Limited Pass-Through from Policy to Retail Interest Rates: Empirical Evidence and Macroeconomic Implications

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In this paper we survey empirical evidence on the limited pass-through from policy to retail interest rates and summarize some recent research on potential implications for monetary policy and macroeconomic fluctuations. Empirical evidence suggests that while the pass-through is incomplete in the euro area as well as in the U.S.A., it appears to be higher in the U.S.A. This is especially true for the long-run pass-through. Research in this field suggests that a limited pass-through alters the Taylor Principle. In the case of a perfect pass-through, the Taylor Principle requires that policy rates increase by more than one-to-one with an increase in (expected) inflation. If the pass-through is incomplete, policy rates have to respond by even more to compensate for the smoothing of retail rates. However, the monetary policies currently implemented in the euro area and the U.S.A. seem to satisfy the conditions for a unique and stable equilibrium and thus avoid sunspot shocks. Furthermore, findings in the literature also show that a limited pass-through has implications for the stabilizing role of monetary policy and therefore, fluctuations arising from fundamental shocks.

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1 Introduction

Monetary policy affects the economy through various transmission channels, e.g. interest rates, exchange rates, asset prices, etc. One of the most important channels of monetary policy is the interest rate channel. The monetary authority sets policy rates; these affect short-term money market rates, which in turn influence medium to long-term market rates, bank retail rates, etc. Borio and Fritz (1995, p. 3) argue that "bank lending rates are a key, if not the best, indicator of the marginal cost of short-term external funding in an economy." Households and firms take out bank loans in order to finance consumption and investment expenditures. Therefore, the price of bank loans is key in the determination of final demand and consequently inflation in an economy. However, not only bank lending rates but also bank deposit rates are important, as they influence the saving vs. consumption (and the saving vs. investment) decisions of economic agents.

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In this paper we focus on the interest rate channel of monetary policy transmission, in particular on the link between policy rates and bank retail rates. The purpose of this paper is twofold: First, we summarize empirical evidence on the extent of the pass-through to retail rates in the euro area and the U.S.A. and second, we discuss potential implications for monetary policy and macroeconomic stability.

A vast literature on the pass-through to retail interest rates (e.g. Cottarelli and Kourelis, 1994; Mojon, 2000; Angeloni and Ehrmann, 2003; de Bondt et al., 2005) documents that bank interest rates are characterized by a lower variance than money market rates. Put differently, banks typically do not fully adjust retail rates when market rates change. Banks are no neutral conveyors of monetary policy. Consider, for example, that a

central bank wants to counteract overheating in an economy and increases its policy rates, which is reflected in an increase in money market rates. The ultimate effect on the economy will, however, depend on the reaction of those interest rates that are relevant for aggregate demand, e.g. bank retail rates. Thus, a limited pass-through to retail rates will have macroeconomic implications.

From a theoretical point of view, it is not fully understood why retail rates do not track money market rates more closely. There are different explanations: One potential explanation is that the limited pass-through may be interpreted as an implicit contract between the bank and its customers, which arises as a consequence of long-term relationships (Berger and Udell, 1992; Allen and Gale, 2004). That is, banks with close ties to their customers offer relatively stable retail interest rates in order to insulate the customers from volatile market rates. Moreover, a limited interest rate pass-through may also be the consequence of adjustment costs (e.g. Hannan and Berger, 1991; Hofmann and Mizen, 2004), like labor costs, computing costs and notification costs. Because of these costs, banks refrain from frequent interest rate adjustments and change rates only when the gain of the change is larger than the associated costs. Furthermore, in a varying interest rate environment banks can also change other components of a loan or deposit contract, such as collateral requirements, fees, etc. All the causes for rigid retail interest rates mentioned above are similar to the explanations for sticky consumer prices (e.g. Fabiani et al., 2006). Another explanation for a limited pass-through to retail rates is related to asymmetric information and moral hazard. In particular, banks have an incentive not to raise interest rates by too much, because borrowers who accept a higher rate are likely to be of poor quality. If borrowers take up a loan at a high rate, they are more likely to choose riskier projects, decreasing the expected value of the amount paid back.

