WORKING PAPER

43 (82) 2020

BANK OF ALBANIA

FINANCIAL SECTOR AND MACROECONOMICS LINKS IN MEAM

Lorena Skufi

WORKING PAPER

43 (82) 2020

BANK OF ALBANIA

FINANCIAL SECTOR AND MACROECONOMICS LINKS IN MEAM

LORENA SKUFI

Lorena Skufi
Monetary Policy Department, Bank of Albania, e-mail: lskufi@bankofalbania.org

Acknowledgements: I would like to thank Michele Caivano for his worthy contribution since the first steps of this project, as part of IMF TA for the improvement of MEAM model; Juna Bozdo and Gjergj Legisi for clarification of Financial Stability terminology and financial data; Erjona Suljoti, Anjeza Gazidede and Lindita Vrioni for insights of second level banks system; and Erald Themeli for useful comments and sugjestions.

Notes: The views reflected in this paper are of the authors alone and do not represent views or policy stances those of the Bank of Albania.

CONTENT

ABSTRACT

This paper describes the links between financial sector and macroeconomic conditions into MEAM macro model. The focus is on banking lending rate, in terms of macroeconomic indicators impact, such as the probability of default of private sector and economic developments. Through this material we try to enrich MEAM macro model with financial indicators.

Keywords: financial sector, default probability, macromodel, Albania

1. INTRODUCTION

Financial sector developments and symbiotic relationships with economic activity led to the need for a quantitative measurement between financial sector and the real sectors of the economy. In other words, this implies the inclusion of the financial sector (banking sector) in the macroeconomic model used for forecasting and analysis (MEAM). This way MEAM model is expanded with financial block, which has been an important missing link into the model.

The role of financial (banking) intermediation is of high importance as it enables investment financing in a satisfactory level (Bank of Albania, 2018), therefore it supports growth directly and indirectly. The direct impact on economic growth is based on the allocations of funds for investments and the optimization of intertemporal consumption. Meanwhile, the indirect impact is derived from the multiplicative effects of investments in the economy, wealth effect and the overall increase of social welfare, and the opportunity to collect and use more efficiently the small deposits.

This material presents concisely in a sufficiently detailed structure, the banking sector in the context of the macro econometric model used at the Bank of Albania to carry out forecasts and analyses. The upgraded macroeconomic model with financial sector examines

links between the banking sector and the real economy, based on the lending channel in terms of probability default of private sector and its determinants.

Default probability of private sector provides the link between the loan interest rate and the possibility to failure on its repayment. The deterioration of the firm's solvency gives incentives to banks to raise risk premium rates, therefore financing costs of the firms will accelerate (expand).

MEAM model is modified/ expanded through the addition of banking lending channel. Banking sector indicators are including close to macroeconomic indicators. In the previous version of MEAM there was no banking indicator, while in this version monetary policy rate is transmitted to the real economy through banking intermediation.

The properties of financial sector are assessed through the impulse response functions analysis. MEAM model is simulated with and without the inclusion of the probability default channel to a monetary policy shock and a foreign demand shock. Through these simulations is highlighted that in normal times (in the absence of a stress situation) the enrichment of the MEAM model with the financial sector modifies the transmission of shocks gently, with amplified effects.

The material is organized as follows. Section 2 presents a brief literature review. Section 3 describes credit price and credit volume determinants, and shows how the default probability of firms dependes on macroeconomic conditions and on business cycle. Section 4 focuses on bank lending channel transmission mechanism. Section 5 discusses the impulse response functions of monetary policy shock and foreign demand shock. Section 6 provides the findings and gives insights for further research.

2. A BRIEF LITERATURE REVIEW

The importance of financial sector and real sector of the economy relationships is studied extensively by the literature. One can say that there were two schools almost opposite related to the importance of the financial sector in the real sector of the economy.

On one hand, financial intermediation is seen as crucial to growth and economic activity (Schumpeter, 1911; Goldsmith, 1969; McKinnon and Shaw, 1973). A number of models present the mechanisms through which financial sector affects real developments. The idea behind is that financial markets give the oppurtunites to the 'small savers' that their funds to be allocated in more productive investments (or have higher returns). Empirically, research has shown that financial indicators such as the size and functioning of financial system are positively correlated with economic growth. Well functioning of financial systems led to higher growth in the long run (Levine, 2005; and Ueda, 2012), especially if markets are of monopolistic competition structure (Jayaratne and Strahan, 1996; Cetorelli and Strahan, 2006; and World Bank, 2007), or oligopoly structure (Jackson and Thomas, 1995; and Petersen and Rajan, 1995).

On the other hand, it is belived that the causality is invese (Robinson, 1952) and the financial sector does not play an important role in growth (Beck and Levine, 2004; Demirguç-Kunt and Maksimovicë, 2002; and Levine, 2003). Well developed economies are able to develop institutions that provide the necessary funds to support growth. From this point of view, economy leads and financial sector follows. Also, Lucas (1988) does not support the positive correlation between economic and financial development, stating that economists 'badly over-stress' the role of financial factors in economic growth.

Empiric research on Albanian economy embraces the first school. Simultaneously, there are studies emphasising that financial sector development replicates economic development. Sejko (2018) finds that there exists a positive long run relationship between economic growth and financial development, meanwhile in the short run the

results are turbulent. Also, the causality between the real sector and financial sector turns out two sided. The positive correlation between economic development and financial development is supported also by Rama (2016) and Yzeiraj (2016). There are numerous studies concluding that bank lending in Albania is, among other factors, a function of economic development (Vika and Suljoti, 2018; Note and Suljoti, 2017; Shijaku and Kalluci, 2014; Dushku and Kota, 2014; Kalluci, 2012; Ceca and Shijaku, 2010; and others).

In a macro-model, financial flows can be analyzed by economic agents (firms, consumers, government, foreign firms) or by markets (money market, capital market, etc.). The first approach seems to be more promising for emerging markets (Klein et al., 1999). As a macromodel put aims on transmission mechanism, the links between the financial and real sectors, in the literature, are developed through the banking capital channel and the default probability of the private sector.

The banking capital channel affects lending through the lack of competition in the capital markets, due to the costs that agents face when they want to increase capital (Myers and Majluf, 1984); and the fact that banking capital is subject to regulatory capital (Claessens et al., 2018; Frasheri and Dushku, 2018; Thakor, 2014; Bolton and Freixas, 2006; Stein, 1998; Calomiris and Hubbard, 1995; Cornett and Tehranian, 1994).

