Service Sector in Terms of Changing Environment

Interest Rate Pass-Through in a Small Open Economy with a Fixed Exchange Rate - The Case of Macedonia

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Abstract

This paper examines the effectiveness and stability of interest rate pass-through in a small open economy with fixed exchange rate focusing on Macedonia during the period of transition, including the recent economic recession. Specifically, we examine the size and speed of adjustment of money market rate and banks’ lending rate to changes in the 'cost of funds' rate and their stability by employing two cointegration methods: Dynamic Ordinary Least Squares and Autoregressive Distributed Lag Model. The results reveal the existence of a cointegrating relationship among the interest rate series with an almost complete long-run adjustment. However, the size and speed of short-run adjustment of lending rate is quite low and sluggish, implying that in the short-run, the domestic monetary policy may have a limited impact on the interest rate channel. Regarding the stability of the interest rate pass-through, the empirical evidence is mixed.

JEL Classification: C22, E4, E50, E52.

Keywords: Interest rate pass-through; Monetary policy; Time series; Cointegration; Structural breaks.

1. Introduction

The aim of this paper is to examine the interest rate pass-through in a small open transition economy with a fixed exchange rate, such as Macedonia during the period 2002-2010. In that respect we investigate the size and speed of adjustment of banks' lending rate to changes in the money market and key policy rate, respectively by using two different time-series cointegration methods. In addition, we
explore the pass-through multipliers from the key policy rate to money market rate that will provide some information to what extent and how quickly changes in the key policy rate are transmitted to the money market rate. Exploring these issues in more depth will provide some indication for monetary policy makers of whether the signal provided by the central bank is important for banks' decisions in adjusting their interest rates in an open economy with fixed exchange rates characterised with relatively high level of currency substitution. Having in mind that the sample period covers the process of transition that is characterised with economic, financial, political and institutional changes and reforms, as well as the recent economic recession that may also have altered the relationship among the variables; we test for the stability of the pass-through coefficients. This has not been done in the previous literature in this area not only for the case for Macedonia but also for majority of the transition economies from Central and South Eastern Europe (CSEE). Consequently, the results of this paper may be generalised for other transition economies with fixed exchange rates and/or currency boards, such as: Croatia, Bulgaria, Bosnia and Herzegovina as well as the advanced transition economies like the Baltic States.

The structure of the remaining part of this study is as follows: Section 2 surveys the theoretical and empirical literature in this field. The model, data series used and estimation methods are presented in Section 3. In Section 4 we discuss the results, whereas in the final section we provide the concluding remarks from the research.

2. Theoretical background and literature review

One of the main formal theories of how banks set their retail rates was developed by Rousseas (1985), who states that banks in the loan market are price setters because they set their retail interest rates as a mark-up (profit margin) over their variable costs, expressed with the equation:

\[ i = k(u) \]  

(1)

where, \( i \) is the interest rate on loans, \( u \) represents the unit prime or variable costs and \( k \) is the mark-up or the profit margin over the variable costs.

Banks’ variable costs are mainly determined from the variations in the ‘raw material’ component which represents the costs of funding their lending activities (‘cost of funds’) and is assumed to be exogenously determined. Consequently this refers to the key policy rate because it is determined outside the scope of the banks' decision making process and the money market rate because in this market segment, banks are seen as price takers due to the relatively high level of competitiveness (Rousseas, 1985, and Ho & Saunders, 1981). Thus, changes in the lending rates are mainly determined by the changes in the ‘cost of funds’ where the profit margin is taken to be constant over the business cycles. The latter implicitly implies that in the long-run it may be expected the interest rates to be in equilibrium relationship.

Based upon the mark-up pricing models of Rousseas (1985) and Ho & Saunders (1981), de Bondt (2005) has defined the empirical retail interest rate setting specification as follows:

\[ i = \beta_1 + \beta_2 u \]  

(2)

where, \( i \) is the banks’ interest rate, \( \beta_1 \) is the constant mark-up, \( u \) is the ‘cost of funds’ rate and \( \beta_2 \) represents the size of the pass-through coefficient. According to this equation, variations in retail rates are determined by the variations in the ‘cost of funds’ rate, but the extent to which those variations are transmitted to banks’ retail rates, depends upon the size of the coefficient \( \beta_2 \). In these regards, it can be less than one, implying an incomplete pass-through from the ‘cost of funds’ rate to banks’ retail rates; equal to one, referring to a complete pass-through; or higher than one suggesting an overshooting.
Among the pioneering studies of interest rate pass-through are those of Cottarelli & Kourelis (1994), and Borio & Fritz (1995), who find that the long-run pass-through is complete for most of the countries, but there is evidence for sluggishness in the short-run adjustment of lending rates across individual countries. In addition, Cottarelli & Kourelis (1994) identify several structural determinants of the speed of pass-through, such as: the size of the market for short-term securities, constraints to international capital mobility, bank competition, the public ownership of the banking system, and the volatility of money market rates. Among the studies that focus on the euro area, Mojon (2000), Donnay & Degryse (2001), Toolsema et al. (2001), de Bondt (2002), Heinemann & Schüller (2002), Kleimeier (2003), Sander & Kleimeier (2004a), and de Bondt et al. (2005) find that the pass-through from the money market rate to bank retail rates is not complete, there is evidence of asymmetric adjustment of banks' retail rates to changes in the money market rate as well as cross-country differences in pass-through multipliers.

