Korea's experience of the monetary transmission mechanism

Bank of Korea

Introduction

In explaining the monetary transmission mechanism, attention has generally focused on the interest rate channel which works by affecting the cost of capital via changes in real interest rates. However, the validity of the interest rate channel has been questioned as the money demand function has become unstable in the wake of the process of financial reform and deregulation since the 1980s.

Accordingly, greater attention has been paid to the other channels through which monetary policy is transmitted. These include, in particular, the credit channel centring on changes in the volume of bank lending and in net worth, the exchange rate channel and the channels which operate through other asset prices.

It has become a pressing task for the central bank to make an accurate assessment of the impact of changes in monetary policy on the real sector, such as the time lags and the magnitudes involved, by gaining a better understanding of the interaction between the financial and the real sector. This necessitates a clearer specification of the monetary transmission mechanism.

In this context, the present paper, after outlining the chief characteristics of the various transmission channels, analyses the monetary transmission mechanism in Korea on the basis of the findings of recent empirical studies of the credit channel.

1. Theoretical underpinnings of the credit channel

The credit view contends that two channels of monetary transmission arise due to informational asymmetries between borrowers and lenders in financial markets. The bank lending channel emphasises the special role of bank loans, particularly for "bank-dependent" borrowers (e.g. small

firms), while the balance-sheet channel operates through the balance-sheet positions of business firms.

The bank lending channel rests on the idea that small firms, facing informational frictions in financial markets, must rely primarily on bank loans for external finance because it is prohibitively expensive for these borrowers to issue securities in the open market. When bank loans are of special importance for bank-dependent small firms, the effects of a monetary contraction may be amplified through the following two channels beyond those working through the interest rate channel: the direct channel operates through the reduced willingness of banks to lend at the going market interest rates owing to institutional factors such as regulatory action and moral suasion to restrain bank lending directly. This channel is direct because it does not depend on the extent to which market interest rates rise. The indirect channel becomes operative when the increase in market interest rates following a monetary contraction raises loan rates enough both to cover the increase in lenders' cost of funds as a result of the higher interest rates and to compensate them for the higher default risk. Banks also tend to tighten other non-price terms of lending, such as collateral requirements and the maturity of loans (Morgan (1992)). When either of these two bank lending channels operates, the banks are forced to reduce their total lending, and in most cases small firms which rely primarily on banks for credit must curtail their spending on investment.

Kashyap and Stein (1994) argue that banking firms may be subject to the same sort of capital market imperfections as their non-financial counterparts. According to their view, if a bank lending channel is effective, a monetary contraction should have a disproportionately large impact on the lending behaviour of small banks, which are more likely to experience difficulties offsetting a loss of reserves by expanding non-deposit sources of external finance. Consequently, they wish to cut loan supply by relatively more than do large banks.

The balance-sheet channel of monetary policy transmission arises because rising interest rates, following the adoption of a tight monetary policy, directly increase the interest expenses of those non-financial firms which rely heavily on short-term debt to finance inventories and working capital, reducing their net cash flows and weakening their financial positions. Furthermore, rising interest rates are also associated with falling asset prices, which indirectly erode the value of the firms' collateral.

These effects lead to a reduction in the firms' net worth, thereby raising the premium for external finance (the wedge between the cost of funds raised externally and the opportunity cost of internal funds). Small borrowers such as small firms are most likely to face a proportionately larger premium for external finance. One possible reason for this is that small borrowers have proportionately smaller collateralisable net worth. Therefore, small firms that have relatively poor access to short-term credit markets respond to the deteriorated balance-sheet positions principally by drawing down inventories and by cutting investment spending more than large firms.

It is worth emphasising that the credit channels provide support for an asymmetric effect of monetary policy: the sharpest differences in financing and investment behaviour between large and small firms arise mainly in tight-money periods and in recessions, thereby serving to amplify the impact of monetary policy on real spending and real activity that could be predicted via the interest rate channel.

2. An empirical study of the effectiveness of the bank lending channel in Korea

In the following section, we present a summary of the findings of recent research analysing the case for the existence of a bank lending channel in the transmission of monetary policy in Korea.