Despite its unambiguous implications for the volatility of retail rates, a limited pass-through may have ambiguous consequences for business cycle volatility. On the one hand, the banking sector may contribute to macroeconomic stability by insulating the economy from adverse interest rate shocks. This issue appears to be particularly relevant for bank-based financial systems like the euro area where retail rates play a more important role than in market-based systems like that in the U.S.A. (Allen and Gale, 2000). Issing (2002) argues that since relationship lending is relatively widespread in the euro area, business cycles should be smoother. On the other hand, a limited pass-through also means that monetary policy actions are to some extent absorbed or smoothed by the banking sector. Thus, a limited interest rate pass-through might interfere with the stabilizing role of monetary policy (Scharler, 2006) in the sense that policy-induced changes in short-term market rates are not fully transmitted to the economy. Moreover, a limited pass-through alters the so-called Taylor Principle (described in 3.1), which is an important requirement for macroeconomic stability (Kwapil and Scharler, 2006).

The remainder of the paper is structured as follows: Section 2 summarizes the empirical evidence on the pass-through process from money

market rates to retail rates. Section 3 presents simulations to investigate the effect of a limited pass-through on macroeconomic volatility and the stability criteria of equilibria. Finally, Section 4 summarizes and concludes the paper.

2 Empirical Evidence on the Incompleteness of the Interest Rate Pass-Through

The literature on the pass-through to retail rates distinguishes between the "cost of funds approach" and the "monetary policy approach" (Sander and Kleimeier, 2004). The cost of funds approach focuses on the "price-setting decision" of banks. The cost of funds mainly reflects the opportunity costs that arise for a bank that issues loans and the financing costs for a bank that takes in deposits. One important criterion in this respect is the maturity of the rates; de Bondt (2005) argues that retail bank and market interest rates have to be of comparable maturity to avoid maturity mismatches. Thus, mortgage loans, for example, are better explained by long-term than by short-term interest rates. In contrast to that, the monetary policy approach is interested in the effect monetary policy has on retail rates and includes no other explanatory variables. It focuses solely on the question of how closely retail rates follow policy rates. Following the work of Cottarelli and Kourelis (1994), most of the empirical estimations found in the literature use an equation similar to

$$\Delta r_t = c + \sum_{j=0}^{n} \alpha_j \Delta i_{t-j} + \sum_{k=1}^{m} \beta_k \Delta r_{t-k} + \gamma(r_{t-1} - i_{t-1}) \quad (1)$$

where r_t is the retail rate of banks, i_t is the interest rate targeted by the central bank and Δ denotes the difference operator. As most studies find that the retail rate, as well as the policy rate, are integrated of order 1, it is common to estimate the equation in first differences to avoid the problem of spurious regressions. Thus, a change in retail interest rates is explained by a change in monetary policy rates, the persistence of a change in the retail rate and an error-correction term, which allows for a long-term relationship between the retail and the policy rate. The number of lags $n \leq 6$ and $m \leq 6$ are chosen according to the Akaike Information Criterion.