The default probability channel links directly the borrowing cost with the chance that the firms fail to repay the loan. The credit risk associated with default probability of private sector and macroeconomic uncertainties counts for 85% of the risks that banks face (Thoraval, 2006). A series of studies model the default probability as a function of macroeconomic indicators (Ekanayake and Azeez, 2015; Messai and Jouini, 2013; Shijaku and Ceca, 2012; Castren et al., 2009; Fiori et al., 2009; Moretti et al. 2008; Jakubik, 2006; Wong, 2006; Babouček dhe Jančar, 2005; Hamerle et al, 2004; Wilson, 1997), but there are less studies modelling explicitly the feedback effect of default probability (through cost of borrowing) to macroeconomic indicators (Miani et al., 2012; Curdia and Woodford, 2010; Marcucci and

Quagliariello, 2008; Jacobson et al., 2005). The idea behind is that the feedback mechanism operates through the default probability of private sector channel.

In this material, the default probability of private sector is seen as a function of firms' solvency.[1] Also, a study in terms of individual banks for the banking system in Albania models default probability of private sector similarly (Kota and Dushku, 2014). The rate of non-performing loans to the total stock of outstanding loans is a good proxy for the current situation of a default, while the solvency approximates the prespective of a default. The lower the solvency, the higher are the chances to default on repaying the loan, higher interest rates will charge banks. Otherwise, this is known as the balance sheet channel.

The banking capital channel is not part of financial sector modelling, in this material, but its developments can be included in the model through stochastic simulations.[2] The empirical research on financial sector has shown that lending in Albania is largely driven by demand rather than supply (Shijaku and Kalluci, 2014).

3. FINANCIAL SECTOR AND MACROECONOMIC CONDITIONS

Adding the financial sector in the macromodel MEAM enriches monetary policy transmission mechanism with the bank lending channel. A system of equations determines simultaneously economic development, default probability and error terms. Based on a dynamic process, macroeconomic and financial indicators are mutually dependent. At the same time, the inlcusion of financial sector allows to analyze the backward effects of bank activity in the economy, as financial indicators are lagged.

[1] Households financial intermeditation modelling is absent. Survey results on households' financial and borrowing situation indicate that only 5% of consumption is financed through lendind (Financial Stability Report 2018-H1, 2018). Intertemporary consumption behaviour remains proxied by goverment treasury bills.

[2] Simulation can be run by shocks or by giving a path to interest' variables (known in macromodeling terminology as soft tunnig and hard tuning).

In this section are presented the determinat factors of the price and of the volume of the loan given to the business. In this way, the inclusion of financial block allows for a feedback mechanism between the real economy and the lending rate, which amplifies the effects of real and financial shocks.

3.1 DETERMINATS OF THE PRICE OF LOAN

The loan price is assumed to be the function of two indicators: a risk-free asset and a risk premium.

$$(1) \qquad i_L = f(r^f, \theta)$$

Where, i_L is the bank lending rates, r^f the risk-free rate, and θ the risk premium.

The risk-free rate is proxy by yield of 12 months Treasury Bills. The risk premium itself is unobserved, in principle, but in terms of borrower riskiness, it can be approximated with the probability of defaulting the loan (i.e. the probability that a given loan becomes a non-performing loan). The probability default is consistent with the definition used in the Bank of Albania's Financial Stability Report and the Annual Report. Given this logic, the risk premium is approximated by the ratio of non-performing loans to total stock of outstanding loans granted to business, calculated as follows:

$$(2) \qquad npl_t = NPL_t / L_t$$

Where, NPL is non-performing loans, and L is total stock of outstanding loans granted to business.

In Albanian banking sector a significant share of credit stock granted to business is denominated in foreign currency.[3] Therefore, there are estimated separate lending rates in domestic and foreign currency, in order to reflec distinguish risk-free assets and mainly risk premiums, due to hedged and unhedged borrowers. Consequently, the linear specification of equation (1) can be written as follows by

[3] See Annex D, graph 1 for credit stock in domestic currency vs foreign currency shares.

specifying the lending rate for the loans given to businesses in Lek and Euro:

$$(3) \qquad i_{L,Lek,t} = \alpha + \varrho i_{L,Lek,t-1} + \beta r_t^f + \gamma npl_t + error_t$$

$$(4) \qquad i^*_{L,t} = \phi + \sigma i^*_{L,t-1} + \kappa r_t^{f*} + \lambda npl_t^* + error_t$$

Where, index '*' stands for Euro.

In the long run, the transmission of risk free asset rate to lending rate is complete, both to Lek rate and to Euro rate, $\beta = \kappa = 1$. While, risk preamiums feature different elasticites on bank lending rates in Lek and Euro, respectively γ=0.23 and λ=0.11. An equal increase of default probability of the borrower, i.e. by 1 percentage point, will lead to higher lending rate in Lek versus Euro by 12 bases points. This counterintuitive result of risk premiums may be subject of: loans disbursed in domestic currency are less covered by collateral versus foreign curreny, consequently requiring higher risk premiums; higher mark-ups for foreign currency lending (reflected by the constant parameter $\phi > \alpha$);[4] and slower adjustment of Euro lending rate (replicated in a higher autoregresive term $\sigma > \varrho$).[5]

Subsequently, the lending rates for the loans denominated in Lek and Euro are ponderated in a single rate with weights varing in time, according to the developments of domestic and foreign currency credit stock granted to businesses. The interest rate on the loan granted to the business is given by the equation (5).

$$(5) \qquad i_{L,t} = \omega_t \, i_{L,LEK,t} + (1-\omega_t) \, i_{L^*,t}$$

[4] The loan disbursed to private non-financial corporations in local currency is dominated by overdraft and working capital loans, with over 50%. Overdraft and working capital loans are classified as short-term loans and therefore collateral coverage is less required. While, the share of overdraft and working capital for loans disbursed in foreign currency to private non-financial corporations is about 30% (Bank of Albania, 2020). According to these figures, it can be approximated that loan disbursed in domestic currency is less covered by collateral versus the foreign currency one.

[5] Stochastic parameters of equations and diagnostics are presented in Annex C/I.

Where, $i_{L,t}$ is weighted interest rate of loans granted to businesses, and ω_t is the share of credit stock denominated in domestic currency to total credit stock granted to business.

The parameter ω takes values in the segment [0.2-0.4]. The share of credit stock granted in local currency has increased during the last years.

3.2 DEFAULT PROBABILITY

The feedback mechanism between real economy and financial sector is captured by expressing the rate of non-performing loans as a function of real and financial indicators. Generally, it is acknowledged that the default probability (non-repayment of loan) increases in times of economic downturns and in whenever financial burden is related to the loan increases versus borrower's income (Marcucci and Quagliariello, 2008; Jacobson, et al, 2005). These two components can be approximated, respectively, with the cyclical state of the economy, such as output gap, and solvency, such as the total annual loan payments (interest payments and principal repayments) to income. The linear specification can be written as below:

$$(6) \quad npl_t = \varsigma + \varphi npl_{t-1} + \upsilon x_t + \chi\left((i_{L,Lek,t} + h_t)\, L_{Lek,t} / Y_t\right) + error_t$$

$$(7) \quad npl^*_t = \tau + \psi npl^*_{t-1} + \xi x_t + \Pi\left((i^*_{L,Eur,t} + h^*_t)\, eL^*_t / Y_t)\right) + error_t$$

Where x is output gap, h is the fraction of total loan that gets repaid in period t, e is exchange rate Lek-Euro, L^* foreign-denominated loans granted to business, and Y is gross domestic product. A dummy variable is included to capture the effect of financial resolution measures in the year 2016.

