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The monetary policy transmission mechanism and the role of money market funds in the Eurozone

Nicholas Apergis
University of Derby

Tasawar Hayat
King Abdulaziz University

Tareq Saeed
King Abdulaziz University

Abstract

This paper investigates the pass-through mechanism of monetary policy through money market funds and bank loan rates under conventional and unconventional monetary policy. Using the Autoregressive Distributed Lag method, spanning the period 2003-2018, the findings document that the pass-through of bank loan rates is weaker than that of MMF rates (0.642 vs 1.044, respectively), especially during the unconventional monetary policy period (0.637 vs 1.568, respectively). They highlight that in this period, banks earned less from traditional lending business, due to low or even negative rates, while taking increasingly large risks.

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Contact: Nicholas Apergis - n.apergis@derby.ac.uk, Tasawar Hayat - fmgpak@gmail.com, Tareq Saeed - fmgpak@gmail.com.
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1. Introduction

The literature documents that interest rates have an important role in the monetary transmission mechanism. Accordingly, the pass-through mechanism from policy rates to banks' rates is crucial on the grounds that monetary decisions can affect the real economy. The literature has also shown that the pass-through mechanism in the Eurozone is incomplete, especially, for longer maturities and non-corporate clients (de Bondt, 2005; Kleimeier and Sander, 2006; Banerjee et al., 2010).

This work explores the transmission (pass-through) of monetary policy through money market funds (MMFs) and conventional bank loan rates under different regimes of monetary policy. MMFs illustrate the extent to which financial intermediation takes place outside the traditional banking system, given their size and interdependence with traditional banks. They are similar to banks in that they perform financial intermediation and maturity transformation, while they offer short-term investments and provide short-term funding to wholesale borrowers. The analysis compares their relative strength in terms of the pass-through process. It extends the literature on monetary policy by accounting the potential differential role between conventional and unconventional monetary policy through the mechanism of pass-through of the European Central Bank (ECB) activities. An additional novelty is that the analysis considers both constant and variable Net Asset Value (NAV) MMFs. The findings could shed more light on how fast and effectively monetary policy actions impact on the real economy and, thus, to determine the manner monetary policy is implemented given that the presence of MMFs affects the term of funding to other systemically intermediation mechanisms, such as banks. The literature emphasizes the role of MMFs in money markets, as well as their role in monetary policy. Investors view them as a safe alternative to bank deposits, although the presence of the crisis rendered them as a substantial source of systemic risks (Gordon and Candia, 2014). The European MMFs invest a large part of their portfolio in banks' liabilities, where institutional investors form a substantial part of their investing base (Ansidei et al., 2012). In an environment of strong negative bank lending rates, MMFs rebalance their portfolios towards riskier assets by attracting more inflows, while keeping positive returns (La Spada, 2018).

The presence of unconventional monetary policy has been very challenging for the industry of MMFs. Due to the global financial crisis, the ECB implemented a practically zero-lower bound monetary policy, with lending rates reaching negative percentages. During the implementation of the ECB's Expanded Asset Purchase Program (EAPP), a substantial wedge emerged between ECB rates and the yields on short-term debt securities, while MMFs managed to maintain their risk profiles constant by moving into deposit-type of securities to preserve liquidity. Such investment actions led them to significant investor redemptions due to adverse macroeconomic conditions, finally leading them to exit the industry. Different types of monetary policies are important for the interaction between banks and MMFs. Although MMFs cannot have any direct access to the ECB deposit facilities, banks can mediate on their behalf. This study touches certain literature strands. First, it is associated with the impact of unconventional monetary policy on MMFs performance (La Spada, 2018). The findings highlight that funds respond fully to changes in short-term interest rates. Another strand is that on flights-to-safety and investors' run within the MMF industry (Witmer, 2016; Bellavite-Pellegrini et al., 2017), where MMFs exert a destabilizing effect on financial markets through higher systemic risks.

