In Search of Monetary Transmission in Moldova

Nick Gigineishvili

1. Introduction

Monetary transmission is a mechanism through which monetary policy actions pass through to its target variables, which, in most cases, is inflation. In order to design and implement appropriate monetary policy, a central bank should have a deep insight into the transmission process. Channels and the strength of transmission can vary depending on a host of factors including the structure of the economy, the extent of financial market development, balance sheet positions of economic agents, the history of inflation, etc. Since the objective of monetary policy is quantifiable, it is not sufficient to qualitatively understand the transmission process; it is equally important to establish quantitative relationships between policy and target variables, and even more so under inflation targeting – a policy framework, which is rapidly gaining popularity around the globe.

There is a number of channels through which transmission can take place. At early stages of transition, the exchange rate channel played a key role. In many countries with a high degree of currency substitution, undeveloped financial markets, import dependence of inputs and consumption, and lack of central bank credibility foreign exchange was perceived as a single most liquid and inflation proof asset. Hence, its price – the exchange rate – became the most important variable, which moved quickly with changes in monetary policy and fed into consumer prices.

Other channels of transmission, of which the interest rate channel, the asset price channel and the credit channel are most widely sited in the literature, tend to be dominant in more developed countries. With economic development and deepening of financial markets, they gained prominence in transition countries as well. More recently, as central banks in an increasing number of countries opted for inflation targeting (IT) as an alternative policy framework, the interest rate channel started to attract a growing attention. Proper functioning of this channel of transmission is one of the pillars of IT, and it is essential for an inflation targeter central bank to thoroughly understand how, by how much and over what period of time changes in policy interest rates affect inflation.

The National Bank of Moldova (NBM), following experiences of other central banks in Central and Eastern Europe, has recently decided to move to formal inflation targeting over the medium term. There has been very limited research done in this area for Moldova and, therefore, a little is known about determinants of inflation and monetary transmission. This paper is an attempt to make a contribution.

The paper is structured as follows. Section 2 gives an overview of the interest rate channel of transmission. The next section provides a background of Moldovan financial markets, liquidity conditions and the current framework of monetary policy. Section 4 sets out the formal model used to estimate the strength and the speed of the pass-through, and section 5 discusses the results. The final section draws conclusions.

2. Interest Rate Channel of Transmission

The process of transmission can be divided into three stages. At the first instance, an innovation in the central bank policy rate causes market rates (money market, treasury bills, etc.) to move, from short term rates to longer maturities through the yield curve. In the next stage, the changes in market rates pass through to commercial bank lending and deposit rates, which in turn, in the final stage, alter spending and investment behavior of households and enterprises, and ultimately prices through shifts in aggregate demand. The potency of monetary policy to a large extent depends on the speed and the degree of pass-through, i.e. how fast and by how much changes in interest rates get passed through at each stage of the process. Stronger and faster is the impact, more effective is transmission.

Normally central banks operate at the lower end of the maturity structure, where the impact of policy rates on market rates is strongest and immediate. The first stage of transmission occurs as the change in short term rates works its way through the rest of the money market yield curve, which if stable, would only shift in response without modifying its slope. In this case the pass through would be proportionate, if not one-to-one, to the policy rate change (Crespo-Cuaresma, Egert, and Reininger, 2006). However, depending on the shape and stability of the yield curve longer term market rates may react differently to policy shifts and, therefore, strengthen or weaken the transmission. Several different approaches, or a combination of those, could explain the term structure of interest rates. First, according to the expectations hypothesis, if investors are risk-neutral, market arbitrage will ensure that long-term rates derive as a geometric mean of expected short-term yields, which in turn depend on

expectations of inflation and exchange rate movements. Second, liquidity preference induces risk-averse investors to demand a term premium on longer maturities resulting in higher long-term rates. Finally, the market segmentation view, which allows for long and short term maturities to be traded independently in separate market segments, implies that interest rates at two ends of the yield curve are disconnected and do not move in tandem.

