum_{s\in\Omega} P_s\ B_s^b$

Max Π_b (P_b)

$\Pi_b = r_L L^+ + r \sum_{s\in\Omega} P_s B_s^b - r_D D^-$ $L^+ = \sum_{s\in\Omega} P_s B_s^b + D^-$

Until now, the main issue has been to handle the demand deposit in the banking area and it related to money support closely. In the data of Board of Governors of the Federal Reserve System, demand deposit and money stock data have been collected from Demand Deposit, Currency and Related items (J.3, Semi monthly) in 1960 to Money Stock Measures in 2012.

Under the fractional reserve banking, deposit is important indicator for economy because of money multiplier effect. In the formula of $moneysupply = currency + deposits$, demand deposit which has highest liquidity among deposits on the balance sheet of banks is directly related to the M1 of central banks. Diamond and Dybvig model (1983) explains why bank runs occur at an undesirable equilibrium and why banks issue demand deposits that are more liquid than their assets by providing better risk sharing among people who need to consume at different random times. The key to describe the rationality both for the existence of banks and for their vulnerability to runs is the illiquidity of assets, especially by the demand deposit. His conclusion on the bank runs as better indicator of economic distress than money supply is too quick because there is the duplicated section of deposits and money supply. A bank run is the sudden withdrawal of deposits of just one bank and money supply contains the currency section.

In case of bank runs, the government of country should prepare the recovery solution for economy. Regularly, given information about money supply, the government can figure out about both moving of currency and deposits. Krugman (2006) points this out that deposits are usually considered part of the narrowly defined money supply, as they can be used, via checks and drafts, and a means of payment for goods and services and to settle debts. The money supply of a country is usually held to consist of currency plus demand deposits. In most countries, demand deposits account for a majority of the

money supply. To explain the correlation between deposit (demand deposit) and money supply, bank runs can be interpreted as the sudden constraint of deposit and money supply. We research on indicators of economic crisis so economic crisis is not the indicator to analyse the status of economy.

Gorton and Pennacchi (1990) assume that the uniqueness of demand deposits roles as a desirable medium of exchange so the existence of demand for privately produced riskless trading securities induces issuing demand deposits by banks. Actually, under the fractional reserve banking, a bank deposit is not a bailment that implies physical possession of personal property. It moves safely upon the banking revenue process,

Firstly, the property of customer was deposited. In turn, the customer receives an asset called the deposit account. Finally, The deposit account is the liability of the bank on its balance sheet. On the balance sheet of Liabilities of all commercial banks in the United States (2014.01), 70% is the deposit account. The circulation of deposits is important in economy. David Vanhoose (2010) categories the deposit into three sections like transaction deposit, large-denomination time deposit, savings deposits and small-denomination time deposits, at the United States commercial bank liability and equity capital. Transaction deposit contains non-interest-bearing demand deposits. Transaction deposit is 6% among total liabilities and equity capital of bank balance sheet.

Dewatripont-Tirole (2012) points out that deposit insurance is the prevention of banks runs following the Diamond-Dybvig (1983). In the model of Boyd-Chang-Smith (2004), even though project return is safe because of a large number of borrowers, he assumes possibility for banks to fail. Regardless of a single borrower and aggregate of borrower, potential bankers can suggest needless to operate the bank. In the model of Covas-Fujita (2010), the bank can raise funds through either deposits or equity so holding equity involves the equity issuance cost.

Diaz model (2005) also try to select the considerable sources. For example, firms only source of financing is bank lending the bank can claim the full amount of firm's cash flow. bank equity motion, upper limit of dividend (under the hypothesis that the bank can turn equity into dividend with restriction), balance sheet constraint. Goodhart-Kashrap-Tsomocos (2012) mentioned shadow banking. The securitized loans, called mortgage backed securities (MBS) can be sold to the non-bank and the non-bank will finance the purchase with an repo loan from the bank (that will have the MBS as collateral).

4. Federal Reserve Banks and general equilibrium

The Federal Reserve Banks chooses its investment level I and its financing (through real asset $D_h + \sum_{s\in\Omega} P_s B_s^h$, liabilities to bank $D_h + \sum_{s\in\Omega} P_s B_s^h - L_{fr}$ (or Liabilities to central bank L_{fr}) in a way that maximizes its profit:

Max Π_f (P_f)

Π_f=$f(I) + r_f(D_h + \sum_{s\in\Omega} P_s B_s^h) - r_{L^{Bank}}(D_h + \sum_{s\in\Omega} P_s B_h - L_{fr}) - r_{L^{fr}} L_{fr}$

$I = S_h$

Where f denotes the production function of the representative firm. r_f is the premium of firm real asset. $r_{L^{Bank}}$, $r_{L^{fr}}$ is the interest rate on bank loans and federal reserve bank loan. D_h denotes for bank deposits. B_s^h denotes for securities. Especially B_s^{fr} denotes for securities of federal reserve banks. L_{fr} is loan claimed by the firm to the federal reserve bank. For each future state of the world s ($s \in \omega$) one can determine the price P_s of the contingent claim that pays one unit of account in state s and nothing otherwise. I is the investment level and S_h denotes for savings.

Interior Solution P_f has an interior solution only when: $r_f = r_{L^{Bank}} = r_{L^{fr}}$

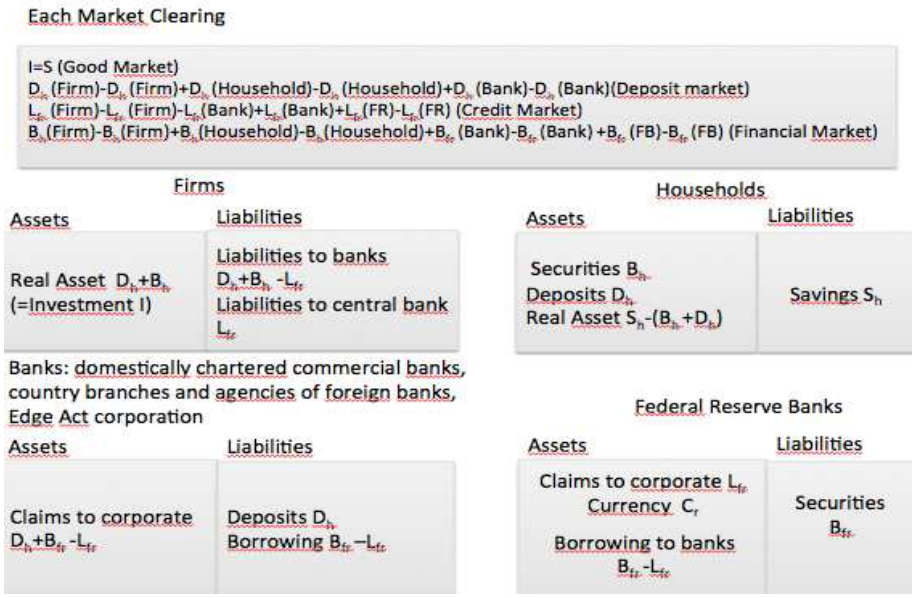
5. General Equilibrium

General equilibrium is characterized by a vector of interest rates (r, r_D, r_h, r_f, $r_{L^{Bank}}$, $r_{L^{fr}}$) and three vectors of demand and supply levels (C_1, C_2, $\sum_{s\in\Omega} P_s B_s^h$, D^h) for the consumer, (I, $\sum_{s\in\Omega} P_s B_s^h$, D_h, L_{fr}) for the firm, (L_{fr}, $\sum_{s\in\Omega} P_s B_s^h$, D_h, L_{fr}, $\sum_{s\in\Omega} P_s B_s^{fr}$) for the bank, and ($D_h$, $\sum_{s\in\Omega} P_s B_s^h, L_{fr}$) for the federal reserve banks

Each agent behaves optimally (i.e., his or her decisions solve P_h, P_f, or P_b respectively.

