The relationship between unemployment, NAIRU and investment: microfundations for incomplete nominal adjustment

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The relationship between Unemployment, NAIRU and Investment. Microfundations for Incomplete Nominal Adjustment

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Abstract

This paper proposes a simple method to estimate a macro shock-specific Okun elasticity: it measures by how much the unemployment rate falls over a certain horizon when output increases by one percentage point over the same horizon because of a specific macroeconomic shock. Inference is based on simple instrumental variable regressions of cumulative unemployment on cumulative output. Using data for the Republic of Moldova I consider government spending, tax, monetary policy, financial, technology, and oil shocks. We obtain eight key results:

- At medium horizons (2-3 years), Okun elasticities are largely stable across different kinds of shocks.
- At shorter horizons, differences are more pronounced. The speed at which unemployment adjusts relative to output depends on the shock driving fluctuations. This highlights the importance to consider longer horizons. Otherwise, one could incorrectly conclude that the elasticity breaks down for some cycles.
- The elasticity is larger for financial shocks. Importantly, it is larger than for monetary policy and government spending shocks.
- The largest elasticity is for technological shocks followed by oil shocks.
- An increase/decrease in unemployment by (0.14 p.p.) caused an increase/decrease in GDP by 1 p.p. period 2011--2015.
- An increase/decrease in unemployment by (1.79 p.p.) caused an increase/decrease in money supply by 1 p.p. period 2011--2015.
- An increase/decrease in unemployment by (0.17 p.p.) caused an increase/decrease in GDP by 1 p.p. period 2007--2011.
- An increase/decrease in unemployment by (0.06 p.p.) caused an increase/decrease in money supply by 1 p.p. period 2007--2011.

Keywords: Unemployment; investment; monetary policy; rational expectations; interests rates; credit index implications

JEL Classification: E43;E52;E61;J68.

1 Introduction

In fact. Today world seems to be more and more disintegrated and "no gate"[1], news media influence as much as more in 1980's and leading newspapers condemning the **casino mondiale** (world casino), the shift in the world economy away from production and real goods and into pure financial speculation, and warming of a crash to come, unless changes were made[2].

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[1] **gate /geit/ noun**; a door which leads to an aircraft at an airport; Intermediate Dictionary, Second Ed. Bloomsburry Publishing ISBN 0 7475 6989 4 eISBN-13: 978-1-4081-0199-5 Copyright $\copyright$ P.H. Collin, F. Collin, S.M.H. Collin 2000

[2] In the early 1990s, Allais added a detailed attackvon globalization to his critique of the existing national andvworld monetary systems. Where, Maurice Alais, is Nobel Prize Winner in Economics in 1988, argued that [...] hether it is currency or stock speculation, the world has become one vast casino where gambling tables are spread over all meridians and latitudes.... Speculation everywhere is boosted by credit-issuance, since one can buy without paying and sell without owning.... All our difficulties stem from ignoring the fundamental reality, that no [market system] may properly operate if uncontrolled

In line of mathematics, we can write such as $a^2 + b^2 = c^2$ but this is more far away from a technical modeling which could be drawn as in common own space: $\alpha x^2 + \beta y^2 = \gamma z^2$
If we do not leave any blank lines we will continue to make and transforming equations, create indentation and hit a new paragraph of economic analysis.

Okun's (1962) Law predicts the short-run output elasticity of unemployment, i.e. by how much the unemployment rate falls, on average, when output increases by one percentage point. A stable Okun's Law is a key ingredient in macroeconomics textbooks, and business cycle models. Yet, little is known about whether the elasticity depends on the force driving the business cycle. For instance, whether unemployment and output co-move differently in recessions triggered by financial turmoil or an oil supply disruption is unclear ex-ante. The lack of evidence is surprising considering worries that the relationship breaks down occasionally and is particularly weak during recoveries from recessions rooted in financial market distress (e.g. Gordon, 2010).

We argue these findings can help to understand the initially "jobless" recovery following the 2007 financial crisis. Our mission is to investigate in an empirical framework, Okun Law in the Republic of Moldova, in the context of Covid 19, and pandemic of 2020's. Our paper is closely related to Daly et al. (2013) who also estimate shock-specific Okun elasticities. We build on their work along three dimensions. First, we consider a more general selection of macroeconomic shocks. Second, we propose a new one-step approach to estimate the elasticities, whereas Daly et al. (2013) follow a two-step procedure. This increases efficiency and simplifies the construction of confidence bands. Third, my method allows us to perform weak-IV robust inference. The last point is crucial because the forecast-error variance contribution of macro shocks to the variables of interest is often small (Gorodnichenko and Lee, 2017).

In the 2020, seasonally adjusted GDP decreased by 6.825% in the euro area and by 6.375% in the EU, compared with the previous year, according to a preliminary flash estimate published by Eurostat, the statistical office of the European Union. These declines, related to COVID-19 containment measures, follow a strong rebound in the third quarter of 2020 (+12.4% in the euro area and +11.5% in the EU) and the sharpest decreases since time series started in 1995 observed in the second quarter of 2020 (-11.7% in the euro area and -11.4% in the EU). According to a first estimation of annual growth for 2020, based on seasonally and calendar adjusted quarterly data, GDP fell by 6.8% in the euro area and 6.4% in the EU.

For Economy of the Republic of Moldova, seasonally adjusted GDP decreased by 14.0 in the second quarter, 9.7 in the third quarter and 3,3 in the forth quarter, starting with recovery period of boom and bust, respectively for 2021, first quarter -1,8, second quarter – 21,5, third quarter 8,3 and the forth quarter 18,9. According to a first estimation of annual growth for 2020, based on seasonally and calendar adjusted quarterly data, GDP fell by 6.9% in 2020, but smoothly recovery was been registered at 12.3.

Throughout last two years, economy of Republic of Moldova has gone through recurrent periods of boom and bust. This is the fascinating phenomenon of business cycles and economic fluctuations. Although long periods of high economic growth have sometimes led people to believe that the business cycle was dead, statistical data show that it is still alive and well: economic activity continues to fluctuate in an irregular cyclical manner around its long-run growth trend and the persistence of the shocks describe the origin: financial shocks, demand shocks and inflation shocks classical theory of modeling to nuisance: short-run shocks, disequilibrium shocks and innovative shocks, but also unobserved variables: long-term trends, gaps and shocks (rather than otherwise technological). and at the start of the present decade the growth rate of real GDP per capita turned negative in all of the three largest OECD economies. A fundamental challenge for macroeconomic theory is to explain why the economy goes through these cyclical movements rather than evolving smoothly over time.

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credit creation of means of payment ex nihilo allows (at least temporarily) an escape from necessary adjustments.

The two previous years of COVID-19 implications derived the capitalist market economies of the world through recurrent periods of dynamic trends. At the start of the present decade the growth rate of real GDP per capita turned negative in all of the three largest Eastern European Economies: Russia, Ukraine and Romania. We concludes that that numerous disarrays identifying with the arrangement of strategies utilized by Monetary Policy in a specific space of study financial variables and parameters can reconsider anticipated time-arrangement and/or uncertainty in terms of model errors. Economic activity today depends crucially on expected economic conditions tomorrow. A drop in the economy's expected future growth rate will tend to reduce the propensities to consume and invest by reducing the expected future earnings of households and firms. Hence the aggregate demand curve will shift down, causing an immediate fall in current output. As another example, a change in the expected rate of inflation will shift the aggregate supply curve by feeding into the nominal wages negotiated by workers and firms. It may also move the aggregate demand curve through its impact on the expected real rate of interest.

2 Literature Review

What is the shock of unemployment? The arrangement banters during the Great Recession prompted an overflow of examination on this inquiry. The greater part of studies have tracked down gauges of unobtrusive multipliers in total unemployment, frequently beneath solidarity. Assuming that unemployment are for sure this low, they propose that expansions in government spendings are probably not going to animate confidential movement what's more, that financial solidifications that include spending diminishes are probably not going to cause a lot of damage to the confidential area. The majority of the evaluations depend on midpoints for a specific country over a specific verifiable period. Since there is no extension for controlled, randomized preliminaries on nations, all assessments of total government multipliers are essentially reliant upon verifiable chance. Hypothesis lets us know that subtleties like the industriousness of expenditure changes, how they are supported, how financial strategy responds, and the snugness of the work market can fundamentally influence the extent of the unemployment especially non-acccelerating inflation rate of unemployment (NAIRU). Sadly, the information don't give us clean regular investigations that can respond to these inquiries. While the new Moldovan economy[3] boost bundle was simply shortage supported and embraced during a time of high joblessness what's more, accommodative money related strategy, it was established because of a frail economy and thus any total assessments are dependent upon concurrent conditions predisposition.

During the most recent decades, the writing has started to investigate whether evaluations of unemployment shocks differ contingent upon conditions. One strand of this writing thinks about how conceivable it is that government investment are different during downturns (for example Auerbach what's more, Gorodnichenko (2012), Bachmann and Sims (2012), Baum et al. (2012), Auerbach and Gorodnichenko (2013), Fazzari et al. (2013) and Riera-Crichton et al. (2014)). Another strand of the writing thinks about what money related approach means for government investment. New Keynesian DSGE models show that when loan costs are stuck at the zero lower bound, multipliers can be higher than in ordinary times (for example Cogan et al. (2010), Christiano et al. (2011), Coenen and et al. (2012)). This paper adds to the exact writing by exploring whether government investment vary as per two possibly significant elements of the economy: 1) how much leeway in the economy and (2) whether loan fees are close to the zero lower bound.[4] Expanding the underlying examination in Owyang et al. (2013), we exploit the way that the whole twentieth Century contains possibly more extravagant data than the post-WWII information that has been the focal point of the majority of the new exploration. We make another quarterly informational collection for the Moldova reaching out back to 1992. This example remembers episodes of immense varieties for government investment, wide vacillations in joblessness, delayed periods close to the zero lower bound of transfers, and an assortment of duty reactions. This paper broadens the little, however developing, writing on government reliance of multipliers in two alternate ways. In the first place, none of the current papers that gauge state subordinate models consider the zero lower bound on

[3] Veaceslav Ioniță, Moldovan economic analyst argued that country GDP has reached the level of 1992, he was interviewed an national broadcast on August 29, 2022.

[4] We will use government "spending" and "purchases" interchangeably. It should be noted that our multipliers apply only to government investment, not government transfers.

interest as a government.[5] Subsequently, our paper is quick to investigate state-reliance including the zero lower bound under unemployment. Second, we add to state-subordinate multiplier writing by featuring a few key strategic issues that emerge. Specifically, we show that the absolute most generally referred to discoveries of higher investment rate during downturns are because of unique subtleties of the computation of multipliers and are not powerful to conceivable speculations. Utilizing Jordà's (2005) neighborhood projection technique, which we view as a more powerful strategy, we find no proof that the government investment is higher during high joblessness period. Most gauges of the multiplier are somewhere in the range of 0.6 and 1. We perform broad power checks as for our proportions of the model, test period, recognizable proof strategy and the way of behaving of duties and track down little change in the appraisals. We exhibit that the vast majority of the distinctions in ends between our work and that of Auerbach and Gorodnichenko (2012) lie in unpretentious, yet urgent, suspicions hidden the development of motivation reaction capabilities on which the investment are based. Rather than direct models, where the estimation of motivation reaction capabilities is a clear endeavor, building motivation reaction capabilities in nonlinear models is loaded with confusions. We additionally find little proof that the investment is higher at the zero lower bound (monetary policy interest rate in the reaction function equation). The just case in which the stabilizers recognizably surpasses solidarity in the zero lower bound state is at the point when we prohibit the proportioning times of Covid 19 and pandemic of 2020's.

