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THE EFFICIENCY AND SPECIFICS OF INTEREST RATE PASS-THROUGH IN THE MONETARY POLICY TRANSMISSION MECHANISM IN EMERGING ECONOMY

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Abstract: In emerging economies banks play a pivotal role in the financial system. The interest rate channel plays a primary role in the economies that adopted the inflation targeting strategy of monetary policy. The causal relationship among interest rates, key policy rate – market interest rates – bank retail interest rates, is at the core of the transmission of monetary policy impulses from the central bank's move to the economy. The results discussed in the paper show a strong pass-through from the key policy rate to the 3-month BELIBOR rate. The speed of adjustment is rapid and pass-through complete. The bank lending rates are less prompt in their immediate response to the underlying change in the key policy rate, but the final long-run outcome is adequate since there is a complete pass-through. The opposite case is observed when examining bank deposit interest rates that show either discord with long-run developments in the money market rates, i.e. absence of long-run relationship, or low degree of statistical significance (10%) of pass-through with prominent sluggishness. A finding arise that interest rate pass-through in Serbia is characterized by a dichotomy in two sub channels of bank pass-through – lending and deposits. Lending sub channel works properly and spreads the stance of monetary policy adequately onto the borrowers, while deposits sub channel does not provide enough incentives for savers to change their behavior which dampens efficacy of monetary policy transmission mechanism.

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1. Introduction

The process through which monetary policy decisions affect the economy in general, and the price level in particular, is known as the transmission mechanism of monetary policy (ECB, 2011). Central banks are very powerful actors in the national economies, and central banks of the major advanced economies are highly influential in the international setting too. Any time the central bank undertakes some action, either by buying or selling some type of financial assets or announcing a change in its official interest rates, a collection of economic and financial decisions made by all economic agents in the economy is set in motion. Financial markets adjust swiftly after central bank's move through change in bond and stock prices and change in exchange rates. Apart from the financial system, central bank's actions produce real effects on the economy (Đorđević, 2003). Firms reconsider their investments' plans and challenge their previous decisions on how fast and how big to grow. Households rethink purchases of residential real estate and durable and non-durable consumer goods.

Taylor (1995) distinguishes between the monetary transmission mechanisms that focus on financial market prices (short-term interest rates, bond yields, exchange rates) or on financial market quantities (money supply, bank credit, the supply of government bonds, foreign denominated assets). In the course of time those focused on the prices of quantities prevailed.

The counterparty role of central banks in transacting with banks varies with the country's level of economic development and the international status of the currency. On the one hand, in the advanced economies central banks typically provide funds to banks, while on the other hand in less developed countries central banks often need to sterilize the excess liquidity from the banking system. In the first case central banks act like a creditor to the banks, in the other case they act as a debtor to the banks (Lukić, 2012). However, in both instances central banks exert a predominant influence on money market interest rates by the means of controlling the money market conditions. In essence, central banks can impact money market rates by its actions directly, while other retail interest rates in turn react merely to changes in the money market rates, meaning central banks impact them only indirectly and to a lesser degree.

The designated change in the key policy rate of central bank does not, by default, induce a linear and proportionate change in the market interest rates. If the change in market interest rates triggered by a change in a key policy rate is not one-for-one in terms of the size, then the market rates are sluggish. Since the adjustment of market interest rates does not occur immediately, the response of interest rates may be assessed in the short run and long run setting separately. While it may prove correct that over time market interest rates will incorporate a shock driven by the change in the key policy rate almost in full, in the short run it may not be the case.

In Serbia and the rest of continental Europe banks play a pivotal role in the financial system. Although the transmission of monetary policy on the real economy encompasses a set of channels, their ways regularly cross paths with the banking system. The interest rate channel plays a primary role in the economies that adopted the inflation targeting strategy of monetary policy (Marinković & Radojičić, 2009). Countries that follow this strategy, Serbia officially from 2009, need to rely more heavily on the interest rate and credit channel, with diminishing role of the exchange rate channel in the transmission mechanism. Thus, the transmission of monetary policy's impulses on the real economy in inflation targeting countries rests immensely on the reaction and developments in the banks' retail interest rates.

