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Capital Adequacy Requirements and the Bank Lending Channel of Monetary Policy

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Abstract

In this paper a modified version of Bernanke and Blinder's (1988) model of the bank lending channel of monetary policy under asymmetric information is presented. If, aside from reserve requirements, banks have to meet capital adequacy requirements as well, then the results suggested by Bernanke and Blinder have to be amended in several respects. Most noticeably, when the net worth constraint is binding, the efficacy of monetary policy is severely lessened. Further, we are able to show that a positive relationship between banks' capital base and the real economy exists.

1 Introduction

Asymmetric information between borrowers and lenders leads to adverse selection and moral hazard and, therefore, renders capital markets imperfect (e.g. Bester and Hellwig (1987), Gertler (1988), Stiglitz and Weiss (1981)). Taking informational capital market imperfections as given, the conventional interest rate channel of monetary policy (*money view*) is strengthened by a balance sheet channel as well as a bank lending channel. Both the balance sheet channel and the bank lending channel are discussed under the so called *credit view* of monetary policy (e.g. Bernanke (1993, 1988), Bernanke and Gertler (1995), Bernanke, Gertler and Gilchrist (1996), Cecchetti (1999, 1995), Gertler and Gilchrist (1993), Hu (1999), Hubbard (2001, 2000, 1995), Kashyap and Stein (1997a, 1997b), Mishkin (2001, 1996, 1995)). In a well-known paper Bernanke and Blinder (1988) elucidate the bank lending channel, in which financial intermediaries (i.e. banks) have a dominant role to play, by integrating a separate market for bank loans into the classic IS-LM-model. In their model banking institutions do not hold any excess reserves and, as a consequence, the volume of central bank reserves together with the reserve ratio determines the overall money supply in the economy.

The purpose of the present paper is to extend the Bernanke-Blinder-model by taking capital adequacy restraints into consideration, i.e. banks have to fulfill both reserve requirements and capital adequacy requirements. The latter are of current interest because they play the dominant role in the present-day Basle II discussion. Our modification has important implications because the results derived by Bernanke and Blinder need to be amended in several respects. The qualitative findings of Bernanke and Blinder are confirmed only if banks have a large base of equity capital at their disposal, so that it is the reserve constraint which is binding. If, on the other hand, banks' net worth is low and, therefore, the capital adequacy constraint is binding, then monetary policy is less effective than suggested by Bernanke and Blinder. Furthermore, we are able to show that there is a positive relationship between banks' capital base and the real economy.

The paper proceeds as follows: In the next section we briefly repeat how monetary policy affects the real economy under the bank lending channel. Section 3 presents our modifications of the Bernanke-Blinder-model, and section 4 concludes.

2 A Model of the Bank Lending Channel of Monetary Policy

To start the analysis, in this section we briefly present a modified version of the Bernanke-Blinder-model of the bank lending channel of monetary policy (see also Freixas and Rochet (1997, chap. 6.2.2) or Walsh (1998, chap. 7.3.1)).

Consider an economy with four kinds of agents, households (*h*), firms (*f*), banks (*b*), and government (*g*) (including the central bank). Suppose that there are three types of assets – money (*D*), bonds (*B*), and bank loans (*L*). Due to asymmetric information between borrowers and lenders, bonds and loans are imperfect substitutes for both firms (on the right-hand side of their balance sheets) and banks (on the left-hand side of their balance sheets). Assume further that prices are sticky.

The households' behavior is given by

$$S(Y,i) = D^h(Y,i) + B^h(Y,i)\,. \tag{1}$$

S are savings which are channeled to money (held in form of deposits only), D^h, and bonds, B^h. Y denotes real income, and i is the interest rate on bonds. We assume that $\partial S/\partial Y$,

$\partial S/\partial i$, $\partial D^h/\partial Y$, $\partial B^h/\partial Y$, $\partial B^h/\partial i$ > 0 and $\partial D^h/\partial i < 0$ holds. Especially, the higher *Y* and *i* the more consumers save.

To finance investment, *I*, firms issue bonds, B^f, or raise loans, L^f. Therefore,

$$I(i,r) = B^f(i,r) + L^f(i,r), \tag{2}$$

where *r* denotes the interest rate on bank loans. Suppose that $\partial I/\partial i$, $\partial I/\partial r$, $\partial B^f/\partial i$, $\partial L^f/\partial r$ < 0 and $\partial B^f/\partial r$, $\partial L^f/\partial i$ > 0, i.e. as *i* and *r* increase firms invest less.

