

## Symposium on the Monetary Transmission Mechanism

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**B**oth economists and politicians have been heard to advocate in recent years that the stabilization of output and inflation be left to monetary policy. Fiscal policy has lost its luster since its heyday in the 1960s, partly because of concern over persistently large budget deficits, partly because of doubts that the political system can make tax and spending decisions in a timely way to achieve desirable stabilization outcomes. Meanwhile, monetary policy has been ever more at the center of macroeconomic policymaking.

To understand some of the ways that monetary policy can affect the economy, begin with an arbitrary starting point in the late 1970s, when an overly loose monetary policy is commonly thought to have contributed to the burst of double-digit inflation in 1979 and 1980. Tight monetary policy engineered by the Federal Reserve under the leadership of chairman Paul Volcker broke the back of that inflation, but also dragged the economy into a deep recession. High real interest rates in the mid-1980s are often linked to the large run-up in the exchange rate value of the dollar and the resulting temporary decline in competitiveness of American industry. Lower interest rates then helped extend the economic upswing of the 1980s, and also bring down the dollar exchange rate. But when it seemed that inflation might be accelerating again in the late 1980s, the Fed tightened once more. After the recession of 1990–91, lower interest rates helped the economy recover. More recently, since early 1994, the Federal Reserve System has raised

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interest rates to preempt a bout of increased inflation arising from an overheated economy.

Monetary policy is a powerful tool, but one that sometimes has unexpected or unwanted consequences. To be successful in conducting monetary policy, the monetary authorities must have an accurate assessment of the timing and effect of their policies on the economy, thus requiring an understanding of the mechanisms through which monetary policy affects the economy. These transmission mechanisms include interest rate effects, exchange rate effects, other asset price effects and the so-called credit channel. This symposium contains papers that should help acquaint the reader with the explosion of research on how monetary policy is transmitted that has taken place in these last few years. This introduction will provide an overview of the main types of monetary transmission mechanisms found in the literature and provide a perspective on how the papers in the symposium relate to the overall literature and to each other.

## The Interest Rate Channel

The transmission of monetary policy through interest rate mechanisms has been a standard feature in the economics literature for over 50 years. It is the key monetary transmission mechanism in the basic Keynesian textbook model, which has been a mainstay of teaching in macroeconomics. The traditional Keynesian view of how a monetary tightening is transmitted to the real economy can be characterized by a schematic diagram,

$$M \downarrow \Rightarrow i \uparrow \Rightarrow I \downarrow \Rightarrow Y \downarrow,$$

where  $M \downarrow$  indicates a contractionary monetary policy leading to a rise in real interest rates ( $i \uparrow$ ), which in turn raises the cost of capital, thereby causing a decline in investment spending ( $I \downarrow$ ), thereby leading to a decline in aggregate demand and a fall in output ( $Y \downarrow$ ).

Although Keynes originally emphasized this channel as operating through businesses' decisions about investment spending, later research recognized that consumers' decisions about housing and consumer durable expenditure also are investment decisions. Thus the interest rate channel of monetary transmission outlined in the schematic above applies equally to consumer spending in which  $I$  represents residential housing and consumer durable expenditure. John Taylor's paper in this symposium argues that the interest rate channel of monetary transmission is a key component of how monetary policy effects are transmitted to the economy. In his model, contractionary monetary policy raises the short-term nominal interest rate. Then, through a combination of sticky prices and rational expectations, the real long-term interest rate rises as well, at least for a time. These higher real interest rates lead to a decline in business fixed investment, residential housing

investment, consumer durable expenditure and inventory investment, which produces the decline in aggregate output.

Taylor takes the position that there are strong interest rate effects on consumer and investment spending and, hence, a strong interest rate channel of monetary transmission. His position is controversial, as can be seen in the paper in this symposium by Ben Bernanke and Mark Gertler. They state that empirical studies have had great difficulty in identifying quantitatively important effects of interest rates through the cost of capital. Indeed, they see the lack of support for a strong interest rate channel as having provided the stimulus for the search for other transmission mechanisms of monetary policy, especially the credit channel discussed in their paper.