3 Assumption

The single-run simulation results should be displayed to show short-term boom-bust cycles, different for length and intensity, along a long-run growth path. During periods of faster growth, the increase in capacity utilization boosts investment, profits, consumption, and creates asset price inflation. The strong demand generates a positive feedback loop by pushing for further increases in investment. As a side effect, the strong investment expenditure leads to increase in leverage (raising also the debt service) and share of secondary workers. At the peak, the decrease in consumption caused by secondary workers and the reduction in investment due to high interest rates and bankruptcies reach a critical threshold. The positive feedback of loop is now reversed as testified the increase in bankruptcy ratio and the decrease in secondary workers. These two effects, with the exit from the market of the weakest firms and the increase in the share of primary workers, pave the way for the transition to a new expansionary phase. In our story, price evolution is partially disentangled from output (correlation approximately equal to 0.1) mostly because of the use secondary workers as a cost-containing strategy. Both primary workers' and secondary workers' wages are strongly and positively correlated with output (about 0.6), so in the absence of (large) wage differentials we would observe a standard cost-push inflation. However, the increase in the share of secondary workers that occurs during sudden jumps in aggregate demand drives costs down and contains the inflationary pressure. In fact, Λt is positively correlated with output (0.6) and negatively with inflation (−0.4). As discussed with reference to figures 4-5, the model satisfactorily mimics
the response of the aggregate economy to shocks. The agent-based approach allows for an investigation of the changes at the micro level that determine the macroeconomic outcomes. In particular, we focus here on the effect on inflation of shocks on foreign exchange and on export. The previous empirical results shows the bivariate distribution for inflation and number of workers before and after a depreciation, which in this model is represented by an increase in the
price of raw materials. The shock generates an increase in dispersion in both distribution and higher use of temporary workers, as testified by the movement of firms' density towards the South-East corner of the space. The median of the distribution of Λ shifts to the right, determining a change in the opposite direction for firm-level inflation. A decrease in employment and a proportionally larger use of secondary workers leads to a containment of the inflationary effect that would otherwise result from an exogenous increase in costs. Also, results in the same way, plots the same bimodal distribution, showing the changes caused by a negative variation in export. For this plot we simulated the same negative variation in export that Moldovan experienced in 2013-2022, equal to 5 times the standard deviation of the export time series. After the shock, firms with relatively little secondary

[5] Only two papers have investigated the aggregate investment at the zero lower bound, Ramey (2011) for the U.S. and Crafts and Mills (2012) for the U.K. Both of these papers simply estimated multipliers over an episode of the zero lower bound rather than estimating state-dependent models.

workforce absorb the shock by increasing the share of secondary workers, exacerbating the deflationary effect.

Our results determined through the use of empirical data from past recessions in the 1970s, 1990s, and 2000s that Okun's law was a useful theory. All recessions showed two common main trends: a counterclockwise loop[clarification needed] for both real-time and revised data. The recoveries of the 2021s and 2022s did have smaller and tighter loops in the benchmark.

4. Quarterly Projection Model (canonical model). The shock-specific Okun elasticity

Conventional macroeconomic models often assume that the expected future values of economic variables depend only on the past history of those variables. Indeed, we postulate that the expected inflation rate for the current period is simply equal to the actual inflation rate experienced in the previous period. The assumption of backward-looking expectations may be plausible in 'quiet' times when the macroeconomy is not subject to significant shocks. When people have no particular reason to believe that the tightness of labour and product markets next year will be much different from what it is today, it seems reasonable for them to assume at next year's inflation rate will be more or less the same as this year's. However, if the economy is hit by an obvious and visible shock such as a dramatic change in the price of imported oil or if there is a clear change in the economic policy regime, say, due to a change of government it does not seem rational for people to assume that next year's economic environment will be the same as this year's.

- It is a **structural model** because each key equation has an economic interpretation, but the equations are not fully micro-founded. In other words, for every key model equation that exists in the model we can explain an underlying economic mechanism that this equation approximates. For example, how the central bank sets the interest rate or how the output is determined. We will discuss this in more detail in this module.
- It is a **general equilibrium model** because it describes how the equilibrium is established in the economy as a whole, and not only in some particular markets or sectors.
- The model is **stochastic** because it allows for stochastic shocks (ex. financial shoks or interest rate shocks) in its equations. Later in the course, you will see a set of the so-called structural shocks in the key equations for domestic variables, such as aggregate demand shock, cost push shock, exchange rate shock, and monetary policy shock.
- This model also assumes the **rational** formation of **expectations** for inflation and exchange rate or, in other words, model-consistent expectations.
- The QPM is a tool suitable for **monetary policy analysis and forecasting**.
- The QPM is a tool suitable for Balance of Payments and international investment position statistics (BOP-IIPx)[6]

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[6] BalanceOfPaymentsAndInternationalInvestmentPosition4x-Yield Curves Data Model} (Date statistice pentru analiza balanței de plăți: Contul financiar și a cursului (real efectiv) de schimb - REER)} (BPIIPS-FAx, 12002 obs.)

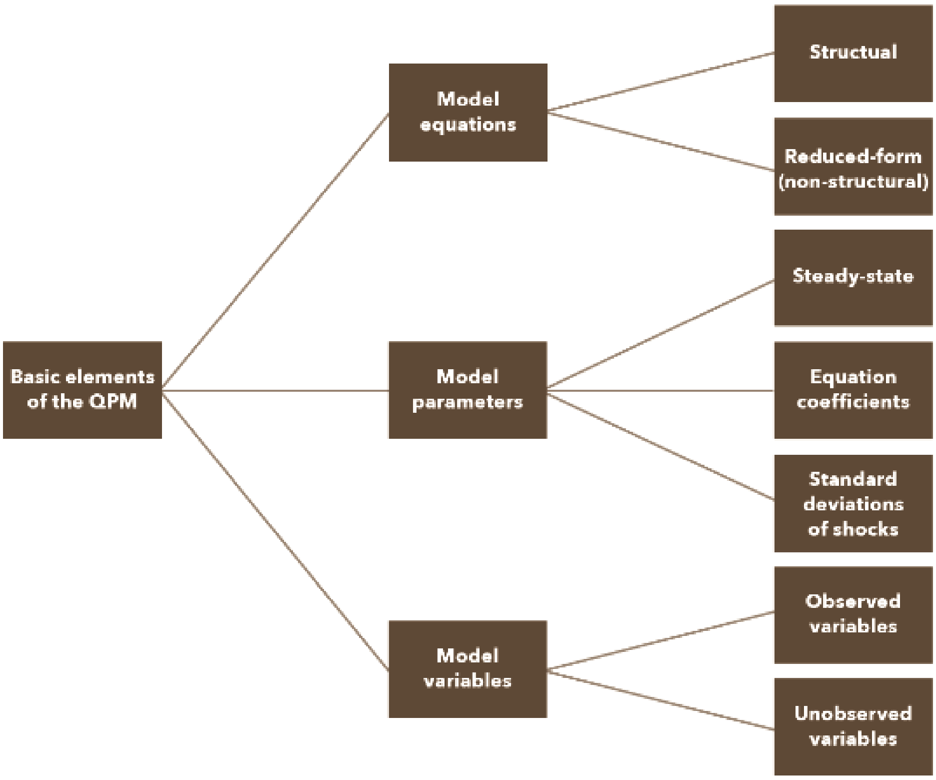

Figure 1: The building elements of the canonical QPM, classified in three main dimensions.

I define the macro shock-specific Okun elasticity as the cumulative change in the unemployment rate over the next h periods caused by a macroeconomic shock that changes real GDP

by 1 ppt over the next h periods:

$$\beta_h = \frac{\delta \sum_{i=0}^{h} u_{t+i}/\delta_{\varepsilon_t}}{\sum_{i=0}^{h} y_{t+i}/\delta_{\varepsilon_t}}, \text{ h} \geq 0 \quad (1)$$

y denotes log real GDP, u the unemployment rate, and ${}^{\delta_{y_{t+h}}}\!/\!_{\delta_{\epsilon_t}}$ is the marginal effect of an exogenous macroeconomic shock ε_t on \$$y_{t+h}$. $\beta_h$measures relative changes of u and y at an increasing horizon. This is important because both variables adjust to shocks slowly.
I estimate the macro shock-specific Okun elasticity using the statistic:

$$\beta_h = \frac{\delta \sum_{i=0}^{h} IR_i^u}{\sum_{i=0}^{h} IR_i^y}, \text{ h} \geq 0 \quad (2)$$

$IR_i^u$is the causal impulse response of variable y to a macroeconomic shock ε_t at horizon h:

$$IR_i^u\text{=E}(y_{t+h} \mid \varepsilon_t = 1, c_t)\text{- E}(y_{t+h} \mid \varepsilon_t = 0, c_t) \quad (3)$$

where c_t is a vector of control variables. β_h measures the cumulative causal effect of a shock on the unemployment rate over h periods, relative to the cumulative causal effect of a shock on output over h periods. With an instrumental variable i_t for the shock ε_t we can estimate the shock-specific Okun elasticity via a sequence of IV regressions.[7]

$$\sum_{i=0}^{h} = b_h \sum_{i=0}^{h} y_{t+i} + d'_h + e_{t+h} \tag{4}$$

wherei_t instruments $\sum_{i=0}^{h} y_{t+i}$. I conduct inference on the elasticity using (a) HAC (Newey and West, 1987) standard errors and (b) a HAC and weak-IV robust method based on inverting the Anderson and Rubin (1949) statistic (see Andrews et al.2019).

4.1 Households

The case against backward-looking expectations One way of justifying the assumption of rational expectations is to examine more carefully the implications of a macro model with backward-looking expectations. As we will illustrate in this section, in some circumstances the assumption of backward-looking expectations implies that economic agents are implausibly naive. Consider the model of aggregate demand and aggregate supply, and suppose for simplicity that public spending always stays on trend so that $g_t = \bar{g}$ In the usual notation, our AS-AD model may then be restated as follows:

Goods market equilibrium:

$$y_t = \bar{y} = \vartheta_t - a_2(r_t - \bar{r}) \tag{5}$$

Where, $\bar{y}$ is potential GDP, $\bar{r}$-is interest rate[8] and ϑ_t is investment.

The following sections, Romer makes use of the log utility function to solve for the balanced growth path. Here, we derive the savings rate under these assumptions. To solve for the log utility case, the household's consumption choice is defined by the following Lagrangian.

The case against backward-looking expectations One way of justifying the assumption of rational expectations is to examine more carefully the implications of a macro model with backward-looking expectations. As we will illustrate in this section, in some circumstances the assumption of backward-looking expectations implies that economic agents are implausibly naive. Consider the model of aggregate demand and aggregate supply, and suppose for simplicity that public spending always stays on trend so that$g_t = \bar{g}$$ In the usual notation, our AS-AD model may then be restated as follows:

The household's lifetime budget constraint is given by:

$$C_{1t} + \frac{1}{1 + r_{t+1}} C_{2t+1} = A_t w_t \tag{6}$$

The household's lifetime income must therefore be equal to the household's present value of lifetime consumption. Period (2) consumption, C_{2t+1} is "discounted" to the present.