2. Related Literature

The empirical research on retail bank interest rates pass-through explores the extent to which positive and negative variations in the financial market or money market interest rates, spurred by monetary policy decisions, are transmitted to interest rates on deposits and loans that banks collect or grant, respectively, to their clients (households and companies). The causal relationship among interest rates, key policy rate – market interest rates – bank retail interest rates, is at the core of the transmission of monetary policy impulses from the central bank to the economy and is a key determinant of how effective is monetary policy in influencing economic activity, inflation and overall financial stability.

In early works on the interest rate channel in the European countries on average a complete pass-through was found (Cottarelli & Kourelis, 1995; Borio & Fritz, 1994; Mojon, 2000), with long term coefficient estimated for loan rates within the range of 0.8-1.25. Crespo-Cuaresma et al. (2006) found their pass-through estimates undershot in comparison to estimates from previous studies, with stronger pass-through in countries of Central and Eastern Europe than in core EU countries. Horvath et al. (2004) underline that corporate deposit and loan rates exhibit both a stronger pass-through and the speed of adjustment than comparable household interest rates in the case of Hungary. De Bondt (2002) identified that the proportion of changes in market interest rates transmitted to bank deposit and loan rates within one month period after change is between 13% (consumer lending rates) and 54% (rates on loans over 1 year to firms).

Andries & Billon (2016) and Gregor et al. (2021) deliver a comprehensive survey of recent literature dedicated to the pass-through of policy rates to the retail rates. A meta-data study pursued by Gregor et al. (2021), encompassing over 50 studies on pass-through, finds that the average pass-through from reference interest rates to lending rates is around 0.8. Andries & Billon (2016) argue that a long-run pass-through to loan rates to firms is almost complete, while a transmission of monetary policy change to deposit rates is only partial. A common feature of both

studies is that contemporaneous pass-through coefficients are strictly below unity, so a pass-through of reference rates to bank retail rates takes some time to occur. Overall finding of both exhaustive studies is that it seems the pass-through mechanism differs among countries, is dissimilar for opposite bank products (deposit and loans), and varies between customer types (corporate and households).

The interest rate pass-through process is not static and evolves in parallel with prominent shifts in the economic and monetary environment. The introduction of the euro in the euro area countries at the onset of the century, as an example of permanent shift, has brought about a faster pass-through process (De Bondt, 2005), a stronger short-run pass-through (Angeloni & Ehrmann, 2003), but on the opposite side a weaker long-run pass-through that fell below unity (Sander & Claimer, 2004; Marotta, 2009).

With the tensions on the global financial markets in 2008, propelled by the financial crisis in the USA, European Central Bank as a response initiated a series of cuts in interest rates. However, in order for these cuts to produce impact on the economy a monetary policy transmission mechanism should have operated properly. A bulk of studies explored how banks passed a monetary policy easing stance on their interest rates (Hristov et al., 2014; Blot & Labondance, 2013; Avouyi-Dovi et al. 2017; Holton & d'Acri, 2018). Those studies provide an empirical evidence that the interest rate channel became significantly impaired in the aftermath of the global financial crisis. A short-run and long-run pass-through have slowed with a diminished ability of monetary policy to steer aggregate demand and inflation in crisis times. Favorably, the financial crisis propagated a more homogenous and aligned interest rate pass-through process across euro area countries (Blot & Labondance, 2013).

The subsequent episode of sovereign debt crisis in the euro area highlighted a distinctive response to the decline in the ECB rates across countries, with a less pronounced decrease in interest rates in peripheral euro area countries to that in core euro area countries (Al-Eyd & Berkmen, 2013).

3. Research Methodology

In the operational framework of monetary policy, the short-term money market interest rates are used as a policy instrument or operational target. It is a variable that responds to the central bank's tools and signals the stance of monetary policy (easing or tightening). Owing to the transmission of monetary impulses from money market rates to the deposit and loan bank rates, monetary policy spreads its influence beyond financial system and affects a broader economy.

When exploring the nature of interest rates movements, one should always keep in mind a possible existence of dynamic relationships between interest rates. A dynamic relationship exists such that contemporaneous change in one variable

has an impact on that same variable and set of other variables too, in one or more forthcoming periods. It is common in real life that change in the explanatory variable has repercussions on other variables beyond the instant in which change occurred. The shift in one variable often has varying effects on other variables – immediate, medium-term, long-term or permanent impact. The effect of the policy rate cut or hike ripples through the spectrum of interest rates.