Macroeconomic indicators have a significant impact on the default probability of firms. The output gap, included as a 4-quarter moving average, has a significant negative impact on default probability, as an economic expansion implies an increase of firm

revenues.[6] Domestic cyclical position seems to have a larger impact on the default probability of borrowers in foreign currency against borrowers in domestic currency (υ = -2.3 and ξ = -4.0). This result is expected under the assumption that a part of the borrowers in foreign currency realize their activity with the foreign economy, the developments of which are introduced only indirectly in the output gap, through exports.[7]

On the other hand, an increase on interest rate, component of the solvency term in first lag, expands the financial burden of the borrower, and consequently reduces his ability to repay the loan. The exchange rate effect affects only the default probability of unhedged borrowers. The impact of exchange rate on hedge and unhedged borrowers is not modelled explicitly (therefore can not be separated as an effect), but implicitly is taken into account by the teta parameter (Π), since it is estimated stochastically. A depreciation of the domestic currency would increase the cost of interest and principal payments and lead to lower solvency. Estimation results indicate that the default probability increases by 0.2 percentage points for a decrease in solvency by 1 percent for the borrower in domestic currency and 0.5 percentage points for the borrower in foreign currency (χ = 0.2 and Π = 0.5). This is because the latter also carries the risk of exchange rate fluctuations in income (when it is not hedge). Consequently, its solvency appears more volatile, consequently requires a higher risk premium.

---

[6] If we assume that the borrowers whom takes loans denominated in foreign currency operates in foreign sector, the output gap in equation (7) could alternatively be specified as a weighted average between the domestic cyclical position and the foreign cyclical position. Currently, the impact of foreign economic developments on firm revenues is realized through export channel in the macromodel. A change in foreign demand or foreign prices will affect the level of exports and consequently the gross domestic product, which will be transmitted to the output gap.

[7] The estimated parameter (ξ) should be adjusted in order to correct for the proper share of foreign cyclic position, which is implicitly expressed in the domestic output gap. This difference in the measurement tends to shift the parameter upwards. Exports account for about 30% of gross domestic product (Instat, 2020). The correlation coefficient between the cyclical position in the country and the foreign one for the estimated period is 0.26 (approximate to the weight of exports in GDP). The correlation coefficient is calculated on the series of the MPM model (Hledik et al., to be published)

3.3 DETERMINATS OF TOTAL STOCK OF LOANS TO BUSINESS

The equations of total stock of loans granted to business have been kept simple, based mainly on the information on the total credit dynamics, including non-performing loans. The parameter next to the lagged rate of loans to GDP is estimated to be slightly higher than 1 (ψ =1.0, equation (8)), implying that the part of the activity financed by financial intermediation remains unchanged.[8]

$$l_t = \delta + \psi l_{t-1} + error_t \quad (8)$$

Where, l is the ratio of total stock of outstanding loans granted to business to GDP.

Similarly, but taking into account also the financing costs it is estimated the rate of loans to GDP denominated in domestic currency. The parameter on the first lag of ratio of loan granted to business to gross domestic product denominated in Lek, results less than 1 (ϑ = 0.8, equation (9)), while the estimated elasticity of financing costs results o = -0.4. The difference between the parameters psi and varteta reflects the elasticity of substitution between currencies.

$$l_{Lek,t} = \eta + \vartheta l_{Lek,t-1} + oi_{Lek,t} + error_t \quad (9)$$

Where, l_{Lek} ratio of loan granted to business to GDP denominated in Lek.

The loan denominated in foreign currency is calculated as the difference between the total loan stock and loan stock denominated in Lek (equation (10)). This way, a substitution effect between the currencies takes place. So, in case of a need for financing if borrowing in domestic currency is more expensive, then firms will borrow in foreign currency. More specifically, an increase in the bank lending rate in Lek by 100 basis points would reduce the ratio

[8] International Finance Corporation and World Bank in Entreprise Survey for Albania have estimated the financing of investment by financial intermedation 20% in both years 2008 and 2013 (IRBD, 2009 and 2014).

of loan to GDP denominated in domestic currency disbursed to the business by 0.4 percentage points. Due to the higer financing costs in domestic currency, the loan stock denominated in Lek would fall by 4.0 percent.[9] But the need for financing remains unchanged, being determined by economic activity. Under these circumstances, foreign currency borrowing will be introduced, which will increase the loan stock denominated in Euro given to the business by 2.5 percent.

(10) $$l_{Eur,t} = l_t - l_{Lek,t}$$

Where, l_{Eur} ratio of loan to GDP denominated in Euro in Lek terms.

4. TRANSMISSION CHANNELS

The equations in the previous section show how macroeconomic indicators affect the financial sector. This section presents the importance of bank financing to the private sector. About 20% of private investments are financed through bank lending (IBRD, 2014), therefore the capital cost (in the equation of private investment in MEAM model) is defined as a weighted average of the cost of bank lending approximated by the interest rate in the equation (5) and the opportunity cost approximated by the average yield of government papers specified in the equation (12). The cost of capital is given by the equation (11).

(11) $$i_{K,t} = \upsilon_{iL,t} + (1 - \upsilon) i_{G,t}$$

Where, $i_{K,t}$ is cost of capital, $i_{G,t}$ is average yield-i of government papers, and υ is the share of banking loan in investment fonds, calibrated at 20 percent and assumed to be constant in time (υ=0.2).

Average yield-i of government securities is a function of 12-months Treasury Bills, where the estimated parameter reflects the weight of

[9] For deterministic relationships in the financial block see Annex C/II.

this instrument in the domestic debt, for the estimated sample ($\varkappa$ =0.5); and capital expenditures, which approximate the 'golden rule' impling the government can only borrow to finance public investment (VKM, 2019). The results indicate that an increase by 1 percent of capital expenditures asks for an increase by 1 base point of average yield-i of government securities, assuming that the extra expenditure will be financed through domestic borrowing (λ=0.01).

$$(12) \qquad i_{G,t} = \delta + \mathfrak{H}_{iG,t-1} + \varkappa i_{B,t} + \lambda g_t + error_t$$

Where, i_B is yield of 12-months Treasury Bills, and g is the logarithm of capital expenditures.