(i) Identification issue

In order to identify a special role played by the bank lending channel in monetary policy transmission, it is important to correctly identify whether a reduction in bank lending following a tightening of monetary policy is largely the consequence of an inward shift in loan supply, rather than just an inward shift in loan demand. The identification problem boils down to the following question: can the central bank reduce the loan supply of banks merely by draining reserves?

Two rather convincing approaches to addressing the identification problem have been put forward in recent years.

First, Kashyap and Stein (1995) analyse cross-sectional differences in financing and lending decisions of banks of different size. They argue that

the relative movements in loan volumes and securities holdings across large and small banks may be able to provide useful information for identifying the loan supply effects – small banks' supply schedule shifts in by more when the central bank tightens its stance. Their analysis provides the following testable predictions: if both the volume of lending and the securities holdings of small banks decline more rapidly in response to a given contraction of reserves (deposits) than do those of large banks, the effects of a monetary contraction would be transmitted to the real economy through the lending channel, largely via the dampening effects on the loan supply behaviour of small banks.[1] This sort of identification of the loan supply effects rests on the idea that banking firms may also face the same sort of capital market imperfections as their non-financial counterparts. The intuitive case for the loan supply effects is as follows. A tightening of monetary policy should cause small banks to cut their loan supply by relatively more than large banks, reflecting the hypothesis that small banks face higher costs in attracting non-deposit sources of external finance to make up the funding shortfall.

Secondly, an alternative approach involves identifying independent monetary shocks on the basis of evidence derived from historical records. The central element of this "narrative approach" is to isolate periods of tight monetary policy when the central bank clearly shifts to an active policy of trying to reduce aggregate demand and bring down inflation (Romer and Romer (1989 and 1990)). The next step involves examining whether tight monetary policy following negative shocks causes lower output through a decline in bank loans.

(ii) Test for the existence of the bank lending channel using disaggregated bank data

We now focus on testing the theoretical predictions of the loan supply effects discussed above. Does the asset side (loan volume and securities holdings) of small banks shrink more in response to a monetary contraction than that of large banks? We tested the implication using the impulse

[1] For a more detailed discussion of the theoretical implication, see Kashyap and Stein (1995). Most notably, the identification of loan supply effects requires that loan demand facing small banks has to be sufficiently inelastic. It is likely that this requirement is satisfied in practice in Korea. Since small banks in Korea, compared with large banks, tend to lend to smaller, more recession-sensitive customers who rely heavily on bank loans for external funds, the loan demand curve facing them is likely to be inelastic in terms of changes in loan interest rates.

responses of the standard Vector Auto Regression (VAR). The VAR approach was applied to monthly Korean data for four time series variables from January 1987 to May 1994. The monetary base was chosen to proxy for changes in the stance of monetary policy (monetary policy indicator). The industrial production index and the consumer price index (CPI) were selected to proxy for the real sector variables. We followed Kashyap and Stein (1995) by dividing banks on the basis of their total assets into "small and medium-sized" and "large" categories that reflect differences in their cost of raising external funds. In our case, given data insufficiency, the six largest commercial banks were classified as banks in the "large" category and the other commercial banks and ten local banks as banks in the "small and medium-sized" category.[2] Furthermore, one class of primary assets (bank loans, cash and securities holdings) of each bank group was considered in the VAR analysis. Data used were logarithms of the nominal, seasonally adjusted, level data of all variables considered. Graph 1 provides a graphical illustration, tracing the impulse responses of loan volumes and securities holdings for banks in each category (large banks, small and medium-sized banks) to one negative standard deviation shock to the monetary base.