2. Data

The analysis uses 3-month EONIA Swap rates (the overnight index swap rate) as policy rates over the period of conventional monetary policy and a shadow short-rate as proposed by Wu and Xia (2016). This shadow rate shows considerable movements during the zero-lower bound period. For Eurozone MMFs, the analysis uses the end-of-month term-spread yields for the 3-month and 2-year terms obtained from the term structure of euro-area bond yields. Both variables are sourced from the ECBs website. Data on bank lending rates are obtained from the Orbit database and are measured as a weighted average of consumer loan rates, mortgage loan rates, small corporate loan rates, and large corporate loan rates, with the weights being the loans to the specific class over total loans. Small corporate loan rates are lending rates on loans up to one million euros granted to non-financial corporations.

Following the literature on the drivers of mutual funds and loans rates (Dahlquist et al., 2003; Joyce and Tonks, 2012; Carpenter et al., 2015; Bua et al., 2019), certain control variables were also included in the modelling specification; the additional controls are: i) the expense-ratio (a significant driver that determines mutual funds' cost structure and accordingly their performance-Wermers, 2000; Gil-Bazo and Ruiz-Verdu, 2009), ii) the size of each fund measured as NAV (the literature has emphasized that larger funds can better promote the fund after a time of success, Ciccotello and Grant (1996), while larger funds can enjoy economies of scale with respect to their operating costs, Latzko (1999)), iii) changes in the outstanding amount of government short-term debt (as part of the rebalancing portfolio approach where money is seen as an imperfect substitute for other assets, including government bonds, being purchased by the fund and the sellers seek to rebalance their portfolios by buying them, which may be riskier; the sellers of these assets then in turn wish to rebalance their portfolios and so on, while during this process of rebalancing, asset prices rise until investors are indifferent to the overall supplies of money and financial assets; next, higher asset prices, or equivalently lower yields, may be passed on into lower borrowing costs for households and firms and thus increase the net wealth of asset holders, Joyce et al., 2015 and through the signaling channel when central banks' decisions can change the private sector's expectations of future policy rates, as transferring assets between the private and public sectors-Woodford, 2012), iv) changes in the outstanding monetary financial institutions' short-term debt (similarly with respect to the rebalancing portfolio and signaling approaches as before), v) changes in the outstanding supply of commercial paper (again according to the rebalancing portfolio and signaling approaches), and vi) changes in the outstanding non-financial firms' short-term debt (once again based on the rebalancing portfolio and signaling approaches). The literature, along with the theoretical underpinnings above expect a positive association with respect to the variables of size, short-term government debt, short-term monetary institutions debt and short-term non-financial firms' debt, while a negative sign is expected with respect to the expense ratio and changes in the supply of commercial paper. Data are also obtained from the ECB, while they are on a quarterly basis, spanning the period 2003-2018.

3. Empirical Analysis

The analysis employs the autoregressive distributed lag (ARDL) modelling method (Pesaran and Shin, 1999). The main advantage lies in its flexibility; it can be applied with variables of any different order of integration, while it can take sufficient numbers of lags to capture the data-generating process. The ARDL framework yields:

Equation 1:

$$\Delta lend_t = a_0 + \sum_{i=1}^{p} b_{1i}\, \Delta lend_{t-i} + \sum_{i=1}^{p} b_{2i}\, \Delta pol_{t-i} + \lambda_1\, lend_{t-1} + \lambda_2\, pol_{t-1} + u_{1t}$$

where the lending rate is either the loan or the MMF rates. The part with the λ terms corresponds to the long-run relationship. The null hypothesis is $\lambda_1 = \lambda_2 = 0$, indicating the non-presence of any long-run relationship.

Equation 2:

$$\Delta lend_t = c_0 + \sum_{i=1}^{p} b_{1i}\, \Delta lend_{t-i} + \sum_{i=1}^{p} b_{2i}\, \Delta polt\text{-}i + \sum_{i=1}^{p} b_{3i}\, expense_{t-i} + \sum_{i=1}^{p} b_{4i}\, \Delta NAV_{t-i} +$$

$$\sum_{i=1}^{p} b_{5i}\, govdebt_{t-i} + \sum_{i=1}^{p} b_{6i}\, mondebt_{t-i} + \sum_{i=1}^{p} b_{7i}\, commp_{t-i} + \sum_{i=1}^{p} b_{8i}\, nonfindebt_{t-i} +$$