Each market clearing
I=S (Good market)
D_h(Firm)-D^h(Firm)+D_h(Household)-D_h(Household)+D_h(Bank)-D_h(Bank) (Deposit market)
L_{fr}(Firm)-L_{fr}(Firm)-L_{fr}(Bank)+L_{fr}(Firm)+L_{fr}(FR)-L_{fr}(FR) (Credit market)
B_s^h(Firm)-B_s^h(Firm)+B_s^h(Household)-B_s^h(Household)+B_s^{fr}(Bank)-B_s^{fr}(Bank)+B_s^{fr}(FR)-B_s^{fr}(FB) (Financial market)

It is clear in this model that the only possible equilibrium is such that all interest rates are equal: r=r_L=r_D



(result) Arrow (1953)

If firms and households have unrestricted access to perfect financial markets, then at the competitive equilibrium

(result) Cho (2014)

If the sume accumulated variables is not negative, for example, the components Investment I, Savings S_h, L_{fr} are not negative, there is the equilibrium in the economy and the existence of each factors like firms, Household, Banks, Federal Reserve Banks is fulfilled. The size of banks is affecting on each agent because equity capitals depend on previous deposits. Depending the change of bank size influencing on total deposit D_h, the liability of firms is affected by liabilities to banks $D_h + \sum_{s\in\Omega} P_s B_s^h - L_{fr}$, deposit of household D_h and real asset of household and firms. This is supported by the following the process of equity capital multiplication.

Part IV

How we can induce the moral hazard problem?

we can assume optimal consumption profile with the Autarky concern (no trade) and trade condition. Then, we check that the market economy does not provide perfect insurance against liquidity shocks, and therefore does not lead to an efficient allocation of resources. By the crucial assumption is that no individual withdraw at earlier period if he or she does not have to. Hence, we induce why the moral hazard problem occurs.
Irving Fisher developed the theory of intertemporal choice in his book *Theory of interest* (1930). Contrary to Keynes, who related consumption to current income, Fisher's model showed how rational forward looking consumers choose consumption for the present and future to maximize their lifetime satisfaction. According to Fisher, an individual's impatience depends on four characteristics of his income stream: the size, the time shape, the composition and risk. Besides this, foresight, self-control, habit, expectation of life, and bequest motive (or concern for lives of others) are the five personal factors that determine a person's impatience which in turn determines his time preference.

6. Autarky concerns

The simplest case, in which there is no trade between agents, is called "autarky".

Each agent chooses independently the quantity I that will be invested in the illiquid technology, assumed to be perfectly divisible. If he has to consume early, then this investment will be liquidated at $t = 1$, yielding

$C_1 = 1 - I + LI = 1 - I(1 - L)$ is equivalent or less than 1 Consumer can

liquidate investment I and re-invest LI.

On the contrary, if he has to consume late, he obtains profit R about
Investment I. Hence, he get RI
$C_2 = 1 - I + RI = 1 + I(R-1)$ is equivalent or less than R
With equality only when $I = 1$

In autarky, each consumer will select the consumption profile that maximizes his ex-ante utility u under the constrains C_1 and C_2

7. Market Economy - With trade

If agents are allowed to trade, welfare improves. In this simple context, it is enough to open a financial market at $t = 1$ in which agents can trade the good at $t = 1$ against a riskless bond (that is promised to receive some quantity of the consumption good at $t = 2$). Let p denote the price of the bond at $t = 1$ which, by convention, yields one units of good at $t = 2$. Clearly p is less than or equal to 1 ; otherwise people would prefer to store. By investing I at $t = 0$, an agent can now obtain

$$C_1 = 1 - I + pRI$$

If she needs to consume early (in which case she will sell RI bonds). If, on the contrary, she needs to consume late, she will obtain

$$C_2 = \frac{p}{1-I} + RI = \frac{p}{1}(1 - I + pRI)$$

Since she can then buy $\dfrac{1-I}{p}$ bonds at $t = 1$ and I can be freely chosen by

agents, the only possible equilibrium price is $p = \dfrac{1}{R}$. Otherwise either an excess supply or an excess demand of bonds will occur ($I = +\infty$) if $p > \frac{1}{R}$

The equilibrium allocation of the market economy is therefore $C_1^M = 1$, $C_2^M = R$ and the corresponding investment level is $I^M = \Pi_2$. Notice that this market allocation Pareto dominates the autarky allocation. Since there is no liquidation. In addition, it is not ex-ante Pareto optimal.

8. Optimal allocation

From an ex-ante viewpoint, there is a unique symmetric Pareto Optimal Allocation (C_1^*, C_2^*) obtained by solving

$$\max \Pi_1 u(C_1) + \rho \Pi_2 u(C_2)$$

$$\Pi_1 C_1 + \Pi_2 \frac{C_2}{R} = 1$$

$$\text{L}=\Pi_1 u(C_1) + \rho \Pi_2 u(C_2) - \lambda(1 - \Pi_1 C_1 + \Pi_2 \frac{C_2}{R})$$

$$\frac{\partial L}{\partial C_1} = 0$$
$$\frac{\partial L}{\partial C_2} = 0$$

$$\Pi_1 u'(C_1) + \lambda[Pi_1 C_1] = 0$$

$$\rho \Pi_2 u'(C_2) + \lambda[\frac{Pi_2}{C_1}] = 0$$

This optimal allocation satisfies in particular the first-order condition: u'(C_1^*)= ρRu'C_2^* Therefore, except in the very peculiar case in which u'(1)=ρRu'(R),

The market allocation (C_1^M=1, C_2^M=R) is not Pareto optimal. In particular, Diamond and Dybvig (1983) assume that C $\longrightarrow$ Cu'(C) is decreasing. In that case, since R>1, $\rho R u'(R) < \rho u'(1) < u'(1)$, and the market allocation can be Pareto improved by increasing C_1^M and decreasing C_2^M:

$$C_1^M = 1 < C_1^* \; ; \; C_2^M = R > C_2^*$$

The market economy does not provide perfect insurance against liquidity shocks, and therefore does not lead to an efficient allocation of resources.