The representative bank's balance sheet is

$$R + B^b + L^b = D^b. \tag{3}$$

The bank's assets are reserves at the central bank, *R*, bonds, B^b, and loans, L^b. The liabilities consist of deposits, D^b, only.

Bernanke and Blinder suppose that banks do not hold any excess reserves. Thus, *R* equals minimum reserves and the total money supply in the economy is determined by the multiplier R/α, where α is the reserve ratio. Inserting $D^b = R/\alpha$ into equation (3) and rearranging terms yields

$$B^b + L^b = R(1-\alpha)/\alpha. \tag{4}$$

The distribution of the amount of $R(1-\alpha)/\alpha$ to bonds, B^b, and loans, L^b, is the result of a portfolio optimisation problem which, for the save of convenience, is not explicitly modeled by Bernanke and Blinder. Here it is of only importance that a part of $R(1-\alpha)/\alpha$ goes to bonds, and the remainder is invested in loans, i.e.

$$B^b = \upsilon(i,r)R, \tag{5}$$

$$L^b = \mu(i,r)R, \tag{6}$$

where $\partial\upsilon/\partial i$, $\partial\mu/\partial r$ > 0 and $\partial\upsilon/\partial r$, $\partial\mu/\partial i$ < 0 is assumed. Clearly, $\upsilon(i,r) + \mu(i,r) = (1-\alpha)/\alpha$ holds.

Finally, the government's budget constraint is

$$G = R + B^g. \tag{7}$$

In the model outlined so far there are four markets (i.e. commodity market, money market, bond market and loan market) as well as three endogenous variables (*Y*, *i* and *r*). Due to *Walras' law*, the bond market may be ignored altogether, so that in the following we will restrict our attention to the other three markets. The money market equilibrium condition, the well-known LM-curve, is

$$R = \alpha D^h(Y,i). \tag{8}$$

The IS-curve represents the commodity market equilibrium, i.e.

$$I(i,r) + G = S(Y,i). \tag{9}$$

Further, if

$$L^f(i,r) = \mu(i,r)R \tag{10}$$

holds, the loan market is cleared as well. Solving equation (10) for *r* yields

$$r = \phi(i,R), \tag{11}$$

and (by totally differentiating equation (10)) it is straightforward to show that $\partial\phi(i,R)/\partial i > 0$ and $\partial\phi(i,R)/\partial R < 0$. The intuition behind the signs of the partial derivatives is easy to understand: First, when the interest rate of bonds, *i*, rises, firms issue fewer securities. Instead, their demand for bank loans increases. At the same time banks reduce the supply of loans as bonds get more attractive from their perspective. There is therefore an excess demand for loans, and an increase in the loan rate, *r*, will follow. Second, if central bank reserves, *R*, rise, banks offer more loans. As a result, there is an excess supply in the market for loans which in turn decreases *r*.

By inserting $r = \phi(i,R)$ into the IS-curve the following expression is obtained:

$$I(i,\phi(i,R)) + G = S(Y,i)\,. \tag{12}$$

Bernanke and Blinder call equation (12) the CC-curve (*commodities and credit*) because it represents all combinations of *Y* and *i* which ensure that the commodity market and the loan market are simultaneously in equilibrium. By totally differentiating equation (12) it can simply be shown that the slope of the CC-curve is negative, i.e. $di/dY < 0$. The negative relationship between *i* and *Y* is straightforward to explain: An increasing bond rate, *i*, gives rise to both an excess demand for bank loans as well as an excess supply of commodities. A rising loan rate, *r*, brings the market for bank loans back to an equilibrium, but it aggravates the situation of excess supply in the goods market. Therefore, real income, *Y*, has to decrease until $I + G = S$ holds again. Note that in the (i,Y)-space the central bank reserves, *R*, are a shift parameter of the CC-curve. This result has important consequences for the efficacy of monetary policy. In figure 1 the implications of an expansionary monetary policy are illustrated.