The household's maximization problem can be expressed as:

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[7] Ramey and Zubairy (2018) and Barnichon and Mesters (2019) use the approach for government spending and Philipps multipliers, respectively.

[8] PTN, from Economic Utility-Yield Curves Data Model, which represents Simulate Yield curve spot rate, 30-year maturity - Government bond, nominal, all issuers, whose rating is triple B - Republic of Moldova (changing composition) rate returns, Mireleess Coefficient, mirrlees_cf=abs((urx-nairu_us_urx)/urx)+1, Modified: 1992Q1 2022Q3 // ptn=1.38431667, Modified: 1992Q1 2022Q3 // ptn_ajustat=icp+ptn, where CPI - Overall Index, Index, Neither seasonally nor working day adjusted data, INDEX BASE quarterly change.

$$L = \frac{C_{1t}^{1-\theta}}{1-\theta} + \frac{1}{1+\rho}\frac{C_{2t+1}^{1-\theta}}{1-\theta} + \lambda_t(A_t w_t - C_{1t} - \frac{1}{1+r_{t+1}} C_{2t+1}) \quad (7)$$

This yields the following first-order conditions:

$$C_{1t}: \ C_{1t}^{\theta} - \lambda_t = 0 \text{ Type equation here.} \quad (8)$$

$$C_{2t+1}: \frac{1}{1+\rho}\frac{C_{2t+1}^{-\theta}}{1-\theta} - \lambda_t \frac{1}{1+r_{t+1}} = 0 \quad (9)$$

Combining and rewriting, we find the following Euler equation:

$$C_{1t}^{\theta} = \frac{1+r_{t+1}}{1+\rho} C_{2t+1}^{-\theta} \quad (10)$$

The term on the left is the marginal utility of consumption today. The term on the right is the marginal utility of consumption tomorrow, discounted to the present. We can substitute out for C_{2t+1} (using the definition given above) to solve for C_{1t} in terms of the parameters and lifetime income:

$$C_{1t} = \frac{(1+\rho)^{\frac{1}{\theta}}}{(1+\rho)^{\frac{1}{\theta}} + (1+r_{t+1})^{\frac{1-\theta}{\theta}}} A_t w_t \quad (11)$$

The utility-maximizing household defines the savings rate as a function of the discount rate and the interest rate. The savings rate is increasing in r_{t+1} - an increase in the interest rate causes households to save more, and therefore increase second-period consumption. Using the lifetime budget constraint and the solution for period (1) consumption above, we can solve for C_{2t+1}:

$$C_{2t+1} = (1 + r_{t+1})(1 - s(r_{t+1}))A_t w_t \quad (12)$$

The savings rate is:

$$s(r_{t+1}) = \frac{(1+\rho)^{\frac{1}{\theta}}}{(1+\rho)^{\frac{1}{\theta}} + (1+r_{t+1})^{\frac{1-\theta}{\theta}}} \quad (13)$$

The size of the parameter θ has important implications for how households respond to changes in the interest rate. This is because the parameter θ measures the household's willingness to substitute consumption across time. When making a choice about consumption today versus tomorrow (e.g., consuming versus saving today), one must consider the substitution and income effects. Suppose that the interest rate increases - what is the effect on savings?

- *Substitution effect*. The higher interest rate means that C_{1t} is relatively more expensive than C_{2t+1}, causing households to substitute toward future consumption. The result is an increase in savings.
- *Income effect*. The increase in the interest rate implies the household's earnings from capital investment are higher, increasing the lifetime earnings available for consumption. This should cause the household to save less of its income, increasing C_{1t}.

It can be shown that when $\theta < 1$, the substitution effect dominates. That is, the benefits of an increase in the interest rate cause the household to save more and consume less today. When $\theta > 1$, the income effect dominates. In this case, the households will respond to an increase in the interest rate by consuming more today. To demonstrate this mathematically, differentiate the savings function with respect to r. The sign of the derivative depends on the value of θ.

The following sections, Romer makes use of the log utility function to solve for the balanced growth path. Here, we derive the savings rate under these assumptions. To solve for the log utility case, the household's consumption choice is defined by the following Lagrangian:

$$L = \log(C_{1t}) + \frac{1}{1+\rho} log\ (C_{2t+1}) + \lambda_t\ (A_t w_t - C_{1t} - \frac{1}{1+r_{t+1}} C_{2t+1}) \quad (14)$$

The Euler equation is found by combining the first-order conditions:

$$\frac{1}{C_{1t}} = \frac{1+r_{t+1}}{1+\rho}\frac{1}{C_{2t+1}} \quad (15)$$

Rewriting this expression and substituting out for C_{2t+1} :

$$C_{1t} = \frac{1+\rho}{2+\rho} A_t w_t \quad (16)$$

Therefore, the savings rate is independent of the interest rate in this case. The savings rate, s = $\frac{1}{2+\rho}$. When $\Theta = 1$ the substitution and income effects associated with a change in the interest rate are offset by one another, making the savings rate independent of the interest rate.

4.2 Firms

This model schematically describes the basis of the business cycle based on Schumpeterian innovation, in which the radical innovator is copied by other players, based on a stock of information as "exogenous". The stock being diminished, thus ends the cycle of innovation. Likewise, it would put an end to the "pure" profit of the entrepreneur and thus marginalize the wave of creative destruction. However, it should be mentioned that innovation processes are characteristic of large companies, where the first three hypotheses are drawn, namely:

Hypothesis 1: Large firms are more capable than smaller firms of generating routine innovation by capturing economies of scale.
Hypothesis 2: Small firms play a decisive role in creating a monopolistic competition.
Hypothesis 3: The greater the market power is, the greater incentive to be engaged in innovation, due to the possibility of lowering costs.

According to Schumpeter, the concept of creative destruction comes to explain that innovation has become an unconditional necessity and synonymous with the survival and growth of companies.

Monopolistic rivality merges from idea thar real interest rate is counter-cycle and fore more is privately restricted by rational expectations framework,

Real interest rate:

$$r_t = i_t - \pi^e_{t+1} \quad (17)$$

However, if we assume a Cobb-Douglas production function and log utility, we can solve for the steady state level of capital per effective worker. From above, the savings rate is constant in the log utility case:

$$s = \frac{1}{2+\rho} \quad (18)$$

The real wage rate per effective worker is:

$$A_t w_t = (1-\alpha)\ k_t^{\alpha} \quad (19)$$

Therefore, the law of motion for the capital stock is:

$$k_{t+1}=\frac{1}{(1+n)(1+g)}\ \frac{1}{2+\rho}\,(1\text{-}\alpha)k_t^{\alpha} \qquad (20)$$

Since the Diamond model is a two-period model, it doesn't have a diagram analogous to the Solow Growth Model. We can use the expression above to see how a change in the model parameters affect outcomes. The underlying dynamics and convergence to steady state is similar to Solow. Consider the following:

- Increase in population growth rate n :

$$k_{t+1} > \frac{1}{(1+n)(1+g)}\ \frac{1}{2+\rho}\,(1\text{-}\alpha)k_t^{\alpha} \Longrightarrow \Delta k > 0 \Longrightarrow k\uparrow \textit{until}\ k_{t+1} \ = \ k_t \ = k_{new}^{*} \qquad (21)$$

- Increase in savings rate (decrease in ρ) :

$$k_{t+1} < \frac{1}{(1+n)(1+g)}\ \frac{1}{2+\rho}\,(1\text{-}\alpha)k_t^{\alpha} \Longrightarrow \Delta k < 0 \Longrightarrow k\downarrow \textit{until}\ k_{t+1} \ = \ k_t \ = k_{new}^{*} \qquad (22)$$

We maintain the same basic implications as the Solow Growth model. The fundamental difference in the Diamond model is that the savings rate is determined by households maximizing utility. The key implications for economic growth are identical:

- The growth rates of key variables are identical. Specifically, per capita output grows at rate g.
- Changes to the model parameters (besides g) lead to changes in steady state, but do not lead to changes in the growth rate of variables in per capita terms. In other wards, a change in the savings rate affects per capita income, but does not affect its growth rate.

4.3 Government

The government's contingent liabilities are potential claims on the government that may or may not be incurred depending on macroeconomic conditions and other events. Unlike direct liabilities, such as pension obligations, which are predictable and will arise in the future with certainty, contingent liabilities are obligations triggered by discrete but uncertain events. By nature, contingent liabilities are difficult to measure. While information is usually available on debt formally guaranteed by the central government, debt not explicitly guaranteed has often been an important contributor to public debt buildup.

The market-access country (MAC) debt sustainability analysis (DSA) framework is based on a general and flexible identity characterizing the evolution of the stock of public debt. In its most basic form,

the evolution of public debt can be characterized in the following way:

$$D_{t+1} = \frac{e_{t+1}}{e_t}(1 + i_{t+1}^{f}) * D_t^{f} + (1 + i_{t+1}^{d}) * D_t^{d} - (T_{t+1} + G_{t+1} - S_{t+1}) + O_{t+1} + RES_{t+1}\ ) \qquad (23)$$

(1)

Obligations associated with the stock of debt from the previous period — Primary Fiscal Balance — Other one-time factors

Where subscripts refer to time periods and superscript *"f"*, *"d"*, refer to foreign-currency and domestic-currency denominated debt, respectively.

D_t^f is the stock of foreign currency as obligations-denominated debt at the end of period t.
D_t^d is the stock of domestic currency as obligations -denominated debt at the end of period t.
e_{t+1} is the stock of foreign currency as obligations -denominated debt at the end of period t.
i_{t+1}^f is the stock of domestic currency as obligations -denominated debt at the end of period t.
i_{t+1}^d is the stock of domestic currency as obligations -denominated debt at the end of period t.
T_{t+1} is the stock of taxes-denominated debt at the end of period t.
G_{t+1} is the stock of grants-denominated debt at the end of period t.
S_{t+1} is the stock of expenditures-denominated debt at the end of period t.
O_{t+1} is the stock of other one-time factors-denominated debt at the end of period t.
RES_{t+1} is the stock of other one-time factors -denominated debt at the end of period t.