The second stage of transmission describes how changes in market interest rates influence retail lending and deposit rates. The connection is well illustrated by the cost of funds approach (De Bondt, 2002), which assumes that market rates represent opportunity costs for banks and depositors. Instead of loans, banks can channel liquidity into the money market or corporate securities, while households and enterprises may also opt for the latter as opposed to deposits. Therefore, an increase in market rates, including in response to changes in policy rates, translates into higher lending and deposit rates.

Following De Bondt the cost of funds approach can be formalized as a mark-up pricing model:

$$i^R = \alpha + \beta \cdot i^M$$

where i^R and i^M are retail and market rates respectively; β is a pass through coefficient, and α is a markup. In perfect markets (full information and perfect competition), β would equal to 1, implying a unit interest rate elasticity of demand for deposits and loans (Coricelli, Egert,

and McDonald, 2006). In practice, however, the pass-through is usually weaker with $\beta < 1$. Imperfect substitutability of money market instruments for loans and deposits, imperfect competition among banks and in the financial sector in general, customer loyalty to banks and vice a versa, and possibly high switching costs may weaken the connection between retail banking and money market interest rates to various degrees.

In the final stage of transmission changes in retail interest rates cause households and enterprises to adjust their spending behaviors. Other things equal, as interest rates increase, household consumption declines and savings increase. Similarly, demand for loans decreases and businesses cut spending and investment. As a result, aggregate demand declines putting downward pressure on prices. Clearly, retail interest rates are not the only variables that influence inflation. The exchange rate, money supply, income growth and distribution, to mention only a few, also affect inflationary expectations or otherwise cause shifts in aggregate demand and/or supply, and thus play an important role in price dynamics.

3. Moldova's Financial Market

The background in the preceding section points to the fact that the strength of transmission at each stage and, therefore, the potency of monetary policy as a demand management tool in the hands of country authorities, largely depend on the effectiveness and the degree of development of financial markets. Market segmentation and disconnect between interest rates on different market instruments is more likely to occur in shallow and underdeveloped

markets than in mature ones with more sophisticated financial infrastructure.

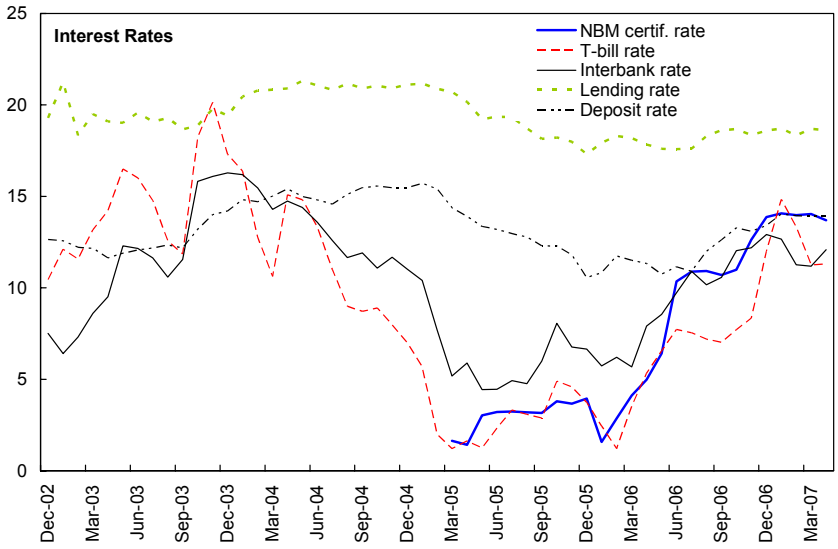
The main challenge facing the National Bank of Moldova is to manage large inflows of foreign exchange. Remittances from Moldovans working abroad have been steadily growing over the past 7 years reaching 35 percent of GDP in 2006. More recently, foreign direct investments have also picked up. These inflows have been exerting strong appreciation pressures, while at the same time pumping liquidity in the system. Although the central bank law clearly defines price stability as the primary objective of monetary policy, the attempts to balance multiple, and often conflicting, objectives of inflation, exchange rate stability and low interest rates, have led to partly sterilized foreign exchange intervention and a liquidity overhang.