Recently, there has been a growing interest in the interest rate pass-through in Central and Eastern European (CEE) countries. The studies of Egert et al. (2007), Sander & Kleimeier (2004b), Sander & Kleimeier (2006), Wröbel & Pawłowska (2002), Chmielewski (2003), Horváth et al. (2005), Tieman (2004), and Égert & MacDonald (2006) generally confirm that the pass-through is more complete and quicker compared with the euro area. Also, the asymmetry and cross-country heterogeneity in the pass-through are much lower.

The empirical evidence for the interest rate pass-through in Macedonia is scarce. Jovanovski et al. (2005) analyse the pass-through in Macedonia find a cointegrating relationship between the lending rate, policy rate and money market rate for the period from 2002 to 2004. Yet, they show that the pass-through from the market rate to lending rates is low and the short-run adjustment is extremely slow (over 5 years). Velickovski (2006) investigates the interest pass-through during 1998-2006 and finds that in the long-run the pass-through is complete from the policy rate to the money market rate but it is absent from the latter to the bank retail rates. As for the short-run adjustment, the estimates imply that it takes 4.5 months for a full adjustment to the long-run equilibrium. However, the short-run pass-through has become quicker since the reform of the monetary policy instruments in 2000.

3. Model, estimation method and data issues

In the analysis of the interest rate pass-through in Macedonia we employ the following three empirical models:

\[ i_{mr} = \beta_1 + \beta_2 i_{lb} \]  
\[ i_{br} = \gamma_1 + \gamma_2 i_{mr} \]  
\[ i_{br} = \delta_1 + \delta_2 i_{lb} \]

where, \( i_{mr}, i_{lb}, \) and \( i_{br} \) are the money market rate, policy rate, and banks' lending rate, respectively; \( \beta_1, \gamma_1, \) and \( \delta_1 \) are constants; and \( \beta_2, \gamma_2, \) and \( \delta_2 \) represent the size of the respective pass-through coefficients. The expected signs of \( \beta_2, \gamma_2, \) and \( \delta_2 \) are positive, while if they are equal to 1, then it implies a complete pass-through. The sample covers the period from 2002 to 2010 and all the time series are obtained from the NBRM. The above empirical models have been estimated by two cointegration methods: Dynamic Ordinary Least Squares (DOLS), and Autoregressive Distributed Lag (ARDL).

In determining the number of the leads and lags in the DOLS method and the order of the distributed lag on the dependent variable and the regressors in the ARDL model we have used several information criteria, such as: the Schwarz Information Criterion (SIC), the Akaike Information Criterion (AIC), the
Hannan-Quinn Information Criteria (HQ) and the Log-Likelihood Ratio (LR). In cases where the information criteria produce different results, we present the estimates of the models based on separate information criteria (see Appendix A).

Finally, besides estimating the long-run pass-through and the short-run adjustment, we want to explore the stability of parameters in the short-run relationship among the variables. Hence, we have employed several stability tests, such as: the cumulative sum of the recursive residuals (CUSUM) and the squared cumulative sum of the recursive residuals (CUSUM SQ), suggested by Brown et al. (1975); the Chow's breakpoint and forecasting tests (1960); and the Quandt-Andrews test for the unknown breakpoint (Quandt, 1988, and Andrews & Ploberger, 1994).

4. Results

The results from time series cointegration methods are presented in the Appendix A. Both cointegration methods indicate that there exists a cointegrating relationship between the interest rate series assessed, which is usually interpreted as a long-run equilibrium relationship. The short- and long-run adjustment coefficients are statistically significant and positive, whereas the ECT is statistically significant and negative bounded between 0 and -1.

Regressions 1 to 2 present the results of the pass-through from the key policy rate to the money market rate. The size of the long-run pass-through from the key policy rate to the money market rate ranges between 1.3 and 1.5. This overreaction of the money market rate may be explained by the underdeveloped short-term securities market in Macedonia, which is dominated by the CB Bills. As a consequence, banks rely almost exclusively on the CB Bills in preserving their liquidity, especially given their high return/low risk profile. Therefore, changes in the CB Bills rate have a pronounced effect on the supply of funds in the interbank market. Furthermore, the overshooting in the pass-through from the official to the money market rate may reflect the lenders' desire to compensate for the higher credit risk on the interbank market as compared to the CB Bills.