9. Financial Intermediation ("FI" as below)

Provided the possibility of strategic behavior of depositors is ruled out, the Pareto optimal allocation (C_1^*, C_2^*) can be implemented very easily by a financial intermediary who offers a demand deposit contract stipulated as follows:
In exchange for a deposit of one unit at $t = 0$, individuals can get either C_1^* at $t = 1$ or C_2^* at $t = 2$. In order to fulfill its obligation, the FI stores $\Pi_1 C_1^*$ and invests the rest in the illiquid techonology. Thus we have established the following:

(result) In an economy in which agents are individually subject to independent liquidity shocks, the market allocation can be improved by a deposit contract offered by a financial intermediary.

The reason why the market allocation is not Pareto optimal is that complete contingent markets cannot exist: the state of economy (i.e., the complete list of the consumers who need to consume early) is not observable by anyone. The only (noncontingent) financial market that can be opened (namely the bond market) is not sufficient to obtain efficient risk sharing.
Notice that a crucial assumption is that no individual withdraw at $t = 1$ if he or she does not have to. Provided $\rho R > 1$, this assumption is not unreasonable, since it corresponds to a Nash equilibrium behavior. The first-order condition of the optimal allocation implies (since $\rho R \geq 1$) that $C_1^* < C_2^*$: in other words, a deviation by a single late consumer (withdraw at $t = 1$ and store the good until $t = 2$) is never in that consumer's own interest. Also, another Pareto-dominated Nash equilibrium exists in which deviations of all late consumers occur simultaneously.

In this simple setup, an FI cannot coexist with a financial market. Indeed if there is a bond market at $t = 1$, the equilibrium price is necessarily p=$\frac{1}{R}$. then the optimal allocation (C_1^*, C_2^*) is not a Nash equilibrium anymore:

$$RC_1^* > R > C_2^*$$

10. The Moral Hazard Issue

Related to the moral hazard, we can simply start with the static model with only two period k and $k+1$. At $k+1$, the deposit insurance premium is paid by the bank. At $t = 1$, the bank is liquidated, and depositors are compensated whenever the bank's assets are insufficient. For simplicity, the riskless rate (and the deposit rate) is normalized to zero. The balance sheets of the banks are as below:

Assets ($t = 0$)	Liabilities ($t = 0$)
Loans L	Deposits D
Insurance premium P	Equity F

Assets ($t = 1$)	Liabilities ($t = 1$)
Loan Repayments $\tilde{L}$	Deposits D
Insurance Payment $\tilde{S}$	Liquidation Value $\tilde{V}$

At date 1, the stockholders receive the liquidation value of the bank: $\tilde{V} = BankAsset - Deposits + RecoveredDeposits = \tilde{L} - D + \tilde{S}$ where $\tilde{S}$ is the payment received from deposit insurance: $\tilde{S} = max(0, D - \tilde{L}$ using the balance sheet at date 0 to replace D, $\tilde{V}$ can also been written as $\tilde{V} = F + (\tilde{L} - L) + [max(0, D - \tilde{L}) - P]$ thus the value of equity will be the sum of its initial value, the increase in the value of loans, and the net subsidy (positive or negative) from the deposit insurance. suppose, for instance, that $\tilde{L}$ can take only two values: X with probability θ (success) and 0 with probability $(1 - \theta)$ (failure). The expected profit for the bank's stockholders will be $\pi := E(\tilde{V} - F = (\theta X - L) +$

$((1-\theta)D - P)$, where the first term represents the Net Present Value (NPV) of the loans and the second term is the net subsidy from the deposit insurance system. If deposit insurance is fairly priced, this term is nil ($P = (1-\theta)D$), and the strong form of the Modigliani-Miller result obtains: the market value of firm, $E(\tilde{V}) + D$, is independent of its liability structure. The moral hazard problem is easily captured from this formula. Suppose that P is fixed and that banks are free to determine the characteristic (θ, X) of the projects they finance in a given feasible set. Then, within a class of projects with the same NPV (θX-L = constant),the banks will choose those with the lowest probability of success θ (or the highest risk). This comes from the fact that the premium rate $\frac{P}{D}$ is given, and does not depend on the risk taken by the bank. Such a "flat" rate deposit insurance pricing was in place in the United States until December 1991, when Congress legislated a new system involving risk-rated insurance premiums.

Part V

Effects of Equity Capital Regulation

11. The Countercyclical Buffer - The portfolio composition effected by the minimum equity capital regulation

In the model of Kahane (1977), the minimum capital requirement causes an unintended result: it worsened, rather than improved the intermediary's condition and increases its probability of ruin. He check this calculation with the ruin constraint and given standard deviation of rate of return at the portfolio composition of liability, stock and bonds.

In this paper, with the portfolio of risky portfolio and stable portfolio, explanation will be easier to be understood why minimum equity regulation

induces for banks to operate riskier portfolio. In addition, it intends to reduce procyclicality (to the financial shocks) and promote the countercyclical buffer.

If we assume that the bank manages a risky portfolio with an expected rate of return of 17% and a standard deviation of 27%. The expected rate of return on equity is 7%. and even though, there is pressure to raise the required equity every period, liability is same every period. The bank try to meet the bank capital condition regulated by the financial intermediaries, the bank should operate much more riskier portfolio comparing to the previous period as following.

Effects of increasing the equity at the portfolio composition

Period	Required Equity, Liability	Portfolio composition (risky portfolio, stable portfolio)
1	12 (12%), 88(88%)	(-61.6%, 161.6%)
2	13 (13%), 88(87.12%)	(-61 %, 161 %)
3	14 (14%), 88(86.72%)	(-60.4 %, 160.4 %)

To calculate the portfolio composition, we calculate the expected value (Mean).

Mean $0.12(12/100) \times 0.07 + 0.88 \times 0 = 0.0084$
$0.1287(13/101) \times 0.07 + 0.8712 \times 0 = 0.0090$
$0.1372(14/102) \times 0.07 + 0.8672 \times 0 = 0.0096$

Suppose that the bank decides to invest in the portfolio having a proportion Y of the total investment budget so that the overall portfolio will have an expected rate of return as above.

We know an expected rate of return of a risky portfolio R_p is 17% and an expected rate of return of a stable portfolio is 7%. Hence, we get the risky portfolio proportion Y.

$R_f + (R_p - R_f)) \times Y$	Proportion Y
$0.07 + 0.1 \times Y = 0.0084$	-0.616
$0.07 + 0.1 \times Y = 0.0090$	-0.61
$0.07 + 0.1 \times Y = 0.0096$	-0.604

Thus, in order to obtain a mean return of 0.84%, 0.90%, 0.96%, the bank must invest -61.6%, -61%, -60.4 of total funds in the risky portfolio and 161.6%, 161%, 160.4% in stable portfolio.

Standard deviation which implies the probability to get mean return, is also increasing.