For simplification, the primary balance (PB) is no longer decomposed into taxes (T), grants (G) and expenditures (S). The basis for the decomposition of the change in the debt-to-GDP ratio—the debt dynamic—is as follows:

$$D_{t+1} = (1+\varepsilon_{t+1}) * (1+i_{t+1}^f) * D_t^f + (1+i_{t+1}^d) * D_t^d - PB_{t+1} + O_{t+1} + RES_{t+1} \qquad (24)$$

Where, ,$1+\varepsilon_{t+1} = \frac{e_{t+1}}{e_t}$

A CENTRAL BANK BALANCE SHEET	
ASSETS	**LIABILITIES**
• Official Foreign Reserves	• Banknotes in Circulation
• Claims Related to Monetary Policy Operations • Credits • Repos	• Liabilities Related to Monetary Policy Operations • Minimum Reserves • Deposits • Issued Central Bank Debt Instruments
• Securities Held for Monetary Policy Purposes	• Capital/Reserves

5 Effective nominal interest rate (weighted average)

Where it+1 is the effective nominal interest rate (weighted average)

Where i_{t+1} is the effective nominal interest rate (weighted average)

$$d_{t+1} - d_t = \frac{1}{\rho_{t+1}}\left[d_t * (i_{t+1} - * \pi_{t+1} * (1+g_{t+1})) + \varepsilon_{t+1} * (1+i_{t+1}^f) * d_t^f - d_t * g_{t+1}\right] - pb_{t+1} + o_{t+1} + res_{t+1} \qquad (25)$$

Contribution of effective interest rate	Contribution of the exchange rate	Contribution of real GDP growth	Contribution of primary balance and other factors

This can also be expressed in terms of real interest rates and real exchange rates:

$$d_{t+1} - d_t = \left(\frac{1}{1+g_{t+1}}\right) * \left(d_t * \left[r_{t+1}^d \frac{d_t^d}{d_t} + r_{t+1}^f \frac{d_t^f}{d_t}\right] - d_t * g_{t+1} + d_t^f * \xi_{t+1} * (1 + r_{t+1}^f)\right)$$
$$-pb_{t+1} + o_{t+1} + res_{t+1} \qquad (26)$$

Contribution of effective interest rate	Contribution of the exchange rate	Contribution of real GDP growth	Contribution of primary balance and other factors

5.1 Optimization and Pension System

Expectations:

$$\pi_t^e = \pi_{t-1}$$

We consider the following pension system. The pension system is modeled as a pay-as-you-go system, consisting of defined contributions. This system is financed by gross salary pension taxes. To run properly, the pension system has a balanced budget every year. In a certain year all pensioners receive the same pension.

$$P_t^j = \sum_{s=21}^{72} \sum_{j=1}^{4} h_{s,t}^j \qquad (27)$$

5.1.1 Welfare Distribution

In order to assess the reform of the single tax rate, we measured the utility for each type j agent, based on the two different tax systems. There are two formulas for the utility function:

$$U_{FLAT_s}^j = \sum_{s=21}^{72} \beta\, [ln(1-x)C_{FLAT_s}^j + \frac{U_{FLAT_s}^{j\; 1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} - (1-K) \qquad (28)$$

$$U_{PRG_s}^j = \sum_{s=21}^{72} \beta\, [ln(1-x)C_{PRG_s}^j + \frac{U_{PRG_s}^{j\; 1-\frac{1}{\gamma}}}{1-\frac{1}{\gamma}} - (1-K) \qquad (29)$$

To measure the effect of applying such a tax system, I first calculate x_j. In this way it can be more easily estimated to increase the utility of each category of population in the consumption equivalent.

5.2 Model-Based Monetary Policy Analysis and Forecasting

5.2.1 Monetary policy reaction function or Policy rule. Taylor Rule (original version):

$$i_t = r_t + \pi_{t+1}^e + h(\pi_t - \pi_t^*) + b(y_t - \bar{y}) \qquad (30)$$

where r_t is the Federal funds rate, π_{t_t} is the rate of inflation over the previous four quarters and $y_t - \bar{y}$ is the percentage deviation of real GDP from target. This implies that the policy interest rate goes up if inflation increases above the 2% target or if real GDP rises above trend GDP. Taylor (1998) modified this rule by adding two extra variables, namely the central bank's target inflation rate (π^*) and estimate of the equilibrium real rate of interest (r_t^f) as shown below:

$$i_t = \pi_{t+1}^e + b(y_t - \bar{y}) + h(\pi_t - \pi^*) + r_t^f$$

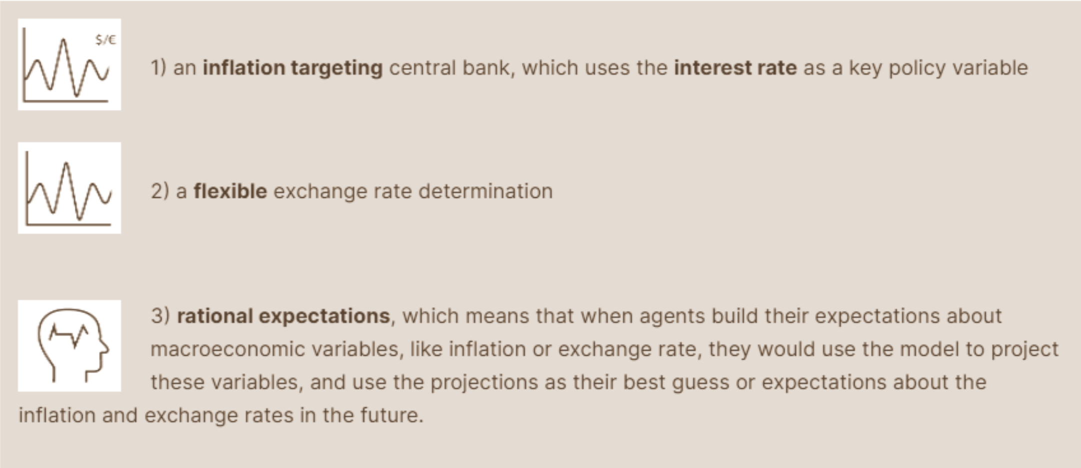


Figure 12: Goal Priority in Economic Poicy (monetary policy)

\

$$i_t = r_t + \pi_{t+1}^e + h(\pi_t - \pi_t^*) + b(y_t - \bar{y}) + \mathrm{c}(bdf_t - \overline{bdf}) + \mathrm{d}(exr_t - \overline{exr}) + \mathrm{e}(len_t - lnn) + \mathrm{f}(yed_t - \overline{yed}) + \mathrm{g}(nairu_t - \overline{nairu}) + \mathrm{k}(yep_t - \overline{yep}) + \mathrm{l}(wage_t - \overline{wage}) + \mathrm{m}(wrn_t - \overline{wrn}) + \mathrm{n}(paxl_t - \overline{paxl}) + \mathrm{x}(vat_t - \overline{vat}) \quad (31)$$

where,

bdf – budget fiscal deficit;
$\overline{\text{bdf}}$- budget fiscal deficit (criteria) – 3.04074% of GDP;
exr - exchange rate;
len – employees;
lnn – total employment;
yed – gdp deflator;
nairu – non-accelerating inflation rate of unemployment (nairu);
yep – potential GDP;
wage – salary, monthly allowance;
wrn -Wage per Head. Calculated as the ratio of compensation of employees, and total employment (WRN = WIN / LNN).
paxl – pension, monthly allowance;
vat - value-added tax (VAT);
h – 0.3;
b – 0.7;
c –(-0.2);
d –(-1.2);
e,g,l,n – (-0.05);
f,k,m,x -0.05.

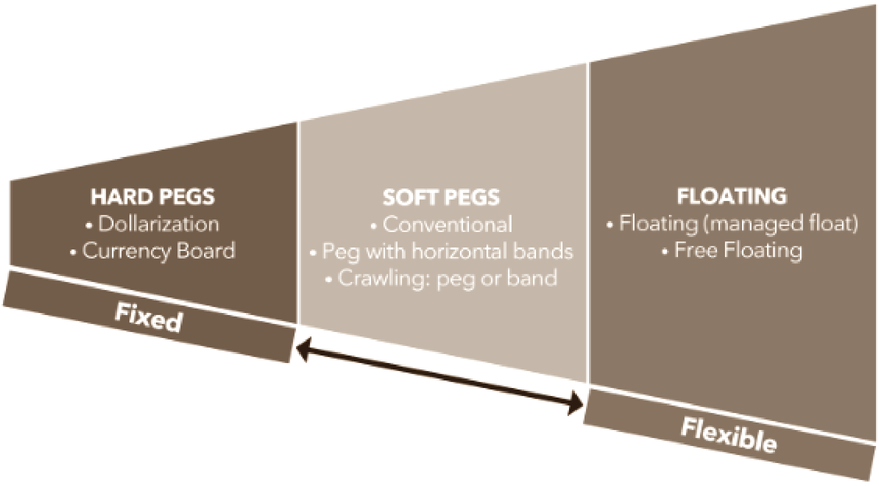
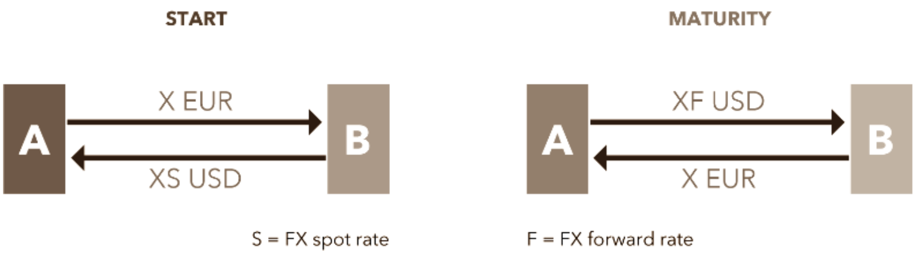


Figure 3: Exchange Rate Management

At the start of the operation, A sells X EUR to party B in return for XS USD, where S is the FX spot rate. When the contract expires at maturity, A sells XF USD to B, and B provides X EUR to A, where F is the forward rate as of the start. In other words, the term spot rate refers to the exchange rate, i.e., the price of a currency to be delivered immediately, rather than in the future. By contrast, the forward leg of the transaction refers to the sale/purchase of the currency on a fixed future date. This is determined at the start of the operation.

A foreign exchange swap is a typical "derivatives" transaction. A foreign exchange forward transaction is another type of a derivatives contract. This involves an agreement between two parties to exchange two currencies at a future date and an agreed exchange rate (i.e. there is no "spot" transaction). Some central bank laws grant the power to the central bank to conduct such other derivatives transactions as well within their monetary policy framework.



5.2.2 Phillips curve (original version):

is is the equation that describes the relationship between the inflation and real marginal costs. This equation also belongs to the category of structural equations.

In contrast, equations in a reduced form usually describe the dynamics of a variable, but do not tell us much about the economics of the underlying processes. In fact, we often use simple autoregressions in such cases. The long-term (potential) rate of economic growth will be described in our model using an autoregressive process.

5.2.3 IS curve (original version):

$$\hat{y}_t = b_1 \widehat{y_{t-1}} - b_2 \text{mci} + b_3 \widehat{y_t^*} + \varepsilon_t^y \quad (32)$$

where$\widehat{y_{t-1}}$Lagged output gap; mci -- Real monetary conditions index and $\widehat{y_t^*}$Foreign output gap.

From theoretical and empirical literature, which studies monetary policy transmission, we identify four transmission channels:

1. The asset price channel;, with wealth and const of equity sub-channels;
2. The credit channel, which we further look at the bank lending and the balance sheet sub-channels;
3. The interest rate channel;
4. The exchange rate channel, including direct and indirect sub-channels.