Regarding the short-run relationship, the reaction of the money market rate to changes in the key policy rate (within one month period), is relatively high, although incomplete, ranging between 0.55 and 0.6. However, the speed of adjustment of the money market rate towards its equilibrium value, measured by the ECT is quite sluggish (around -0.10), which means that it takes relatively long time for the money market rate to reach its long-run equilibrium value following a shock in the key policy rate (between 6 and 9.4 months).

Assessing the relationship between the money market rate and banks' lending rate (Appendix A., regressions 3 to 6), the long-run estimate is less than 1 (0.7 - 0.8) or around 1, depending on the model. As for the short-run reaction of banks’ lending rate to changes in the money market rate, the estimates are around 0.05. This implies that changes in the money market rate have a low immediate effect on banks’ lending rate. Moreover, the speed of adjustment is also sluggish, estimated around -0.07, which implies that it takes from 9 to 13 months for the banks’ lending rate to reach its long-run equilibrium following a shock in the money market rate.

As for the transmission channel between the key policy rate and banks’ lending rate (Appendix A., regressions 7 and 8), the cointegration estimates indicate a complete long-run pass-trough. Here, the long-run coefficient varies less across the estimation methods compared to the long-run estimates of the relationship between money market rate and banks’ lending rate. As for the size and speed of short-run adjustment of banks’ lending rate to changes in the key policy rate, the estimates are even lower than the ones between the banks’ lending rate and money market rate. For instance the, the magnitude of the short-run coefficient is between 0.02 and 0.05, whereas the ECT is estimated around -0.05. As a result, it takes a much longer period for banks’ lending rate to reach its long-run equilibrium value when the key policy rate changes (between 17 and 20 months). This implies a lower and more sluggish adjustment of banks’
lending rate to changes in the key policy rate compared to the pass-through from the money market rate to the lending rate.

In order to assess the stability of the short-run parameters we have used several methods. First, we have examined the stability of the short-run pass-through from the key policy rate to the money market rate by means of the CUSUM and CUSUM SQ tests. The CUSUM from the regression estimated with DOLS and ARDL methods points to a structural break in the beginning of 2004, whereas the results from the CUSUM SQ suggest two structural breaks occurring in the beginning of 2004 and 2009, respectively.

In order to check the robustness of these findings we have proceeded with the Chow's breakpoint and forecasting tests. Both tests reject the null hypothesis of no structural break in 2009, but not in 2004, implying that with the beginning of the economic recession in 2009, there might have been a structural change in the relationship between these two interest rates. Consistent results are obtained from the recursive residuals estimates that, also, indicated a structural break in 2009 for the model estimated with both DOLS and ARDL methods. In contrast, the test results from the Quandt-Andrews test for the unknown breakpoint failed to reject the null hypothesis of no structural break in the sample period.

In a similar way, we examine the stability of the short-run pass-through from the money market rate to banks' lending rate and key policy rate and banks' lending rate, respectively. The estimates of the CUSUM SQ indicate two structural breaks occurring in the beginning of 2004 and 2009 for the models estimated with DOLS and ARDL methods. The CUSUM estimates confirm the structural break in both periods for the relationship between the money market and banks' lending rate but not for the relationship between the key policy rate and banks' lending rate.

In addition, the Chow's breakpoint and forecasting tests are not able to reject the null hypothesis of no structural breaks in both 2004 and 2009. The only exception is the Chow's breakpoint test for the models estimated with ARDL, which suggests a structural break in 2004. This finding could also be confirmed by the results from the recursive residuals estimates that point to a structural break in 2004 for the models estimated with DOLS and ARDL methods. In contrast, the Quandt-Andrews test fails to reject the null hypothesis of no structural break during the whole sample period in both models.

As for the short-run relationship between the key policy rate and money market rate, the results imply that only the 2009 dummy variable is statistically significant in the models estimated with both ARDL and DOLS methods. This is, to some extent, consistent with the results from the Chow's breakpoint and forecasting test and from the recursive residuals estimates. Regarding the relationship between the banks' lending rate and money market rate and banks' lending rate and key policy rate, respectively, the results indicate that only the dummy variable for the structural break in 2004 is statistically significant in the model estimated with ARDL. Again, this is in line with the Chow's breakpoint test and recursive residuals estimates, discussed previously.