### The Exchange Rate Channel

With the growing internationalization of the U.S. economy and the advent of flexible exchange rates, more attention has been paid to monetary policy transmission operating through exchange rate effects on net exports. Indeed, this transmission mechanism is now a standard feature in the leading textbooks in macroeconomics and money and banking. This channel also involves interest rate effects, because when domestic real interest rates rise, domestic dollar deposits become more attractive relative to deposits denominated in foreign currencies, leading to a rise in the value of dollar deposits relative to other currency deposits, that is, an appreciation of the dollar (denoted by  $E \uparrow$ ). The higher value of the domestic currency makes domestic goods more expensive than foreign goods, thereby causing a fall in net exports ( $NX \downarrow$ ) and hence in aggregate output. The schematic for the monetary transmission mechanism operating through the exchange rate is thus:

$$M \downarrow \Rightarrow i \uparrow \Rightarrow E \uparrow \Rightarrow NX \downarrow \Rightarrow Y \downarrow.$$

Both the Taylor paper and the paper in this symposium by Maurice Obstfeld and Kenneth Rogoff emphasize the importance of the exchange rate channel of monetary transmission. Both papers emphasize that a framework for the conduct of monetary policy must be inherently international in scope.

### Other Asset Price Effects

As emphasized by Allan Meltzer in his paper for the symposium, a key monetarist objection to the Keynesian paradigm for analyzing monetary policy effects on the economy is that it focuses on only one relative asset price, the interest rate, or in the case of Taylor's model, two interest rates and the exchange rate. Instead, monetarists hold that it is vital to look at how monetary policy affects the universe of relative asset prices and real wealth. Monetarists are often loath to commit

themselves to specific transmission mechanisms, because they see these mechanisms as changing during different business cycles. However, two channels are often emphasized in monetarist stories about the monetary transmission mechanism: these involve Tobin's  $q$  theory of investment and wealth effects on consumption.

Tobin's  $q$  theory provides a mechanism through which monetary policy affects the economy through its effects on the valuation of equities. Tobin (1969) defines  $q$  as the market value of firms divided by the replacement cost of capital. If  $q$  is high, the market price of firms is high relative to the replacement cost of capital, and new plant and equipment capital is cheap relative to the market value of business firms. Companies can then issue equity and get a high price for it relative to the cost of the plant and equipment they are buying. Thus investment spending will rise because firms can buy a lot of new investment goods with only a small issue of equity. On the other hand, when  $q$  is low, firms will not purchase new investment goods because the market value of firms is low relative to the cost of capital. If companies want to acquire capital when  $q$  is low, they can buy another firm cheaply and acquire old capital instead. Investment spending will be low.

The crux of this discussion is that a link exists between Tobin's  $q$  and investment spending. But how might monetary policy affect equity prices? In a monetarist story, when the money supply falls, the public finds it has less money than it wants and so tries to acquire it by decreasing its spending. One place the public can spend less is in the stock market, decreasing the demand for equities and consequently lowering their prices. A more Keynesian story comes to a similar conclusion because it sees the rise in interest rates coming from contractionary monetary policy making bonds more attractive relative to equities, thereby causing the price of equities to fall. Combining these views with the fact that lower equity prices ( $P_e \downarrow$ ) will lead to a lower  $q$  ( $q \downarrow$ ), and thus to lower investment spending ( $I \downarrow$ ), leads to the following transmission mechanism of monetary policy:

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow q \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow.$$

An alternative channel for monetary transmission through equity prices occurs through wealth effects on consumption. This channel has been strongly advocated by Franco Modigliani and his MIT-Penn-SSRC (MPS) model, a version of which is currently in use at the Board of Governors of the Federal Reserve System. In Modigliani's life-cycle model—explained very clearly in Modigliani (1971)—consumption spending is determined by the lifetime resources of consumers, which are made up of human capital, real capital and financial wealth. A major component of financial wealth is common stocks. When stock prices fall, the value of financial wealth decreases, thus decreasing the lifetime resources of consumers, and consumption should fall. Since we have already seen that contractionary monetary policy can lead to a decline in stock prices ( $P_e \downarrow$ ), we then have another monetary transmission mechanism:

