Monetary Policy Transmission Mechanism Using Econometric Models

Prof. Ion PÂRŢACHI PhD  
The Academy of Economic Studies of Moldova  
Republic of Moldova,  
ipartachi@gmail.com

Simion MIJA, PhD. Candidate  
The Academy of Economic Studies of Moldova  
Republic of Moldova,  
simionmija@mail.ru

Abstract
The purpose of this paper is to present the framework for statistical analyzing the monetary transmission mechanism: the process through which monetary policy decisions are transmitted into changes in real GDP, and inflation; and to evaluate the transmission mechanism in the monetary policy actions confronting it with the evidence in the literature that has been more concentrated in the use of the structural approach.

Our results allowed the identification of long run relationships that produce new information on how to evaluate the real interest rate and the nominal interest rate links respectively with the output gap and the nominal inflation derived from the IS and interest rule. We specify the model allowing variables that represent the government fiscal effort to enter in the econometric model based on theoretical models. The statistical identification approach allowed the further identification of a long run relationship that might help to uncover how output gap is related with nominal variables and debt to GDP ratio. Particular monetary transmission channels functions through the effects that monetary policy has on short and long term nominal interest rates, asset prices, exchange rates, bank lending and firm balance sheets.

Recent research on the transmission mechanism investigates to realize how these channels work, under the context of dynamic, stochastic and general equilibrium models. Aggregate output and inflation, real variables, are impacted by the policy-induced modifications in the short and long-term nominal interest rates.

Key words: economic statistics, monetary policy, econometric models, transmission mechanism, asset prices, short term nominal interest rate, household, firms, prices.

JEL Clasification: Economic statistic, Statistical metodologies
1. Introduction

The monetary transmission mechanism describes how policy-induced changes in the nominal money stock or the short-term nominal interest rate, asset prices and exchange rate have an impact on real variables such as aggregate output, import prices and inflation.

Monetary policy works largely via its influence on aggregate demand in the economy. It has little direct effect on the trend path of supply capacity. Rather, in the long run, monetary policy determines the nominal or money values of goods and services—that is, the general price level. An equivalent way of making the same point is to say that in the long run, monetary policy in essence determines the value of money—movements in the general price level indicate how much the purchasing power of money has changed over time. Inflation, in this sense, is a monetary phenomenon.

However, monetary policy changes do have an effect on real activity in the short to medium term. And though monetary policy is the dominant determinant of the price level in the long run, there are many other potential influences on price-level movements at shorter horizons. There are several links in the chain of causation running from monetary policy changes to their ultimate effects on the economy.

Central bank liabilities include both components of the monetary base: currency and bank reserves. Hence, the central bank controls the monetary base. Indeed, monetary policy actions typically begin when the central bank changes the monetary base through an open market operation, purchasing other securities—most frequently.

Figure 1. Transmission mechanism

Source: Author’s calculation
The quantitative effect of a change in the official rate on other interest rates and on financial markets in general, will depend on the extent to which the policy change was anticipated and how the change affects expectations of future policy. Assume that for simplicity that changes in the official rate are not expected to be reversed quickly, and that no further future changes are anticipated as a result of the change.

This is a reasonable assumption for purposes of illustration, but it should be borne in mind that some of the effects described may occur when market expectations about policy change, rather than when the official rate itself changes.

2. Economic interpretation of the monetary transmission mechanism

2.1 Short term nominal interest rate

If, in the today economy, neither component of the monetary base pays interest or if, more generally, the components of the monetary base pay interest at a rate that is below the market rate on other highly liquid assets such as short-term government bonds, then private agents’ demand for real base money $M/P$ can be described as a decreasing function of the short-term nominal interest rate $r$:

$$M/P = L(r).$$

This function $L$ summarizes how, as the nominal interest rate rises, other highly liquid assets become more attractive as short-term stores of value, providing stronger incentives for households and firms to economize on their holdings of currency and banks to economize on their holdings of reserves. Thus, when the price level $P$ cannot fully adjust in the short-run, the central bank’s monopolistic control over the nominal quantity of base money $M$ also allows it to influence the short-term nominal interest rate $r$, with a policy-induced increase in $M$ leading to whatever decline in $r$ is necessary to make private agents willing to hold the additional volume of real base money and, conversely, a policy-induced decrease in $M$ leading to a rise in $r$. In the simplest model where changes in $M$ represent the only source of uncertainty, the deterministic relationship that links $M$ and $r$ implies that monetary policy actions can be described equivalently in terms of their effects on either the monetary base or the short-term nominal interest rate.