The NBM uses a so-called “corridor” structure of policy rates whereby standing facilities of overnight deposits and credits form the lower and upper bounds for market rates. The main monetary policy tool used for liquidity management purposes is weekly auctions of NBM certificates, which was introduced in 2005 to gradually replace credit and deposit auctions. However, with the overnight deposit rate set at 2 percent, when 7-day NBM certificates yield 16 percent, the corridor appears to be too “wide” to attract liquidity. Moreover, even at 16 percent, the NBM has been facing difficulties in sterilizing foreign exchange inflows, implying that further tightening by increasing interest rates might be in order. The resistance to allow more exchange rate flexibility and to raise policy rates has been complicating the conduct of monetary policy sending confusing signals to market participants regarding policy intentions.

The banking system, which is by far the largest and the most advanced segment of the Moldovan financial sector, remains underdeveloped despite strong growth over the past 15 years. While expanding rapidly at about 35-40 percent per annum over the past 5-7 years, the total credit is only 31 percent of GDP, and maturities are short. Competition has also been weak and foreign banks have only recently started to show interest and enter the Moldovan market. Capital markets are at a rudimentary level with only a handful of corporate stocks being publicly traded, and thus are not yet perceived as a source of financing. Instead, personal savings fed by remittances from abroad, bank loans and, more recently, rapidly growing foreign direct investments underpin capital and consumer spending.

The money market comprises three segments: T-bills, NBM certificates and the direct interbank market. T-bills are auctioned weekly, mostly 91-day papers, though 182 and 364-day bills are also sold in small quantities. The outstanding stock is only 3.6 percent of GDP and is owned mainly by commercial banks, while the share of non-bank investors is less than 2 percent. NBM certificates are currently being offered to banks at pre-announced interest rates in 7-day, 14-day and 28-day maturities. There is virtually no secondary trading in T-bills or NBM certificates. Due to liquidity overhang, both papers are primarily used as short-term investment vehicles, rather than a liquidity management tool. The T-bill market is the smallest with an average monthly turnover of lei 176 million followed by the interbank market at about lei 1.3 billion, which is dominated by overnight and up to 14-day interbank loan. With increased sterilization needs, monthly sales of certificates increased from about lei 550 million in 2006 to more than lei 2 billion in 2007.

Important drawbacks of the Moldovan financial market, that goes back to market development issues, are market segmentation and the incomplete term structure of market instruments. A very limited number of only short-term maturities distorts the yield curve, which, as noted, is a key component of monetary transmission linking short term interest rates with longer term rates. Although the four main segments - the interbank market, government securities, NBM certificates and bank lending - compete for the same pool of liquidity, the connection between respective interest rates is still weak. The first three - interbank, 91-day T-bill and NBM certificate rates, all of comparable maturities – while exhibit strong correlation, often significantly diverge and sometimes move in opposite directions. Starting from May 2006 the T-bill rate has been consistently below the NBM certificate rate (except for a brief episode in January 2007), even though these papers attract the same clientele, commercial banks, which tend to invest in and hold until maturity both of these instruments with the sole purpose of deriving income. Moreover, with longer duration T-bills are likely to carry higher exchange and interest rate risks, and should, therefore, yield returns at least as high as NBM certificates. This hints at the existence of some degree of market segmentation that could weaken transmission.