A long-term restriction has been tested and imposed between the yield of 12-month Treasury Bill and the monetary policy rate (repo). Equation (13) specifies the yield of 12-month Treasury Bill as a function of repo and a constant risk primia. The transmission of monetary policy rate to the yield of 12-month Treasury Bill is complete, but occurs gradually. This behavior is expressed through the implementation of the first difference lag where $\Lambda < 1$.

$$(13) \qquad \Delta i_{B,t} = \alpha_B (i_{B,t-1} - repo_{t-1}) + \beta_B + \Lambda \Delta repo_{t-1} + error_t$$

All the factors that affect positively the yield of government securities increase opportunity cost. Consequently, banks get incentives to increase the cost of credit (equation 3). A higher level of capital expenditures rises the cost of capital. Any other indicator that increases the default probability of the private sector (described in section 3) increases capital cost. The yield of 12-months Treasury Bill also approximates the substitution effect in the consumption equation. The main transmission mechanism is shown in Annex D, chart 2. The relevance of the financial sector is discussed in the next section.

5. ASSESSING THE INTERACTION BETWEEN THE BANKING SECTOR AND THE REAL ECONOMY

Adding the financial sector in MEAM model enriches the transmission of monetary policy shocks, taking into account the impact of domestic monetary policy on both domestic and foreign currency lending conditions. This section shows the impact of default probability channel on the indicators of the model. To asses this effect, it is compared the response of private investment to two shocks: a monetary policy shock (a permanente increase by 100 basis points of repo), and a foreign demand shock (a permanet increase by 10 percent of foreign demand in goods and services). For each of the shocks, MEAM model is simulated in its standard version and augmented version with the default probability channel.

It is worthy to note that running these simulations, it is not taken into account the restriction of credit supply by banks or other shocks to the economy. So, the set of assumptions reflects 'normal conditions', while with credit constraints or macroprudential measures in place the results would be quite different.

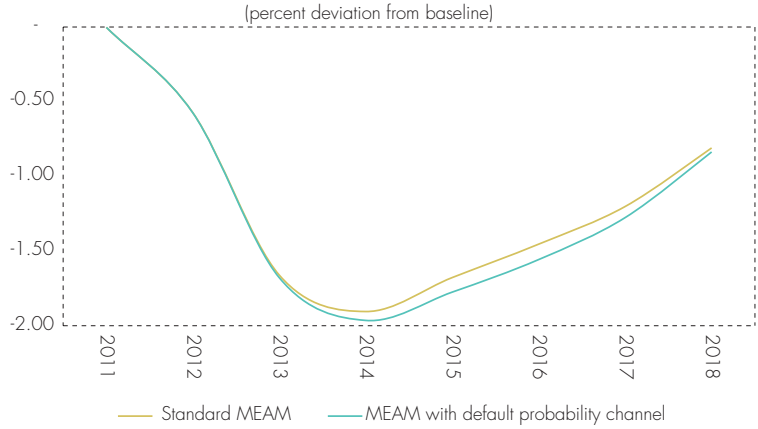
5.1 MONETARY POLICY SHOCK

Chart 1 reports the effects of a 100 basis point permanent increase in the policy rate in private investments. The shock generates a decline in private investment, giving the rise in capital cost (equation, 3). The deterioration of macroeconomic conditions, through the default probability channel, promote further lending growth, maximally decreasing private investment after 3 years.[10] The impact of the monetary policy shock on the lending rate in domestic currency, foreign currency and at the weighted interest rate of loans is shown in Annex D, chart 3.

[10] Transmission mechanism of monetary policy shock is ilustrated in Annex D, chart 5.

Chart 1 Private investment response to monetary policy shock

(percent deviation from baseline)



Source: Authors' calculations.

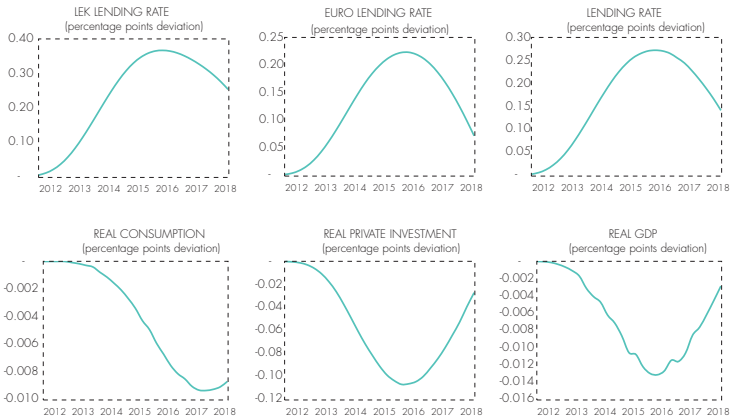
The increase of monetary policy rate provides a stronger reaction to the interest rate on lending in domestic currency. About 3 years later the interest rate in Lek increases by 135 basis points (versus 100 basis points without the default probability channel), 35 basis points more (as it shown in chart 2). At first, Lek lending rate increases due to higher financial burden related to higher interest rates. The worsening of solvency leads to a higher default probability. Therefore, banks tend to ask for higher interest rates, resulting in higher capital costs. Higher capital costs will shrink private investments and subsequently economic growth and its components.

At the same time, the domestic monetary policy shock is also transmitted to interest rates on loans denominated in foreign currency, through the cyclical conditions of domestic economy channel. Euro lending rate increases by about 25 basis points compared to baseline.

Domestic monetary policy shock is transmitted to both Lek lending rate and Euro lending rate, resulting in an increase of lending rate by 30 basis points compare to baseline. The feedback mechanism between the real economy and the financial sector allows the

amplification of the domestic monetary policy shock[11], making the weighted interest rate of lending react twice more than without the default probability channel (see Annex D, chart 3).

Chart 2 Response to a monetary policy shock with default probablility channel compared to standard



Source: Authors' calculations.

5.2 FOREIGN DEMAND SHOCK

Chart 3 reports the effects of a 10 percent permanent increase in the foreign demand in goods and services in private investments. The shock generates an increase in private investment, reaching the maximum after 4 years. The response of private investment is higher in the model version augmented with the default probability channel. The highest effect of the feedback mechanism reach 0.25 percentage points more compared to the standard version of MEAM.