In order to capture the dynamic features of the spectrum of interest rates a model with lagged dependent (*r*) and explanatory variable (*m*), specified interest rates in both cases, proves adequate:

$$r_t = f(r_{t-1}, r_{t-2}, r_{t-3}, \cdots, m_t, m_{t-1}, m_{t-2}, m_{t-3}, \cdots) \quad (1)$$

A lagged dependent variable (money market or retail interest rates) is one of the explanatory variables in the model above, together with the current and previous time periods value of conventional explanatory variable (policy rate or money market rates). Such model is referred to as autoregressive distributed lag model (ARDL). ARDL models are standard least squares regressions that include lags of both the dependent variable and explanatory variables as regressors (Greene, 2008). Inclusion of a lagged dependent variable (y_{t-1}, y_{t-2},...) in a model captures influences similar to those derived from inclusion of lagged error term (e_{t-1}) or a long history of an explanatory variable (x_{t-p}) (Hill et al., 2011).

A general form of ARDL with *p* lags of dependent variable (y) and *q* lags of the explanatory variable (*x*) is an ARDL (*p,q*) model that can be stated as:

$$y_t = \alpha + \beta_1 y_{t-1} + \cdots + \beta_p y_{t-p} + \delta_0 x_t + \delta_1 x_{t-1} + \cdots + \delta_q x_{t-q} + e_t \quad (2)$$

A form above is known as infinite distributed lag model because there is not cut off point in the time dimension at which explanatory variables stop producing effect on the dependent variable. On the other hand, in the finite distributed lag model the effect of the lagged conventional explanatory variable expires after *q* lags, and the effect of the lagged dependent variable vanishes after *p* lags.

ARDL models are frequently employed as a device of examining cointegrating relationships between variables due to the advancements of the model carried out by Pesaran & Shin (1999) and Pesaran et al. (2001). In these papers a Bounds Testing methodology was developed that can be used for cointegration testing of a long-run relationship between the variables that may be of the order of integration I(0) or I(1), and which involves a single equation set-up, which is convenient for implementation and interpretation.

The research focused on studying the interest rate pass-through follows either a monetary policy approach or a cost of funds approach. The monetary policy approach investigates the transmission of key policy rate change into the financial system by the means of the uniform proxy for the monetary policy stance (most often some short term interbank market interest rate), while the cost of funds

explores transmission from a benchmark market interest rates that are selected by the means of correlation analysis with relevant retail interest rates or through precise maturity matching of market interest rates with relevant retail interest rates (Sander & Claimer, 2004; Andries & Billon, 2016; Pham et al., 2018). The monetary policy approach looks directly at the relationship between policy rates and interest rates, for which the assumption of a stable yield curve needs to hold (Sander & Claimer, 2004). The cost of funds approach observes changes in the policy rate as a cost shock to banks that is transmitted to the price of money paid by all economic agents (De Bondt, 2005).

Theoretically, bank interest rates are based on the marginal cost pricing model and are priced as a markup over bank marginal funding costs (Rousseas, 1985).

The retail interest rate pass-through unfolds in two distinctive environment of perfect (Freixas & Rochet, 2008) or imperfect market competition (De Bondt, 2005). The environment of perfect competition presupposes a full pass-through on bank retail interest rates. De Bondt (2005) has elaborated the determination of retail interest rate pass-through under the framework of the marginal cost pricing model of bank products. In effect, bank retail interest rate (*br*) is determined by the equation (1) inspired by Rousseas (1985):

$$br = \gamma_0 + \gamma_1 mr \qquad (3)$$

where *mr* is the marginal cost of funds for banks represented by some market interest rate (i.e. Ester, 1 month or 3 month EURIBOR). Two coefficients γ_0 and γ_1 are estimated in equation (1). The former coefficient accounts for a constant markup in the structure of retail bank products price, the latter (pass-through coefficient) captures the responsiveness and the portion of current market interest rates change that is transmitted on bank retail interest rates. The pass-through coefficient has a positive sign.

In the case of perfect transmission and smooth interest rate pass-through process, the coefficient γ_1 takes the unity value. Under some circumstances, the pass-through coefficient may take the value above unity. The low value of pass-through coefficient (closer to zero) indicates a malfunctioning of the interest pass-through process that hampers the efficacy of the monetary policy transmission mechanism.

The transmission of NBS's monetary policy to the retail rates relies on how market participants and banking sector react to interest rates – monetary policy mainly sets the framework for bank lending and deposits, and influences market interest rates, but only banking industry reactions can fully deliver the efficacy of the interest rate channel.