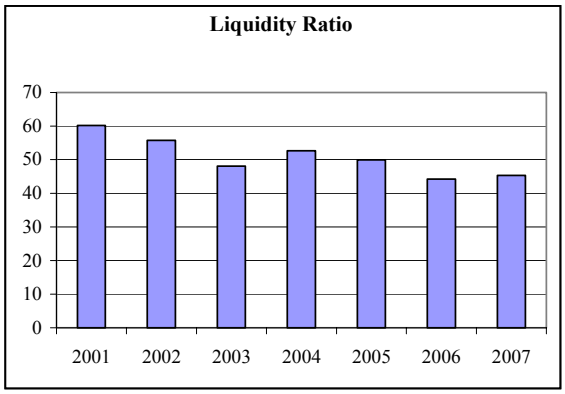


Lending and deposit rates also appear disconnected from short-term money market rates. The latter declined from as high as 18-20 percent in late 2003 to as low as 2-3 percent in early 2005, and increased again to about 16 percent in 2007. Retail rates, however, remained practically unchanged over the same period.

Apart from undeveloped markets and lack of competition, the disconnect between market

and retail rates owes to liquidity overhang in the banking system fuelled by continuous large inflows of remittances. Over the past 5-7 years Moldovan banks have been excessively liquid with liquidity ratios ranging between 45-60 percent, most liquid assets being cash and equivalents.[1] While part of cash balances is precautionary, held voluntarily to meet demand for a large volume of cash transactions, the remaining balances have still been exceeding banks' lending needs. Nevertheless, loan rates have not declined partly because of high inflation and high inherent business and credit risks, and also due to weak competition among banks. Instead, liquidity pressures shifted to T-bills and NBM certificates – the only remaining alternatives to non-yielding deposits at the NBM – pushing their rates down into a negative territory in real terms. With the change in the monetary policy stance from loose in 2004 and 2005 to more tight thereafter, market rates increased. Retail lending and deposit rates, however, proved to be less responsive, and credit growth remained robust. This suggests that liquidity in the system continued to exceed market demand for cash and loans, and that the NBM was sterilizing only a 'leftover'. In other words, short-term market rates remained too low to compete with bank lending weakening the link between market and retail interest rates.

[1] Liquidity ratio is defined as a ratio of liquid assets to total deposits.

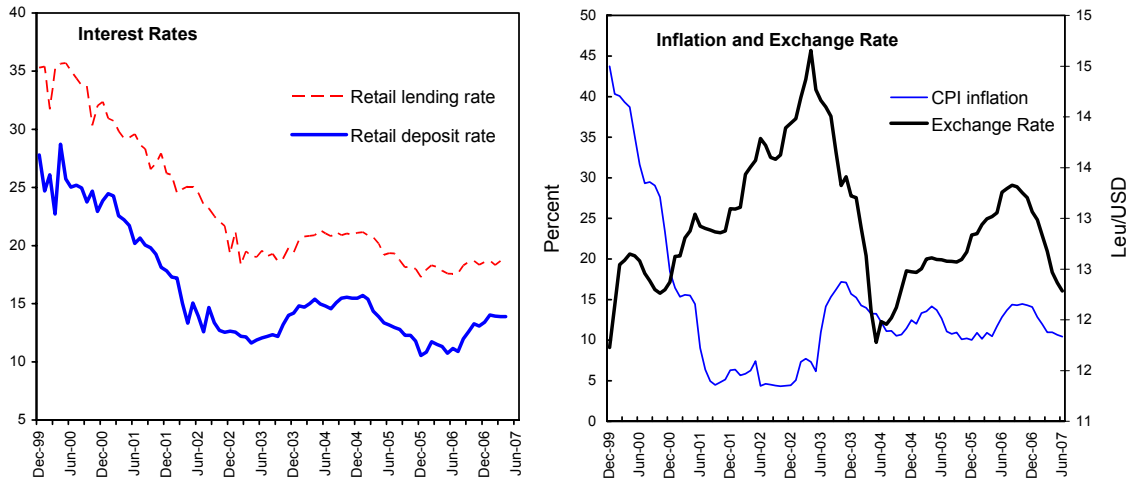


Retail deposit rates did not decline under liquidity pressures and banks continued to attract funds at high rates. Total deposits grew by about 30 percent in 2006. Possibly, the liquidity overhang was perceived as temporary, and banks were betting on longer-term returns from building reputation and a solid client base.