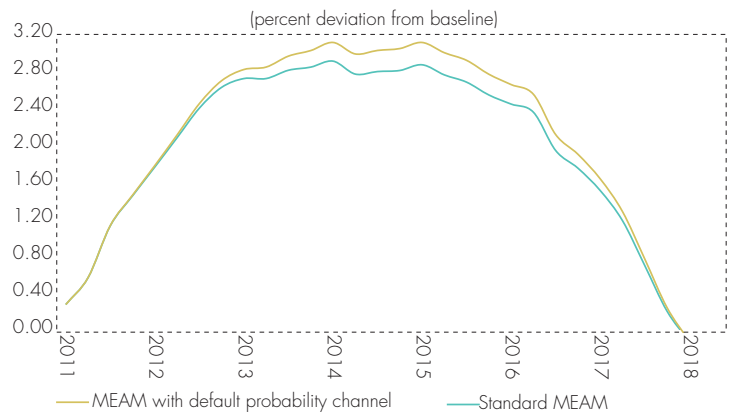
The positive shock on foreign demand improves macroeconomic conditions and consequently reduces the default probability of the private sector. The default probability channel works by lowering the lending interest rate both in domestic and foreign currency (Annex D, chart 4), which will stimulate private investment.[12]

[11] The model provides foreign monetary policy shock too.

[12] Transmission mechanism of foreign demand shock is ilustrated in Annex D, chart 6.

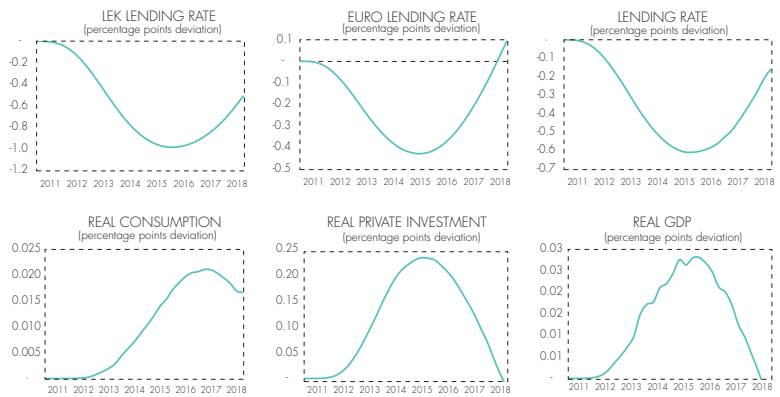
The shock in foreign demand affects all together domestic and foreign lending rates simultaneously, in contrast to the shock in monetary policy (Chart 4). Simultaneous response of lending rates accelerates the adjustment process to the shock.

Chart 3 Private investment response to a foreign demand shock



Source: Authors' calculations.

Chart 4 Response to a foreign demand shock with default probablility channel compared to standard



Source: Authors' calculations.

6. CONCLUSIONS

This material showed the enrichment of the MEAM model with the default probability of private sector channel to reflect the links between the financial sector and the real economy. The default probability of private sector channel shows how the banking indicators may impact the lending interest rate, and the latters affect the macroeconomic indicators. The simulation results indicate that the effects of real and financial shocks are amplified compared to the standard version of the MEAM model.

The material does not address the effects of limitations in loan supply, or the use of the model for stress situations, but this remains for further study. In the near future, the financial sector can be improved through the expansion by the banking capital channel; distinguish hedge and unhedged borrowers; estimation of the solvency in terms of the borrower's revenues versus GDP; the influence of financial intermediation on consumer behavior.

REFERENCE

Babouček, I., Jančar, M. (2005). ''Effects of Macroeconomic Shocks to the Quality of the Aggregate Loan Portfolio'', Working Paper, Czech National Bank.

Bank of Albania (2018). "Financial Stability Report, 2018 H2< Bank of Albania, pp. 37-38

Beck, T., a Levine, R. (2004). "Stock Markets, Banks, and Growth: Panel Evidence", Journal of Banking and Finance, Vol. 28, pp. 423–42.

Bolton, P., Freixas X. (2006). ''Corporate Finance and the Monetary Transmission Mechanism'', The Review of Financial Studies, 19, pp. 829-870.

Calomiris, C., Hubbard G. (1995). ''Internal Finance and Investment: Evidence From the Undistributed profit tax of 1936-37'' Journal of Business, 68(4), pp. 443-482.

Castrén , O., Fitzpatrick, T., Sydow, M. (2009). ''Assessing Portfolio Credit Risk Changes In A Sample Of Eu Large And Complex Banking Groups In Reaction To Macroeconomic Shocks'', Working Paper, ECB.

Ceca, K., Shijaku, H. (2010) ''Një Model për Rrezikun e Kredisë në Shqipëri'', Material diskutimi në vijim i Bankës së Shqipërisë.

Cetorelli, N., Strahan, P. (2006) "Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets," Journal of Finance, Vol. 61, pp. 437–61.

Claessens, S., Low, A., Wang, T. (2018) ''How Do Credit Ratings Affect Bank Lending Under Capital Constraints?'' BIS Working Paper, Bank for International Settlements.

Cornett, M., Tehranian H. (1994). ''An Examination Of Voluntary Versus Involuntary Security Issuances By Commercial Banks: The Impact Of Capital Regulations On Common Stock Issuances On Common Stock Returns'' Journal of Financial Economics, 35, pp. 99-122.

Curdia, V., Woodford M. (2010). ''Credit Spreads and Monetary Policy'', Journal of Money, Credit and Banking, 42, pp. 3-35.

Demirguç-Kunt, A., Maksimovic, V. (2002) "Funding Growth in Bank-Based and Market- Based Financial Systems: Evidence from Firm Level Data", Journal of Financial Economics, Vol. 65, pp. 337–63.

Dushku, E., Kota, V. (2014). The Financial Model for Albania: A panel data approach", Working paper, Bank of Albania.

Ekanayake, E., Azeez, A. (2015). ''Determinants Of Non-Performing Loans In Licensed Commercial Banks: Evidence From Sri Lanka'', Asian Economic and Financial Review, 5, pp. 868-882

Fiori, R., Foglia, A., Iannotti A. (2009). ''Beyond Macroeconomic Risk: The Role of Contagion in Corporate Default Correlation'', CAREFIN Working Paper, Università Bocconi, (12).

Frashëri, A., Dushku, E. (2018). ''Provigjionimi i Humbjeve nga Huatë në Sektorin Bankar Shqiptar'', Material Diskutimi, Banka e Shqipërisë.

Hamerle, A., Liebig, T., Scheule H. (2004). ''Forecasting Credit Portfolio Risk'', Discussion Paper Series 2, Banking and Financial Studies, Deutsche Bundesbank, 1.

Hledik, T, Kika, E., Mitre, O. (to be published) ''The Albanian Medium Term Projection Model'', Working Paper, Bank of Albania.

IBRD (2014). ''Albania Country Profile 2013'', International Bank for Reconstruction and Development Enterprise Surveys, Washington

IBRD (2009). ''Albania Country Profile 2008'', International Bank for Reconstruction and Development Enterprise Surveys, Washington

Jackson, E., Thomas, A. (1995). "Bank Structure and New Business Creation: Lessons from an Earlier Time", Regional Science and Urban Economics, Vol. 25, pp. 323–53.