The impulse responses shown in Graph 1 indicate that a 1% decrease in the monetary base seems to have a much greater dampening effect on the lending volume and the securities holdings of small and medium-sized banks, as well as of the local banks alone, than on those of the six largest banks.[3] We interpret this evidence as being consistent with the prediction of the lending channel. The finding that the loan volume of smaller banks shrinks more in the wake of a monetary contraction may reflect the following tendency: since smaller banks tend to rely heavily on deposits for fund-raising and face higher borrowing costs compared with large banks, they appear to cut their lending volume (loan supply) by a relatively

[2] Small and medium-sized banks include ten local banks and the following eight nationwide commercial banks, excluding the six largest: Shinhan Bank (established in 1982), KorAm Bank (established in 1983), Donghwa Bank (established in 1989), Dongnam Bank (established in 1989), Daedong Bank (established in 1989), Hana Bank (established in 1991), Boram Bank (established in 1991), Peace Bank of Korea (established in 1992). Note that due to lack of data our estimates are restricted to the period from January 1987 to May 1995.

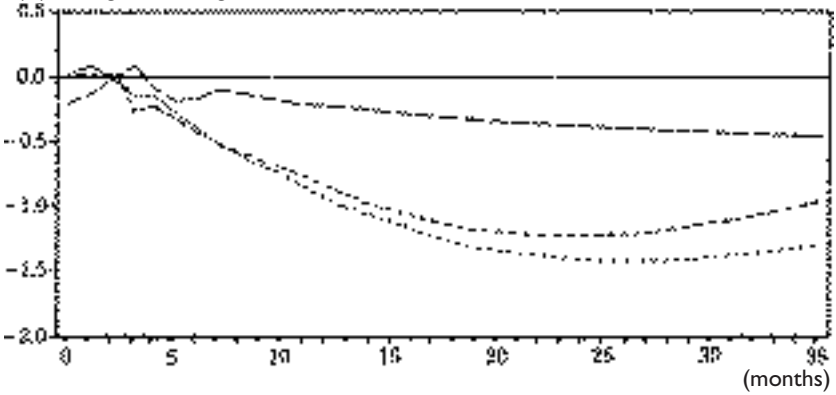
[3] It is the case in Korea that preferential access of small and medium-sized firms to bank credit at subsidised rates has been relatively easier at small and medium-sized local banks than at large banks. Interestingly, this practice seems in line with the theoretical requirement that needs to be satisfied for the bank lending channel to work well, namely that the loan demand facing small banks has to be sufficiently inelastic.

Graph 1

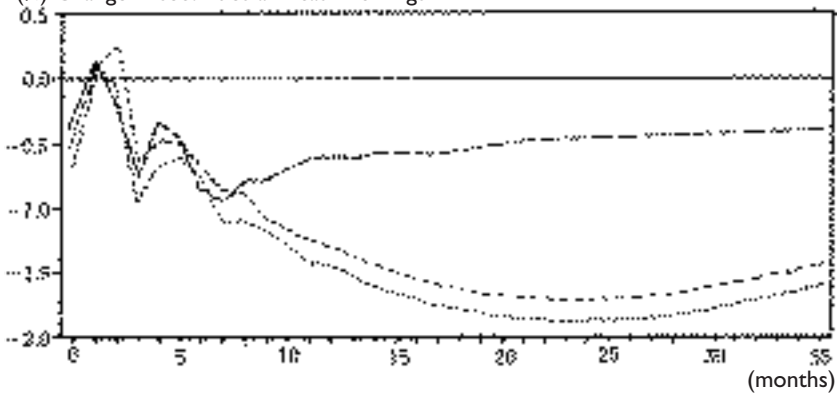
Changes in lending volume, securities and cash holdings following a reduction in the reserve base

— — — Large banks – – – Local banks ····· All small and medium-sized banks

(%) Change in lending volume



(%) Change in securities and cash holdings



greater extent than large banks do. Most notably, smaller banks are shown to attract external funds by resorting to larger issuance of CDs at a rather high interest rate cost, while they have comparatively lesser recourse to borrowing from the Bank of Korea and to foreign currency borrowings at low interest rates. As a result, it seems likely that smaller banks incur higher borrowing costs.

(iii) Test for the existence of the bank lending channel on the basis of the narrative approach

The central goal in this section is to provide a detailed examination of whether the focal episodes of tight monetary policy, identified by a narrative approach, caused the bank lending channel to play a distinctive role in amplifying the real effects of general tightening (Romer and Romer (1989 and 1990)). To this end, we conducted the following empirical tests.

