

## 2. Transmission channels of monetary policy

There is a consensus among economists that the instruments of monetary policy are able to generate real effects – at least in the short run. The exact mechanism is still the subject of controversial debate. Some time has passed since Milton Friedman concluded that “long and variable lags” are involved in transmitting monetary policy impulses (Friedman (1960), p. 87); yet the controversy has remained.

To shed some light on the question how the transmission of monetary policy works, this chapter introduces the topic and outlines the most important transmission channels.

This discussion then lays the basis for a detailed review of the bank lending channel in the next chapter (chapter 3). That is important, because the bank lending channel is a key tenet of the theoretical framework that is necessary to explain the determinants of banks' lending reactions.

### 2.1. The money view

The most widely shared view on monetary policy transmission can be summarized under the heading “the money view”.<sup>2</sup> The most important representative of the money view is the traditional interest-rate channel, which explains the effect of monetary policy on aggregate spending through changes in interest rates.

This mechanism is based on two key assumptions. The first assumption is that the central bank can affect the short-term nominal interest rate. This is doubtless the case, as empirically supported by Mojon (2000), for example. Control over the short-term *nominal* interest rate enables the central bank to influence both the short-term and long-term *real* interest rates. In seeking to understand the transmission from nominal to real short-term interest rates, the key concept is “price stickiness”. Due to

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<sup>2</sup> The systematization of the money view presented herein follows Mishkin (2010), chapter 26. Different approaches are taken by Bofinger (2001) or Jarchow (2003), for example.

factors such as menu costs and money illusion,<sup>3</sup> the aggregate price level adjusts slowly, with the result that an expansionary monetary policy shock lowers not only the nominal but also the real short-term interest rate.<sup>4</sup> The relationship between real short-term interest rates and real long-term interest rates is established by a concept called expectations theory and works as follows: In line with expectations theory, it follows that real long-term interest rates are the average of expected future short-term interest rates. For example, buying a bond with a maturity of one year, holding it to maturity and then buying another bond with a maturity of one year should yield the same expected return as a bond with a maturity of two years. Following the same logic, different maturities can be regarded as substitutes for each other.

The second assumption of the money view is that investment and consumption expenditures are sensitive to changes in the real interest rate. The more interest-rate elastic both are, the greater is the impact of monetary policy stimulus. This is especially plausible for long-term investments such as business fixed investment, residential housing investment and consumer durable spending.

To sum up: Monetary policy makes use of its influence on short-term nominal interest rates to affect long-term real interest rates. This precipitates a decline in the interest-sensitive components of spending, especially those that are geared to long-term considerations.

Three further prominent transmission mechanisms have also evolved under the heading of the money view: first, the exchange rate mechanism, which is also predicated on real interest-rate changes; second, the Tobin's  $q$  channel; and third, the wealth mechanism (with the latter two both based on stock price values). All three mechanisms are briefly sketched below.

The exchange rate mechanism of monetary policy transmission assumes that, if the domestic real interest rate rises, domestic deposits will appear relatively more

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<sup>3</sup> Menu costs are the costs incurred in the change of prices. They include printing new price lists (e.g. menus in restaurants), re-tagging items, updating systems and updating merchandise material, etc. Money illusion refers to people's tendency to think of prices in nominal rather than in real terms. Consequently, they do not adjust instantly to new real price levels (see Fisher (1928) for the original reference to money illusion).

<sup>4</sup> The discussion of the third condition required for the bank lending channel examines price stickiness in more detail. See section 3.1.3.

attractive to investors than deposits held in a foreign currency. This leads to increased demand for the domestic currency, and the domestic currency appreciates relative to foreign currencies. Domestic goods thus become more expensive abroad, while net exports are reduced. Since net exports are also a component of aggregate spending, aggregate demand declines.