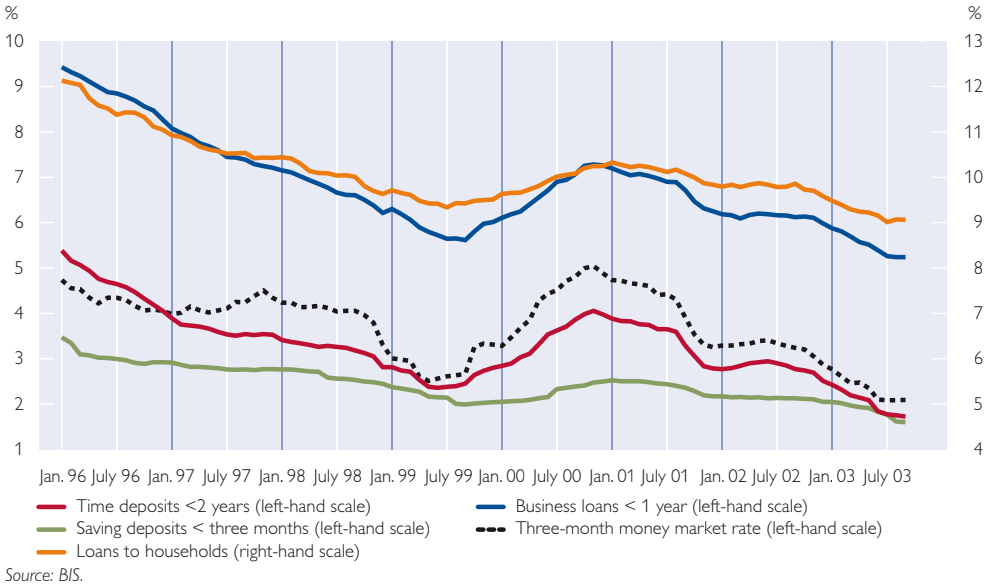
When estimating this equation, one is interested in the immediate pass-through, which is given by α_0. It gives the reaction of retail rates to a change in policy rates within the same time period. The second piece of information worth looking at is the long-run multiplier λ as defined in equation 2. It shows by how much the retail rate changes in reaction to a change in the policy rate by 100 basis points after all adjustments have taken place. This long-run multiplier is defined as:

$$\lambda = \frac{\sum_{j=0}^{n} \alpha_j}{1 - \sum_{k=1}^{m} \beta_k}, \quad (2)$$

where α_j and β_k are the coefficients on the policy rate and the retail rate, respectively, and n and m give the number of lags chosen when estimating equation 1. A high long-run pass-through might, thus, be due to high direct effects passed through from policy rates to retail rates or a high persistence in the retail rates. If λ is equal to 1, the pass-through is said to be complete in the long run and changes in policy rates are to the full extent transmitted to retail rates.

Chart 1

The Pass-Through from Money Market Rates to Bank Retail Rates in the Euro Area[1]



Source: BIS.

[1] *Chart 1 presents synthetic euro area aggregates from January 1996 to September 2003.*

As monetary policy rates and short-term money market rates (e.g. the three-month money market rate) move closely together, money market rates are often taken as proxies for policy rates. Additionally, policy rates are constant for long time periods and change only when policy decisions are taken, which makes them less suitable for econometric purposes. That is why we use money market rates instead of policy rates in the following analysis.

Chart 1 shows the three-month money market rate (dotted line) as a proxy for policy rates and four selected retail interest rates from the euro area. We chose two deposit rates and two lending rates with different maturities. Chart 1 shows quite clearly that the pass-through differs depending on the type of retail rate. While the interest rate on saving deposits with a maturity of less than three months is relatively constant and features a low pass-through, the interest rate on time deposits with a maturity of less than two years moves more in line with the money market rate. A similar picture emerges from retail lending rates. While the interest rate on loans to households does not fluctuate much and, thus, has a low pass-through, the interest rates on short-term business loans moves quite in parallel with the money market rate. This pattern of considerable differences in the pass-through depending on the type of retail interest rates found for the euro area is a common finding in the literature. Mojon (2000), Sander and Kleimeier (2004), de Bondt (2005) and Kwapil and Scharler (2006) share the result that deposit rates with short maturities (e.g. overnight deposits, saving deposits) have a lower pass-through than deposit rates with longer maturities (e.g. time deposits). Furthermore, Sander and Kleimeier (2004), de Bondt (2005) as well as Kwapil and Scharler (2006) find that interest rates on short-term loans to corporations (prime rate) feature a higher

Table 1

The Pass-Through from Money Market Rates to Retail Rates in the Euro Area

	Deposit rates		Lending rates	
	immediate	long-term	immediate	long-term
Mojon (2000)	0.27	×	0.53	×
Angeloni and Ehrmann (2003)	0.38	0.74	0.38	0.74
Sander and Kleimeier (2004)	~ 0.20	0.62–0.68	~ 0.20	0.40–0.47
de Bondt (2005)	0.00–0.35	0.35–0.98	0.13–0.54	0.92–1.53
de Bondt et al. (2005)	0.36	0.68	0.04–0.38	0.48–0.74
Kwapil and Scharler (2006)	0.16	0.32	0.34	0.48
Kaufmann and Scharler (2006)	×	×	0.48	×
Kleimeier and Sander (2006)	0.10–0.45	0.25–0.80	0.25–0.45	0.65–0.75
Sorensen and Werner (2006)	×	0.15–0.84	×	0.38–1.17

Note: Angeloni and Ehrmann (2003) estimate the immediate pass-through for the euro area using an average of deposit and lending rates.

pass-through than medium to long-term lending rates.