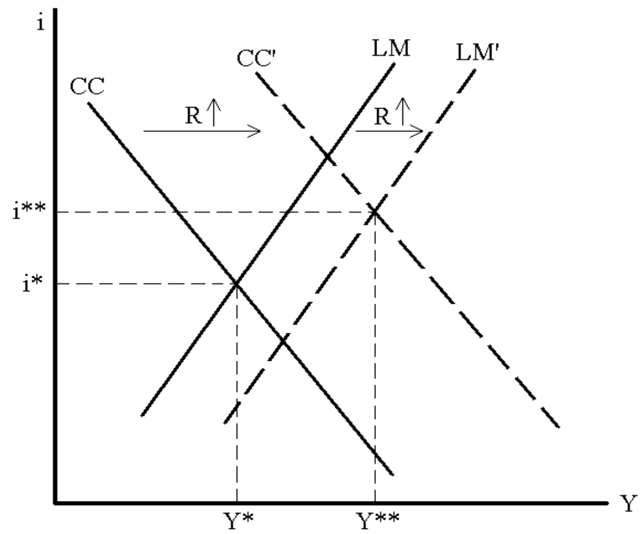

Figure 1: A monetary expansion and the bank lending channel

As under the interest rate channel of monetary policy (money view), an increase in reserves, *R*, shifts the LM-curve to the right. Under the bank lending channel (as part of the credit view) there is an additional effect: The CC-curve shifts to the right too. The reason for this is as follows: An increase in central bank reserves, *R*, causes an excess supply of bank loans in the loan market. As a result, the loan rate, *r*, declines. The decline in *r* in turn increases investment, *I*. Thus, for a given bond rate, *i*, $I + G$ rises. Consequently, savings, *S*, and therefore income, *Y*, has to increase until $I + G = S$ holds again. Put another way, the effect of the LM-curve shifting to the right is reinforced by the CC-curve shifting to the right as well. In the new equilibrium real income, *Y*, is higher. As for the new equilibrium value of the bond rate, *i*, no unambiguous statement can be made. In figure 1 in the new equilibrium *i* is higher than before, i.e. $i^{**} > i^*$. To sum up:

Proposition 1 (Bernanke und Blinder (1988)):
A change in the monetary base, R, shifts to the right both the LM-curve and the CC-curve. Expansionary monetary policy increases real income, Y, and decreases the loan rate, r. Restrictive monetary policy causes Y to decline and r to rise. The reaction of the bond rate, i, is ambiguous.

Proposition 1 has important implications for the conduct of monetary policy. Especially, monetary policy can have real effects without influencing the interest rate on bonds in the economy. If banking institutions have more central bank reserves at their disposal, then they will offer more loans to firms, i.e. L^b increases. Particularly bank-dependent borrowers profit from the increased supply of bank loans because, as a consequence of asymmetric information between borrowers and lenders, they have no direct access to organized securities markets.

3 A Model Including Capital Adequacy Requirements

In the CC-LM-model of the last section the volume of central bank reserves, R, together with the reserve ratio, α, determines the overall money supply in the economy. The banking sector's balance total is $D^b = R/\alpha$. However, in the real world, aside from reserve requirements banks have to meet capital adequacy requirements as well. Especially, the items which are listed on the left-hand side of their balance sheets, i.e. bonds and loans, have to be backed up at least partly with equity capital in order to protect depositors from banks going bankrupt.[1]

In this section we extend the Bernanke-Blinder-model by adding a capital adequacy restraint for banks. Both bonds, B^b, and loans, L^b, have to be underpinned with equity capital. To be more precise, at least $\beta \cdot 100$ $(0 < \beta < 1)$ percent of the interest bearing assets have to be backed up with the banks' own resources.[2]

Suppose that E is the banking sector's exogenous equity capital base. Consequently, the representative bank's balance sheet is

$$R + B^b + L^b = D^b + E, \tag{13}$$

and both

$$\alpha D^b \leq R \tag{14}$$

and

$$\beta(B^b + L^b) \leq E \tag{15}$$

have to be fulfilled. Equations (14) and (15) represent the reserve constraint and the capital adequacy constraint, respectively. Equations (1), (2), and (7) continue to describe the behaviour of consumers, firms, and the government. As before, the banking institutions behave perfectly passively in that they attempt to run down their excess reserves at the central bank as far as possible. Crucial for the following analysis is whether the reserve requirement or the capital adequacy requirement is binding. We start with the case in which equation (14) holds with equality in the next subsection. The scenario of equation (15) holding with equality is postponed to subsection 3.2.

[1] Today, according to the 1988 Basle Accord, banks' liable equity capital has to be at least as large as eight percent of their risk weighted assets. Starting in 2007 new instructions, contemporarily discussed under the heading of Basle II, are supposed to come into force. The chief intention of Basle II is to take into account to a greater extent the (externally or internally evaluated) risks of the banks' assets when backing up the latter with net worth. In other words, the riskier a loan is, the higher the required share which has to be underpinned with equity capital. The planned new percentages are 20, 50, 100, and 150 percent of the aforementioned eight percent, i.e. 1.6, 4, 8, and 12 percent.

[2] In another context Blum and Hellwig (1995) analyse the macroeconomic consequences of reserve as well as capital requirements which banking institutions have to meet. In their model the capital constraints affect loan supply and investment in the economy too. Furthermore, a multiplier mechanism is at work. The main lesson gleaned from Blum and Hellwig is that equilibrium prices and income react more sensitively to demand side shocks when the capital adequacy restraint is binding.