First, we identified a sequence of four focal episodes of monetary contraction since the second half of the 1970s in which the Bank of Korea appeared to have deliberately been willing to accept output sacrifices to reduce inflation (anti-inflationary policy), around the time when business booms were peaking. Like Romer and Romer (1989 and 1990), we identified the focal episodes of monetary contraction on the basis of the main shifts in the policy stance of the Bank of Korea and on the basis of information from the historical trend of all available financial variables, including the growth rates of the monetary base, total reserves, M2 and bank loans; movements in interest rates; and the gap between the targeted growth rate of M2 and its actual rate. We thus selected four focal episodes of restrictive monetary policy: August 1978, October 1983, May 1984 and March 1990.[4] We then estimated the effects of the general tightening after each focal episode of restrictive monetary policy on the monetary base, M2 and bank loans.

Secondly, if monetary policy is indeed a relatively more important source of output fluctuations in the focal episodes than at normal times, and if monetary policy affects output through the lending channel as well, we would expect the effects of bank lending on output to be stronger in the focal episodes than at other times. Thus we tested for the implication.

To assess whether the effects of monetary contraction take place in the focal episodes, we proceeded as follows. We first regressed, from

[4] It could be pointed out that the focal episodes of restrictive monetary policy in this analysis were not selected solely on the basis of the official policy statements on the part of the Bank of Korea. Since there were no appropriate official statements available which could provide useful information for selecting with sufficient precision the focal episodes of monetary tightening, we instead relied on the historical trends of major financial variables, including monetary aggregates and short-term interest rates. To this end, before selecting each focal episode of monetary contraction, we verified whether the movements of these financial variables around the focal episodes as initially identified on the basis of major shifts in the policy stance of the Bank of Korea (such as a rapid increase in the reserve requirement ratio and official statements signalling the Bank's intention of bringing inflationary pressures down) were largely due to a monetary tightening.

January 1970 up to the month just before each episode, the monthly change in the logarithm of the monetary base on 12 own lags in a univariate forecast equation 1, and the monthly change in the logarithm of M2 (and the logarithm of bank loans) on 16 own lags, the contemporaneous value and eight lags and eight leads of the change in the logarithm of industrial production, as shown respectively in equations 2 and 3.[5]

$$\Delta \ln RB_t = a + \sum_{i=1}^{12} b_i \Delta \ln RB_{t-i} \tag{1}$$

$$\Delta \ln M_t = a + \sum_{i=1}^{16} b_i \Delta \ln M_{t-i} + \sum_{i=-8}^{8} c_i \Delta \ln Y_{t-i} \tag{2}$$

$$\Delta \ln L_t = a + \sum_{i=1}^{16} b_i \Delta \ln L_{t-i} + \sum_{i=-8}^{8} c_i \Delta \ln Y_{t-i} \tag{3}$$

where *RB* is the monetary base, *M* is M2, *Y* is the industrial production index, and *L* is bank loans. Note that a monthly dummy (*D*) for restrictive monetary policy was included (although not shown) in all equations and that they were estimated by OLS. We then used the actual paths of money (monetary base, M2) and bank lending up to the month before each focal episode and the estimated coefficients from those equations to construct dynamic forecasts of the paths of money and bank lending over the next 24 months. We cumulated the predicted changes to obtain forecasts for the levels of money and bank lending, finding the resulting forecast errors. If the cumulative forecasting errors (cumulative forecasts minus actual values) for money and lending are negative soon after the shift to an anti-inflationary policy, money and bank lending may be said to have fallen as a result of tight monetary policy after the individual focal episodes.

The plotting of the monetary base shown in Graph 2 indicates that the forecast errors for individual episodes as well as their average over the four episodes are consistently negative and their absolute values continue to increase over the forecasting period. The analogous forecast errors for M2 and bank lending, as shown in Graph 3, also indicate patterns that are quite similar to those for the monetary base. Note in particular that the deviations of actual lending from its predicted path are greater on average than the movements in the average forecast errors for M2. Our findings

[5] The reason that we estimated the univariate forecast equation of the monetary base was to reflect Schwartz's comment that the best indicator of the central bank's actions is the growth of high-powered money (Schwartz (1989)).