Standard Deviation

$0.12 \times 0.27 = 0.0324$

$0.13 \times 0.27 = 0.0351$

$0.14 \times 0.27 = 0.0378$

12. Deposit affects optimized equity capital

n	*Deposits*	*Borrowings*	*OptimizedEquityCapital*
$n = 0$	$D_0 = 1$	-	-
$n = 1$	$D_1 = (1 - \beta - K)$	$B_1 = (1 - \beta)$	$OEC_1 = K$
$n = 2$	$D_2 = (1 - \beta - K)^2$	$B_2 = (1 - \beta)(1 - \beta - K)$	$OEC_2 = K(1 - \beta - K)$
$n = 3$	$D_3 = (1 - \beta - K)^3$	$B_3 = (1 - \beta)(1 - \beta - K)^2$	$OEC_3 = K(1 - \beta - K)^2$
$\cdots$	$\cdots$	$\cdots$	$\cdots$
$n = k$	$D_k = (1 - \beta - K)^k$	$B_k = (1 - \beta)(1 - \beta - K)^{k-1}$	$OEC_k = K(1 - \beta - K)^{k-1}$
$\cdots$	$\cdots$	$\cdots$	$\cdots$
$n \to \infty$	$D_\infty = 0$	$B_\infty = 0$	$OEC_\infty = 0$
	total deposits $D = \frac{1}{K+\beta}$	total borrowings $B = \frac{1-\beta}{K+\beta}$	total optimized equity capital $OEC = \frac{K}{K+\beta}$

[β = restriction of borrowing] Then, Borrowings can be executed between Deposit 1 and Restriction β

[balance sheet equality constraint] $D_n = B_n - OEC_n$

Hart and Jaffee(1974) analyzed the properties of the feasible and efficient set with the assumption that the initial equity capital is zero (i.e. K=0). However, it is possible that the intermediary's equity is zero in the substantial degrees of leverage (high liabilities to equity ratios $\frac{EquityCapital}{D_h + B_{fr} - L_{fr}}$). Then, we should assume that the equity is negligible.

In the paper, following the KAHANE (1977), we assume the equity is positive ($K > 0$) so that the opportunity set does not pass through the origin (i.e. the vector of Deposit D, Borrowing B, Optimized Equity Capital = 0 give an infeasible solution).

Then the theoretical superior limit for deposits is defined by the following:
$Deposits = \sum_{n=0}^{\infty}[(1 - K - \beta)] = \frac{1}{K + \beta}$

Theoretically, superior limit for the equity capital by the firm is defined by the following:
$OptimizedEquityCapital = K \times Deposits = \frac{K}{K + \beta}$

and the theoretical superior limit for total borrowings in banks is defined by the following:
$Borrowings = (1 - \beta) \times Deposits = \frac{1 - \beta}{K + \beta}$

The process described above by the geometric series can be represented, where

Borrowings at stage k are a function of the deposits at the precedent stage:
$B_k = (1 - \beta - K) \times D_{k-1}$

Optimized Equity Capital at stage k is a function of the deposits at the precedent stage: $OEC_k = K \times D_{k-1}$

Hence, if the optimized equity capital depends on the initial deposit and assume the terminal condition of bank is liquidation of bank deposits,

(result) Hence, Optimized Equity Capital depends on the previous deposit. In addition, deposit insurance cost also increases because deposit insurance depends on the number of household.

Deposits at stage k are the difference between additional borrowings and optimized equity capital relative to the same stage: $D_k = B_k - OEC_k$

In the model of Gorton-Winton (1995), bank size is given. In the theorem of Modigliani-Miller, the size and composition of banks' balance sheets have no impact on other agents. However, as population grows, insured deposits will increase. Then, the bank size should grow so bank size growth concern should be measured.

13. k index for the indicator of risk taking

Define the equity capital ratio with respect to total liabilities and equity capital, $\frac{EquityCapital}{D_h + B_{fr} - L_{fr}}$, $K \in (0,1)$, the borrowing (from the federal banks) ratio $\frac{B_{fr} - L_{fr}}{D_h + B_{fr} - L_{fr}}$, $\beta \in (0,1)$; suppose the demand for funds is unlimited;

By summing up two quantities, the theoretical equity capital multiplier is defined as

$$k = \frac{Deposits + OptimizedEquityCapital}{Borrowings + OptimizedEquityCapital} = \frac{1+K}{K+\beta}$$

where the equity capital ratio with respect to total liabilities and equity capital, $\frac{EquityCapital}{D_h + B_{fr} - L_{fr}}$, the borrowing (from the federal banks) ratio $\frac{B_{fr} - L_{fr}}{D_h + B_{fr} - L_{fr}}$

k is the index to decline to increase the risk at the portfolio of commercial banks. The deposit is fixed at total 1 and borrowings have the constraint can not be negative value beyond the minimum borrowings β. For example, if deposit=1, the minimum of required equity = 10%, borrowings = 0.3

$$\frac{1+0.1}{0.3+0.1} = \frac{1.1}{0.4} = 2.75$$

If the minimum of required equity is raised from 10%, to 15%, k index was downed as below.

$$\frac{1+0.15}{0.3+0.15} = \frac{1.15}{0.45} = 2.55$$

To increase the k index, the bank should increase the deposit beyond the initial deposit level (1 in this simulation) or allocate the borrowing portfolio.

14. Conclusion

The minimum capital requirement is a necessary condition for banking sector stability to raise the quality, consistency and transparency of the capital base. However, it has friction with the portfolio management. By using effects of increasing the equity at the portfolio composition, reducing procyclicality (to the financial shocks) and promoting the countercyclical buffer are pursued.

In the Basel 3 system, The risk coverage framework intends to capture all material risks by using counterparty credit risk formula weighted on the external rating of the counter party. Exposure measures contain on-balance sheet, repurchase agreements and securities finance, derivatives and off-balance sheet (OBS) items. In the paper, rather than enlarging the risk contagion, related factors and risk affection scope are detected without overstatement by using the general equilibrium model and deposit affection to the optimized equity capital. Deposits are in the large portion at the household, firm and banks. To explain risk coverage, by proving correlation of optimized equity capital upon the previous deposit level, the paper aims to ensure that banking sector capital requirements take account of the macro-financial environment in which each substantial economic entities operate.

Basel 3 introduced a minimum leverage ratio. the leverage ratio was calculated by dividing Tier1 capital by the bank's average total consolidated assets. In the paper, k index is suggested as the indicator of risk taking. Within the liability, three major fractions like deposits, borrowings and optimized equity capital are considered as the complementary of minimum capital requirement. Assets of commercial banks are mainly consisted with loans and securities. Because the optimized equity capital grows and deposits is restricted by change, borrowings which is the difference between asset and deposit+equity capital should be checked whether borrowings can cover the optimized equity by k index.

The combination of portfolio composition test, deposit-equity optimization and k index enables bounding the bank capital regulation problems.