Table 1 summarizes the findings of the literature on the immediate and the long-term pass-through for the euro area, where most authors listed in the table use an equation similar to (1). In general the authors use monthly data, implying that the immediate pass-through reflects the response of retail rates to changes in money market rates within the same month. Exceptions are Mojon (2000), who reports the response after three months as well as Kaufmann and Scharler (2006), who use quarterly data; thus, the immediate pass-through gives the response within the first quarter.

A problem in comparing results in the literature is that the authors cover different time periods and use different data sources. Furthermore, some use euro area aggregates, while others take the average of country results of only a few euro area countries and, thus, use only a proxy for the euro area. In some cases table 1 includes ranges instead of point estimates. Ranges are given if the authors report estimates of the pass-through to various retail interest rates.

Table 1 shows that there are considerable differences in the estimates of pass-throughs in the euro area. However, the differences are not bigger across studies than across retail interest rates within one study as indicated by the ranges given in table 1. The first common finding is that the adjustment of retail rates to changes in money market rates does need some time and does not occur instantaneously, as the immediate pass-through is smaller than the long-term pass-through. This seems to be true for deposit rates as well as for lending rates. The second common finding is that the immediate pass-through seems to be below 0.55 in all cases. This means that only around half of the change in money market rates is immediately passed through to retail interest rates. For the long-term pass-through the range of estimates is bigger. However, the results seem to suggest that with only few exceptions, the long-term pass-through in the euro area is below 1 and, thus, not complete. This indicates that banks indeed insulate their customers from volatile money market rates by absorbing part of the changes.

Table 2

The Pass-Through from Money Market Rates to Retail Rates in the U.S.A.

	Deposit rates		Lending rates	
	immediate	long-term	immediate	long-term
Cottarelli and Kourelis (1994)	×	×	0.41	0.97
Borio and Fritz (1995)	×	×	0.34	0.79
Moazzami (1999)	×	×	0.34	1.05
Sellon (2002)	×	×	×	1.00
Angeloni and Ehrmann (2003)	0.74	1.30	0.74	1.30
Kwapil and Scharler (2006)	~1.00	~1.00	0.79	0.57
Kaufmann and Scharler (2006)	×	×	0.92	~1.00

Note: Angeloni and Ehrmann (2003) estimate the immediate pass-through for the euro area using an average of deposit and lending rates.

Table 2 summarizes pass-through estimates for U.S. retail interest rates. Also for the U.S.A., one has to keep in mind that the authors use different data sets and cover different time periods. The estimates for the pass-through in the U.S.A. seem to be higher than in the euro area, and most of the studies seem to suggest that the pass-through to U.S. retail rates is nearly complete in the long-run.

3 Macroeconomic Implications

Since empirical evidence indicates that the pass-through to retail rates is incomplete, the question of what the macroeconomic implications of this stylized fact are remains. On the one hand, one would expect that the economy is less exposed to interest rate shocks. That is, shocks to the overall liquidity situation on financial markets have a smaller impact on households and firms. This argument applies in particular to bank-based economies like the euro area. Angeloni and Ehrmann (2003, p. 10) argue that banks are important for the transmission of monetary policy in the euro area, "given their overwhelming role in financial intermediation in continental Europe." Thus, it appears plausible that the euro area economy experiences smoother business cycles than a more market-based system, as for instance the U.S.A.[1] However, a limited pass-through to retail rates also has the implication that monetary policy is less effective in the sense that policy-induced changes in short-term market rates are not fully transmitted to the economy.