The Tobin's  $q$  channel (see Tobin (1969)) is based on the assumption that monetary policy can affect the market valuation of a company's stocks. If monetary policy is eased, more money flows into the stock markets, increasing the stock market value of companies. The question is: Where is the connection to aggregate spending? The necessary concept is the Tobin's  $q$  ratio, which is defined as the market value of an enterprise divided by the replacement value of the enterprise's capital. Given a high value for  $q$ , the market valuation of the company will exceed the replacement cost of capital, thereby making it attractive to issue new stocks (equity) in order to finance investments. An increase in investments also increases aggregate spending.

While the wealth mechanism (see Modigliani (1971)) is also based on stock prices, this concept focuses on stocks as a component of private wealth. The basic premise is that private individuals desire to smooth their periodic consumption<sup>5</sup> over time depending not on current financial resources, but on lifetime financial resources. Since stocks are a significant component of financial wealth, stock price movements can affect lifetime financial resources and, hence, private consumption. The increase in consumption positively affects aggregate spending.

These three mechanisms, together with the traditional interest-rate channel, add up to the money view.

Criticism has been leveled at attempts to explain what are relatively substantial real effects using the money view mechanism *only*. As pointed out above, the first assumption is that the central bank can affect the short-term nominal interest rate. The second assumption is that investment and consumption expenditures are sensitive to changes in the real interest rate. Both assumptions have been questioned mainly due to the fact that the relatively small impulses given by monetary policy are not sufficient to explain the relatively large real effects as explained, for example, by Bernanke and Gertler (1995) and Mishkin (1995). In

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<sup>5</sup> Consumption in this context excludes consumer durables expenditures.

particular, in order to explain the strong real effects using the direct interest-rate channel only, the interest-rate changes effected by the central bank would have to be much more pronounced than those that are observable, especially in light of the relatively low interest-rate elasticity of investment. Furthermore, it is questionable whether the empirically strong influence of the central bank on the demand for long-lived assets can indeed be attributed to this channel: The power of the central bank to influence long-term interest rates is observable, yes; but it is also limited according to Bernanke and Gertler (1995).

These observations have led a number of authors, such as Gertler and Gilchrist (1993), Bernanke and Gertler (1995), Cecchetti (1995), Hubbard (1995) and Bernanke et al. (1996), to conclude that credit market imperfections too – in addition to the traditional interest-rate channel/money view – must play a crucial role in explaining the relatively large real effects stemming from relatively small monetary policy impulses. This view, called the credit view of monetary transmission, is central to the following section.

## 2.2. The credit view

As hinted at at the end of the last section, the beginnings of the credit view can be traced back to some puzzling observations that could not be brought into line with the conventional interest-rate channel view – or money view – of monetary transmission. Most notably, the federal funds rate, over which the US Federal Reserve exercises close control, is an *overnight* money market rate.<sup>6</sup> One would therefore expect the impact on (real) long-term interest rates to be relatively weak. Strikingly, however, research on monetary policy has found a substantial impact of short-term rates on aggregate demand, especially on long-lived assets such as housing or fixed business equipment, which should in theory primarily be sensitive to *long-term* interest rates (see e.g. Bernanke and Gertler (1995), Bernanke et al. (1996) and Peek and Rosengren (2010)).

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<sup>6</sup> Reference is made here to the Federal Reserve and the federal funds rate simply because the observations mentioned were first made in a US context. The credit view is not limited to the US, of course, and its implications also hold for the euro area. Some differences between the US and the euro area are discussed in the course of the available empirical evidence (section 6.1).

The solution to the puzzle can be found in credit market imperfections, as myriad papers emphasize (see Gertler and Gilchrist (1993), Cecchetti (1995), Bernanke and Gertler (1995) and Bernanke et al. (1996), to name but a few). As pointed out by Bernanke and Gertler (1989), the important insight is that deadweight losses occur whenever there is an asymmetry in information between the borrower and the lender relative to an equilibrium in a world of perfect information. These agency costs are reflected in the difference between raising funds internally (e.g. through retained earnings) as opposed to externally (e.g. by issuing equity or debt). The cost differential is inversely related to the borrower's balance sheet position, especially the borrower's net worth, and referred to as the external finance premium. The external finance premium plays a role in both the balance sheet channel and the bank lending channel, as will be outlined in the sections that follow.