Jacobson, T., Lindé, J., Roszbach K. (2005). ''Exploring Interactions Between Real Activity and the Financial Stance'', Journal of Financial Stability, 1(3), pp. 308-341.

Jakubik, P. (2006). ''Does Credit Risk Vary with Economic Cycles ? The case of Finland'', IES Working Papers, 11.

Jayaratne, J., Strahan, P. (1996) "The Finance-Growth Nexus: Evidence from Bank Branch Deregulation", Quarterly Journal of Economics, Vol. 111, pp. 639–70.

Klein L., Welfe A., Welfe W. (1999). ''Principles of Macroeconometric Modeling'', Vol 36, North Holland.

Goldsmith, R., (1969). ''Financial Structure and Development'' New Haven, Connecticut: Yale University Press.

Kalluci, Irini (2012). "Credit behavior in Albania: a sign of convergence or a deviation from its long-term trend?, Working Paper, Bank of Albania.

Levine, R. (2003). "Bank-Based or Market-Based Financial Systems: Which Is Better?", Journal of Financial Intermediation, Vol. 11, pp. 398–428.

Levine, R. (2005). "Finance and Growth: Theory and Evidence" Handbook of Economic Growth, Vol. 1, ed. Aghion, P. and Durlauf, S. North Holland, pp. 865–84.

Lucas, R. (1988). "On the Mechanics of Economic Development", Journal of Monetary Economics, Vol. 22, pp. 3–42.

Marcucci, J., Quagliariello M. (2008). ''Is Bank Portfolio Riskiness Procyclical? Evidence from Italy using a Vector Autoregression'', Journal of International Financial Markets, Institutions and Money, 18(1), pp. 46-63.

McKinnon, R., dhe Shaw E. (1973). ''Financial Deepening in Economic Development'', New York, Oxford University Press.

Messai, A., Jouini, F. (2013). ''Micro and macro determinants of non-performing loans'', International Journal of Economics and Financial Issues, 3(4), pp. 852-860

Miani, C., Nicoletti, G., Notarpietro, A., Pisani, M. (2012). ''Banks' Balance Sheets and the Macroeconomy in the Bank of Italy Quarterly Model'', Questioni di Economi e Finanza, Banca d'Italia

Moretti, M., Stolz, S., Sëinburne, M. (2008). ''Stress Testing At The IMF'', Working Paper, International Monetary Fund.

Myers, S., Majluf N. (1984). ''Corporate Finance and Investment Decisions When Firms Have Information That Investors Do Not Have'', Journal of Financial Economics, 13, pp. 187-221.

Note, S., Suljoti, E. (2017) "Assessment of Banks' Lending Determinant in Central Eastern & Southeastern European Countries", Working paper, Bank of Albania.

Petersen, A., Rajan, R. (1995) "The Effect of Credit Market Competition on Lending Relationship," Quarterly Journal of Economics, Vol. 110, pp. 407–43.

Rama, A. (2016). "Investigating financial development - economic growth nexus. A Southeastern Europe perspective", Working Paper, Bank of Albania.

Robinson, J. (1952). "The Generalization of the General Theory" The Rate of Interest and Other Essays, London, pp. 69–142.

Schumpeter, A. (1911). ''A Theory of Economic Development'' Cambridge, Massachusetts: Harvard University Press).

Sejko, G. (2018). "Financial development and economic Growth in Albania", Researches on the Banking System and Economic Development, Bank of Albania, pp 23-49 (only in Albanian".

Shijaku, G., Kalluci, I. (2014). "Determinants of bank credit to the private sector: The case of Albania", Working paper, Bank of Albania.

Shijaku, H., Ceca, K. (2012) ''Një Model për Rrezikun e Kredisë në Shqipëri Duke Përdorur të Dhënat e Bankave'', Material diskutimi, Banka e Shqipërisë.

Stein, J. (1998). ''An Adverse-Selection Model of Bank Asset and Liability Management with Implications for the Transmission of Monetary Policy'' RAND Journal of Economics, 29(3), pp. 466-486.

Thakor, V. (2014). ''Bank Capital and Financial Stability: an Economic Tradeoff or a Faustian Bargain?'', Annual Review of Financial Economics, 6, pp. 1–487.

Thoraval, J. (2006). ''Stress testing on Credit risk'', In Macroprudential Supervision Conference: Challenges for Financial Supervisors Seoul.

Ueda, K. (2012) "Banks as coordinators of economic growth and stability: Microfoundation for macroeconomy with externality." Journal of Economic Theory.

Vika, I., Skufi, L., Çela, E., Abazaj, E. (2016). "Re-estimation of the Macro-econometric Model of the Albanian Economy (MEAM)", Working paper, Bank of Albania.

Vika, I., Suljoti, E. (2018) "A review on Bank Lending Channel in Transmission Mechanism in Albania", Researches on Banking System and Economic Development, Bank of Albania, pg 51-75, (only in Albanian).

VKM (2019). ''Për Miratimin E Kuadrit Makroekonomik Dhe Fiskal Për Periudhën 2020–2022'', Vendim Nr. 4, datë 9.1.2019.

Wilson, T. (1997). ''Portfolio Credit Risk (II)'', Risk, vol. 10, issue 10, pp. 56-61.

Wong, J., Choi, K., Foi, T. (2006). ''A Framework For Macro Stress Testing The Credit Risk Of Banks In Hong Kong'', Hong Kong Monetary Authority Quarterly Bulletin December 2006.

World Bank. (2007) ''Finance for All? Policies and Pitfalls in Expanding Access'' Washington.

Yzeiraj, E. (2016), "The development of the financial system and the impact on growth in Albania", Bank of Albania, Economic Review, 206 H1, pp. 35-44.

ANNEX A. A BRIEF DESCRIPTION OF MACRO ECONOMETRIC ALBANIAN MODEL (MEAM)

The updated version of the MEAM macromodel reflecs features similar to the version published in 2016 (Vika et al., 2016). Long-term characteristics are consistent with neoclassical models that postulate an exogenous growth, which implies full utilization of production factors at constant prices. The level of production, employment and capital utilization is consistent with the Cobb-Douglas production function parameters, also defining the steady state. The short-term characteristics of the model are determined by the dynamics of the indicators and the adjustment process. The adjustment process reflects the rigidity of prices and wages, the lack of full use of production capacities, and the fact that the expectations may not be materialized. These features give to the model the Keynesian approach.