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{wealth} \downarrow \Rightarrow \text{consumption} \downarrow \Rightarrow Y \downarrow.$$

Meltzer's contribution to this symposium emphasizes that asset price effects extend beyond those operating through interest rates, exchange rates and equity prices. For example, in his description of the Japanese experience in the 1980s and 1990s, monetary policy has an important impact on the economy through its effect on land and property values. The two channels in the schematics in this section provide support for this view. A monetary contraction can lead to a decline in land and property values, which causes households' wealth to decline, thereby causing a decline in consumption and aggregate output. This is described by the schematic above in which  $P_r$  also represents land and property values. Tobin's  $q$  theory also applies equally to structures and residential housing so that the schematic outlining the  $q$ -theory mechanism applies. A monetary contraction that leads to a decline in land and property values lowers their market value relative to replacement cost, with the resulting fall in their  $q$  leading to a decline in spending on structures and housing.

## **Credit Channel**

As pointed out in the paper by Bernanke and Gertler in the symposium, dissatisfaction with the conventional stories about how interest rate effects explain the impact of monetary policy on expenditure on long-lived assets has led to a new view of the monetary transmission mechanism that emphasizes how asymmetric information and costly enforcement of contracts creates agency problems in financial markets. Two basic channels of monetary transmission arise as a result of agency problems in credit markets: the bank lending channel and the balance-sheet channel.

The bank lending channel is based on the view that banks play a special role in the financial system because they are especially well suited to deal with certain types of borrowers, especially small firms where the problems of asymmetric information can be especially pronounced. After all, large firms can directly access the credit markets through stock and bond markets without going through banks. Thus, contractionary monetary policy that decreases bank reserves and bank deposits will have an impact through its effect on these borrowers. Schematically, the monetary policy effect is

$$M \downarrow \Rightarrow \text{bank deposits} \downarrow \Rightarrow \text{bank loans} \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow.$$

Doubts about the importance of the bank lending channel have been raised in the literature—for example, after all the financial innovation of the last couple of decades, banks play a less important role in credit markets now than in the 1950s, 1960s or 1970s (Edwards and Mishkin, 1995). This criticism and others are raised in the symposium papers by Meltzer and by Bernanke and Gertler.

The balance-sheet channel operates through the net worth of business firms and as emphasized by Bernanke and Gertler, there is no reason to think that it has

become less important in recent years. Lower net worth means that lenders in effect have less collateral for their loans, and so losses from adverse selection are higher. A decline in net worth, which raises the adverse selection problem, thus leads to decreased lending to finance investment spending. Lower net worth of business firms also increases the moral hazard problem because it means that owners have a lower equity stake in their firms, giving them more incentive to engage in risky investment projects. Since taking on riskier investment projects makes it more likely that lenders will not be paid back, a decrease in business firms' net worth leads to a decrease in lending and hence in investment spending.

Monetary policy can affect firms' balance sheets in several ways. Contractionary monetary policy ( $M \downarrow$ ), which causes a decline in equity prices ( $P_e \downarrow$ ) along lines described earlier, lowers the net worth of firms and so leads to lower investment spending ( $I \downarrow$ ) and aggregate demand ( $Y \downarrow$ ), because of the increase in adverse selection and moral hazard problems. This leads to the following schematic for the balance-sheet channel of monetary transmission:<sup>1</sup>

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{adverse selection } \uparrow \ \& \ \text{moral hazard } \uparrow \Rightarrow \text{lending } \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow.$$

The balance-sheet channel provides a further rationale for asset price effects emphasized in monetarist thinking.