According to Bernanke and Gertler (1995), the external finance premium reflects three kinds of costs: first, the expected costs the lender has to bear for evaluating, monitoring and administering the borrower; second, the costs of the typical "lemon's premium" stemming from the fact that borrowers possess better information about their financial position than lenders; and third, the expected costs associated with moral hazard of the borrower.

When the European Economic and Monetary Union was established, the question of the importance of the credit view attracted renewed attention in the euro area. As a preliminary judgment of the ongoing debate it is fair to say this: In particular the conclusion that the interest rate channel is not sufficient to explain the magnitude of observable real effects also holds true for the euro area. Accordingly, there must be some mechanism(s) at work that is (are) amplifying or complementing the transmission of monetary policy impulses over and above what is explained by the money view. These mechanisms are the balance sheet channel and the bank lending channel.

### *2.2.1. The balance sheet channel*

Central to the balance sheet channel is the concept of the external finance premium which was introduced by Bernanke and Gertler (1989). The external finance premium states that a borrower's cost of financing is inversely contingent on his financial position, measured especially in terms of net worth but also in terms of liquidity and

current and future expected cash flows. The stronger the financial position of the borrower, the more collateral he will be able to provide and the more he will be able to bear his own losses. This fact strengthens the incentive not to act in a morally hazardous way, but instead to do one's best to ensure favorable financial results, because the borrower has more 'skin in the game' which he risks to lose (Bernanke (2007)). This in turn makes investing in the borrower less risky, yielding more favorable credit terms and lowering the overall cost of financing. Since it was first introduced, the idea of an inverse relationship between a borrower's financial position and the cost of credit has gained popularity. The concept has, for example, been applied by Kiyotaki and Moore (1997), Bernanke and Gertler (1995), Bernanke et al. (1999), Carlstrom and Fuerst (2001) and Iacoviello (2005), most notably in a business cycle research context.

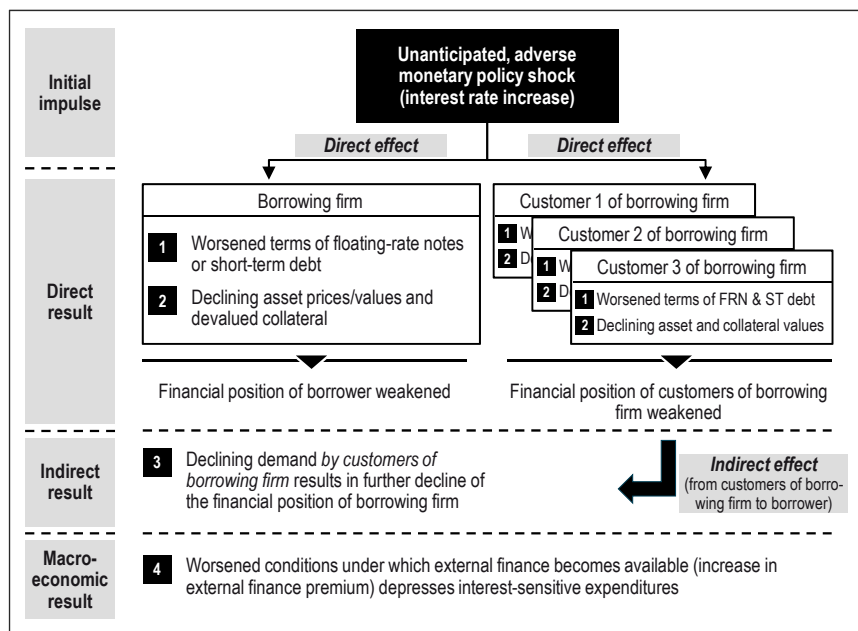


Figure 2.1: Mechanism behind the balance sheet channel of monetary policy transmission

The research on business cycles referred to above used the concept of the external finance premium to solve the puzzle of how relatively small, unanticipated monetary changes can have substantial and persistent real effects: A change in interest rates

provoked by monetary policymakers – an increase, say – negatively impacts a borrower's financial position both directly and indirectly (see figure 2.1).