ANNEX B. DATA

Acronym	Variable name	Unit	Type	Source
CREDIT_BIZ	Total credit stock to businesses	mio ALL	Endogenous	BoA
CREDIT_BIZ_ALL	Domestic currency credit stock to businesses	mio ALL	Endogenous	BoA
CREDIT_BIZ_ALL_GDP	Ratio of domestic currency credit stock to businesses to GDP	percent	Endogenous	MPD
CREDIT_BIZ_EUR	Foreign currency credit stock to businesses	mio EUR	Endogenous	BoA
CREDIT_BIZ_GDP	Ratio of total credit stock to businesses to GDP	percent	Endogenous	MPD
D_NPL	Dummy variable for financial resulotion of NPL	0/1	Exogenous	MPD
FIN_BURD_ALL	Financial burden of borrowers in domestic currency	mio ALL	Endogenous	MPD
FIN_BURD_EUR	Financial burden of borrowers in foreign currency	mio ALL	Endogenous	MPD
GDP	Real GDP	mio ALL	Endogenous	INSTAT
GE_CAE	Central government capital expenditure	mio ALL	Exogenous	MoF
I_B12	Real 12-month treasury bond rate	percent	Endogenous	MPD
I_B12_N	Nominal 12-month treasury bond rate	percent	Endogenous	BoA
I_CREDIT_BIZ	Real interest rate applicable to business credit	percent	Endogenous	MPD
I_CREDIT_BIZ_ALL	Real interest rate applicable to business credit in ALL	percent	Endogenous	MPD
I_CREDIT_BIZ_ALL_N	nominal interest rate applicable to business credit in ALL	percent	Endogenous	BoA
I_CREDIT_BIZ_EUR	Real interest rate applicable to business credit in EUR	percent	Endogenous	MPD
I_CREDIT_BIZ_EUR_N	Nominal interest rate applicable to business credit in EUR	percent	Endogenous	BoA
I_CREDIT_BIZ_N	Nominal interest rate applicable to business credit	percent	Endogenous	MPD
I_DB_POND	Real avg yield of government paper for all maturities (excluding BoA)	percent	Endogenous	MPD
I_DB_POND_N	Nominal avg yield of government paper for all maturities (excluding BoA)	percent	Endogenous	MoF
I_EURIBOR_N	3m euribor in nominal terms	percent	Exogenous	ECB
I_POND	Real composite interest rate of credit interest rate and yield of goverment papers	percent	Endogenous	MPD
I_POND_N	Nominal composite interest rate of credit interest rate and yield of goverment papers	percent	Endogenous	MPD
I_REPO	Real base interest rate	percent	Endogenous	MPD
I_REPO_N	Nominal base interest rate	percent	Exogenous	BoA
LEV_ALL	Financial leverage of businesses with credit in Lek	percent	Endogenous	MPD
LEV_EUR	Financial leverage of businesses with credit in Eur	percent	Endogenous	MPD
P_ALL_EUR	Nominal ALL-Euro exchange rate	ALL/EUR	Exogenous	BoA
P_INF	Annualized inflation	percent	Endogenous	INSTAT
P_INF_EA	Annualized inflation of euro area	percent	Exogenous	ECB
R_NPL_BIZ_EUR	NPL of business for credit denominated in Lek	percent	Endogenous	BoA
R_NPL_BIZ_LEK	NPL of business for credit denominated in Eur	percent	Endogenous	BoA
S_GAP	Output gap	percent	Endogenous	MPD
W_CREDIT_ALL	Share of credit in ALL to total credit stock granted to business	points	Exogenous	MPD

ANNEX C. EQUATIONS

Results of stochastics estimations

	CREDIT_BIZ_ALL_GDP	CREDIT_BIZ_GDP	I_B12_N	I_CREDIT_BIZ_ALL_N	I_CREDIT_BIZ_EUR_N	I_DB_POND_N	R_NPL_BIZ_EUR	R_NPL_BIZ_LEK
AR	0.80***	1.001**	0.24***	0.34**	0.49***	0.45***	0.82**	0.54***
C	2.16**		1.71***	0.23***	2.9***	-4.02*	-7.7***	-0.16*
D_NPL		-0.32*						-3.07***
GE_CAE						0.78***		
I_B12_N				1		0.59***		
I_CREDIT_BIZ_ALL_N	-0.07*							
I_EURIBOR_N					1			
I_REPO_N			1					
LEV_ALL								3.96**
LEV_EUR							2.67**	
R_NPL_BIZ_EUR					0.05***			
R_NPL_BIZ_LEK				0.23***				
S_GAP							-0.72***	-1.04***
Adj R-sq	0.91	0.88	0.22		0.83	0.84	0.92	0.90
*** regressor signicant at 99%; ** at 95%; * at 90%								

II. "DETERMINISTIC RELATIONSHIPS IN THE FINANCIAL BLOCK"

LEV_EUR = 100 * FIN_BURD_EUR / (GDP_N + GDP_N(-1) + GDP_N(-2) + GDP_N(-3))

LEV_ALL = 100 * FIN_BURD_ALL / (GDP_N + GDP_N(-1) + GDP_N(-2) + GDP_N(-3))

FIN_BURD_EUR = (I_CREDIT_BIZ_EUR_N / 100 + 0.16) * CREDIT_BIZ_EUR * P_ALL_EUR

FIN_BURD_ALL = (I_CREDIT_BIZ_ALL_N / 100 + 0.16) * CREDIT_BIZ_ALL

CREDIT_BIZ_ALL = @MOVSUM(GDP_N , 4) * CREDIT_BIZ_ALL_GDP / 100

CREDIT_BIZ = @MOVSUM(GDP_N , 4) * CREDIT_BIZ_GDP / 100

CREDIT_BIZ_EUR = (CREDIT_BIZ - CREDIT_BIZ_ALL) / P_ALL_EUR

I_CREDIT_BIZ_N = W_CREDIT_ALL * I_CREDIT_BIZ_ALL_N + (1 - W_CREDIT_ALL) * I_CREDIT_BIZ_EUR_N

I_POND_N = 0.8 * I_DB_POND_N + 0.2 * I_CREDIT_BIZ_N

I_REPO = I_REPO_N - P_INF

I_B12 = I_B12_N - P_INF

I_DB_POND = I_DB_POND_N - P_INF

I_CREDIT_BIZ_ALL = I_CREDIT_BIZ_ALL_N - P_INF

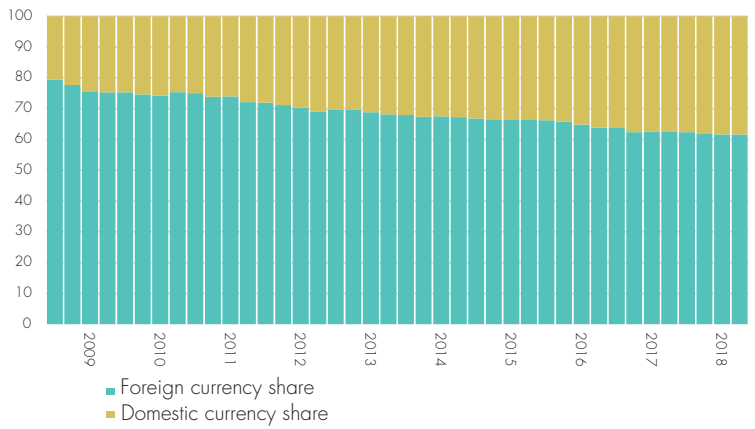
I_CREDIT_BIZ_EUR = I_CREDIT_BIZ_EUR_N - P_INF_EA