Graph 2

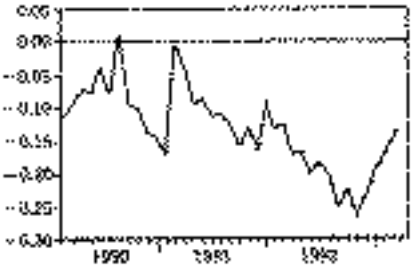
Accumulated forecasting errors in reserve money following focal points of monetary tightening

Date of monetary tightening: August 1978

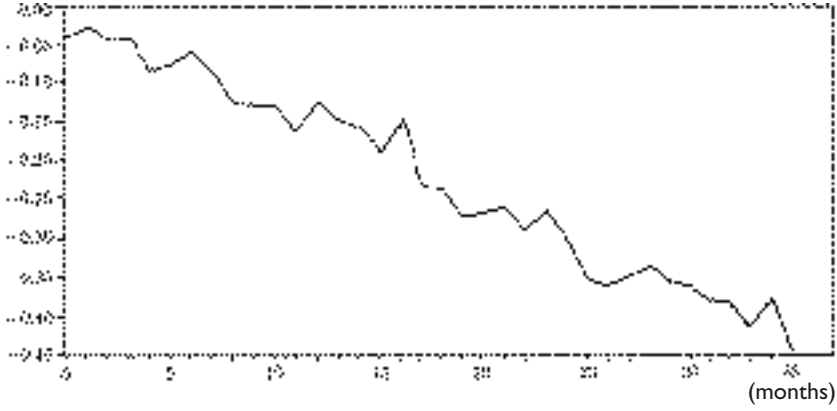
Date of monetary tightening: October 1983

Date of monetary tightening: May 1984

Date of monetary tightening: March 1990



Average accumulated forecasting error of reserve money

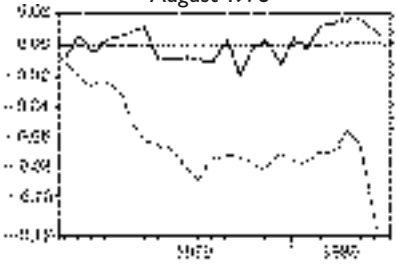


Graph 3

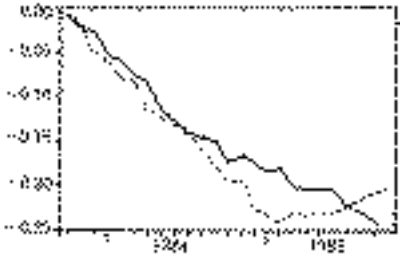
Accumulated forecasting errors in M2 and bank lending following focal points of monetary tightening

—— M2 – – – Bank lending

Date of monetary tightening: August 1978



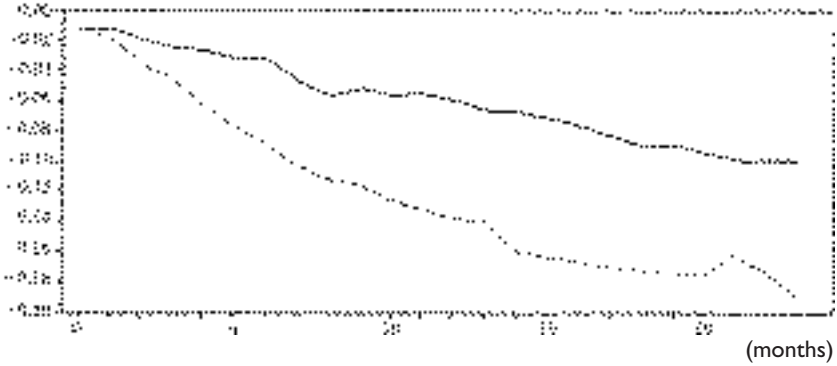
Date of monetary tightening: October 1983



Date of monetary tightening: May 1984

Date of monetary tightening: March 1990

Average accumulated forecasting errors of M2 and bank lending



(months)

strongly suggest that the individual focal episodes we identified represented important monetary shocks and that the bank lending channel played a crucial role in the monetary transmission mechanism.