$$\lambda_1\, lend_{t-1} + \lambda_2\, pol_{t-1} + \lambda_3\, expense_{t-1} + \lambda_4\, NAV_{t-1} + \lambda_5\, govdebt_{t-1} + \lambda_6\, mondebt_{t-1} +$$

$$\lambda_7\, commp_{t-1} + \lambda_8\, nonfindebt_{t-1} + u_{2t}$$

The null hypothesis is $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = \lambda_7 = \lambda_8 = 0$, indicating the non-presence of any long-run relationship. Based on both the Akaike and Schwartz criteria, the models selected associated with Equations 1 and 2 are (1, 1) and (2, 1, 2, 1, 1, 0, 1, 0), respectively. Although the ARDL methodology does not require any stationarity hypothesis to hold, the first step in the empirical analysis begins by investigating the unit root properties of the relevant variables using the Elliott et al. (1996) (ERS) test. The unit root test is performed both in the levels and in the first differences of the variables under consideration. The results are reported in Table 1 and they signify that all series involved are integrated of order one, i.e. they are all I(1) variables.

Table 1: ERS unit root results

Variables	Levels	1^{st} Differences
loan rates	-1.38(3)	-5.96(2)***

MMF rates	-1.27(3)	-6.53(2)***
policy rate	-1.32(4)	-6.78(2)***
expense ratio	-1.56(3)	-6.18(1)***
size	-1.25(4)	-6.38(2)***
government debt	-1.31(3)	-6.24(1)***
monetary debt	-1.45(4)	-6.18(2)***
commercial paper	-1.39(3)	-5.99(2)***
non-financial debt	-1.53(4)	-6.09(2)***

Notes: Figures in brackets denote p-values, while those in parentheses denote the lag length used to obtain white noise residuals. The lag length was selected using both the Akaike and Schwartz information criteria. ***: $p \leq 0.01$.

The long-run estimates, reported in Table 2, document: i) Equation 1: the policy rate exerts a stronger pass-through effect in the case of MMFs. The coefficient is 1.105 for the MMF rates and 0.863 for the loan rates. The former is significant at 1%, while the latter at 5%. Equation 2: the findings provide similar evidence, with the coefficient of the policy rate being 1.044 for the MMF rate and 0.642 for the loan rate. The former is significant at 1%, while the latter at 10%. The more than proportionate association between policy and lending rates could support an indirect reflection of the impact of unconventional monetary policy on lending rates. The remaining controls show the expected theoretical signs. Pesaran's Bounds testing is a Wald test (F-test) to check the joint significance of the model's long-term parameters. Pesaran et al. (2001) provide bounds on the critical values for the F statistic, where the lower level is calculated on the assumption that all variables of the model are ARDL stationary and, therefore, there is no such a long-run equation, whereas the upper bound is calculated on the assumption that all variables are I(1), that is, there is such a long-run equation. Finally, an F-statistic falling between the bounds means that the test is inconclusive. In our case, the null hypothesis of 'no long-run vectors' is rejected (at 5%) for both modelling specifications and both types of lending rates since the F-statistics are greater than Pesaran's critical values.

To check the heteroscedasticity of the residuals of the ARDL models, the analysis employs the Harvey test, while for the correlation check, it uses the LM autocorrelation test. The results on these tests illustrate that the residuals obtained from both equations and both lending rates are homoscedastic and uncorrelated. Next, for the normality test, the analysis makes use of the Jarque-Bera test, which confirms that the residuals are normally distributed. Moreover, to check for the validity of the functional form, the analysis uses the Ramsey RESET test. The results suggest that both models and in both lending rate cases are well specified. Finally, the analysis has used the cumulative sum (CUSUM) test and the CUSUM of square test to check for models' stability. These two tests explore the stability of the estimated parameters, which depends on the cumulative sum of the recursive residuals. They find the parameters to be stable in the case that the cumulative sum lies between the two 5% critical straight lines; however, if the cumulative sum goes outside the critical lines, the parameters turn out to be unstable. The results are presented in Figures 1 through 4 and they clearly indicate that both model specifications (Equation (1) and Equation (2)) and in both lending rate types (loans and MMFs) show 'parameter constancy', as well as 'no identified systematic change' in the estimated coefficients at the 5% significance level.