I_CREDIT_BIZ = W_CREDIT_ALL * I_CREDIT_BIZ_ALL + (1 - W_CREDIT_ALL) * I_CREDIT_BIZ_EUR

I_POND = 0.8 * I_DB_POND + 0.2 * I_CREDIT_BIZ

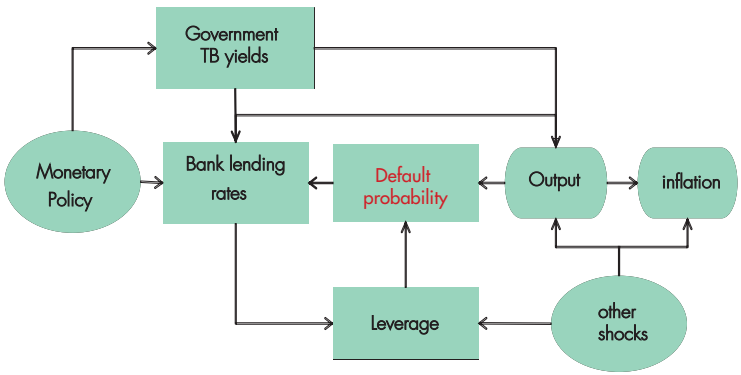
ANNEX D.

Chart 1 Credit stock foreign currency versus domestic currency share



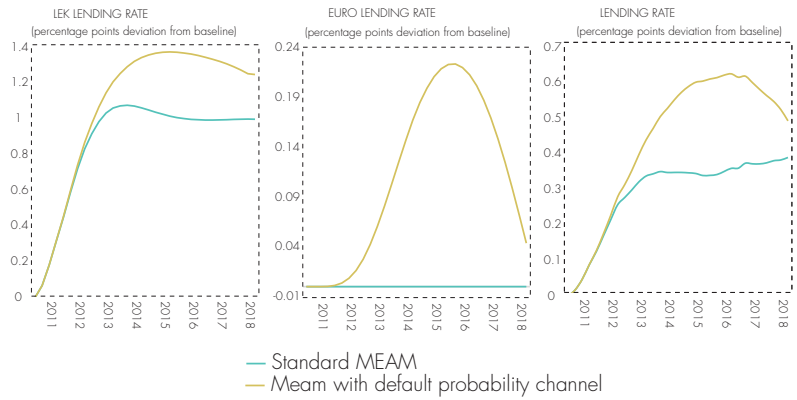
Source: BoA, authors' calculations.

Chart 2 Transmission mechanism of financial block



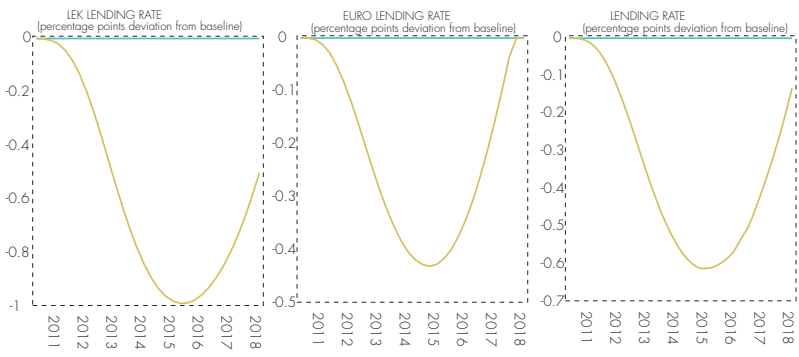
Source: Authors' calculations.

Chart 3 Financial block variables response to a monetary policy shock



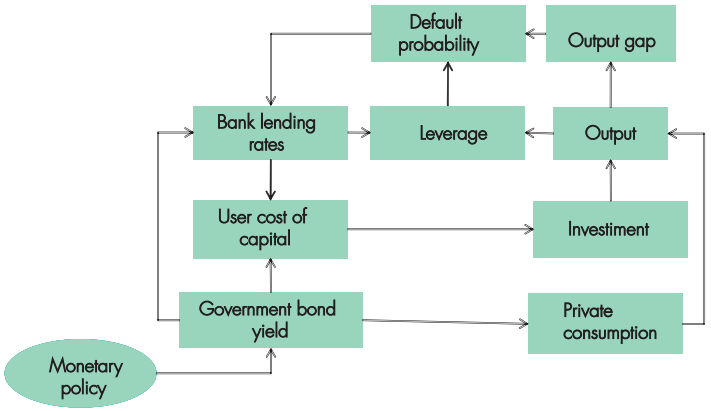
Source: Authors' calculations.

Chart 4 Financial block variables response to a foreign demand shock



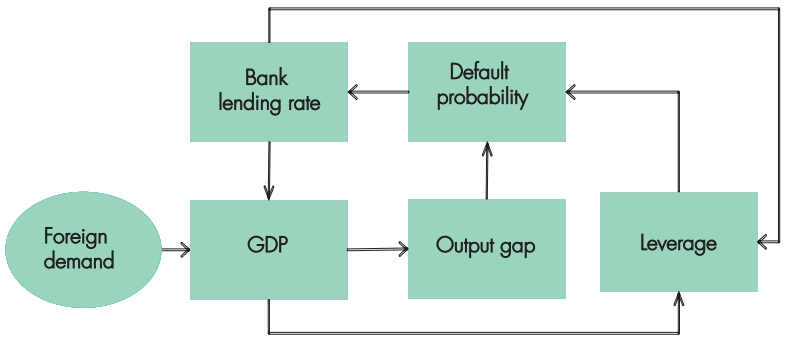
Source: Authors' calculations.

Chart 5 Financial channel transmission mechanism of monetary policy shock



Source: Authors' calculations.

Chart 6 Financial channel transmission mechanism of foreign demand



Source: Authors' calculations.

CIP Katalogimi në botim BK Tiranë

Skufi, Lorena
Financial sector and macroeconomics links in MEAM /
Lorena Skufi. – Tiranë : Banka e Shqipërisë, 2021
40 f. ; 21x15 cm. – (Working paper ; 43(82) 2020)
ISBN 978-9928-262-41-7

1.Banka dhe veprimtaria bankare 2.Banka e Shqipërisë

336.71(496.5)

ISBN 978-9928-262-41-7
9 789928 262417 >

www.bankofalbania.org

ISBN 978-9928-262-41-7