Two distinct effects are immediately apparent (see Bernanke and Gertler (1995)). First, to the extent that borrowers are financed using short-term (floating) debt, they are directly affected by higher interest payments. This weakens their cash flows and their overall financial positions and increases the external finance premium. Second, a rise in short-term interest rates is usually accompanied by a decline in asset prices, thereby diminishing the value of collateral and the creditworthiness of companies through higher discount factors, again increasing the external finance premium.

Indirectly, there is also an effect on borrowing firms when *customers* of the borrowing firms are themselves directly and negatively affected by an unanticipated monetary policy shock, leading to a higher external finance premium for the customers of the borrowing firm. As a result, the customer companies are likely to reduce spending on goods or services from the borrower.

*Ceteris paribus*, this situation causes credit conditions to deteriorate and, ultimately, leads to a higher cost of financing. This effect amplifies the traditional interest-rate channel in the sense that the level of market interest rates which the borrower has to pay is higher because the increased financing cost – caused by the additional risk premium – places an even higher burden on spending and investment decisions, thereby making even more marginal investment opportunities unprofitable. As a consequence, aggregate spending, aggregate demand and real activity all slow down.<sup>7</sup>

The balance sheet channel is one of two channels in the credit view. The following section addresses the second of these two channels: the bank lending channel.

### 2.2.2. *The bank lending channel – Overview*

In a study on the Great Depression of the early 1930s building on the work of Friedman and Schwartz (1963), Bernanke (1983) suggests the existence of another distinct mechanism by which monetary policy can have non-transitory real effects.

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<sup>7</sup> In the context of business cycle research, the fact "that endogenous procyclical movements in borrower balance sheets can amplify and propagate business cycles" (Bernanke and Gertler (1995)) is referred to as the 'financial accelerator'.

This idea was further developed by Bernanke and Blinder (1988) and explains how a central bank's monetary policy can impact the supply of intermediated loans by affecting banks' loanable funds. This leads to the bank lending channel, which focuses on the role of banks in the propagation of monetary policy.

Despite the fact that non-bank financial intermediaries have gained importance in recent decades and that firms today have access to alternative forms of funding via public debt markets, banks still play the leading role in financing firms, especially in the euro area.<sup>8</sup> The bank lending channel establishes the link between monetary policy and banks and between banks, firms and real activity.

Since it examines the circumstances under which monetary policy can affect the supply of bank lending, this is one of the key reference frameworks within the present study. Before going into the details of the bank lending channel in the next chapter, this section begins with a brief overview of the mechanism at work.

According to the traditional view of the bank lending channel, an increase in key interest rates by the central bank worsens the terms on which banks can equip themselves with reserves by the central bank. This has consequences for banks because reserves are always linked to deposits: Banks are required to hold a certain percentage of (insured) deposits as central bank reserves.<sup>9</sup> As a result, the shortage of or "drain" in reserves limits the banks' ability to create deposits and, at the same time, to grant loans, because granting a loan means creating a deposit on the account of the borrower. Therefore, reducing the availability of reserves impairs the ability to provide loans.

There is another mechanism through which the central bank impacts the availability of deposits as a funding source for banks. This mechanism works by affecting the yields on deposits relative to other assets Disyatat (2011). It can be explained by the motives for holding money.

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<sup>8</sup> Arguments substantiating the view of an intact bank lending channel despite the increased significance of non-bank financial intermediaries and wholesale funding markets are outlined in section 4.1.

<sup>9</sup> The reserve requirement is 1% of all covered liabilities in the euro area (it was 2% until the end of 2011) and 10% in the US. It must be noted, though, that in the euro area the range of liabilities covered by reserve requirements is larger than in the US. For more details on reserve requirements, see Bofinger (2001), p. 343 et seq.