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16. annex

2.5 Deposits held with MFIs: breakdown [1), 2)]

(EUR billions and annual growth rates; outstanding amounts and growth rates at end of period; transactions during period)

2. Deposits by non-financial corporations and households

	Non-financial corporations							Households [3)]						
	Total	Overnight	With an agreed maturity of:		Redeemable at notice of:		Repos	Total	Overnight	With an agreed maturity of:		Redeemable at notice of:		Repos
			Up to 2 years	Over 2 years	Up to 3 months	Over 3 months				Up to 2 years	Over 2 years	Up to 3 months	Over 3 months	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Outstanding amounts													
2012	1,761.5	1,148.5	408.3	106.5	85.4	2.0	10.9	6,119.1	2,346.4	979.1	747.8	1,937.3	98.0	10.4
2013 [p]	1,870.7	1,234.4	403.5	123.0	91.6	1.8	16.5	6,263.1	2,521.3	877.9	806.6	1,968.6	83.9	4.8
2013 Q3	1,791.0	1,173.5	392.2	118.8	95.0	1.8	9.7	6,202.8	2,460.2	902.5	783.6	1,965.2	84.9	6.3
Q4 [p]	1,870.7	1,234.4	403.5	123.0	91.6	1.8	16.5	6,263.1	2,521.3	877.9	806.6	1,968.6	83.9	4.8
2013 Sep.	1,791.0	1,173.5	392.2	118.8	95.0	1.8	9.7	6,202.8	2,460.2	902.5	783.6	1,965.2	84.9	6.3
Oct.	1,814.0	1,181.9	402.1	120.7	94.8	1.8	12.6	6,209.7	2,478.6	891.0	791.1	1,958.7	84.5	5.7
Nov.	1,840.1	1,210.3	400.6	121.0	95.0	1.9	11.4	6,229.6	2,502.3	886.3	796.5	1,954.8	84.2	5.6
Dec. [p]	1,870.7	1,234.4	403.5	123.0	91.6	1.8	16.5	6,263.1	2,521.3	877.9	806.6	1,968.6	83.9	4.8
	Transactions													
2012	81.9	99.3	-35.5	12.9	9.5	0.0	-4.3	224.8	90.4	33.7	21.8	100.7	-9.6	-12.3
2013 [p]	117.4	90.7	-4.3	17.9	7.4	-0.1	5.7	147.3	176.1	-100.0	59.4	31.4	-14.1	-5.6
2013 Q3	36.3	27.4	2.4	4.0	3.2	0.1	-0.8	-6.0	14.1	-26.5	14.0	-4.6	-3.3	0.2
Q4 [p]	81.5	61.9	11.7	4.1	-3.0	0.1	6.8	60.6	61.5	-25.4	23.6	3.4	-1.0	-1.5
2013 Sep.	7.5	10.6	-3.0	1.9	0.4	0.0	-2.3	-17.6	-2.8	-11.9	5.4	-6.2	-1.8	-0.3
Oct.	24.6	9.3	10.7	1.8	-0.2	0.1	2.9	6.9	18.7	-11.8	7.5	-6.4	-0.5	-0.6
Nov.	25.2	27.7	-2.2	0.2	0.6	0.0	-1.2	19.8	23.6	-5.4	6.0	-4.0	-0.3	-0.1
Dec. [p]	31.7	24.8	3.2	2.0	-3.4	0.0	5.1	33.9	19.2	-8.3	10.2	13.8	-0.2	-0.8
	Growth rates													
2012	4.9	9.4	-8.0	13.4	13.0	-1.4	-26.5	3.8	4.0	3.6	3.0	5.5	-8.9	-54.2
2013 [p]	6.7	7.9	-1.1	16.9	8.7	-3.7	52.1	2.4	7.5	-10.2	7.9	1.6	-14.4	-53.9
2013 Q3	6.0	7.8	-2.0	15.2	11.0	2.0	-12.2	3.2	7.2	-6.4	4.9	3.9	-15.8	-50.3
Q4 [p]	6.7	7.9	-1.1	16.9	8.7	-3.7	52.1	2.4	7.5	-10.2	7.9	1.6	-14.4	-53.9

2.5 Deposits held with MFIs: breakdown [1), 2)]

(EUR billions and annual growth rates; outstanding amounts and growth rates at end of period; transactions during period)

1. Deposits by financial intermediaries

	Insurance corporations and pension funds							Other financial intermediaries							
	Total	Overnight	With an agreed maturity of:		Redeemable at notice of:		Repos	Total	Overnight	With an agreed maturity of:		Redeemable at notice of:		Repos	
			Up to 2 years	Over 2 years	Up to 3 months	Over 3 months				Up to 2 years	Over 2 years	Up to 3 months	Over 3 months		With central counter-parties
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Outstanding amounts														
2012	691.4	106.5	81.4	484.4	6.4	0.2	12.5	2,016.5	410.7	236.6	1,021.0	13.6	0.3	334.4	256.7
2013 [p]	653.2	95.9	76.5	462.8	7.0	0.1	11.0	1,854.1	423.6	221.2	942.2	16.5	0.5	250.0	178.0
2013 Q3	669.6	106.5	74.6	470.7	8.2	0.1	9.5	1,960.3	443.2	235.2	969.7	17.2	0.3	294.7	212.5
Q4 [p]	653.2	95.9	76.5	462.8	7.0	0.1	11.0	1,854.1	423.6	221.2	942.2	16.5	0.5	250.0	178.0
2013 Sep.	669.6	106.5	74.6	470.7	8.2	0.1	9.5	1,960.3	443.2	235.2	969.7	17.2	0.3	294.7	212.5
Oct.	668.8	105.6	77.2	467.9	7.9	0.1	9.9	1,917.1	436.9	225.6	964.9	17.3	0.4	272.1	188.1
Nov.	660.7	104.2	72.4	466.2	7.1	0.1	10.6	1,901.3	433.5	216.6	961.9	23.3	0.5	265.5	183.6
Dec. [p]	653.2	95.9	76.5	462.8	7.0	0.1	11.0	1,854.1	423.6	221.2	942.2	16.5	0.5	250.0	178.0
	Transactions														
2012	-12.5	15.2	2.6	-27.6	2.0	0.0	-4.7	-176.7	23.9	-49.5	-166.0	-2.0	-0.3	17.2	13.3
2013 [p]	-36.3	-9.3	-5.3	-22.0	1.3	-0.1	-0.9	-58.4	13.7	-15.1	-77.1	3.1	0.3	16.6	30.6
2013 Q3	-9.1	2.4	-3.7	-9.2	0.9	-0.2	0.6	-80.4	-11.8	4.8	-24.7	0.2	0.1	-49.1	-40.5
Q4 [p]	-16.0	-10.5	1.9	-7.7	-1.1	0.0	1.4	-83.3	-18.0	-13.7	-25.8	-0.4	0.2	-25.6	-16.1
2013 Sep.	-5.2	2.6	-5.9	-2.3	0.0	-0.2	0.7	-6.6	7.2	0.0	-9.2	0.2	0.0	-4.7	5.4
Oct.	-0.6	-0.8	2.6	-2.6	-0.2	0.0	0.4	-30.1	-5.7	-9.1	-4.4	0.1	0.1	-11.1	-12.9
Nov.	-8.1	-1.4	-4.8	-1.7	-0.8	0.0	0.7	-9.0	-3.2	-9.4	-3.1	6.2	0.1	0.5	1.8
Dec. [p]	-7.4	-8.2	4.1	-3.4	-0.1	0.0	0.3	-44.2	-9.1	4.8	-18.3	-6.7	0.0	-15.0	-5.0
	Growth rates														
2012	-1.8	16.5	3.4	-5.4	50.8	-	-32.1	-8.0	6.1	-17.4	-14.0	-14.0	-	4.3	4.2
2013 [p]	-5.3	-8.9	-6.5	-4.5	18.7	-	-8.0	-3.1	3.3	-6.4	-7.6	22.2	-	2.1	9.9