4. Model and Data

This section turns to formal estimation of the strength and the speed of the interest rate pass-through in Moldova. Each stage is modeled separately using monthly data from September 2003 through December 2006. The relationships estimated below appear rather stable over

this period, but change considerably and become unstable when the sample is extended to before September 2003 indicating the presence of structural breaks in the series, possibly due to the changing nature of the economy and financial markets. Indeed, even a visual examination of time series shows that from the post-Russian crisis until early 2003 inflation and deposit and lending rates had been steadily and rapidly declining, and the exchange rate depreciating, while from mid-2003 the trend disappeared. Starting from January 2007, the National Bureau of Statistics of Moldova substantially revised CPI weights introducing another break in price statistics. This period, therefore, is also excluded.



For the first and the second stage of transmission, the following equations were used to establish relationships between monetary policy and market rates, and between market and retail rates:

Stage one: $$i_t^M = \alpha_1 + \beta_1 \cdot i_{t-k}^P + \varepsilon_t \qquad (1)$$

Stage two: $$i_t^R = \alpha_2 + \beta_2 \cdot i_{t-j}^M + \omega_t \quad (2)$$

where *P*, *M* and *R* superscripts identify policy, market and retail rates respectively; β_1 and β_2 are pass-through parameters, α_1 and α_2 are constants, and ε and ω denote error terms for each stage correspondingly. *t* is a time index, while *k* and *j* allow for time lags in the transmission process, and characterize the speed of the pass-through.

Interest rates on NBM certificates were used as a policy rate variable i^P. As noted, NBM certificates were introduced only in 2005, which would considerably shorten the series and weaken the predictive power of equation (1). To avoid a loss of degrees of freedom, the earlier period was substituted with interest rates from credit auctions, held by the NBM as a main monetary policy instrument at that time. Interbank rates were used for the market rate i^M, and average interest rates on outstanding stocks of bank credits and deposits in the domestic currency—for the retail rate i^R. Unit root tests confirm that all interest rates are I(1) processes, implying that their first differences are stationary.

The third stage of pass-through is estimated based on the following inflation equation:

$$\pi_t = \eta + \gamma_1 \pi_{t-1} + \gamma_2 er_{t-l_1} + \gamma_3 rm_{t-l_2} + \gamma_4 wage_{t-l_3} + \gamma_5 i^R{}_{t-l_4} + \delta_t \quad (3)$$

All variables in the above equation are log-differences of the respective nominal values,

where π is annual consumer price inflation, and *er, rm* and *wage* are annual changes in the leu/Euro exchange rate, reserve money and average wages in the economy, respectively. i^R is a change in retail interest rates. The average wage is used as a proxy for disposable income.[2] A one-period lagged value of inflation is included in the model to allow for its persistence. *t* is time, l_1 through l_4 are time lags, and δ is an error term. The logarithmic form of equation (3) implies that γ coefficients represent respective elasticities, showing a percentage change in inflation in response to a one percent change in a dependant variable.

5. Results

All three stages were estimated with a simple OLS run on stationary differenced variables. Time lags for each stage of transmission were determined individually by running regressions with different values for *k*, *j* and l_1 through l_4, and selecting those that produced best fit and statistically significant coefficient estimates. For the retail rate i^R both deposit and lending rates were used in separate regressions to estimate second and third stages. Estimation results are reported in the table below for the following lag specifications of equations (1) – (3):

Stage 1: $i_t^M = \alpha_1 + \beta_1 \cdot i_t^P + \varepsilon_t$, with k=0.

Stage 2: $i_t^L = \alpha_2 + \beta_2 \cdot i_{t-3}^M + \omega_t$, for lending rate (L) as i^R with j=3.