Based on Poole’s (1970) analysis shows, that when the economy is hit by random shocks of various kinds, the central bank in achieving its stabilization objectives can face a trade-off between two strategies: one of setting the nominal quantity of base money and allowing the market to determine the short-term nominal interest rate and the other of setting the short-term nominal interest rate and then supplying whatever quantity of nominal base money is demanded at that interest rate. More specifically, Poole’s analysis reveals that central bank policy insulates output and prices from the effects of large and unpredictable disturbances to the money demand relationship by setting a target for $r$ rather than $M$. Perhaps reflecting the widespread belief that money demand shocks are large and unpredictable, most central banks around the world today, choose to conduct monetary policy with reference to a target for the short-term nominal interest rate as opposed to any measure of the money supply. Hence, in practice, monetary
policy actions are almost always described in terms of their impact on a short-term nominal interest rate, even though, strictly speaking, those actions still begin with open market operations that change the monetary base.

Based on theory, in our day a change in the official rate is immediately transmitted to other short-term money-market rates, both to money-market instruments of different maturity and to other short-term rates, such as interbank deposits. But these rates may not always move by the exact amount of the official rate change. Soon after the official rate change, banks adjust their standard lending rates, usually by the exact amount of the policy change. This quickly affects the interest rates that banks charge their customers for variable-rate loans, including overdrafts. Rates on standard variable-rate mortgages may also be changed, though this is not automatic and may be delayed. Rates offered to savers also change, in order to preserve the margin between deposit and loan rates. This margin can vary over time, according to, for example, changing competitive conditions in the markets involved, but it does not normally change in response to policy changes alone.

2.2 Long-term nominal interest rates

Though a change in the official rate unambiguously moves other short-term rates in the same direction, the impact on longer-term interest rates can go either way. This is because long-term interest rates are influenced by an average of current and expected future short-term rates, so the outcome depends upon the direction and extent of the impact of the official rate change on expectations of the future path of interest rates. A rise in the official rate could, for example, generate an expectation of lower future interest rates, in which case long rates might fall in response to an official rate rise. The actual effect on long rates of an official rate change will partly depend on the impact of the policy change on inflation expectations.

According to the traditional Keynesian interest rate channel, a policy-induced increase in the short-term nominal interest rate leads first to an increase in longer-term nominal interest rates, as investors act to arbitrage away differences in risk-adjusted expected returns on debt instruments of various maturities as described by the expectations hypothesis of the term structure. When nominal prices are slow to adjust, these movements in nominal interest rates translate into movements in real interest rates as well. Firms, finding that their real cost of borrowing over all horizons has increased, cut back on their investment expenditures. Likewise, households facing higher real borrowing costs scale back on their purchases of homes, automobiles, and other durable goods. Aggregate output and employment fall. This interest rate channel lies at the heart of the traditional Keynesian textbook IS-LM model, due originally to Hicks (1937), and also appears in the more recent New Keynesian models.

2.3 Asset prices

Additional asset price channels are highlighted by Tobin’s (1969) q-theory of investment and Ando and Modigliani’s (1963) life-cycle theory of consumption. Tobin’s q measures the ratio of the stock market value of a firm to the replacement
cost of the physical capital that is owned by that firm. All else equal, a policy-
induced increase in the short-term nominal interest rate makes debt instruments
more attractive than equities in the eyes of investors; hence, following a monetary
tightening, equilibrium across securities markets must be reestablished in part
through a fall in equity prices. With a lower value of \( q \), firms find it less desirable
to issue new shares of stock to finance new investment projects; hence, investment,
output, and employment fall. Ando and Modigliani’s life-cycle theory of
consumption assigns a role to wealth as well as income as key determinants of
consumer spending. Hence, this theory also identifies a channel of monetary
transmission: if stock prices fall after a monetary tightening, household financial
wealth declines as well, leading to a fall in consumption, output, and employment.

According to Meltzer (1995), asset price movements beyond those
reflected in interest rates alone also play a central role in monetarist descriptions of
the transmission mechanism. Indeed, monetarist critiques of the traditional
Keynesian model often start by questioning the view that the full thrust of
monetary policy actions is completely summarized by movements in the short-term
nominal interest rate. Monetarists argue instead that monetary policy actions
impact simultaneously on prices across a wide variety of markets for financial
assets and durable goods, but especially in the markets for equities and real estate,
and that those asset price movements are all capable of generating important wealth
effects that impact, through spending, on output and employment.

Changes in the official rate also affect the market value of securities, such
as bonds and equities. The price of bonds is inversely related to the long-term
interest rate, so a rise in long-term interest rates lowers bond prices, and vice versa
for a fall in long rates. If other things are equal, higher interest rates also lower
other securities prices, such as equities. This is because expected future returns are
discounted by a larger factor, so the present value of any given future income
stream falls.