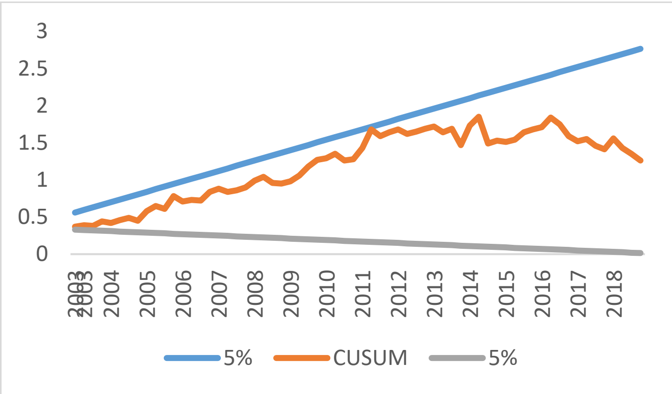
Table 2: ARDL Long-Run Estimates

	MMF		Loan	
Variables	Coefficient	p-value	Coefficient	p-value
Equation 1				
constant	1.326	0.14	0.975	0.29
pol	1.105***	0.00	0.863**	0.03
R^2-adjusted	0.48		0.44	
Harvey F-test	1.119	0.28	1.084	0.36
LM test	0.983	0.37	0.841	0.46
Ramsey F-test	0.994	0.32	0.783	0.45
Jarque-Bera test	1.774	0.29	1.438	0.47
Pesaran F-test	10.778		9.543	
Critical values	I(0) bound	I(1) bound	I(0) bound	I(1) bound
	10% 5%	10% 5%	10% 5%	10% 5%
	2.68 3.05	3.53 3.97	2.68 3.05	3.53 3.97
Equation 2				
constant	0.982	0.31	0.775	0.58
pol	1.044***	0.01	0.642*	0.06
expense	-0.339***	0.01	-0.332***	0.01
NAV	0.403***	0.00	0.385***	0.00
govdebt	0.396***	0.01	0.388***	0.01
mondebt	0.451***	0.00	0.428***	0.00
commp	-0.219**	0.02	-0.196**	0.03
nonfindebt	0.478***	0.00	0.462***	0.00
R^2-adjusted	0.76		0.71	
Harvey F-test	1.065	0.34	0.848	0.51
LM test	0.826	0.43	0.685	0.55
Ramsey F-test	0.911	0.35	0.732	0.53

Jarque-Bera test	1.650			0.32	1.364		0.55	
Pesaran F-test	13.628				10.309			
Critical values	I(0) bound		I(1) bound		I(0) bound		I(1) bound	
	10%	5%	10%	5%	10%	5%	10%	5%
	2.68	3.05	3.53	3.97	2.68	3.05	3.53	3.97

Notes: Harvey is the heteroscedasticity test, LM is the autocorrelation test, Jarque-Bera is the normality test, Ramsey is the RESET test for the validity of the functional form. In all four tests, the goal is the acceptance of the null hypothesis. Pesaran is the investigation of the presence of a long-run equation between the variables, by applying the ARDL Bounds Testing Approach. ***: p≤0.01; **: p≤0.05; *: p≤0.10.

Figure 1: Plots of CUSUM and CUSUM of squares (Equation 1: dependent variable is loan rates)