[2] Average wages may not be an accurate measure of income given heavy dependency of consumption on remittances. However, no reliable data are available for monthly inflow of remittances, nor are the monthly GDP statistics produced in Moldova.

$$i_t^{D} = \alpha_2 + \beta_2 \cdot i_{t-4}^{M} + \omega_t, \qquad \text{for deposit rate (D) as } i^R \text{ with } j=4.$$

Stage 3: $l_1 = l_2 = 1$, $l_3 = 4$ for both lending and deposit rates as i^R.

$$\pi_t = \eta + \gamma_1 \pi_{t-1} + \gamma_2 er_{t-1} + \gamma_3 rm_{t-1} + \gamma_4 wage_{t-4} + \gamma_5 i^{L}{}_{t-8} + \delta_t$$

for lending rate (L) as i^R with $l_4=8$.

$$\pi_t = \eta + \gamma_1 \pi_{t-1} + \gamma_2 er_{t-1} + \gamma_3 rm_{t-1} + \gamma_4 wage_{t-4} + \gamma_5 i^{D}{}_{t-9} + \delta_t$$

for deposit rate (D) as i^R with $l_4=9$.

Pass-Through Coefficient Estimates

	Stage 1	Stage 2		Stage 3	
Variable	i^M	i^L	i^D	π	
	1	2	3	4	5
const.	-0.14 (-0.82)	-0.01 (-0.19)	0.04 (0.48)	0.01 (1.23)	0.01 (1.36)
i^P	0.27 (2.67)				
$i^M_{-3,-4}$		0.13 (2.56)	0.14 (2.18)		
π_{-1}				0.69 (8.19)	0.67 (13.69)
er_{-1}				0.04 (2.46)	0.04 (3.42)
rm_{-1}				0.03 (2.88)	0.03 (3.51)
$wage_{-4}$				0.09 (3.14)	0.10 (4.32)
i^L_{-8}				-0.05 (-1.94)	
i^D_{-9}					-0.06 (-2.48)

Note: t-statistics in parenthesis

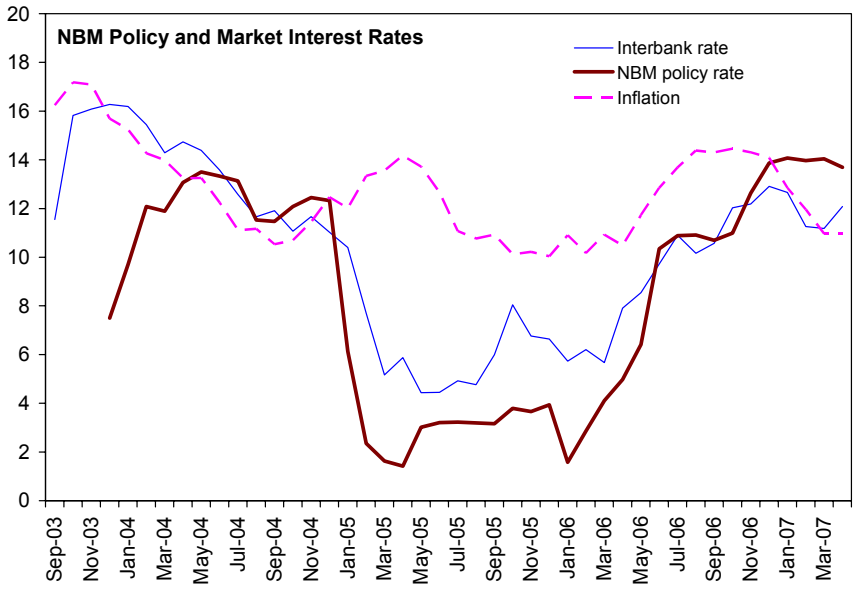
The first stage of transmission, as expected, is fast (k=0) – market rates respond immediately to changes in the central bank rate. However, the pass-through appears rather weak at only 27 percent implying limited effectiveness of monetary policy. In more mature financial markets, the pass-through would normally be considerably higher, and the respective coefficient β_1 - closer to unity.