3.1 Binding Reserve Constraint

When the banking sector is equipped with a large capital base, we have

$$R = \alpha D^b \tag{14'}$$

and

$$E \geq \beta(B^b + L^b), \tag{15}$$

i.e. the reserve constraint is binding whereas the capital adequacy constraint is not. Therefore, as in the preceding section, the overall money supply in the economy is $D^b = R/\alpha$. Apart from reserves, *R*, banks have assets of

$$B^b + L^b = D^b + E - R \tag{13'}$$

at their disposal. Inserting $D^b = R/\alpha$ into equation (13') and rearranging terms yields:

$$B^b + L^b = \frac{R(1-\alpha)}{\alpha} + E.$$

By defining $M(R) \equiv R(1-\alpha)/\alpha + E$ the aforementioned equation is simplified to

$$B^b + L^b = M(R), \tag{16}$$

where $dM(R)/dR = (1-\alpha)/\alpha > 0$. As in section 2, the allocation of $M(R)$ to bonds, B^b, and loans, L^b, is the solution to a portfolio optimisation problem which is not explicitly modeled here. Instead, we assume that a share $\overline{\upsilon}$ goes to bonds, and the remaining share of $\overline{\mu} = (1-\overline{\upsilon})$ is invested in loans, i.e.

$$B^b = \overline{\upsilon}(i,r)M(R), \tag{17}$$

$$L^b = \overline{\mu}(i,r)M(R), \tag{18}$$

where $\partial\overline{\upsilon}/\partial i$, $\partial\overline{\mu}/\partial r$ > 0 and $\partial\overline{\upsilon}/\partial r$, $\partial\overline{\mu}/\partial i$ < 0 is assumed. Note further that $\overline{\upsilon}(i,r) + \overline{\mu}(i,r) = 1$ holds.

As before, the LM-curve (i.e. equation (8)) and the IS-curve (i.e. equation (9)) represent the money market equilibrium and the commodity market equilibrium, respectively. Finally, to clear the loan market, $L^f(i,r) = L^b$ or rather

$$L^f(i,r) = \overline{\mu}(i,r)M(R) \tag{19}$$

must hold. Solving equation (19) for *r* yields

$$r = \overline{\phi}(i, M(R)). \tag{20}$$

By totally differentiating equation (19) the partial derivatives of the function $r = \overline{\phi}(i, M(R))$ can easily be determined. The solution to this is $\partial\overline{\phi}(i, M(R))/\partial i > 0$ and $\partial\overline{\phi}(i, M(R))/\partial R < 0$. The intuition is straightforward: First, an increase in the bond rate, *i*, enhances firms' demand for loans, while, at the same time, it decreases the supply of bank loans. Thus, the result is an excess demand for loans. To restore the equilibrium in the loans market the loan rate, *r*, must rise. Second, an expansion of the central bank reserves, *R*, increases the supply of loans offered by banks, and, therefore, an excess supply of loans follows. Consequently, the loan rate, *r*, will decline.

Inserting $r = \overline{\phi}(i, M(R))$ into equation (9) yields the CC-curve,

$$I\left(i, \overline{\phi}(i, M(R))\right) + G = S(Y,i), \tag{21}$$

which, as in section 2, represents all combinations of *i* and *Y* where both the goods market and the loan market are in equilibrium. The CC-curve according to equation (21) has the same characteristics as the CC-curve of section 2, i.e. equation (12). Its slope in the (i,Y)-space is negative, i.e. $di/dY < 0$ (which is easy to see by totally differentiating equation (21)). Furthermore, it shifts to the right when the central bank reserves, *R*, are increased. An increase in *R* causes an excess supply in the market for bank loans which, then, is removed by a

decline in the loan rate, r. As r falls firms' investment is enhanced. Thus, for a given level of the bond rate, i, $I+G$ is higher, and real income, Y, has to grow in order to give households incentives to save more. The process of adjustment lasts until $I+G=S$ holds again. Monetary policy has the same qualitative effects as in the original Bernanke-Blinder-model. An increase of the monetary base, R, shifts to the right both the LM-curve and the CC-curve (see figure 1 once again). Real income, Y, rises, but the reaction of the bond rate, i, is ambiguous, i.e. i may rise or fall or keep the same equilibrium value as before.
As mentioned earlier, in the case of a binding reserve restraint banks have a broad base of equity capital, i.e. E is high relative to R. That is, equations (14') and (15) hold. Inserting equation (16) into equation (15) and using the above definition of $M(R)$ we have

$$E \geq \beta R(1-\alpha)/(1-\beta)\alpha \,. \tag{22}$$

The scenario of a binding reserve constraint is summarised in the following proposition.