In this section we focus on how a limited pass-through influences the behavior of the economy in the face of two different types of shocks. The first type is the so-called "sunspot shock," which refers to self-fulfilling revisions in inflationary expectations. Several authors argue that precisely these shocks were a major source of macroeconomic instability in the 1970s (e.g. Clarida et al., 2000). The second type of shock is a fundamental shock. Scharler (2006) analyzes liquidity shocks, which are shocks to the borrowing needs of firms, as examples of fundamental shocks.

[1] *Of course, differences in business cycle characteristics across countries may be due to various reasons, e.g. different rigidities, different types and magnitudes of shocks and their propagation mechanism. However, different financial systems may be a potential explanation for these differences in business cycle characteristics.*

3.1 Limited Pass-Through and the Taylor Principle

Several authors claim that the so-called Taylor Principle has important implications for macroeconomic fluctuations. Basically, the Taylor Principle holds that the nominal interest rate has to respond more strongly than one-for-one to changes in the inflation rate to avoid self-fulfilling revisions in expectations. Intuitively, if nominal rates do not adjust sufficiently, a rise in expected inflation leads to a decrease in the real interest rate, which stimulates aggregate demand. Higher aggregate demand results in an increase in inflation, and consequently the initial expectation is confirmed. An economy subject to this type of "sunspot shocks" will be highly unstable, and business cycles will be characterized by large fluctuations.

Consider a simple Taylor Rule as a description of monetary policy:

$$i_t = \rho i_{t-1} + (1-\rho)(\kappa_\pi \pi_t + \kappa_y y_t), \quad (3)$$

where i_t denotes the nominal interest rate targeted by the central bank, ρ is the degree of policy inertia and κ_π and κ_y determine the response of monetary policy to changes in inflation (π_t) and the output gap (y_t), respectively. Clearly, the Taylor Principle is satisfied if $\kappa_\pi > 1$. Otherwise, an increase in inflation would lead to an increase in the nominal interest rate by less than one and would thus induce a decline in the real interest rate.

However, as shown in Kwapil and Scharler (2006), the standard Taylor Principle is not sufficient to rule out fluctuations due to self-fulfilling expectations when the interest rate pass-through is limited. Put differently, although monetary policy appears to be tightened sufficiently, retail interest rates do not respond sufficiently to ensure that real rates are stabilizing. It is shown that in this case a modified Taylor Principle applies: $\kappa_\pi \lambda > 1$, where λ denotes the long-term pass-through to retail rates.[2] The intuition is straightforward: For low values of λ, changes in the monetary policy rate are to a large extent absorbed by the banking sector and not passed on to households and firms. Hence, if expected inflation increases, monetary policy has to be tightened considerably to have a stabilizing effect on aggregate demand. For $\lambda = 1$ the pass-through to retail rates is complete at least in the long run, and we obtain the standard Taylor Principle.

Ultimately, our aim is to analyze how the pass-through process to retail interest rates influences equilibrium determinacy and macroeconomic stability. Empirical evidence surveyed in the previous section suggests that for the U.S.A., the long-run pass-through to retail rates is higher than in the euro area. Moreover, the banking sector and therefore retail rates play only a relatively minor role for the determination of U.S. aggregate demand (e.g. Allen and Gale, 2000). Thus, we may conclude that κ_π, which ensures a determinate equilibrium, is likely to be higher in the euro area than in the U.S.A.

[2] *Strictly speaking, this modified Taylor Principle applies to the case $\kappa_y = 0$. However, for empirically plausible values for κ_y, differences are negligible.*

Do the monetary policy rules estimated for the European Central Bank and the Federal Reserve Bank satisfy the modified Taylor Principle? For the U.S.A., Clarida et al. (2000) find a value of 2.15 for κ_π for the Volcker-Greenspan period. Based on real-time-data, Orphanides (2004) reports lower values of around 1.8. For the euro area, Gerdesmeier and Roffia (2004) estimate several specifications. Based on their preferred specification, they obtain estimates ranging from 1.9 to 2.2. A precise evaluation is complicated, since retail rates are only one category of interest rates relevant for the determination of aggregate demand. However, the estimated values for κ_π appear to fall within the determinate region for both economies. Nevertheless, the euro area, with its more bank-based system and its smaller pass-through to retail rates, may be closer to the indeterminate region than the U.S.A.