The weakness of the pass-through in Moldova is mainly due to a liquidity overhang coupled with a loose stance of monetary policy. Policy rates were significantly negative in real terms for the most part of the sample period[3]. Naturally, sterilization operations at these rates were ineffective in mopping-up excess liquidity. Depressed rates distorted markets and reduced elasticity of demand for short-term funds. Shallowness of the money market and its undeveloped infrastructure, and infrequent (once a week) open market operations with no pre-announced calendar further undermined the system's ability to manage and distribute liquidity efficiently. In addition, the perceived uncertainty about monetary policy objectives is likely to have undermined the credibility of the central bank weakening the signaling function of policy rates. Because of confusion about the consistency of policy actions with its long-term goals, market reaction was also muted and varied depending on the market interpretation of NBM intentions. The compounded effect of these factors translated into disconnection between monetary policy and the interbank market.

From the data point of view, the estimate of pass-through coefficients could have been

[3] The policy rate became positive in real terms only in December 2006, which is the last observation included in the sample.

affected by the inherent inconsistency of the interbank rate i^M, which is calculated as a weighted average rate of all monthly transactions. Although the maturity span of the interbank market is not wide, ranging mostly between overnight and 14-days, there has been a noticeable shift towards overnight transactions, which may have resulted in biased estimates of pass-through coefficients.



Turning to the second stage, the results confirm that transmission from market to retail rates is indeed weak as anticipated from the visual examination of interest rate charts. The strength of the pass-through is only 13 and 14 percent for lending and deposit rates respectively, and the estimates are not significantly different from each other. It takes 3-4 months for retail

rates to react to changes in market rates. Apart from underdeveloped financial markets with its incomplete term structure and excessive liquidity, which distort the yield curve, the lack of competition in the banking system and imperfect substitutability of short-term instruments for loans and deposits diluted the connection to various degrees.[4]

The estimation results of the third and the final stage of transmission provide quantitative insight into determinants of inflation. Both specifications (with deposit and lending interest rates as i^R) yield similar parameter estimates, all statistically significant and the signs as expected. Persistence of inflation (measured by γ_1) is strong—about 67-69 percent of inflation is carried over to the following period. Exchange rate depreciation and reserve money affect prices with a one-month delay having respective elasticites of 4 and 3 percent. The income impact is stronger at 10 percent, but with a time lag of four months. The interest rate pass-through is the slowest with a lag of 8-9 months, and the coefficient of negative 5-6 percent.

Coefficients γ represent short-term elasticities, which capture the first round effects of a one-time change in the respective dependent variable. The presence of inflation inertia (the lagged value of inflation in equation (3)), however, introduces a richer structure allowing calculation of a cumulative effects over time, or long-term pass-through coefficients. By repeated substitution of lagged values of π_{t-n} into π_t for all $n>0$, the long-term pass-through

[4] Parameter β_2 may be underestimating the true magnitude of the pass-through because of a possible measurement error of retail interest rates, which are measured as weighted averages on outstanding stocks. The problem is that stocks include longer-term loans (or deposits), which were contracted by banks before changes in policy rates took place, and could not possibly react to them. A more accurate measure of retail rates would be interest rates on new loans or deposits, but such series were not available.

coefficients can be derived as $\gamma_m/(1-\gamma_1)$, where *m* identifies a dependent variable in equation (3). Expressed in percentage terms, this coefficient for interest rates equals to negative 16-18 percent. Similarly, the long-term elasticities with respect to the exchange rate, reserve money and wages are 13 percent, 10 percent and 30 percent, respectively.

5. Conclusions

This paper is one of the first attempts to examine the interest rate channel of monetary policy transmission in Moldova, and to estimate the strength and the speed of the interest rate pass-through. The whole process of transmission from policy innovation to inflation was divided into three stages: the pass-through from policy to short-term market rates, from market rates to retail deposit and lending rates, and finally from retail rates to inflation.