2.5 Deposits held with MFIs: breakdown [1), 2)]

(EUR billions and annual growth rates; outstanding amounts and growth rates at end of period; transactions during period)

3. Deposits by government and non-euro area residents

	General government					Non-euro area residents				
	Total	Central government	Other general government			Total	Banks [3)]	Non-banks		
			State government	Local government	Social security funds			Total	General government	Other
	1	2	3	4	5	6	7	8	9	10
	Outstanding amounts									
2012	448.0	169.7	62.8	111.7	103.8	2,895.2	2,016.6	878.6	39.8	838.7
2013 (p)	440.8	152.3	-	-	-	2,522.9	-	-	-	-
2012 Q4	448.0	169.7	62.8	111.7	103.8	2,895.2	2,016.6	878.6	39.8	838.7
2013 Q1	499.4	207.8	67.2	111.8	112.5	2,904.8	1,989.5	915.2	37.6	877.6
Q2	546.0	235.6	70.9	115.4	124.2	2,806.3	1,873.3	933.0	35.4	897.6
Q3 (p)	495.5	190.9	70.7	113.7	120.1	2,665.9	1,738.4	927.5	43.0	884.5
	Transactions									
2012	-7.9	-22.6	-0.3	-0.4	15.5	-240.4	-135.8	-104.6	-5.1	-99.5
2013 (p)	-8.1	-18.1	-	-	-	-320.7	-	-	-	-
2012 Q4	-61.5	-32.3	-30.2	0.4	0.6	-207.1	-138.9	-68.1	-3.3	-64.8
2013 Q1	50.3	38.2	4.1	0.1	7.9	-2.3	-33.0	30.7	-2.0	32.8
Q2	46.7	27.7	3.8	3.6	11.7	-68.8	-98.6	29.8	-1.8	31.6
Q3 (p)	-49.8	-44.7	-0.1	-1.6	-3.4	-128.8	-126.6	-2.3	7.9	-10.2
	Growth rates									
2012	-1.4	-11.7	10.3	-0.4	18.2	-7.5	-6.3	-10.7	-11.9	-10.6
2013 (p)	-1.8	-10.7	-	-	-	-11.2	-	-	-	-
2012 Q4	-1.4	-11.7	10.3	-0.4	18.2	-7.5	-6.3	-10.7	-11.9	-10.6
2013 Q1	3.6	9.8	-12.3	-1.5	12.8	-13.0	-14.9	-8.7	-33.0	-7.3
Q2	7.6	23.9	-28.2	2.9	16.5	-11.6	-16.3	0.1	-14.4	0.8
Q3 (p)	-2.8	-5.4	-24.1	2.2	16.2	-13.1	-18.4	-1.0	2.0	-1.1

2. Loans to households [3)]

	Total	Consumer credit				Loans for house purchase				Other loans				
		Total	Up to 1 year	Over 1 and up to 5 years	Over 5 years	Total	Up to 1 year	Over 1 and up to 5 years	Over 5 years	Total	Sole proprietors	Up to 1 year	Over 1 and up to 5 years	Over 5 years
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Outstanding amounts													
2013 (p)	5,231.0	576.1	128.4	169.5	278.2	3,858.1	12.7	55.4	3,790.1	796.7	406.1	136.6	76.3	583.8
2013 Q3	5,237.7	583.0	130.4	170.4	282.3	3,847.1	12.6	55.8	3,778.7	807.6	413.5	138.4	77.6	591.6
Q4 (p)	5,231.0	576.1	128.4	169.5	278.2	3,858.1	12.7	55.4	3,790.1	796.7	406.1	136.6	76.3	583.8
2013 Oct.	5,233.6	576.4	126.9	168.6	280.9	3,854.4	12.8	55.9	3,785.7	802.8	410.2	136.3	77.3	589.1
Nov.	5,235.8	573.1	125.4	168.4	279.2	3,857.3	12.7	56.0	3,788.7	805.4	409.5	140.3	76.9	588.2
Dec. (p)	5,231.0	576.1	128.4	169.5	278.2	3,858.1	12.7	55.4	3,790.1	796.7	406.1	136.6	76.3	583.8
	Transactions													
2013 (p)	-3.7	-17.8	-4.1	-6.8	-6.9	27.3	-1.4	-1.5	30.3	-13.3	-13.4	-3.5	-3.7	-6.1
2013 Q3	-1.2	-2.1	0.0	-1.0	-1.1	6.7	-1.1	0.1	7.7	-5.9	-1.4	-6.0	-0.7	0.9
Q4 (p)	1.0	-4.3	-0.6	-1.3	-2.4	11.9	0.1	-0.4	12.2	-6.5	-5.7	-0.3	-1.1	-5.1
2013 Oct.	-0.1	-5.7	-3.1	-1.8	-0.8	7.7	0.2	0.1	7.4	-2.2	-1.6	-1.4	0.0	-0.7
Nov.	3.0	-2.7	-0.8	-0.7	-1.2	2.8	-0.1	0.1	2.8	2.8	-1.0	4.7	-0.5	-1.3
Dec. (p)	-1.8	4.0	3.3	1.2	-0.4	1.3	0.0	-0.6	1.9	-7.2	-3.0	-3.6	-0.6	-3.0
	Growth rates													
2013 (p)	-0.1	-3.0	-3.0	-3.9	-2.4	0.7	-10.1	-2.7	0.8	-1.6	-3.2	-2.5	-4.6	-1.0
2013 Q3	0.1	-2.3	-0.8	-3.9	-2.1	0.8	-10.1	-2.4	0.9	-1.0	-1.2	-1.1	-5.6	-0.4
Q4 (p)	-0.1	-3.0	-3.0	-3.9	-2.4	0.7	-10.1	-2.7	0.8	-1.6	-3.2	-2.5	-4.6	-1.0
2013 Oct.	0.1	-3.1	-2.7	-4.9	-2.2	0.9	-8.3	-2.5	1.0	-1.3	-1.7	-2.0	-5.4	-0.6
Nov.	0.0	-3.3	-2.8	-4.8	-2.5	0.9	-8.8	-2.6	1.0	-1.7	-1.6	-3.2	-5.6	-0.8
Dec. (p)	-0.1	-3.0	-3.0	-3.9	-2.4	0.7	-10.1	-2.7	0.8	-1.6	-3.2	-2.5	-4.6	-1.0

Source: ECB.