2.4 The exchange rate
In open economies, additional real effects of a policy-induced increase in
the short-term interest rate come about through the exchange rate channel. When
the domestic nominal interest rate rises above its foreign counterpart, equilibrium
in the foreign exchange market requires that the domestic currency gradually
depreciate at a rate that, again, serves to equate the risk-adjusted returns on various
debt instruments, in this case debt instruments denominated in each of the two
currencies—this is the condition of uncovered interest parity. In both traditional
Keynesian models that build on Fleming (1962), Mundell (1963), and Dornbusch
(1976) and in the New Keynesian models, this expected future depreciation
requires an initial appreciation of the domestic currency that, when prices are slow
to adjust, makes domestically-produced goods more expensive than foreign-
produced goods. Net exports fall; domestic output and employment fall as well.
3. Results from financial markets to households and firms

We now consider how the spending decisions of households and firms respond to the changes in interest rates, asset prices and the exchange rate just discussed. This paper is focused on the immediate effects of a monetary policy change. Those resulting from subsequent changes in aggregate income, employment and inflation are considered below. Since the effects of policy changes on expectations and confidence are ambiguous, we proceed on the basis of a given level of expectations about the future course of real activity and inflation, and a given degree of confidence with which those expectations are held. Also assume an unchanged fiscal policy stance by the government in response to the change in monetary policy.

3.1 Statistical analysis of effects to households

Households are affected by a monetary policy change in several ways. There are three direct effects. First, they face new rates of interest on their savings and debts. So the disposable incomes of savers and borrowers alter, as does the incentive to save rather than consume now. Second, the value of households’ financial wealth changes as a result of changes in asset prices. Third, any exchange rate adjustment changes the relative prices of goods and services priced in domestic and foreign currency. Of these three effects, the one felt most acutely and directly by a significant number of households is that working through the interest rate charged on personal debt, especially mortgages, and the interest rate paid on their savings.

Loans secured on houses make up, and most mortgages are still floating-rate. Any rise in the mortgage rate reduces the remaining disposable income of those affected and so, for any given gross income, reduces the flow of funds available to spend on goods and services. Higher interest rates on unsecured loans have a similar effect. Previous spending levels cannot be sustained without incurring further debts (or running down savings), so a fall in consumer spending is likely to follow. Those with fixed-rate mortgages will not face higher payments until their fixed term expires, but all new borrowers taking out such loans will be affected by rate changes from the start of their loan (though the fixed interest rate will be linked to interest rates of the relevant term, rather than short rates).

Wealth effects will also be likely to work in the same direction. Higher interest rates tend to reduce asset values, and lower wealth leads to lower spending. Securities prices were mentioned above; another important personal asset is houses. Higher interest rates generally increase the cost of financing house purchase, and so reduce demand. A fall in demand will lower the rate of increase of house prices, and sometimes house prices may even fall. Houses are a major component of (gross) personal wealth. Changes in the value of housing wealth affect consumer spending in the same direction as changes in financial wealth, but not necessarily by the same amount. Part of this effect comes from the fact that households may feel poorer when the market value of their house falls, and another part results from the fact that houses are used as collateral for loans, so lower net worth in housing makes it harder to borrow.
Another influence on consumer spending arises from the effects of an official rate change on consumer confidence and expectations of future employment and earnings prospects. Such effects vary with the circumstances of the time, but where a policy change is expected to stimulate economic activity, this is likely to increase confidence and expectations of future employment and earnings growth, leading to higher spending. The reverse will follow a policy change expected to slow the growth of activity.

So far, the effects mentioned all normally work in the same direction, so that higher interest rates, other things being equal, lead to a reduction in consumer spending, and lower interest rates tend to encourage it. However, this is not true for all households. For example, a person living off income from savings deposits, or someone about to purchase an annuity, would receive a larger money income if interest rates were higher than if they were lower. This higher income could sustain a higher level of spending than would otherwise be possible. So interest rate rises (falls) have redistribution all effects—net borrowers are made worse (better) off and net savers are made better (worse) off. And to complicate matters further, the spending of these different groups may respond differently to their respective changes in disposable income.

However, the MPC sets one interest rate for the economy as a whole, and can only take account of the impact of official rate changes on the aggregate of households in the economy. From this perspective, the overall impact of the effects mentioned above on consumers appears to be that higher interest rates tend to reduce total current consumption spending, and lower interest rates tend to increase it.

Exchange rate changes can also affect the level of spending by households. This could happen, for example, if significant levels of wealth (or debt) were denominated in foreign currency, so that an exchange rate change caused a change in net wealth.

In summary, a rise in the official interest rate, other things (notably expectations and confidence) being equal, leads to a reduction in spending by consumers overall and, via an exchange rate rise, to a shift of spending away from home-produced towards foreign-produced goods and services. A reduction in the official rate has the opposite effect. The size—and even the direction—of these effects could be altered by changes in expectations and confidence brought about by a policy change, and these influences vary with the particular circumstances.