Contractionary monetary policy that raises interest rates also causes a deterioration in firm's balance sheets because it reduces cash flow. This leads to the following additional schematic for the balance-sheet channel:

$$M \downarrow \Rightarrow i \uparrow \Rightarrow \text{cash flow } \downarrow \Rightarrow \text{adverse selection } \uparrow \ \& \ \text{moral hazard } \uparrow \\ \Rightarrow \text{lending } \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow.$$

Although most of the literature on the credit channel focuses on spending by business firms, Bernanke and Gertler suggest that the credit channel should apply equally as well to consumer spending. Declines in bank lending induced by a monetary contraction should cause a decline in durables and housing purchases by consumers who do not have access to other sources of credit. Similarly, increases in interest rates cause a deterioration in household balance sheets because their cash flow is adversely affected.

<sup>1</sup> If the contractionary monetary policy produces an unanticipated decline in the price level, there is an additional reinforcement of the balance-sheet transmission mechanism. Because debt payments are contractually fixed in nominal terms, an unanticipated decline in the price level raises the value of firms' liabilities in real terms (that is, it increases the burden of the debt), but does not raise the real value of the firms' assets. Monetary contraction, which leads to an unanticipated drop in the price level, therefore reduces real net worth and causes an increase in adverse selection and moral hazard problems, which cause a decline in investment spending and aggregate output along the lines of the schematic here. This is a rationalization of the debt-deflation view of the Great Depression espoused by Irving Fisher (1933).

Another way of looking at how the balance-sheet channel may operate through consumers is in the work on liquidity effects on consumer expenditures on durable goods and housing, which have been found to be an important factor during the Great Depression (Mishkin, 1978). In the liquidity-effects view, balance-sheet effects work through their impact on consumers' desire to spend rather than on lenders' desire to lend. In this model, if consumers expect a higher likelihood of finding themselves in financial distress, they would rather be holding fewer illiquid assets like consumer durables or housing and more liquid financial assets. The underlying reason is that if consumers needed to sell their consumer durables or housing to raise money, they would expect to suffer large losses, because they could not get their full value in a distress sale.<sup>2</sup> In contrast, financial assets like money in the bank, stocks or bonds can more easily be realized at full market value to raise cash.

This leads to another transmission mechanism for monetary policy operating through the link between money and equity prices. When falling stock prices reduce the value of financial assets, consumer expenditures on housing or consumer durables will also fall, because consumers have a less secure financial position and a higher estimate of the likelihood of suffering financial distress. Expressed in schematic form,

$$M \downarrow \Rightarrow P_e \downarrow \Rightarrow \text{financial assets} \downarrow \Rightarrow \text{likelihood of financial distress} \uparrow \\ \Rightarrow \text{consumer durable and housing expenditure} \downarrow \Rightarrow Y \downarrow$$

The illiquidity of consumer durables and housing provides another reason why a monetary contraction that raises interest rates and thereby reduces cash flow to consumers leads to a decline in spending on consumer durables and housing. A decline in consumer cash flow increases the likelihood of financial distress, which reduces the desire of consumers to hold durable goods or housing, thus reducing spending on them and hence aggregate output. This view of cash-flow effects differs from the view outlined in the earlier schematic in that it is not the unwillingness of lenders to lend to consumers that causes expenditure to decline, but the unwillingness of consumers to spend.

## Concluding Remarks

Understanding monetary transmission mechanisms is crucial to answering a broad range of policy questions. What is the appropriate monetary policy in different business cycle episodes? What should be the appropriate rule for monetary policy? What is the correct choice of a tradeoff between output variability and

<sup>2</sup> This is just a manifestation of the "lemons" problem described by Akerlof (1970), which helped stimulate research on the credit channel.

inflation variability? Would a fixed rather than a flexible exchange rate regime produce better inflation and output outcomes? The papers in this symposium discuss the research that will help answer these questions.

■ *All opinions expressed are those of the author and not those of Columbia University, the National Bureau of Economic Research, the Federal Reserve Bank of New York or the Federal Reserve System. I thank Mark Gertler, Allan Meltzer and Timothy Taylor for helpful comments.*

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