Balance sheet of commercial banks of US in 2008 (Vanhoose)

Table 2.1 Assets of U.S. commercial banks

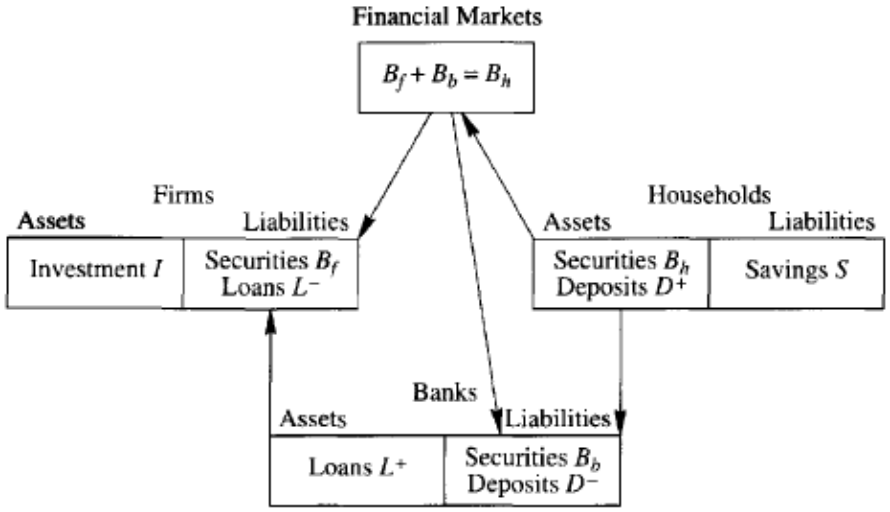
Asset category	$ Billions	%
Commercial and industrial loans	1,197.9	12.3
Consumer loans	847.4	9.0
Real estate loans	3,573.9	36.7
Interbank loans	364.6	3.6
Other loans	269.0	2.7
Total loans	6,252.8	64.3
Securities	2,017.7	20.7
Cash assets	247.1	2.5
Other assets	1,220.4	12.5
Total assets	9,738.0	100.0

(Source: Board of Governors of the Federal Reserve System, August 2008)

Table 2.2 U.S. commercial bank liabilities and equity capital

Category	$ Billions	%
Transactions deposits	579.1	6.0
Large time deposits	1,016.4	10.4
Savings and Small Time Deposits	4,171.6	42.8
Total deposits	5,767.1	59.2
Borrowings	1,744.8	17.9
Other liabilities	1,051.4	10.8
Total liabilities	8,563.3	87.9
Equity capital	1,174.7	12.1
Total liabilities and equity capital	9,738.0	100.0

(Source: Board of Governors of the Federal Reserve System, August 2008)



Each Market Clearing

I=S (Good Market)
D_h (Firm)-D_f (Firm)+D_h (Household)-D_h (Household)+D_b (Bank)-D_h (Bank)(Deposit market)
L_f (Firm)-L_f (Firm)-L_b(Bank)+L_b(Bank)+L_b(FR)-L_b(FR) (Credit Market)
B_h(Firm)-B_h(Firm)+B_h(Household)-B_h(Household)+B_f (Bank)-B_f (Bank) +B_f (FB)-B_f (FB) (Financial Market)

Firms

Assets	Liabilities
Real Asset D_h+B_h (=Investment I)	Liabilities to banks D_h+B_h -L_f Liabilities to central bank L_f

Households

Assets	Liabilities
Securities B_h Deposits D_h Real Asset S_h-(B_h+D_h)	Savings S_h

Banks: domestically chartered commercial banks, country branches and agencies of foreign banks, Edge Act corporation

Assets	Liabilities
Claims to corporate D_h+B_f -L_f	Deposits D_h Borrowing B_f –L_f

Federal Reserve Banks

Assets	Liabilities
Claims to corporate L_f Currency C_r Borrowing to banks B_f -L_f	Securities B_f

Table 3
Seasonally Adjusted Components of M1
Billions of dollars

Date	Currency[1]	Traveler's checks[2]	Demand deposits[3]	Other checkable deposits		
				At commercial banks[4]	At thrift institutions[5]	Total
Month						
2012-Sept.	1,067.7	3.9	878.5	242.2	191.1	433.4
Oct.	1,076.4	3.9	897.8	246.3	191.0	437.4
Nov.	1,082.7	3.9	886.8	241.3	193.0	434.3
Dec.	1,090.0	3.8	908.9	246.5	197.9	444.4
2013-Jan.	1,096.7	3.8	913.0	253.1	197.9	451.0
Feb.	1,099.8	3.8	918.5	250.5	200.9	451.4
Mar.	1,104.6	3.8	916.2	248.5	203.3	451.8
Apr.	1,110.5	3.7	947.3	252.2	204.0	456.3
May	1,117.4	3.7	947.9	252.5	204.3	456.7
June	1,123.8	3.7	946.0	249.8	205.8	455.6
July	1,131.3	3.6	961.5	253.3	208.7	462.0
Aug.	1,137.7	3.6	959.1	251.0	208.8	459.9
Sept.	1,144.6	3.6	973.0	255.8	210.0	465.9
Oct.	1,150.5	3.6	1,006.5	254.8	210.5	465.3
Nov.	1,153.4	3.5	990.4	253.0	212.0	465.0
Dec.	1,159.8	3.5	1,016.0	256.3	212.6	468.9
2014-Jan.	1,165.4	3.4	1,041.9	259.0	213.4	472.4
Week ending						
2013-Dec. 9	1,158.1	3.5	1,017.1	262.1	212.1	474.2
Dec. 16	1,159.5	3.5	1,019.5	258.2	213.0	471.2
Dec. 23	1,160.3	3.5	1,034.5	256.9	213.1	470.0
Dec. 30	1,161.5	3.5	999.5	248.6	212.3	461.0
2014-Jan. 6	1,163.1	3.5	1,002.3	257.3	210.6	468.0
Jan. 13	1,165.4	3.5	1,014.8	261.4	215.2	476.6
Jan. 20	1,166.2	3.4	1,035.3	261.9	210.7	472.7
Jan. 27	1,166.1	3.4	1,048.1	253.7	214.7	468.4
Feb. 3	1,165.9	3.4	1,143.9	265.1	216.9	482.0

Components may not add to totals due to rounding.

e estimated

1. Currency outside U.S. Treasury, Federal Reserve Banks and the vaults of depository institutions.
2. Outstanding amount of U.S. dollar-denominated traveler's checks of nonbank issuers. Traveler's checks issued by depository institutions are included in demand deposits.
3. Demand deposits at domestically chartered commercial banks, U.S. branches and agencies of foreign banks, and Edge Act corporations (excluding those amounts held by depository institutions, the U.S. government, and foreign banks and official institutions) less cash items in the process of collection and Federal Reserve float.
4. NOW and ATS balances at domestically chartered commercial banks, U.S. branches and agencies of foreign banks, and Edge Act corporations.
5. NOW and ATS balances at thrift institutions, credit union share draft balances, and demand deposits at thrift institutions.