In order to empirically test the transmission from money market rates to bank retail interest rates, a general ARDL (*p,q*) model set out by Pesaran & Shin (1999) is employed.

$$y_t = \alpha + \sum_{i=1}^{p} \beta_i y_{t-1} + \sum_{j=0}^{q} \gamma_j m_{t-j} + \varepsilon_t \quad (4)$$

where $\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$

The initial model can be expressed in terms of first differences:

$$\Delta y_t = \alpha + \sum_{i=1}^{p-1} \beta_i \Delta y_{t-1} + \sum_{j=0}^{q-1} \gamma_j \Delta m_{t-j} + \theta_1 y_{t-1} + \theta_2 m_{t-1} + \varepsilon_t$$

with $\theta_1 = -(1 - \sum_{i=1}^{p} \beta_i)$ and $\theta_2 = \sum_{j=0}^{q} \gamma_j$.

Further rearrangement of initial equation yields an error correction form:

$$\Delta y_t = \sum_{i=1}^{p-1} \beta_i \Delta y_{t-1} + \sum_{j=0}^{q-1} \gamma_j \Delta m_{t-j} + \theta_1 (y_{t-1} + \frac{\theta_2}{\theta_1} m_{t-1} + \frac{\alpha}{\theta_1}) + \varepsilon_t$$

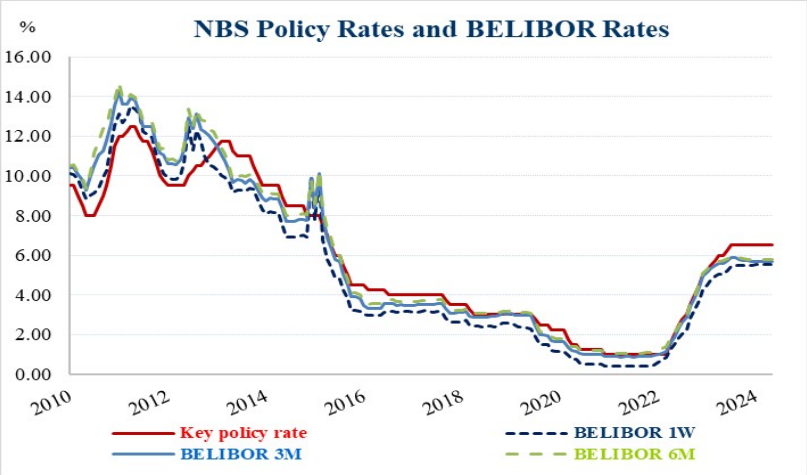
where the co-integrating equation is given by the expression in parentheses. The parameter θ_1 is the error-correction coefficient that represents the speed of adjustment to the long-run equilibrium. The ratio of parameters θ_2 and θ_1 $(\frac{\theta_2}{\theta_1})$ depicts the long-run pass-through coefficient.

4. Developments of policy rate and retail bank interest rates in Serbia

Before engaging in an empirical analysis of interest rate pass-through, it is necessary to examine the behaviour of the key variables during the period under consideration, namely the key policy rate, the money market rates and the bank retail rates. The movement of these time series are similar which indicates a possible cointegration relationship, for instance when the key policy rate increases, the BELIBOR rates also tend to rise, and vice versa. Notably, the fluctuations of the NBS policy rate and the BELIBOR rates were much more volatile before 2016. Since then, there has been a consistent trend where the 3-month BELIBOR rates have generally remained higher than the key policy rate, primarily positive. On average, this spread has amounted to 35 basis points, fluctuating between -17 basis points and +104 basis points.

This observation highlights the effectiveness of the NBS's monetary policy in influencing the movement of BELIBOR rates. The volatility observed before 2016 may reflect a more uncertain economic environment, while the more stable relationship in recent years indicates a greater alignment between the NBS's policy actions and market responses.