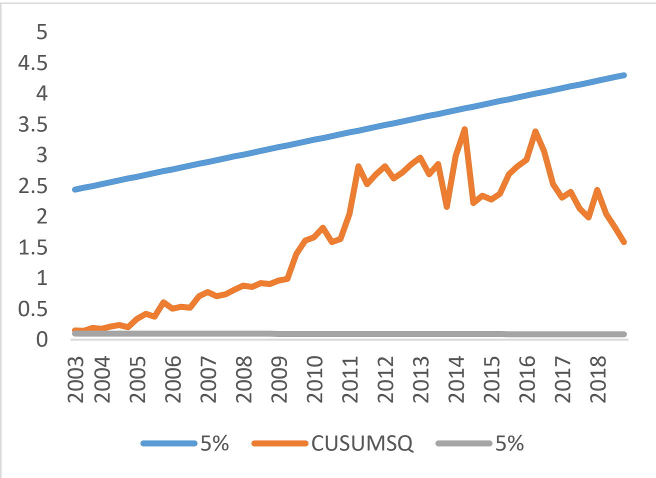
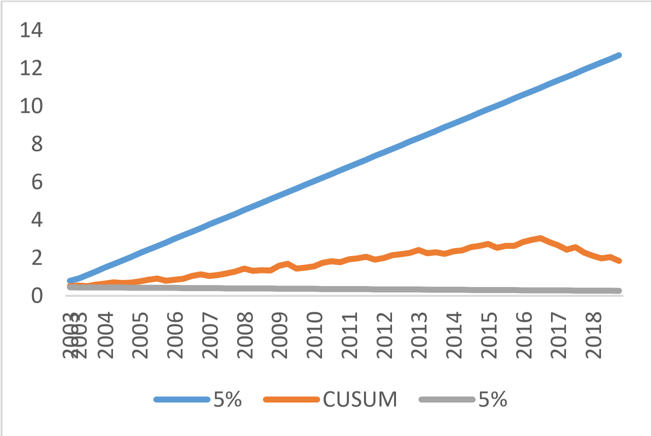


Figure 2: Plots of CUSUM and CUSUM of squares (Equation 2: dependent variable is loan rates)



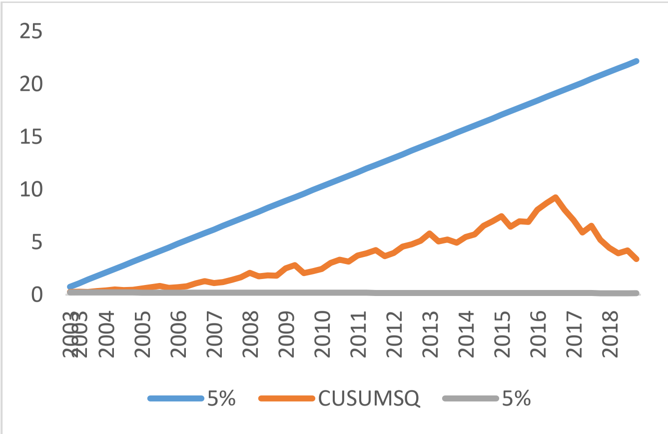
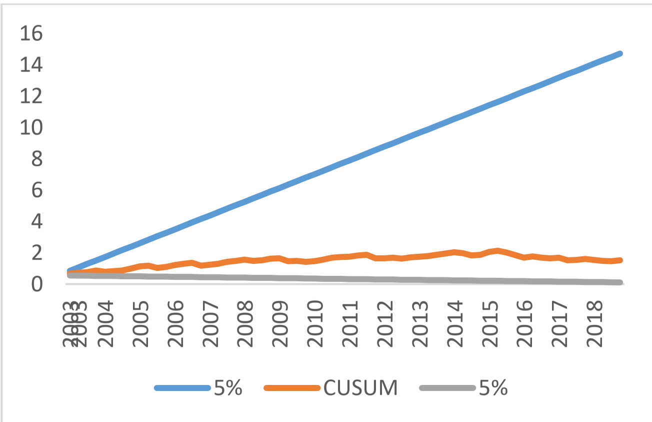


Figure 3: Plots of CUSUM and CUSUM of squares (Equation 1: dependent variable is MMF rates)