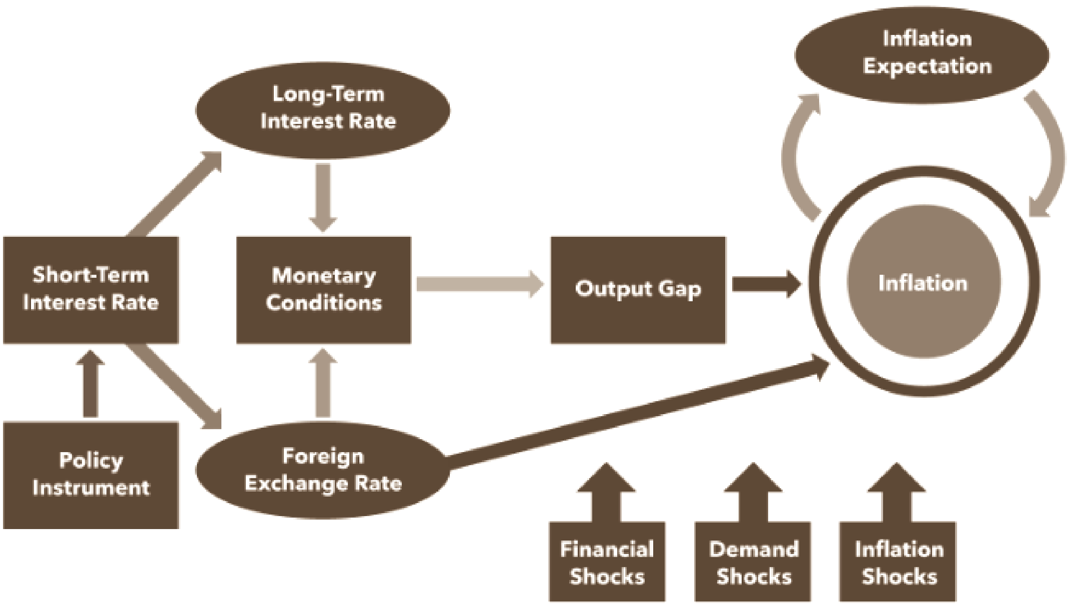
Table 2: Transmission Channels

5.3 Expectations

$$\pi_t = \pi_t^e + \nu(y_t - \bar{y}) + s_t \quad (33)$$

Where, π_t^e – expected inflation in period t;
ν- is the bankruptcy threshold;
$y_t - \bar{y}$ – output gap;
s_t – short term interest rate.

5.4 Credit ranking



A single banking sector supplies credit to firms in a perfectly elastic fashion but at different interest rates for each firm. The nominal interest rate is set as

$$i_X = r_f + r_i^P - i_X^e + \upsilon(y_t - \bar{y}) + s_t + \frac{ddp^e}{\nu} \quad (34)$$

X= ktn, ptn, ytn, qtn, mtn, stn (stn, short-term nominal interest rate, mtn, medium-term nominal interest rate, ltn, long-term nominal interest rate).
Where,

$$\upsilon - 0.05$$[9]

r_f is the risk free rate (assumed to be equal to the policy rate) and r_i^P;
y_t is gdp growth;
$\bar{y}$is potential gdp;
s_t, rate of population saving from total assets, Million of Moldovan Leu;
$ddp^e$is expected level of public debt;
ν is the bankruptcy threshold.

Interest rate	Fogged	Interest rate	Fogged
stn	Industrial Economics	ltn	Keynesian Economics
mtn	Internet and Technology	qtn	Public Choice Theory
ytr	Internet Banking	ytn	Energy Subsidy Reform
ptn	Social Security and Labour Market	ktn	Budget Deficit and Public Debt
dtn	BP: Investment and Capital Account	itn	Credit Ranking \& HICP

Table 3: Moldovan Interest rate

[9] In this equation, the parameters aπ and ay must be positive. At the same time, Taylor in the work published in 1993 proposed setting these parameters at the level of 0.5

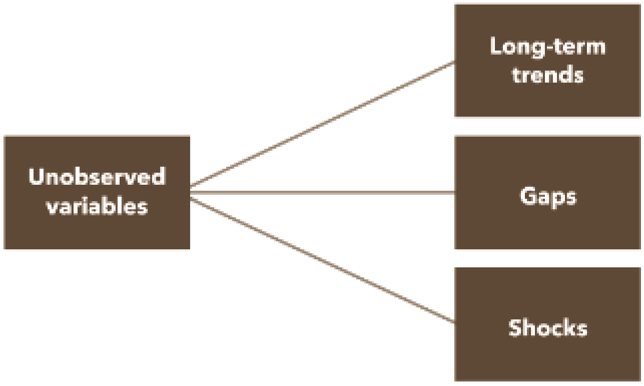


Figure 6: Unobserving variables

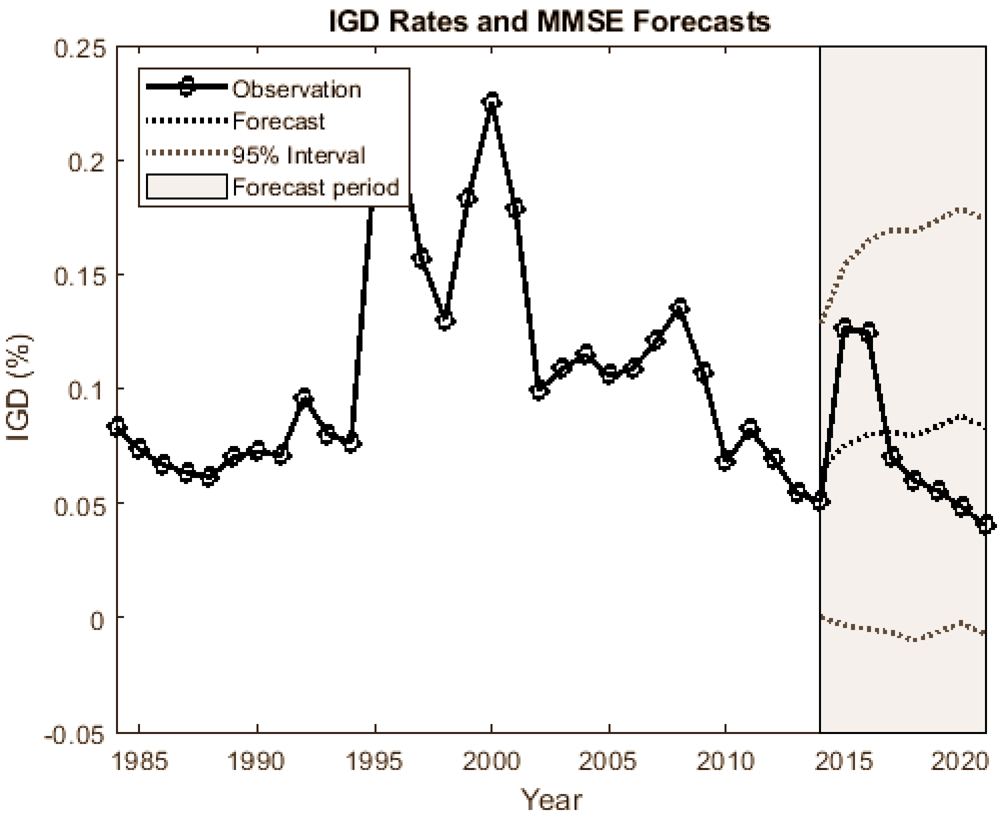


Figure 7: Behavior of long term interest rate (keynesian economics): long-term trend approach

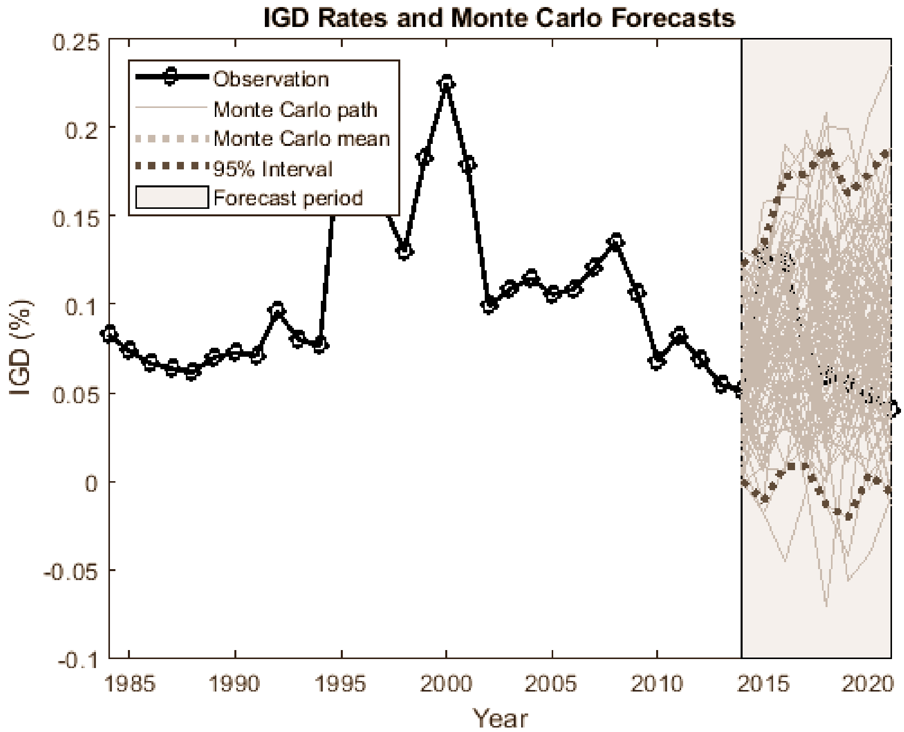


Figure 8: Behavior of long term interest rate (keynesian economics): shocks and gaps approach

5.5 Banking sector

A single banking sector supplies credit to firms in a perfectly elastic fashion but at different interest rates for each firm. The nominal interest rate is set as

$$i_t = r_f + r_i^p \qquad (35)$$

where r_f is the risk free rate (assumed to be equal to the policy rate) and r_i^p

is the risk premium asked to the firm which is equal to

$$r_{it}^p = d_{it} - 1\omega \qquad (36\ )$$

where ω \in (0, 1)$ is a constant parameter and d_{it} is calculated in equation as

$$d_{it} = \frac{d_{it-1}/K_{it-1}}{\nu} \qquad (37)$$

is an index that quantifies the financial soundness of a firm, being close 1 when the firm's leverage ratio approaches the bankruptcy threshold ν and
equal to 0 when the firm has no outstanding debt. Accordingly, as the leverage ratio approaches the bankruptcy threshold
ν, the risk premium becomes closer to its maximum ω. For firms with no debt, r_i^p
Consequently, the real interest rate is

$$r_{it} = i_{it} - \tilde{P} \qquad (38)$$

For simplicity, the profit of the banking sector are accumulated as a precautionary buffer by banks (as in Godley and Lavoie, 2007).

5.6 Money and Output St. Louis Equation[10] (European version):

$$bdf_t^{criteria} = 0.3 * M0_t^{bdf} + 0.7 * M1_t^{bdf} + 0.7 * M3_t^{bdf} + .7 * M3_t^{bdf} \quad (39)$$

Criteria[11] – 3.04.074 (which can be interpreted in a scale and "troix"[12]
Granger Causality test[13], interpreted interfere of transportation and communication policy; rather an example of output results, than government investment.