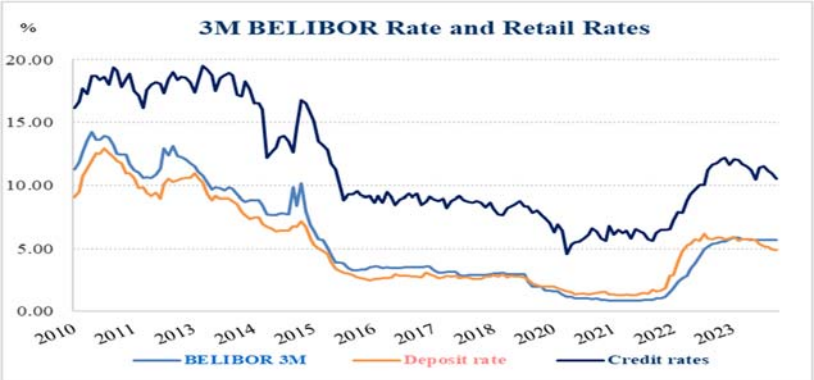
Figure 1. NBS Policy rates and BELIBOR rates



Source: National Bank of Serbia

Similar movements can be seen if we look at retail rates (including deposits and loans to nonfinancial sector and households). There is a consistently large spread between retail lending and deposit rates, suggesting a lack of efficiency gains in the banking system despite its competitiveness. The volatility of retail lending rates for households and non-financial corporations was significantly higher before 2016, which negatively affected their response to changes in the 3-month BELIBOR rate. After 2016, with the relative stabilization of lending rates, a clear correlation emerged between the lending rates for households and non-financial corporations and the 3-month BELIBOR rate, with a correlation coefficient of 0.97 in case of households lending rates and 0.98 in case of lending rates for non-financial corporations.

Figure 2. 3-month BELIBOR rate and bank retail interest rates



Source: National Bank of Serbia

Specifically, the spread between household lending rates and the 3M BELIBOR averaged 7.5 percentage points, always remaining positive and fluctuating between 6.3 and 8.6 percentage points. The spread averaged 2.4 percentage points for non-financial corporations, ranging from 0.9 to 3.6 percentage points. Additionally, the spread between the NBS policy rate and the 3M BELIBOR negatively correlates with the 3M BELIBOR, with a correlation coefficient of -0.28. In contrast, there is barely any correlation between the spread of retail lending rates and the 3M BELIBOR, as well as the movements of the 3M BELIBOR.

Despite their higher volatility, the deposit, interbank, and policy rates exhibit regular co-movement, suggesting a long-run relationship between these rates. Throughout the period covered, monetary policy has been actively utilized to address challenges stemming from domestic and external shocks. These findings highlight the complexities of interest rate pass-through in Serbia's banking sector, with varying degrees of correlation and spreads across different rates. The persistent spread between lending and deposit rates indicates a lack of efficiency gains in the banking system, a notable feature of the retail interest rate dynamics in Serbia.

5. Research results and discussion

With the aim to evaluate the smoothness of the interest rate pass-through in Serbia, we explored the reaction of the money and retail market rates to the change in the key policy rate for the 2013-2024 period. The sample of interest rates under consideration covers the quarterly data from Q1 2013 to Q2 2024 (total of 46 observations). Of the retail bank interest rates considered 100% reflect new business. All time series are retrieved from the statistics of the National Bank of Serbia.

Table 1. exhibits the interest rates used in the analysis of the interest rate channel of monetary policy.

Table 1. Variables used in analysis

Variable name	Variable description
Key policy rate	The NBS key policy rate
3-month BELIBOR (3M BELIBOR)	Money market rate proxy
Interest rate on corporate loans	Interest rates on loans to non-financial sectors
Interest rate on household loans	Interest rates on loans to private persons
Interest rate on corporate deposits	Interest rates on term deposits from non-financial sectors
Interest rate on household deposits	Interest rates on term deposits from private persons

The low liquidity in the interbank money market and the irregular data associated with it have led to the choice of 3-month BELIBOR rate as a critical benchmark in the banking sector, influencing the determination of deposit and loan rates.

A prerequisite for implementation of ARDL models is to check the stationarity of time series. An ARDL allows us to model non-stationary time series, but not of the order greater than two (I(2)). Thereby, the augmented Dickey-Fuller test was carried out and τ statistic computed for each interest rate in levels and first differences. The results from Table 2. confirm that it is justified to proceed with estimating ARDL models.

Table 2. ADF unit root test

	Level	First differences
Key policy rate	0,25	0,01
3-month BELIBOR (3M BELIBOR)	0,28	0,00
Interest rate on corporate loans	0,08	0,00
Interest rate on household loans	0,04	0,00
Interest rate on corporate deposits	0,20	0,01
Interest rate on household deposits	0,09	0,01

Source: Authors' calculation.