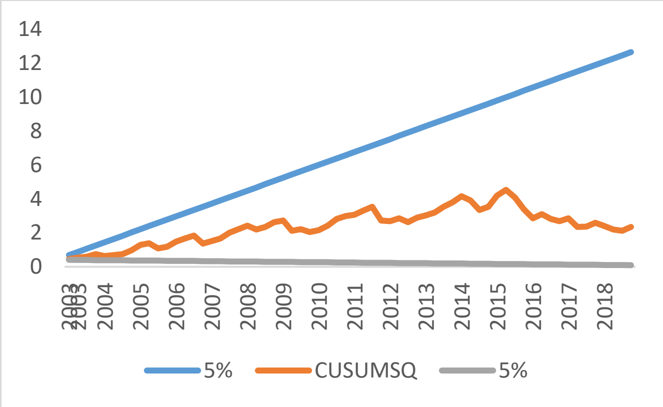
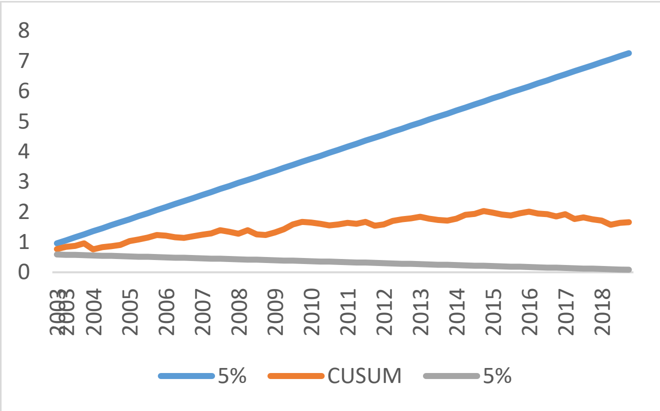
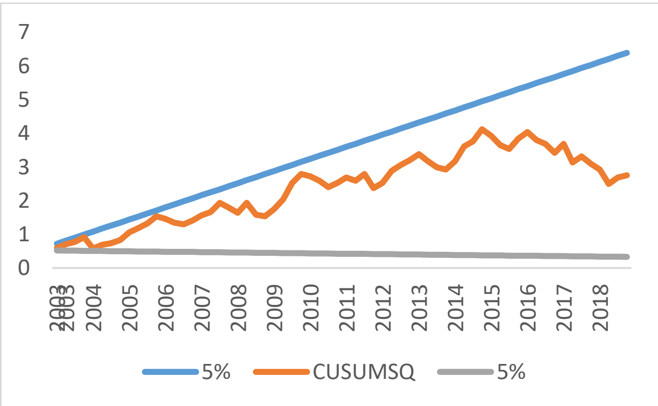


Figure 4: Plots of CUSUM and CUSUM of squares (Equation 2: dependent variable is MMF rates)





The short-run dynamics are in Table 3. Due to space restrictions, only the results in relevance to the policy rates are presented. They highlight a stronger pass-through through the MMF rate channel. The coefficients on the error correction mechanism are relatively small, albeit significant (at 5 or 10 percent), signifying a slow adjustment process. In Equation 1, the two coefficients are significant at 5%; they indicate a 9% and 5% adjustment from disequilibria of the previous policy rate (MMF and loan rate, respectively) shocks back to the long-run equilibrium in the current quarter. The findings remain similar across both equations.

Table 3: ARDL Short-Run Estimates

Variables	MMF Coefficient	MMF p-value	Loan Coefficient	Loan p-value
Equation 1				
Δpol(-1)	0.673***	0.00	0.374*	0.07
λ_2	-0.088**	0.03	-0.051**	0.05
R^2-adjusted	0.53		0.45	
Harvey F-test	1.203	0.25	1.115	0.32
LM test	0.885	0.40	0.697	0.52
Ramsey F-test	0.936	0.36	0.731	0.48
Jarque-Bera test	1.665	0.27	1.382	0.43
Equation 2				
Δpol(-1)	0.582***	0.01	0.328*	0.09
λ_2	-0.075**	0.04	-0.039*	0.07
R^2-adjusted	0.76		0.52	
Harvey F-test	0.785	0.33	0.588	0.59
LM test	0.875	0.38	0.712	0.50
Ramsey F-test	0.843	0.36	0.711	0.52
Jarque-Bera test	1.457	0.33	1.208	0.58

Note: Harvey is the heteroscedasticity test, LM is the autocorrelation test, Jarque-Bera is the normality test, Ramsey is the RESET test for the validity of the functional form. In all four tests, the goal is the acceptance of the null hypothesis. ***: p≤0.01; **: p≤0.05; *: p≤0.10.