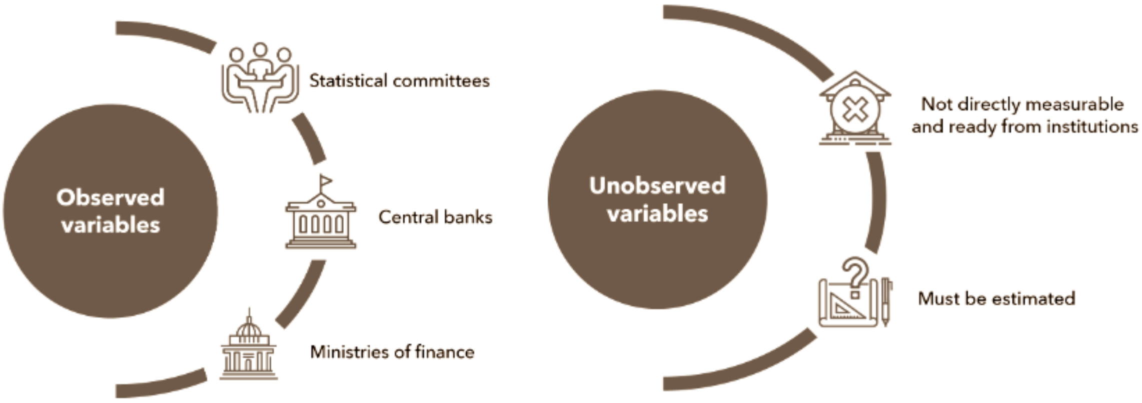


Figure 9. Model Estimation

Model Estimation

Consumer's priority

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[10] Leonall Andersen and Jerry Jordan of the Federal Reserve Bank of St. Louis (Andersen, Jordan, 1968).
[11] Based on European Union and Maastricht Criteria (1993), budget deficit is subject of constraint and level of 3\% from Gross Domestic Product (GDP) or Gross National Product (GNP), For more information, please visit FRED - Federal Bank of Saint Louis website, fred.com)
[12] Author consider that government spendings and investment should be consider on a scale from 5 to 6 on budget deficit as follow: 5 Speculative; 5 Pre-excesive deficit; 6 Excesive deficit.
[13] M1 does Granger Cause M0
M1 does Granger Cause M2
M1 does Granger Cause M3
M2 does Granger Cause M0
M2 does Granger Cause M3
M3 does Granger Cause M1
M3 does Granger Cause M2

M0 does not Granger Cause M1
M0 does not Granger Cause M2
M0 does not Granger Cause M3
M2 does not Granger Cause M1
M3 does not Granger Cause M0

- (First) -- Harmonized Index of Consumer's Price;
- (the second) -- Nominal Long-Term Interest Rate (Euro area 10-Year Government Benchmark bond yield (LTN) and Nominal Short-Term Interest Rate (Euro area 3-Month Government Benchmark bond yield (LTN);
- (the third) -- Budget Deficit and Fiscal Policy (BDF and DDAP)\footnote{David Romer, Advanced Macroeconomics, Chapter 13 Edition 5th, Mc Graw Hill, 2018)};
- (the fourth) -- Nominal Effective Exchange Rate (NEER), Euro area-19 countries vis-a-vis the NEER-38 group of main trading partners , Base year 1999 (1999Q1 = 1) --(EEN).

6 Benchmark and Okun's law

In economics, Okun's law [14]is an empirically observed relationship between unemployment and losses in a country's production. It is named after Arthur Melvin Okun, who first proposed the relationship in 1962. The "gap version" states that for every 1% increase in the unemployment rate, a country's GDP will be roughly an additional 2% lower than its potential GDP. The "difference version" describes the relationship between quarterly changes in unemployment and quarterly changes in real GDP. The stability and usefulness of the law has been disputed.

Okun's law may more accurately be called "Okun's rule of thumb" because it is an approximation based on empirical observation rather than a result derived from theory. Okun's law is approximate because factors other than employment, such as productivity, affect output. In Okun's original statement of his law, a 2% increase in output corresponds to a 1% decline in the rate of cyclical unemployment; a 0.5% increase in labor force participation; a 0.5% increase in hours worked per employee; and a 1% increase in output per hours worked (labor productivity).

Okun's law states that a one-point increase in the cyclical unemployment rate is associated with two percentage points of negative growth in real GDP. The relationship varies depending on the country and time period under consideration.

The relationship has been tested by regressing GDP or GNP growth on change in the unemployment rate. Martin Prachowny estimated about a 3% decrease in output for every 1% increase in the unemployment rate. However, he argued that the majority of this change in output is actually due to changes in factors other than unemployment, such as capacity utilization and hours worked. Holding these other factors constant reduces the association between unemployment and GDP to around 0.7% for every 1% change in the unemployment rate. The magnitude of the decrease seems to be declining over time in the United States. According to Andrew Abel and Ben Bernanke, estimates based on data from more recent years give about a 2% decrease in output for every 1% increase in unemployment.

There are several reasons why GDP may increase or decrease more rapidly than unemployment decreases or increases:

As unemployment increases,

primary factors

- a reduction in the multiplier effect created by the circulation of money from employees;
- unemployed persons may drop out of the labor force (stop seeking work), after which they are no longer counted in unemployment statistics;
- employed workers may work shorter hours;

[14] Okun, Arthur M. "Potential GNP: Its Measurement and Significance," American Statistical Association, Proceedings of the Business and Economics Statistics Section 1962. Reprinted with slight changes in Arthur M. Okun, The Political Economy of Prosperity (Washington, D.C.: Brookings Institution, 1970).

- labor productivity may decrease, perhaps because employers retain more workers than they need.

'secondary factors

- interest rate that affect young population
- results of involving in contract with telecom industry
- educational factors
- asymmetries of pro-cyclical unemployment and monetary policy
- shocks and factors that involves intro market failures such as "The Market for 'Lemons".Adverse selction and moral hazard.\footnote{In 1996, a Nobel Memorial Prize in Economics was awarded to James A. Mirrlees and William Vickrey for their "fundamental contributions to the economic theory of incentives under asymmetric information"}

'additional factors

substantial differences in the structure of the economy
the degree of absorption of European funds
the possibility to access credits in different branches
economic diversification
dynamic inconsistency of economic policies such as [...]

- agriculture
- industry
- energy [industry]
- competition/concurrency [sector]
- social
- internal trade
- fiscal
- monetary

One implication of Okun's law is that an increase in labor productivity or an increase in the size of the labor force can mean that real net output grows without net unemployment rates falling (the phenomenon of "jobless growth")

Okun's Law is sometimes confused with Lucas wedge.

7 Calibration and Mathematical statement

The gap version of Okun's law may be written (Abel \& Bernanke 2005) as:

$$\frac{\bar{Y}-Y}{\bar{Y}} = c(u - \bar{u}) \qquad (40)$$

Y - actual output
$\bar{Y}$ - potential output
u - actual unemployment rate
$\bar{u}$- natural rate of unemployment
c = the factor relating changes in unemployment to changes in output

In the Republic of Moldova since 1996 or so, the value of c has typically been around 2 or 3, as explained above.

The gap version of Okun's law, as shown above, is difficult to use in practice because $\bar{Y}$ and $\bar{u}$ can only be estimated, not measured. A more commonly used form of Okun's law, known as the difference or growth rate form of Okun's law, relates changes in output to changes in unemployment:

$\Delta\frac{Y}{\bar{Y}}$,=k-cΔu where:
Y and c are as defined above
ΔY is the change in actual output from one year to the next
Δuis the change in actual unemployment from one year to the next
k is the average annual growth rate of full-employment output
At the present time in the Republic of Moldova, k is about 3% and c is about 2, so the equation may be written

$$\Delta\frac{Y}{\bar{Y}} = 0.03 - 2\Delta u \quad (41)$$

The graph at the top of this article illustrates the growth rate form of Okun's law, measured quarterly rather than annually.

We consider six types of Moldovan macroeconomic shocks (coverage in parentheses): (1) government spending shocks, using Ramey and Zubairy's (2018) narrative series on defense spending news as an instrument (1945Q1-2013Q4); (2) monetary shocks, using Romer and Romer' (2004) monetary surprises extended by Wieland and Yang (2020) as an instrument (1969Q1-2007Q4); (3) tax shocks, using Mertens and Montiel Olea's (2018) narrative series exogenous average marginal tax rates changes (1964-2012); (4) oil shocks, using Kilian's (2008) exogenous OPEC oil production series (1971-2004Q3); (5) financial shocks, following Gilchrist and Zakrajek (2012) and using the Excess Bond Premium in combination with short-run identification restrictions (1973Q1-2016Q4); (6) technology shocks, using Francis et al.'s (2014) approach based on medium-run restrictions on the effects of technology shocks (1949Q1-2015Q3). For (1)-(4), instrumental variables are readily available. Plagborg-Møller and Wolf (Forthcoming) show how identification procedures in (5) and (6) can be implemented in the Local Projection framework and their results are straightforward to transfer to this setting.
Figure 1 plots the instruments (normalized to unit standard deviation to ease orientation) over time. I use US quarterly data to estimate shock-specific Okun elasticities for a horizon of up to five years, i.e. $h = 0$ until e. $h = 20$To increase estimator efficiency, I add four lags of log real GDP and the unemployment rate as controls.[15]

The paper presents a medium scale model of the Moldovan economy, with specific focus on the consumption-goods producing sector, in order to introduce and study a scenario in which financial distress and uncertain business environment can lead to deflation even in the presence of growing employment, and to test a battery of possible policies and policy mixes. The sensitivity analysis produces a set of relevant results. First the inflation rate is strongly dependent on the sensitivity of firms' hiring decisions to uncertainty, proxied by the standard deviation of demand over recent periods. The elasticity of firms' hiring of secondary workers to leverage and uncertainty can explain the low correlation between employment and prices in a dual labour market with different wage setting mechanisms. Second, this conclusion is straightened by the high sensitivity displayed by both inflation and employment-price correlation to the primary workers' barganing power. In particular, higher bargaining power for workers determines higher inflation and higher employment-price

[15] For tax shocks, I use annual data and two lags because the Mertens and Montiel Olea (2018) instrument is available at an annual frequency only.

correlation for any mix of monetary and fiscal policy and for most of the parameter space for firms' hiring decisions. Third, the effect of the policy rate on inflation depends on the firms' reactions to leverage and, mostly, rely on demand volatility. In any setting, a stronger indexation of minimum wage to price dynamics generates higher inflation and can boost the expansionary effects of a loose monetary policy. Finally, the model captures the spike in inflation generated by increases in the consumption tax rate (although it seems to overestimate the long-term effects) and predicts its strong recessionary effects, in line with the empirical evidence.
Overall the analysis suggests that the interaction between firms' financial fragility and the different factors affecting wages in a dual labor market affects the outcomes of economic policy and can generate unwanted or unexpected effects. In a context where monetary policy is exhausting its options, bringing inflation closer to the Bank of Japan target of 2%, requires a comprehensive strategy aimed at supporting wage dynamics, through suitable institutional arrangements for minimum wage and wage bargaining. The planned further steps in this research project involve the microfoundation of the intermediate-goods producing firms and of the household sector.
In particular, we intend to study the network of upstream and downstream firms using the available data on the commercial credit network in Japan. Although the model captures the negative trend in labor units, an aspect that admittedly has been at least partially left out at this stage is the studyof the possible consequences of tightening in the labor market, which will require an explicit modeling of labor supply. Finally, since other economies are experiencing low inflation and flattening of the Phillips curve, it may be interesting to generalize the model's settings to carry on a comparative analysis. Although the model is built and calibrated on the Japanese economy, the framework is flexible enough to assess whether our conclusions are valid in other institutional contexts.