We now turn to the question of whether the strengths of the money/output and lending/output relationships are different in response to independent shifts in monetary policy than at other times (Romer and Romer (1990)). To address this question, we first considered the regressions of output on money (M2) and on bank lending (equations 4 and 5), using a "St. Louis"-like equation.

$$\Delta \ln Y_t = a + \sum_{i=1}^{16} b_i \Delta \ln Y_{t-i} + \sum_{i=0}^{16} c_i \Delta \ln M_{t-i} + \sum_{i=1}^{4} d_i D_{ti} \tag{4}$$

$$\Delta \ln Y_t = a + \sum_{i=1}^{16} b_i \Delta \ln Y_{t-i} + \sum_{i=0}^{16} c_i \Delta \ln L_{t-i} + \sum_{i=1}^{4} d_i D_{ti} \tag{5}$$

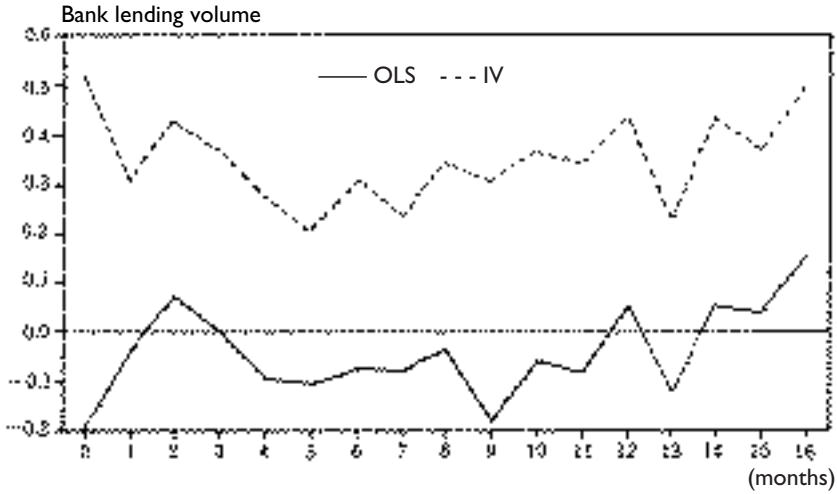
where *Y*, *L* and *M* are the same as in equations 1 to 3 and monthly dummies (*D*) for restrictive monetary policy are included in each equation. We first estimated equations 4 and 5 without dummies (*D*) by OLS and then estimated each equation with dummies (*D*) by two-stage least squares, instrumenting with the current and lagged values of a dummy that is equal to one during each of the four focal episodes in which we identify shifts to restrictive monetary policy. The next step is to show the dynamic responses of industrial production (*Y*) to money (*M*) or bank lending (*L*) implied by the OLS and IV estimates of the money/output or lending/output regressions.[6] We then need to compare the OLS and two-stage least squares (IV) estimates of equations 4 and 5 to examine the relative strength of the estimated relationships between money (or bank lending) and output. Note that the OLS estimates of equation 4 simply summarise the usual money/output relations, whereas the IV estimates summarise the relationship between movements in output and the average deviation of money from its usual behaviour in the focal episodes. Again, analogous comments apply to the difference of the OLS and IV estimates of the lending/output relationship. As just discussed, if we allow for the possibility that monetary policy affects output not only through money but also through bank lending, and if monetary policy is a relatively more important source of output fluctuations in the focal episodes than at other times, it may be the case that the tightened monetary policy in the