A total of five ARDL (*p,q*) models that rest on both the monetary policy approach and the cost of funds approach of the interest rate pass-through were estimated. All regressions include only one explanatory variable with varying lags. Regressions are summarized in the Table 3.

Table 3. ARDL models estimated

Model	Independent variable	Explanatory variable	Type of approach
Model 1	3M BELIBOR	Key policy rate	Monetary policy App.
Model 2	Interest rate on corporate loans	3M BELIBOR	Cost of funds App.
Model 3	Interest rate on household loans	3M BELIBOR	Cost of funds App.
Model 4	Interest rate on corporate deposits	3M BELIBOR	Cost of funds App.
Model 5	Interest rate on household deposits	3M BELIBOR	Cost of funds App.

Since insight into all of the series indicated time series are not centered about zero, we included a constant term as a deterministic component in the specifications of the ARDL models estimated (restricted constant).

Before estimating the model from equation (5), a selection of an appropriate number of lags for the dependent variable (p) and for the regressor variable (q) needs to be determined. Maximal number of lags for both variables was set at 4 ($p=q=4$), with the intention to not over-select the maximum lags.

Akaike Information Criterion (AIC) was used to filter out the best model (out of 100 prospective models at the disposal for max lag=4), so as to minimize the information criterion. However, in the cases of exploring relationship between 3M BELIBOR and key policy rate, and between interest rates on household loans and 3M BELIBOR the preferred model included explanatory variable without lag ($q=0$). In this case it would not be feasible to assess the short term dynamics between the variables considered. This obstacle was circumvented by choosing the model with the lowest value of the Akaike criterion for which number of lags of explanatory variable is greater than zero ($q>0$). As a result, AIC optimal model - ARDL (2,0) - for Model 1 was replaced with the model ARDL (2,1), as a model which was ranked at third place according to the AIC value. In the same manner, ARDL (4,2) model substituted the optimal model – ARDL (4,0) – for Model 3.

Selected on the basis of AIC criterion, the unrestricted error correction models were estimated using standard least squares method, which are a particular type of ARDL model. To verify that the residuals of the models estimated are free from autocorrelation, the null hypothesis that the residuals are serially uncorrelated was carried out with reference to the LM test, and accepted in all cases. The homoskedasticity of residuals was also confirmed with Breusch-Pagan-Godfrey test. With residuals that are serially uncorrelated and homoskedastic, we proceed to the Bounds testing methodology of Pesaran & Shin (1999) and Pesaran et al. (2001)

Table 4. Description and diagnostics of the unrestricted error-correction model (ECM)

Model	ARDL (p,q)	AIC value	Autocorrelation (LM test) – *p value*	Heteroscedasticity (Breusch-Pagan-Godfrey test) – *p value*
Model 1	ARDL (2,1)	1,252	0,9046	0,5049
Model 2	ARDL (4,2)	1,2	0,3087	0,4196
Model 3	ARDL (4,2)	1,38	0,8319	0,4603
Model 4	ARDL (1,2)	0,87	0,7909	0,107
Model 5	ARDL (3,2)	0,415	0,2323	0,642

Source: Authors' calculation.

The F-statistic value (F-Bounds test) for 3M Belibor and interest rate on corporate loans as a dependent variables is greater than the I(1) critical value bound defined for the 1% level of significance, while F-statistic for interest rate on households loans was statistically significant at the 5% level. Since the null hypothesis of the F-Bound test is that there is no equilibrating relationship between variables, we reject it in the Model 1, Model 2 and Model 3.

Due to the fact that the existence of the cointegrating relationship is verified, it is justified to take into consideration the estimation of the long-term equilibrium relationship and the speed of adjustment to the equilibrium. The long-run equilibrium relationship is derived out of the regression in levels between the relevant variables. The residuals of this regression are called error-correction term that enter a conventional error-correction model whose adjoint regression coefficient is referred to as the speed of adjustment.

The long-term pass through coefficient in Model 1 for the key policy rate is 0.96, meaning that a 100 basis point increase in the key policy rate leads to the ultimate 96 basis point increase in the 3M Belibor. This is an example of a complete pass-through, the outcome with which a central bank would be content because its monetary policy impulses are transmitted into the financial system in the proper manner.