Next, the analysis separates conventional and unconventional monetary policy periods. The asset purchase program started in March 2015 to prevent sub-zero inflation from further hitting an economy still reeling from the Eurozone-debt crisis, and ended in 2018. The analysis (with respect to Equation 1) is provided based this time on monthly data for the three variables involved, while the period is extended to the end of 2019; the (long-run) findings are reported in Table 4. They document the strengthening of the pass-through MMF channel, reflecting that unconventional monetary policy pushed yields even more to the negative zone. MMF rates followed policy rates into a negative territory, which is very challenging for the MMF industry, especially for constant value strategies. These estimates are also accompanied by the results of a Wald test for the null hypothesis that the two coefficients are equal across the two monetary regimes. The Wald test results clearly document that the null hypothesis of equality is rejected for both types of lending rates (loans and MMFs).

Table 4. ARDL Long-Run Estimates (Equation 1): Decomposing Monetary Policy Periods

	MMF				Loan			
Variables	Coefficient		p-value		Coefficient		p-value	
Conventional monetary policy period (2003:1-2014:12)								
constant	1.109		0.20		0.862		0.38	
pol	0.784*		0.09		0.928**		0.05	
R^2-adjusted	0.36				0.57			
Harvey F-test	1.015		0.34		0.853		0.49	
LM test	0.843		0.40		0.783		0.48	
Ramsey F-test	0.820		0.43		0.586		0.60	
Jarque-Bera test	1.375		0.37		1.156		0.64	
Pesaran F-test	12.693				10.471			
Critical values	I(0) bound		I(1) bound		I(0) bound		I(1) bound	
	10%	5%	10%	5%	10%	5%	10%	5%
	2.68	3.05	3.53	3.97	2.68	3.05	3.53	3.97
Unconventional monetary policy period (2015:1-2019:12)								
constant	0.764		0.37		0.504		0.50	
pol	1.568***		0.00		0.637		0.22	
R^2-adjusted	0.65				0.40			
Harvey F-test	0.636		0.52		0.671		0.49	
LM test	0.671		0.47		0.732		0.42	
Ramsey F-test	0.582		0.50		0.692		0.44	
Jarque-Bera test	1.208		0.57		1.296		0.52	
Pesaran F-test	14.803				10.612			
Critical values	I(0) bound		I(1) bound		I(0) bound		I(1) bound	
	10%	5%	10%	5%	10%	5%	10%	5%
	2.68	3.05	3.53	3.97	2.68	3.05	3.53	3.97
Wald	9.681		0.00		6.548		0.01	

Note: Harvey is the heteroscedasticity test, LM is the autocorrelation test, Jarque-Bera is the normality test, Ramsey is the RESET test for the validity of the functional form. In all four tests, the goal is the acceptance of the null hypothesis. Pesaran is the investigation of the presence of a long-run equation between the variables, by applying the ARDL Bounds Testing Approach. Wald tests the null hypothesis of the equality of coefficients that the estimates for conventional and unconventional periods are the same. ***: $p \leq 0.01$; *: $p \leq 0.10$.

4. Conclusion

The findings documented that the pass-through mechanism of bank loan rates was weaker than that of MMF rates (0.642 vs 1.044, respectively), especially during the unconventional monetary policy period (0.637 vs 1.568, respectively). This is potentially attributed to the fact that during this period, banks earned less from traditional lending business and took increasingly large risks, while they were struggling to reduce their non-performing loans accumulated before and during the crisis. These findings seem to corroborate close counterparts and explanations provided by Jank and Wedow (2015) for the case of the German MMFs and by DiMaggio and Kacperczyk (2017) for the case of US MMFs. Moreover, the superiority of the MMF mechanism could also indicate that with MMFs certain risks are present, while monetary authorities were well monitoring these risks. According to Jank and Wedow (2015), the presence of those risks led to certain reforms of the regulation of money market funds. The adoption of these regulations ensures the stability of the MMFs market that could lead to help private investors to gain a better insight into the risks associated with money market funds investments.

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