Table 4
Seasonally Adjusted Components of Non-M1 M2
Billions of dollars

Date	Savings deposits[1]			Small-denomination time deposits[2]			Retail money funds[3]	Total non-M1 M2	Memorandum: Institutional money funds[4]
	At commercial banks	At thrift institutions	Total	At commercial banks	At thrift institutions	Total			
Month									
2012-Sept.	5,455.2	1,028.0	6,483.2	478.5	189.5	667.9	623.1	7,774.3	1,746.4
Oct.	5,488.3	1,031.0	6,519.3	470.2	186.2	656.3	623.0	7,798.7	1,739.4
Nov.	5,648.9	949.7	6,598.7	465.1	179.8	644.9	628.6	7,872.2	1,732.2
Dec.	5,728.8	959.1	6,687.9	455.8	176.8	632.6	639.1	7,959.6	1,743.0
2013-Jan.	5,727.5	975.8	6,703.3	448.3	175.7	624.0	650.8	7,978.1	1,765.6
Feb.	5,740.3	986.9	6,727.2	442.3	173.3	615.5	638.4	7,981.2	1,765.1
Mar.	5,796.6	996.2	6,792.8	443.3	169.2	612.5	638.2	8,043.5	1,756.4
Apr.	5,794.3	999.0	6,793.3	439.7	165.7	605.5	637.1	8,035.9	1,758.4
May	5,825.8	1,011.3	6,837.1	433.8	162.3	596.1	631.8	8,065.0	1,753.5
June	5,869.8	1,014.1	6,883.8	424.3	158.9	583.1	642.8	8,109.8	1,757.3
July	5,905.2	1,015.7	6,920.9	419.3	154.3	573.6	649.4	8,143.9	1,765.0
Aug.	5,962.4	1,020.1	6,982.5	417.3	150.4	567.7	645.8	8,195.9	1,764.3
Sept.	5,986.8	1,020.0	7,006.8	412.3	148.6	560.9	647.5	8,215.2	1,787.5
Oct.	6,048.1	1,023.8	7,071.9	408.4	146.3	554.7	647.7	8,274.3	1,785.4
Nov.	6,088.3	1,023.6	7,111.9	403.9	143.7	547.6	637.1	8,296.7	1,789.5
Dec.	6,108.3	1,024.9	7,133.2	403.2	141.7	544.9	632.4	8,310.6	1,779.8
2014-Jan.	6,134.8	1,032.4	7,167.1	393.4	139.8	533.2	628.3	8,328.7	1,774.0
Week ending									
2013-Dec. 9	6,099.3	1,012.4	7,111.8	403.4	142.6	546.1	631.6	8,289.5	1,792.1
Dec. 16	6,102.5	1,013.1	7,115.6	404.9	142.0	546.9	632.6	8,295.0	1,782.3
Dec. 23	6,103.9	1,027.6	7,131.5	403.9	141.4	545.2	632.7	8,309.4	1,767.1
Dec. 30	6,128.1	1,044.2	7,172.2	401.2	140.8	542.0	632.5	8,346.8	1,772.7
2014-Jan. 6	6,130.6	1,024.0	7,154.6	396.5	140.5	537.0	633.0	8,324.6	1,799.6
Jan. 13	6,145.9	1,016.7	7,162.6	394.6	140.1	534.7	630.3	8,327.6	1,765.1
Jan. 20	6,149.0	1,032.2	7,181.2	392.8	139.8	532.6	626.1	8,339.9	1,761.2
Jan. 27	6,150.4	1,049.4	7,199.8	391.9	139.5	531.4	625.6	8,356.8	1,767.3
Feb. 3	6,064.5	1,042.3	7,106.8	390.8	138.8	529.6	626.2	8,262.6	1,786.3

Components may not add to totals due to rounding.

1. Savings deposits include money market deposit accounts.
2. Small-denomination time deposits are those issued in amounts of less than $100,000. All IRA and Keogh account balances at commercial banks and thrift institutions are subtracted from small time deposits.
3. IRA and Keogh account balances at money market mutual funds are subtracted from retail money funds.
4. Institutional money funds are not part of non-M1 M2.

Table 7
Other Memorandum Items
Billions of dollars, not seasonally adjusted

Date	Demand deposits at banks due to		Time and savings deposits due to foreign banks and official institutions	IRA and Keogh accounts			
	Foreign commercial banks	Foreign official institutions		At commercial banks	At thrift institutions	At money market funds	Total
2012-Sept.	30.8	15.2	27.7	274.9	138.9	221.7	635.5
Oct.	31.9	14.7	27.9	276.8	139.9	223.7	640.4
Nov.	33.5	13.9	28.2	279.1	140.8	226.1	645.9
Dec.	35.1	12.3	28.4	281.3	141.7	228.4	651.5
2013-Jan.	36.8	12.5	28.9	281.4	142.3	228.3	651.9
Feb.	38.4	13.8	29.4	280.1	142.5	226.6	649.2
Mar.	40.1	14.0	29.9	278.8	142.7	224.9	646.5
Apr.	42.1	15.1	31.2	280.0	143.1	226.8	649.9
May	44.3	15.9	33.1	283.0	143.7	231.4	658.0
June	46.5	15.2	35.0	286.0	144.2	235.9	666.0
July	50.2	15.1	36.6	287.3	144.6	239.0	670.9
Aug.	55.0	15.2	37.9	287.6	144.9	241.1	673.5
Sept.	59.8	13.6	39.3	287.8	145.2	243.1	676.1
Oct.	61.6 e	13.2 e	39.8 e	289.0 e	145.7 e	244.3 e	679.0 e
Nov.	61.6 e	13.2 e	39.8 e	290.8 e	146.3 e	244.9 e	682.1 e
Dec.	61.6 e	12.6 e	39.8 e	292.6 e	147.0 e	245.6 e	685.2 e
2014-Jan.	61.6 e	12.5 e	39.8 e	294.5 e	147.6 e	245.9 e	688.0 e

Components may not add to totals due to rounding.
e estimated

Table 7 (continued)
Other Memorandum Items (continued)
Billions of dollars, not seasonally adjusted

Date	U.S. government deposits			
	Demand deposits at commercial banks banks	Balance at Federal Reserve	Total cash balance	Time and savings deposits at commercial banks
Month				
2012-Sept.	0.9	58.6	59.5	2.1
Oct.	0.9	63.0	63.9	2.1
Nov.	0.8	30.3	31.1	2.1
Dec.	0.9	49.4	50.4	2.0
2013-Jan.	1.1	67.6	68.7	1.9
Feb.	0.9	40.4	41.3	1.8
Mar.	1.0	56.7	57.7	1.7
Apr.	1.5	101.1	102.7	1.6
May	1.0	71.1	72.1	1.7
June	1.0	72.1	73.1	1.8
July	1.1	74.3	75.4	1.8
Aug.	1.1	51.4	52.5	1.9
Sept.	1.1	40.3	41.3	1.9
Oct.	1.2	37.8	39.0	1.9 e
Nov.	1.1	43.7	44.8	1.9 e
Dec.	1.2	68.3	69.5	1.9 e
2014-Jan.	1.2	93.1	94.3	1.9 e
Week ending				
2013-Dec. 9	1.1	30.3	31.4	
Dec. 16	1.1	43.5	44.7	
Dec. 23	1.1	106.7	107.8	
Dec. 30	1.5	85.5	87.0	
2014-Jan. 6	1.0	132.5	133.5	
Jan. 13	1.1	88.5	89.6	
Jan. 20	1.2	76.6	77.8	
Jan. 27	1.5	88.7	90.1	
Feb. 3	1.6	85.2	86.8	

e estimated
Note: Current and historical H.6 data are available each week on the Federal Reserve Board's website (http://www.federalreserve.gov/). Monthly data are available back to January 1959, and weekly data are available back to January 1975 for most series.