Overall, the results from the above statistical tests employed for detecting possible structural breaks in the short-run pass-through from the key policy and money market rate tend to locate the structural break in 2009, which coincide with the beginning of the economic downturn in Macedonia. However, the statistical evidence related to the stability of the interest rate pass-through from the money market to banks' lending rate and from the key policy rate to banks' lending rate, respectively, is ambiguous. For example, although some of the test results indicate that there might have been a structural break in the beginning of 2004, nonetheless the evidence is mixed and a straightforward conclusion could not be drawn.

5. Conclusions

This paper has investigated the effectiveness of interest rate channel and its stability in a small open economy with fixed exchange rates during the transition period focusing on the case of Macedonia. The results from the time-series cointegration methods imply that in the long-run the interest rate series are in
equilibrium relationship and there is a complete pass-through from the key policy rate and the money market rate to the banks' lending rate.

Additionally, the results suggest that in the long-run there is more than complete adjustment of the money market rate to the key policy rate, implying an overshooting. However, the size and speed of the short-run pass-through is quite low and sluggish for which it takes quite long period for the interest rates to reach their equilibrium value. Moreover, the evidence regarding the stability of the interest rate channel is mixed, although it provides a hint that two structural breaks might have occurred during the sample period.

The first one is in the beginning of 2004 probably due to the shift of the transaction on the money market from the official to the counter market during 2003-2004 period. An additional possible reason may be the issuance of short-term Treasury Bills (T-Bills) by the Government in January 2004 as a new financial instrument on the market. This instrument might have altered banks' lending decisions because in the beginning the T-Bills as a 'risk free asset' had a relatively high interest rate. The second structural break is in the beginning of 2009 that coincides with the recent economic downturn.

Overall, the findings presented in this study imply that the domestic monetary policy in a small open economy with fixed exchange rates during the transition period may be indeed ineffective regarding the interest rate channel. These results could be further generalised for other transition economies that have similar economic and financial environment, such as Croatia and Bulgaria, for example.

References


## Appendix A. Estimates of the interest rate pass-through in Macedonia

<table>
<thead>
<tr>
<th>Estimation method</th>
<th>DOLS</th>
<th>ARDL</th>
<th>DOLS</th>
<th>ARDL</th>
<th>DOLS</th>
<th>ARDL</th>
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</thead>
<tbody>
<tr>
<td>Lag length selection information criteria:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leads/lags</td>
<td>0, 6</td>
<td>1, 2</td>
<td>3, 6</td>
<td>2, 6</td>
<td>4, 1</td>
<td>4, 0</td>
</tr>
<tr>
<td>Unit root statistics</td>
<td>$-3.37^{***}$</td>
<td>$-3.29^{***}$</td>
<td>$-3.32^{***}$</td>
<td>$10.45^{***}$</td>
<td>$14.16^{***}$</td>
<td>$-3.15^{***}$</td>
</tr>
<tr>
<td>F-test statistics</td>
<td>$-3.49^{***}$</td>
<td>$-5.04^{***}$</td>
<td>$5.35^{***}$</td>
<td>$5.43^{***}$</td>
<td>$6.08^{***}$</td>
<td>$5.85^{***}$</td>
</tr>
<tr>
<td>Constant</td>
<td>$1.31^{***}$</td>
<td>$1.49^{***}$</td>
<td>$0.96^{***}$</td>
<td>$0.95^{***}$</td>
<td>$0.70^{***}$</td>
<td>$0.75^{***}$</td>
</tr>
<tr>
<td>Long-run coefficient</td>
<td>$0.59^{***}$</td>
<td>$0.55^{***}$</td>
<td>$0.05^*$</td>
<td>$0.05^*$</td>
<td>$0.05^*$</td>
<td>$0.06^*$</td>
</tr>
<tr>
<td>Short-run coefficient</td>
<td>$-0.13^{***}$</td>
<td>$-0.10^{***}$</td>
<td>$-0.07^{***}$</td>
<td>$-0.07^{***}$</td>
<td>$-0.08^{***}$</td>
<td>$-0.05^{***}$</td>
</tr>
<tr>
<td>Error correction term (ECT)</td>
<td>6</td>
<td>9.4</td>
<td>13</td>
<td>13</td>
<td>9</td>
<td>20</td>
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<tr>
<td>Speed of adjustment in months</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Autocorrelation (p-value)</td>
<td>0.56</td>
<td>0.47</td>
<td>0.89</td>
<td>0.89</td>
<td>0.54</td>
<td>0.63</td>
</tr>
<tr>
<td>Normality (p-value)</td>
<td>0.12</td>
<td>0.14</td>
<td>0.34</td>
<td>0.28</td>
<td>0.15</td>
<td>0.19</td>
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<tr>
<td>Heteroskedasticity (p-value)</td>
<td>0.58</td>
<td>0.80</td>
<td>0.18</td>
<td>0.16</td>
<td>0.25</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Notes: ***/*** denotes statistical significance at 1%, 5% and 10% level, respectively.