Table 5. Overview of the interest rate pass-through process within error-correction framework

Model	F-Bounds test	Immediate pass-through	Final pass-through	Adjustment speed	Long-term constant
Model 1	6,5061***	0,8456***	0,9596***	-0,6776***	-0,144
Model 2	13,5062***	0,3785***	1,096***	-0,7164***	2,1447***
Model 3	4,7983**	0,4417***	1,0439***	-0,35***	7,273***
Model 4	3,4116(2)	0,5309***	0,4387	-0,1435***	1,9673
Model 5	3,755*	0,2021***	0,5452***	-0,2346***	1,5667***

(1) ***, ** and * denote significance at the 1%, 5% and 10% level, respectively.

(2) F-statistic computed for the F-Bounds test is in the gray area, meaning that null hypothesis cannot be neither rejected nor accepted for the 10% significance level.

Source: Authors' calculation.

The long-term pass-through coefficient for the 3M Belibor amounts to 1.1 for corporate loans and 1.04 for households loans. The coefficients are greater than 1, which may be referred to as the pass-through overshooting. The banks increase their lending rates by an amount greater than the increase in the market interest rate.

The coefficient of the error correction term (adjustment speed) is negative and very significant, as it should be when cointegration relationship is present. The magnitude of this coefficient in Model 3 implies that 71% of disequilibrium between interest rate on corporate loan and 3M Belibor is corrected within one period. The speed of adjustment to the long-term equilibrium is 68% for a pair of 3M Belibor and key policy rate, and 35% for a pair of interest rate on household loans and 3M Belibor.

Although it seems that the speed of adjustment is highest for interest rate on corporate loans, one should keep in mind a magnitude of the immediate pass-through. It is lower (38%) for respective interest rate in comparison to other lending rates. Merely 38% of a change of 3M Belibor in period zero is passed through to the interest rate on corporate loans within the same period. A comparable size of immediate pass-through for the 3M Belibor and interest rate on household loans is 84,5% and 44%, respectively. Possibly, the weaker initial reaction of one interest rate to the change in the reference interest rate, the faster the convergence to the equilibrium relationship may be expected, provided that it entails a complete pass-through.

The last point when examining market and loan interest rates is the size of the long-term constant. The purpose of including the constant into the long-run cointegrating regression is to capture all of the time-invariable impacts that are not included into the equilibrium term. Long-term constant is not statistically significant in explaining long-run relationship between 3M Belibor and key policy rate, meaning that there are no left time-invariable impacts beyond the equilibrium term. On the opposite side, long-term constant is important in explaining long-run relationship between interest rate on corporate loans and interest rate on household loans on the one side, and the 3M Belibor on the other side. The size of the long-term constant is especially large for the interest rate on household loans – 7.3. This finding is consistent with comparably higher loan interest rates for households than non-financial companies.

The reaction of deposit interest rates to the change in the money market rate is not alike reaction of loan interest rates, judging by the presence and strength of the long-run equilibrium relationship between the variables. The computed F-statistic for interest rate on corporate deposits does not provide a firm ground to conclude that a long-run relationship with 3M Belibor exists. The F-statistic value of 3.41 falls between the lower bound which is based on the assumption that all of the variables are stationary (I(0)), and the upper bound defined by the assumption that all of the variables are integrated of the order one (I(1)). This finding does not justify further analysis that comprises an estimate of the long-run relationship of variables in level and a restricted error-correction model.

The computed F-statistic for interest rate on household deposits provides a modest prove that there exists a long-run relationship with 3M Belibor. The F-

statistic is above the critical value of the upper bound (I(1)), defined for the level of significance of 10%. A closer look reveals that an immediate pass-through is weak and long-run coefficient low, barely above 50%, although both coefficients are significant. The speed of adjustment is slow and it takes a considerable time for household deposits to reach a long-run equilibrium. These features suggest that even if we accept the hypothesis on the existence of the long-run relationship, the pass-through is not complete.

6. Conclusion

Central bankers are interested in knowing whether monetary policy measures are being transmitted in the envisaged manner. That is, whether monetary policy in the inflationary environment is effective in decreasing aggregate demand, to the extent needed, by curbing lending and enhancing savings with higher interest rates, and vice versa in a recessionary environment. Interest rate pass-through needs to be examined continually in order to reassess whether relationships observed in the past among key policy rate, market interest rates and various bank interest rates still hold.