3.2 Limited Pass-Through and the Transmission of Liquidity Shocks

How does a limited pass-through influence the response of the economy to fundamental shocks? Scharler (2006) addresses this question within a New Keynesian business cycle model where fluctuations arise due to liquidity shocks. Firms have to borrow working capital to finance production. In particular, a fraction of the wage bill has to be paid in advance of production, and stochastic fluctuations in this fraction are interpreted as liquidity shocks. The paper focuses on these shocks, which may be interpreted more generally as shocks to the demand for credit, since the role of the banking sector as a shock absorber might be particularly relevant to such liquidity shocks.

In this model, a liquidity shock raises the borrowing needs of firms, increasing their interest payments on the working capital and making production more costly. This affects the supply and pricing decision of the firm. Higher costs of the working capital are likely to lead to decreases in the volume of production and upward price adjustments. The increase in inflation leads to a monetary policy response and thus to an increase in the policy interest rate, which in turn leads to an increase in lending rates and raises costs even further by making working capital more expensive. Thus, the response of monetary policy tends to amplify the shock. Interest rate smoothing by the banking sector dampens the increase in inflation and therefore leads to a smaller increase in policy rates. Consequently, a limited pass-through reduces the volatility of business cycles in this setup. However, quantitatively, the reduction in volatility is found to be small. Thus, a financial system that only insulates the business sector of the economy against liquidity shocks increases macroeconomic stability only marginally.

However, liquidity shocks affect aggregate demand more generally. Since monetary policy is tightened in response to the liquidity shock, it is not just corporate lending rates which are increased, but retail rates in general. Hence, in addition to the initial liquidity shock, the economy faces an aggregate demand shock, as households delay consumption. Simulations show that if the long-run pass-through to retail rates in general is incomplete, meaning that banks do more than just smooth fluctuations in the policy rate, but partly absorb these fluctuations even in the long run, then larger reductions in aggregate

volatility are obtained. However, the lower volatility of output in this case comes at the cost of a more volatile inflation rate. This result can be understood in terms of how an imperfect interest rate pass-through alters the Taylor Principle and the stability properties of the model. Although we have seen that monetary policy rules estimated for the euro area and the U.S.A. rule out sunspot shocks, limited pass-through also influences how the economy responds to fundamental shocks. Intuitively, lowering the long-run interest rate pass-through while keeping the policy response to inflationary pressure fixed implies that monetary policy becomes more accommodating. Hence, the inflation rate becomes more volatile. Put differently, a limited long-run pass-through alters the trade-off between output and inflation stabilization faced by the central bank. If banks absorb policy-induced variations in interest rates even in the long run, as the empirical findings suggest, monetary policy in some sense becomes more accommodating toward inflationary pressures.

4 Summary

In this paper, we survey empirical evidence on the limited pass-through from policy to retail interest rates. In addition, we summarize some recent research on potential implications for monetary policy and macroeconomic fluctuations which arise from a limited pass-through.

Empirical evidence suggests that while the pass-through is incomplete in the euro area and in the U.S.A., it appears to be higher in the U.S.A. This is especially true for the long-run pass-through.

What are the implications for macroeconomic fluctuations? Despite the result that a limited pass-through alters the Taylor Principle, we conclude that currently implemented monetary policy rules in the euro area and the U.S.A. are likely to satisfy the conditions for a determinate equilibrium. Put differently, even after taking limited pass-through into account, sunspot fluctuations are unlikely to arise. However, a limited pass-through still has implications for the stabilizing role of monetary policy and therefore fluctuations arising from fundamental shocks. Given the empirical evidence in favor of a limited long-run pass-through, any reduction in output volatility that is due to liquidity smoothing by the banking sectors is likely to be accompanied by a more volatile inflation rate. Moreover, in addition to the characteristics of an interest rate rule, the long-run pass-through to retail rates has to be taken into account for the evaluation of monetary policy.

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