7.1 Macroeconomic shocks and estimation details

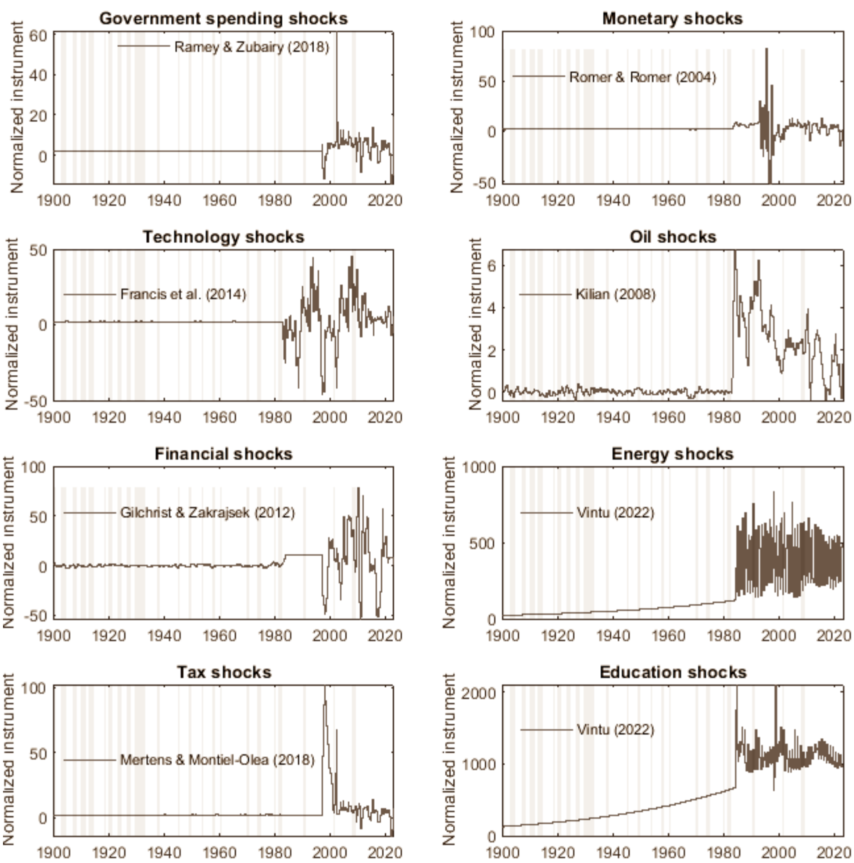

Figure 10. Instrument for macroeconomic shocks.

For financial and technology shocks, we add further controls for identification. Following Ramey and Zubairy's (2018) suggestion, I allow for quadratic deterministic trends in the unemployment rate and log output.[16]

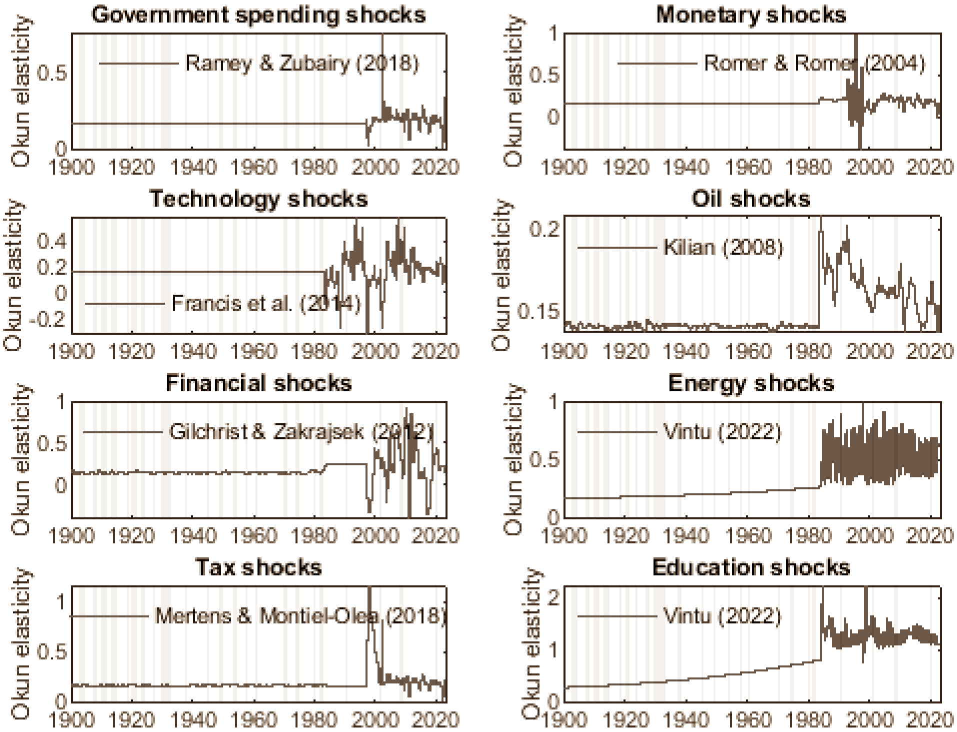

Figure 11. Macro shocks-specific Okun Elasticity.

Table 1: Medium elasticity of unemployment

Period	**Increase/decrease of unemployment**	**Increase of GDP/M2 with 1p.p**
Time		
1982-1990	1.25	GDP
	6.81	M2
1991-1997	1.64	GDP
	19.65	M2
1998-2006	1.63	GDP
	18.79	M2
2007-2011	1.06	GDP
	19.98	M2
2012-2021	2.55	GDP
	0.36	M2

Marginal elasticity of unemployment

Period	**Increase/decrease of unemployment**	**Increase of GDP/M2 with 1p.p**
1982-1990	2.09	GDP
	0.37	M2

[16] Thus, we estimate a gap version of Okun's Law. I show in the online appendix that key results are robust to using a difference version of Okun's Law, i.e. first differenced data

Table 1: Medium elasticity of unemployment		
Period	**Increase/decrease of unemployment**	**Increase of GDP/M2 with 1p.p**
Time		
1991-1997	0.5	GDP
	0.18	M2
1998-2006	1.55	GDP
	0.17	M2
2007-2011	8.00	GDP
	2.49	M2
2012-2021	7.6	GDP
	4.4	M2

7.2 Derivation of the growth rate from long-run equilibrium

We start with the first form of Okun's law:

$$\frac{\bar{Y}-Y}{\bar{Y}} = 1 - \frac{Y}{\bar{Y}} = c(u-\bar{u}) \qquad (42)$$

Taking annual differences on both sides, we obtain

$$\Delta\left(\frac{Y}{\bar{Y}}\right) = \frac{Y+\Delta Y}{\bar{Y}+\Delta\bar{Y}} - \frac{Y}{\bar{Y}} = c(\Delta\bar{u} - \Delta u) \qquad (43)$$

Putting both numerators over a common denominator, we obtain

$$\frac{\bar{Y}\Delta + Y\Delta\bar{Y}}{\bar{Y}(\bar{Y}+\Delta\bar{Y})} = c(\Delta\bar{u} - \Delta u) \qquad (44)$$

Multiplying the left hand side by $\frac{Y+\Delta Y}{\bar{Y}+\Delta\bar{Y}}$which is approximately equal to 1, we obtain

$$\frac{\bar{Y}\Delta\, Y + Y\Delta\bar{Y}}{\bar{Y}Y} = \frac{\Delta Y}{Y} - \frac{\Delta\bar{Y}}{\bar{Y}} \simeq c(\Delta\bar{u} - \Delta u) \qquad (45)$$

$$\frac{\Delta Y}{Y} \simeq \frac{\Delta\bar{Y}}{\bar{Y}} + c(\Delta\bar{u} - \Delta u) \qquad (46)$$

We assume that $\Delta\bar{u}$, the change in the natural rate of unemployment, is approximately equal to 0. We also assume that

$\frac{\Delta\bar{Y}}{\bar{Y}}$, the growth rate of full-employment output, is approximately equal to its average value, k. So we finally obtain

$$\frac{\Delta Y}{Y} \simeq k - c\Delta u \qquad (47)$$

7.3 Okun's law in the Republic of Moldova

Taking into account that the population of the Republic of Moldova is.4.3 million, -- the labor force representing 1.8 million or 40% of the total population, 1 percentage point of the decrease in unemployment which represents NAIRU -- 5% at the moment (90,000 is 1 p.p of unemployment), would decrease the growth rate of the gross domestic product, by 2 percent or with 5,200 million Moldovan Leu, or the value of industrial production for an annual quarter.

Economic Growth (eg.) is a concept that characterizes the relationship between the current value of production and its level at constant prices.

Let's take into account the nominal GDP, which calculates the gross domestic product due to inflation considerations.

Suppose that the nominal gross domestic product is in the value of current prices, which shows that inflation must be considered for the calculation of the real gross product. Gross domestic product at constant prices is an indicator that excludes price increases.

Aggregate indicators that include the inflation rate can be considered nominal indicators.

The inflation rate can be calculated by the government or it can be derived from the gross domestic product at current prices.

Sensitivity is a concept that measures the degree of influence of aggregate indicators.

Table 2: Education system from total GDP and education elasticity on 1.p.p M2 (growth) on each category of population, X_j

Level of education	1982-1990	1991-1997	1998-2006	2007-2011	2012-2021
ω_1[17]	(9.8641)/2.61	(8.5219)/3.47	(8.8151)/3.74	(6.6249)/5.52	(4.7696)/7.75
ω_2[18]	.../2.97	.../3.61	.../3.88	.../5.67	.../7.79
ω_3[19]	.../1.44	.../3.55	.../3.93	.../5.61	.../7.82
ω_4[20]	.../2.96	.../3.60	.../3.87	.../5.59	.../7.95
Average X_i	9.864110.0017	8.5219	8.8151	6.6249	4.7696

[17] Aplicația, Modelarea "M993 ('(I) decalajele de potrivire a - potential gdp (yep)'. Pairwise Granger Causality Test: N/A (Not Applicable, cause of Conf. Int. 5 %), (I) does not Granger Cause (II), (I) does not Granger Cause (III), (I) does not Granger Cause (IV).

[18] '(II) Ajustarea sezoniera - seasonally adjustment'. Pairwise Granger Causality Test: N/A (Not Applicable, cause of Conf. Int. 5 %).

[19] '(III) Firme și întreprinderile mici și mijlocii'. (obs. According to the statistical data, the Republic of Moldova represents a market for about 53600 SME units, generating revenues of over 137.5 billion of Moldovan LEU annually. Pairwise Granger Causality Test: N/A (Not Applicable, cause of Conf. Int. 5 %), (III) does not Granger Cause (I), (III) does not Granger Cause (II).

[20] '(IV) Compuri și computere. Pairwise Granger Causality Test: N/A (Not Applicable, cause of Conf. Int. 5 %), (IV) does not Granger Cause (I)

8 Data

In this sense it should be viewed as an effort to gather and process all the available information in order to cover the gaps in the specific statistical needs to model the euro area. The cut-off date for this update is 27 July 2018} is based on the 18th update of the Area-wide Model (AWM) database[21]. This update, and final version is 3 years out-of-up-to-date, and comparission \\ Macroeconomic-Cointed Data Model[22]compared to the previous one carried out in 2017, extends the database to 2017Q4. As in previous versions, it has been constructed using both euro area data reported by the ECB or Eurostat, where available. It has then been backdated using the numbers of the previous version of the database (in general history pre-1996 has been frozen since the 5th update). This paper[23]which we created during your experience at "National Institute of Economic Research" . And "Analysis of Financial Stability: The Construction of a New Composite Financial Stability Index for Euro Area"[24]

The coverage of fiscal variables is relatively limited[25] . Users interested in fiscal issues, should refer to the euro area fiscal database[26]
, which provides a very rich and more consistent framework for the fiscal series.