3.2 Statistical analysis of effects to firms

The other main group of private sector agents in the economy is firms. They combine capital, labor and purchased inputs in some production process in order to make and sell goods or services for profit. Firms are affected by the changes in market interest rates, asset prices and the exchange rate that may follow a monetary policy change. However, the importance of the impact will vary depending on the nature of the business, the size of the firm and its sources of finance. Again, we focus first on the direct effects of a monetary policy change,
holding all other influences constant, and discuss indirect effects working through aggregate demand later (though these indirect effects may be more important).

An increase in the official interest rate will have a direct effect on all firms that rely on bank borrowing or on loans of any kind linked to short-term money-market interest rates. A rise in interest rates increases borrowing costs (and vice versa for a fall). The rise in interest costs reduces the profits of such firms and increases the return that firms will require from new investment projects, making it less likely that they will start them. Interest costs affect the cost of holding inventories, which are often financed by bank loans. Higher interest costs also make it less likely that the affected firms will hire more staff, and more likely that they will reduce employment or hours worked. In contrast, when interest rates are falling, it is cheaper for firms to finance investment in new plant and equipment, and more likely that they will expand their labor force.

Of course, not all firms are adversely affected by interest rate rises. Cash-rich firms will receive a higher income from funds deposited with banks or placed in the money markets, thus improving their cash flow. This improved cash flow could help them to invest in more capacity or increase employment, but it is also possible that it will encourage them to shift resources into financial assets, or to pay higher dividends to shareholders.

Some firms may be less affected by the direct impact of short-term interest rate changes. This could be either because they have minimal short-term borrowing and/or liquid assets, or because their short-term liquid assets and liabilities are roughly matched, so that changes in the level of short rates leave their cash flow largely unaffected. Even here, however, they may be affected by the impact of policy on long-term interest rates whenever they use capital markets in order to fund long-term investments.

The cost of capital is an important determinant of investment for all firms. We have mentioned that monetary policy changes have only indirect effects on interest rates on long-term bonds. The effects on the costs of equity finance are also indirect and hard to predict. This means that there is no simple link from official rate changes to the cost of capital. This is particularly true for large and multinational firms with access to international capital markets, whose financing costs may therefore be little affected by changes in domestic short-term interest rates.

4. Conclusion

Changes in asset prices also affect firms’ behavior in other ways. Bank loans to firms (especially small firms) are often secured on assets, so a fall in asset prices can make it harder for them to borrow, since low asset prices reduce the net worth of the firm. This is sometimes called a ‘financial accelerator’ effect. Equity finance for listed companies is also generally easier to raise when interest rates are low and asset valuations are high, so that firms’ balance sheets are healthy.

Exchange rate changes also have an important impact on many firms, though official rate changes explain only a small proportion of exchange rate
variation. A firm producing, would have many of its costs fixed (at least temporarily) in domestic currency, but might face competition from firms whose costs were fixed in other currencies. An appreciation of domestic currency in the foreign exchange market would then worsen the competitive position of the firm for some time, generating lower profit margins or lower sales, or both. This effect is likely to be felt acutely by many manufacturing firms, because they tend to be most exposed to foreign competition. Producers of exports and import-competing goods would certainly both be affected. However, significant parts of other sectors, such as agriculture, may also feel the effects of such changes in the exchange rate, as would parts of the service sector, such as hotels, restaurants, shops and theatres reliant on the tourist trade, financial and business services, and consultancy.

The impact of monetary policy changes on firms’ expectations about the future course of the economy and the confidence with which these expectations are held affects business investment decisions. Once made, investments in fixed capital are difficult, or impossible, to reverse, so projections of future demand and risk assessments are an important input into investment appraisals. A fall (rise) in the expected future path of demand will tend to lead to a fall (rise) in spending on capital projects. The confidence with which expectations are held is also important, as greater uncertainty about the future is likely to encourage at least postponement of investment spending until prospects seem clearer. Again, it is hard to predict the effect of any official rate change on firms’ expectations and confidence, but there can be little doubt that such effects are a potentially important influence on business investment.

In summary, many firms depend on short-term money-market borrowing, and they are sensitive to the direct effects of interest rates changes. Higher interest rates worsen the financial position of firms dependent on such short-term borrowing (other things being equal) and lower rates improve their financial position. Changes in firms’ financial position in turn may lead to changes in their investment and employment plans. More generally, by altering required rates of return, higher interest rates encourage postponement of investment spending and reduced inventories, whereas lower rates encourage an expansion of activity. Policy changes also alter expectations about the future course of the economy and the confidence with which those expectations are held, thereby affecting investment spending, in addition to the direct effect of changes in interest rates, asset prices, and the exchange rate.

**Bibliography**


---

Revista Română de Statistică Trim. IV/2013 - Supliment