*Excursus: motives for holding money*

According to Keynes' famous disquisition (Keynes (1936), chapter 15), individuals hold money as deposits for three reasons: for transaction purposes, out of a precautionary motive and for speculative reasons.

First, the transaction motive reflects those parts of liquidity that are held in order to make immediate purchases of goods or services (such as food, rent, electricity, etc.). The desired money is mostly held in the form of demand deposits (rather than as cash). The quantity of money designated for transaction purposes depends on periodic income, but does not hinge on the level of interest rates.

Second, because individuals face expenses whose amount and probability of occurrence is uncertain they hold money out of a precautionary motive to cover these uncertain events (e.g. repairs, replacement purchases). Some textbooks group the precautionary motive together with the transaction motive and do not regard the two items separately. The reason for this is that the amount of money held for unanticipated events stemming from a precautionary motive can be thought of mainly as a function of the amount money spent on transactions and, therefore, ultimately as a function of periodic income.

Third, money is held for speculative reasons. In order to illustrate the logic suppose the simple case that economic agents have the choice between holding money in form of non-interest bearing deposits and a non-maturing bond.<sup>10</sup> The revenue from the bond,  $i$ , arises immediately from the quotient of the annual interest payment,  $K$ , and the purchase price,  $P$ :  $i = K/P$ . In addition, Keynes makes the assumption that every individual makes some assessment of what is the "normal" level of interest rates. The relation between the actual interest rates and the assessment regarding their normal level can be used to reflect the incentive structure for the individual (assuming constant interest payments): If the actual level of interest rates is below the level that is considered to be normal, then rising interest rates and falling bond prices will be expected in future. In this case, individuals hold money as speculative accounts. Conversely, if the actual level of interest rates is above the level that is considered to be normal, economic agents will expect falling interest rates

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<sup>10</sup> The simplifying assumption of a non-maturing bond is only made in order to be able to abstract from repayment effects. Obviously, no conclusion is dependent on this assumption.

accompanied by rising bond prices. In this situation, purchasing a bond will be profitable not only because of the bond price gain. Over and above this gain, a high return is expected due to the low purchase price. *Ceteris paribus*, less money is therefore held in the form of deposits owing to the increased opportunity cost faced by individuals if they hold money in a non-interest bearing form as opposed to interest-bearing bonds. Ultimately, the amount of money individuals hold as speculative accounts correlates inversely to the level of interest rates.

To sum up: The amount of deposits available to banks is a function of (monetary policy) interest rates due to the opportunity cost that individuals face as a result of the speculative motive.

Coming back to the bank lending channel mechanism: In response to a shortfall in funding on the liabilities side of the balance sheet, banks are forced to reduce assets or to replace lost deposits with alternative forms of funding (liabilities).

Since adjusting the balance sheet solely on the asset side (e.g. by selling securities; see detailed explanation below) is a suboptimal approach, banks will also adjust their liabilities. This is where the concept of the external finance premium comes into play: To the extent that lost deposits are replaced by alternative, uninsured forms of funding (e.g. wholesale funding), banks, acting as borrowers in wholesale funding markets, are exposed to the external finance premium which, in turn, depends on the overall financial condition of the bank in question.

Generally speaking, because deposits are subject to deposit insurance schemes, they are the only source of funding to banks that is not subject to asymmetric information and moral hazard problems (see Stein (1998)).<sup>11</sup> Any other form of uninsured funding potentially implies asymmetric information and moral hazard issues, all of which involve an external funding premium.

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<sup>11</sup> Depending on how deposit insurance schemes are implemented in individual jurisdictions, the contributions that banks have to make to the respective deposit insurance funds may be risk-related (e.g. in the US since 1993). However, although this might constitute an incentive to reduce risk from a bank's perspective (since the contribution to the insurance fund increases as the level of risk increases), this has no impact on the customers' propensity to provide (insured) deposits. Therefore, the issue of whether a bank's contribution to deposit insurance funds is risk-related or not has no direct consequences for the significance of the asymmetric information problem.

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