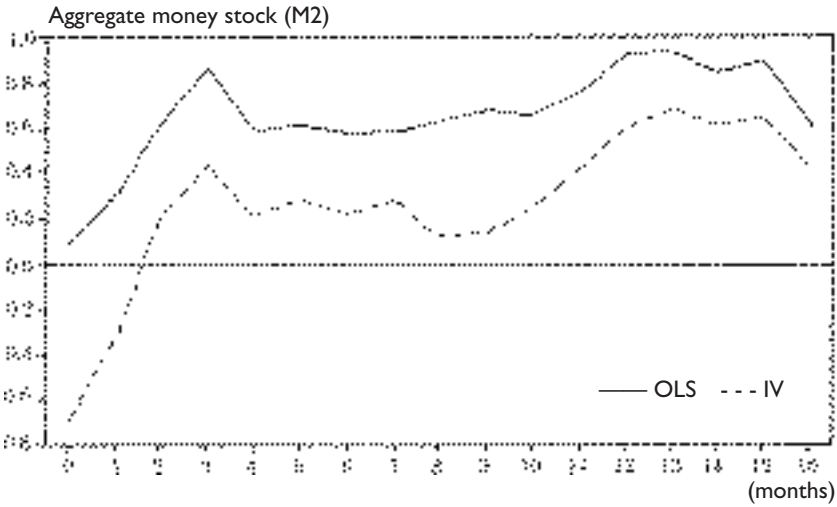
[6] For example, the response of *M* to *Y* at period zero is c_0 . The period one response is $c_0+(b_1c_0+c_1)$. The period two response is $c_0+(b_1c_0+c_1)+b_1(b_1c_0+c_1)+b_2c_0+c_2$; and so on.

focal episodes would cause the IV estimates to imply a weaker impact of money on output than the OLS estimates. In contrast, we may expect the IV estimates of the lending/output relationships to be stronger than the OLS estimates.

Graph 4

Changes in M2 and bank lending and their resulting impact on industrial production





Graph 4 presents the results of the OLS and IV estimates of equations 4 and 5. The top panel shows that the IV estimates of the impact of bank lending on industrial production are much larger than the OLS estimates at all horizons. However, as shown in the bottom panel, the responses of industrial production to money (M2) using the IV estimates are somewhat lower than those obtained using the OLS estimates. These results strongly support the view that bank lending has played an important independent role in amplifying the real effects of policy tightening implied by the interest rate channel in the major episodes of restrictive monetary policy since the second half of the 1970s.

3. Conclusions

As our empirical findings indicate, at times of tight monetary policy, banks (especially small and medium-sized banks) tend to reduce the volume of bank loans either in response to credit controls of the central bank,[7] or to moral suasion, or at their own discretion. This convincingly suggests that the effects of monetary policy tightening are transmitted to the real economy not only through the interest rate channel but also through the lending channel. If this is the case, the following policy implication may be derived: a tightening of monetary policy can have a greater-than-expected impact on aggregate economic activity (e.g. on investment behaviour) through the lending channel, with market interest rates rising more than would have been expected. In this respect, the real effects of a tightening of monetary policy may be amplified beyond what would be predicted by considering only the interest rate channel.

To make an accurate assessment of the timing and the magnitude of the impact of changes in monetary policy on aggregate economic activity in Korea and to adopt appropriate policy measures, the central bank needs to gain a better understanding of the transmission mechanism. In formulating policy, it should monitor an alternative indicator, such as the volume of bank loans which has shown a close link to aggregate spending, in addition to the money supply, interest rates and the exchange rate. Thus, it is desirable for the efficient conduct of monetary policy that

[7] Prior to moving to an indirect control system in December 1988, the Bank of Korea relied heavily on direct controls whereby it set and enforced bank-by-bank credit ceilings.

the central bank makes active use of the volume of bank lending as an information variable.

Since a monetary contraction tends to reduce the willingness of banks to lend, credit allocated to bank-dependent borrowers (small firms) might decline disproportionately, causing these borrowers to curtail their investment spending. Policy-makers, including the Bank of Korea, therefore need to bear in mind such distributional disadvantages and would have to take appropriate actions to facilitate steady credit extension to small firms from a long-term point of view.

The development of substitutes for demand deposits and currency may lessen the central bank's ability to control short-term interest rates. Similarly, as capital market opening proceeds rapidly and derivatives become more actively used, banks may come to rely heavily on non-deposit sources of funds, such as certificates of deposit, and on open market credits. The central bank's ability to influence the supply of bank loans through the lending channel may therefore be reduced to a great extent. Moreover, if derivatives facilitate asset-switching between different maturities in different currencies, hence producing large changes in exchange rates, the exchange rate channel of monetary transmission may be expected to become more important.

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