The estimation results for the three stages imply that the interest rate pass-through is rather weak throughout the whole chain of the transmission process suggesting that effectiveness of monetary policy is limited. For all the reasons mentioned before, the yield curve, which is the key building block of interest rate transmission from policy to retail rates, is distorted. The incomplete term structure of market interest rates results in market segmentation and weakens its ability to channel funds to their best use given the risk-return trade-off.

However, in a rapidly changing environment the strength and the speed of transmission may not remain constant over time, even in the short-run, suggesting that the pass-through could improve if some of the obstacles are removed. Market reaction to policy changes largely depends on its perceptions of the central bank's willingness and ability to achieve the

objective of price stability. Therefore, strengthening central bank credibility and independence, openly pursuing the sole goal of inflation by implementing consistent policies, and communicating its intentions in a timely and transparent manner could substantially improve the policy effectiveness. While the recent monetary tightening and the increased policy rates in 2007 (which is not captured by the data sample in this paper) may have eased part of liquidity pressures, further efforts to mop-up liquidity in support of lower inflation could improve pass-through relationships. In addition, the growing presence of foreign banks in Moldova could intensify competition, bring in fresh capital and banking expertise, and enhance banking intermediation. The links between interest rates would strengthen by expanding the term structure of market instruments and reducing distortions to the yield curve, streamlining monetary policy instruments and improving the money market infrastructure. Over a longer horizon, as economic and financial market development, and income growth make saving-investment decisions more sensitive to interest rates, transmission will also strengthen, especially at its third stage.

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References

Bank for International Settlements, 1998. *"The Transmission of Monetary Policy in Emerging market Economies"*, BIS Policy Papers no. 3.

Bernanke, S. B. and Gertler, M. 1995. *"Inside the Black Box: The Credit Channel of Monetary Policy Transmission"*. The Journal of Economic Perspectives, vol. 9, no. 44, pp. 27-48.

Campbell, J. 1995. *"Some Lessons from the Yield Curve"*. The Journal of Economic Perspectives, vol. 9, no 3, pp. 129-152.

Coricelli, F., Egert, B. and McDonald, R. 2006. *"Monetary Transmission in Central and Eastern Europe: Gliding on a Wind of Change".* Oesterreichische Nationalbank, Focus on European Economic Integration 1/06, pp. 44-87.

Crespo-Cuaresma, J., Egert, B., and Reininger, T. 2006. *"Interest Rate Pass-Through in Central and Eastern Europe: Reborn from Ashes Merely to Pass Away".* Oesterreichische Nationalbank, Focus on European Economic Integration 1/06, pp. 44-87.

DeBondt, G., 2002. *"Retail Bank Interest Rtae Pass-Through: New Evidence at the Euro Area Level"*. European Central Bank, Working Paper no. 136.

DeBondt, G., Benoit, M. and Valla, N. 2005. *"Term Structure and Sluggishness of Retail Bank Interest Rates in Euro Area Countries"*. European Central Bank, Working Paper no. 518.

Gigineishvili, N. 2002. "*Pass-Through from Exchange Rate to Inflation: Monetary Transmission in Georgia* ". Proceedings, Economic Series, Georgian Academy of Science, Vol. 10, no. 3-4. pp. 214-232.

Kim, D. and Orphanides, A. 2007. *"The bond market term premium: what is it, and how can we measure it?"*. BIS Quarterly Review, June 2007. pp. 27-40.

Kugler, P. and Kaufman, S. 2005. *"Does Money Matter for Inflation in the Euro Area?"*. Oesterreichische Nationalbank, Working Paper no. 103.

Mishkin, F. S. 1996. *"The Channels of Monetary Transmission: Lessons for Monetary Policy"*. Banque de France: Bulletin: Digest, No. 27, pp. 33-44.