The AWM database covers a wide range of quarterly euro area macroeconomic time-series. The updated database starts for most variables in 1970Q1 and is now available until 2017Q4. This note elaborates on the methodology and procedures used to update the Area-wide Model database. The first section draws on previous versions of the documentation and briefly explains the sources and methodology to build the historical data. The second section explains how the data for earlier periods are re-scaled to bring the figures in line with recent euro area aggregates. The subsequent sections list the units and seasonal adjustment of the series, elaborates on the main changes with respect to the previous version of the database and gives a tentative timetable for the next update. The document closes with a summary and an appendix with the codification of the database.

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[21] For a description of the model see ECB working paper No. 42: 'An Area-wide Model (AWM) for the euro area' by \textbf{Gabriel Fagan, Jérôme Henry and Ricardo Mestre (January 2001).

[22] is available on https://www.dropbox.com/sh/edldp1gxy5wfh70/AADbIsphfT0tEFp_fA_yPmwca?dl=0

[23] For questions on the construction of the database please email: AWMdatabase@ecb.europa.eu. Empirical testing should be awareness of that this is an update of the database provided with the ECB working paper No. 42, undertaken by ECB staff and does not represent in any way an official ECB data source. Our model data base is named \textbf{Macroeconometric-Impulse Data Model} (statistical data for analysis) (X-MIDM, 105 obs.) and \textbf{Macroeconomic-Cointeg Data Model} (statistical data for modeling) (DD,162 obs.)

[24] Authors: VÎNTU Denis and NEGOTEI Ioana-Alina, "Ovidius" University Annals, Economic Sciences Series. Volume XVIII, Issue 1 /2018. which we grouped macroeconomic variables into 4 different index-is, namely: \textbf{Composite financial stability index (CFSI)} --1) external sector index (ESI); 2) Real Sector Index (RSI) 3) Financial sector index (FSI); 4) Global economy index (GEI);, paper was presented in context of Brexit in 2018 and global-local vs regional "dilemma", see cassettes at the end of the paper. This study is based on ALBULESCU Claudiu-Tiberiu "Stabilitatea sectorului financiar in conditiile aderarii Romaniei la UEM", (PhD thesis) is available on https://www.researchgate.net/ or https://tinyurl.com/yamdn29d

[25] The only fiscal variables available are real government consumption (GCR), government consumption deflator (GCD) and indirect taxes net of subsidies (TIN), the data after 1995Q1 reflects the figures from the ESA2010 database while the numbers before 1995Q1 are related to the frozen information from the 5th update of the AWM database. These series have been kept in the AWM database dataset for consistency reasons (in terms of methodology) with the rest of the series.

[26] Fiscal dataset constructed following: Joan Paredes, Diego J. Pedregal, Javier J. Pérez, Fiscal policy analysis in the euro area: Expanding the toolkit, Journal of Policy Modeling, Available online 28 July 2014, ISSN 0161-8938, http://dx.doi.org/10.1016/j.jpolmod.2014.07.003. For questions on the fiscal database please email: euro_area.fisca_database@ecb.europa.eu .

9 Discussions

In context of Covid 19 and 2020's pandemic, modern advancement has been a significant reason for monetary development. Yield extension has been related with send out advancement, expanded exchange opening, monetary progression and a better business environment in the Republic of Moldova. Nonetheless, net exports and particular government investment have been utilized too.

As neediness in many emerging nations is an overwhelmingly provincial issue, expanded agrarian efficiency is much of the time a key to destitution decrease at the beginning of monetary turn of events. This has been the case for example in Moldova. Nations that have begun their monetary changes - as Moldova did.

- with farming change or generally underscored provincial improvement have - toward the start - commonly experienced declining disparity because of a diminishing of country caching down and speed of convergence.

10 Results and Conclusions

The results from Monte Carlo simulations are displayed in Figure 8. The empirical data are yearly averages from year 2000. In the graph, the results for inflation and share of secondary workers are isolated because they are the results of the optimization in the parameter estimation. The model is able to replicate on average the main quantitative features of the Moldovan economy of the last twenty years in terms of growth and demand structure. The job creation rate reported for the simulation is the variation in the aggregate number of permanent workers. The unit used for labor demand is the number of hours, which is a more suitable proxy for this specific quantity than the number of employees (which we use to measure the distribution of workforce between primary and secondary, in the absence of hourly data). We employ impulse-response function to test the reaction of GDP to a shock in export (figure 7), the reaction of inflation to a shock in the exchange rate (equation 25), and the response of inflation to a shock in export (equation 26). In all cases the model satisfactorily mimics the outcome of the real data for direction and duration of the response. However, for the case of inflation and shock of export, the standard deviation appears to be too large to draw a definitive conclusion.

Figure 10 shows that the average individual firms decay in price correlation is faster than the aggregate price as found by Yoshikawa et al. (2015). In terms of outcomes at the firm level, the size of firms measure by capital, number of workers, and sales all display right-skewed distributions. The lognormal distribution well fits the populations for capital and number of workers at each point in time, while for sales the tail is well approximated by a power law, as displayed in figure 7 (see Growiec et al., 2008, for a discussion of the emergence of power law and log normal distributions in firms size).

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Notes

1 It is important to notice, however, that technological change is not only relevant to manufacturing, but similarly has significant impacts in other sectors of the economy. A good example of this is increased productivity in agriculture, which has been essential for accelerated economic growth in many developing countries.

2 According to some analysts, the distribution of income among all people in the world has become more equal over the last two decades.

3 It has also had negative impacts on income distribution. During the 1970s, for instance, demand for skilled workers in heavy and chemical industries pushed up domestic wages and increased wage differentials between skilled and unskilled workers.

4 The validity of official inequality measures has been questioned, however.

5 These included reduction in tariff levels, tariff dispersion and elimination of major non-tariff restrictions.

6 Moldova is on the other extreme, having increased its openness to trade five times between the early eighties and the first years of the current decade.

7 Job creation has shifted towards the private services sector, in both highly remunerated activities (financial services, telecommunications, etc.) and activities with low barriers to entry, such as informal commerce and personal services (UN ECLAC, 2004a).

8 In 2000, income levels in the informal sector were 72 per cent lower than those pre- vailing in the formal sector on average in the region, up from a 59 per cent differential in 1990.

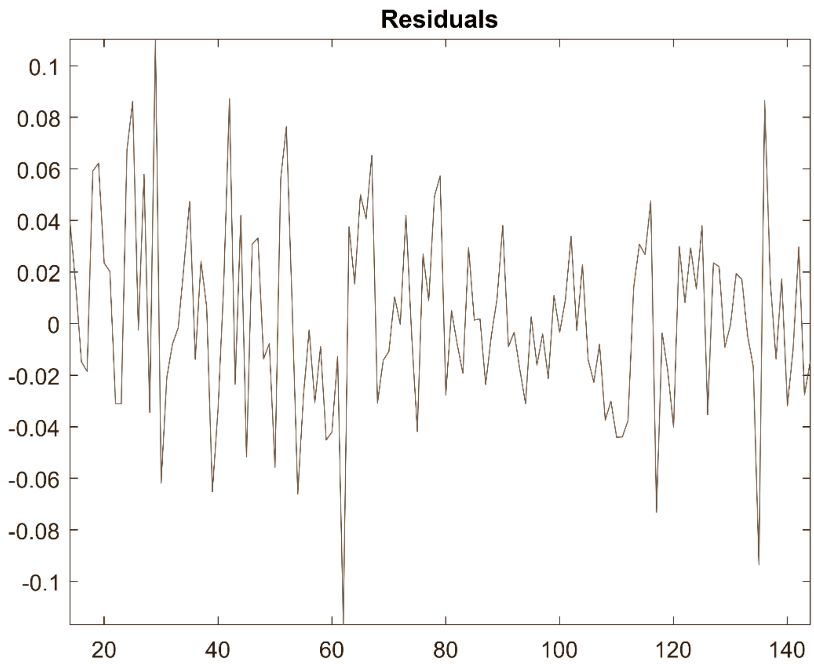

Figure 12: Investment residuals.

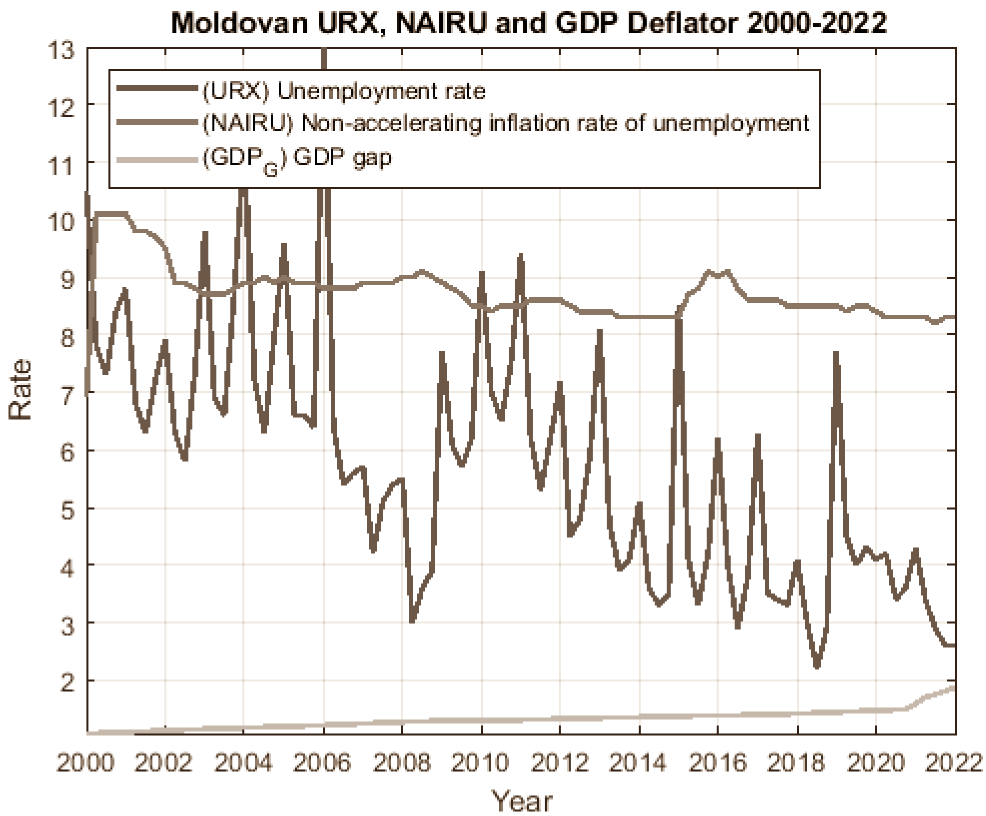

Figure 13: Moldovan urx, nairu and GDP deflator