It is reasonable to guess that different bank interest rates will respond to differing degrees and at differing speeds to changes in market interest rates which, in turn, are determined overwhelmingly by monetary policy.

The results discussed in the paper show a strong pass-through from the key policy rate to the 3-month BELIBOR rate. The 3-month BELIBOR rate responds significantly to changes in the key policy rate. The speed of adjustment of the 3-month BELIBOR rate is rapid and pass-through complete, which is desirable for monetary policy as it sends a strong signal to the economy.

The bank lending rates are less prompt in their immediate response to the underlying change in the key policy rate, but the final long-run outcome is welcomed since there is a complete pass-through. The opposite case is observed when examining bank deposit interest rates that show either discord with long-run developments in the money market rates, i.e. absence of long-run relationship, or mild degree of pass-through with prominent sluggishness.

As a consequence an important finding is that interest rate pass-through in Serbia is characterized by a dichotomy in two sub channels of pass-through – lending and deposits. Lending sub channel works properly and spreads the stance of monetary policy adequately onto the borrowers, while deposits sub channel does not provide enough incentives for savers to change behavior towards the envisaged outcome. Although lending sub channel is more important since it produces more impact onto macroeconomic variables, one should not neglect the necessity to bring back into function a deposits sub channel.

Further investigation into interest rate pass-through in Serbia, which could underlie new research, may be dealing with asymmetric reaction of bank interest rates, in terms of completeness and speed of adjustment, to a drop in the key policy rates relative to a rise in a key policy rate. The hike in NBS's key policy rate, which has been on a downward path since 2013, starting in 2022 gives rise to this examination.

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EFIKASNOST I SPECIFIČNOSTI KANALA KAMATNE STOPE U TRANSMISIONOM MEHANIZMU MONETARNE POLITIKE U EKONOMIJI U RAZVOJU

Apstrakt: U ekonomijama u razvoju banke zauzimaju centralnu ulogu u finansijskom sistemu. Kanal kamatne stope ima primarni značaj u zemljama koje su usvojile strategiju targetiranja inflacije kao okvir monetarne politike. Uzročno-posledična veza između kretanja različitih kamatnih stopa, referentna kamatna stopa centralne banke – tržišne kamatne stope – kamatne stope banaka, je suštinski važna za prenošenje impulsa monetarne politike sa odluka i poteza centralne banke na privredne tokove. Rezultati dobijeni u radu pokazuju ubedljivo prenošenje promena u referentnoj kamatnoj stopi na tržišnu tromesečnu BELIBOR stopu. Brzina reakcije tromesečne BELIBOR stope na izmene u referentnoj stopi i kretanje ka ravnoteži je visoka, a apsolutna veličina promene dve stope je identična u dugom roku. Aktivne kamatne stope banaka su manje responzivne u svom inicijalnom odgovoru na promenu referentne kamatne stope, ali je njihova reakcija u dugom roku adekvatna jer u potpunosti apsorbuju u svojoj veličini promenu u tržišnoj kamatnoj stopi. Suprotan slučaj se uočava kada se ispituje reakcija kamatnih stopa na depozite banaka koje pokazuju ili nepostojanje veze sa dugoročnim kretanjima tržišnih kamatnih stopa, odnosno odsustvo dugoročne ravnotežne veze, ili statistički nisko značajan (10%) i ograničen stepen promene svog nivoa koji je u konačnici značajno niži u odnosu na apsolutnu promenu tržišne kamatne stope. Pored toga, dostizanje dugoročnog ravnotežnog odnosa je vremenski prolongirano, što znači da se ka njemu sporo teži. Zaključak rada je da lančani proces prenošenja promena u kamatnim stopama u Srbiji karakteriše dihotomija u vezi sa dva podkanala za prenošenje promena u bankarskim kamatnim stopama – kreditni i depozitni podkanal. Kreditni podkanal funkcioniše prema očekivanjima i adekvatno se putem njega prenosi zacrtani kurs monetarne politike na dužnike po bankarskim kreditima, dok depozitni podkanal ne pruža dovoljno podsticaja štedišama da promene svoje ponašanje, što generalno umanjuje efikasnost transmisionog mehanizma monetarne politike.

Ključne reči: monetarna politika, prenošenje promene u kamatnim stopama, kamatne stope banaka, model sa korekcijom greške, autoregresioni distribuirani model sa docnjama.

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