Proposition 2:
If $E \geq \beta R(1-\alpha)/(1-\beta)\alpha$ holds, monetary policy (i.e. a change in central bank reserves) has the same qualitative effects as in the original Bernanke-Blinder-model.

3.2 Binding Capital Adequacy Constraint

We now turn to the other case not yet studied in the literature in which the capital adequacy constraint is binding and, therefore, determines the banking sector's balance total. In this scenario

$$R > \alpha D^b \tag{14''}$$

as well as

$$E = \beta(B^b + L^b) \tag{15'}$$

holds. Note that, with regard to equation (14''), the central bank reserves, R, now embrace both minimum reserves and excess reserves. We assume that excess reserves cannot be invested in such interest bearing assets which need not be backed up with equity capital. Put another way, the excess reserves are deposited with the central bank without earning interest. Aside from reserves banks have assets of $B^b + L^b = E/\beta$ at their disposal. Note that there is a multiplier mechanism at work. If banks' net worth, E, increases by an amount of ΔE, then the sum of $(B^b + L^b)$ goes up by more than ΔE (namely by $\Delta E/\beta > \Delta E$). As usual, the allocation of E/β to bonds, B^b, and loans, L^b, is the solution to a portfolio optimisation problem which we do not model explicitly here. Suppose that the optimal solution is

$$B^b = \tilde{\upsilon}(i,r)E\,, \tag{23}$$

$$L^b = \tilde{\mu}(i,r)E\,, \tag{24}$$

where $\partial\tilde{\upsilon}(i,r)/\partial i$, $\partial\tilde{\mu}(i,r)/\partial r > 0$ and $\partial\tilde{\upsilon}(i,r)/\partial r$, $\partial\tilde{\mu}(i,r)/\partial i < 0$ is assumed. Obviously, $\tilde{\upsilon}(i,r) + \tilde{\mu}(r,i) = 1/\beta$ holds. Inserting from equations (13) and (15') into $D^b = D^h(Y,i)$ yields

$$R + \frac{E(1-\beta)}{\beta} = D^h(Y,i)\,. \tag{25}$$

Equation (25) is the well-known LM-curve. As usual, in the (i,Y)-space the LM-curve has a positive slope, and it shifts to the right when the monetary base, R, increases (see figure 2). However, the shift to the right following an increase in reserves is less than in section 3.2 in which the reserve restraint is binding. If the capital adequacy constraint (15) holds with equality, the money supply rises by the same amount as the reserves, R, i.e. $\Delta D^b = \Delta R$. In contrast, when equation (14) holds with equality, i.e. the reserve constraint is binding, a rise in

the monetary base by an amount of ΔR causes the overall money supply to increase by $\Delta R/\alpha > \Delta R$. Therefore, in comparison to the case in which the capital adequacy restraint holds with equality, for a given bond rate, *i*, real income, *Y*, has to rise stronger in the scenario with a binding reserve constraint to bring the money market back to equilibrium.
Note that banks' net worth, *E*, is a shift parameter of LM too. If *E* goes up, the banking institutions both offer more loans and acquire more bonds, i.e. L^b as well as B^b increase. Because of $\Delta(B^b + L^b) = \Delta E/\beta > \Delta E$ the money supply, D^b, rises in accordance with equation (13). Taking the bond rate, *i*, as given, real income, *Y*, has to rise in order to restore the money market equilibrium. Succinctly put, an increase in *E* shifts LM to the right.

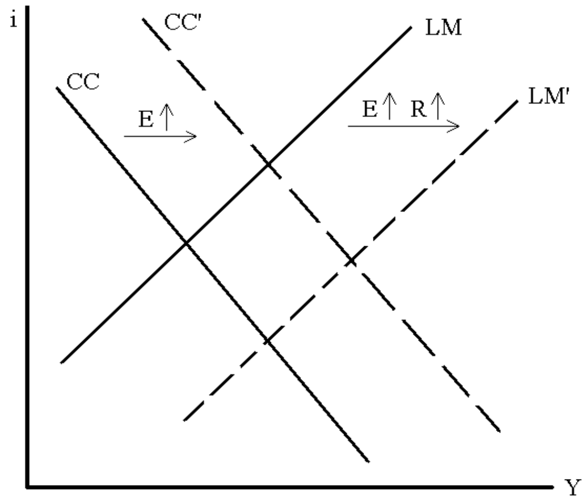

Figure 2: Expansionary monetary policy and an increase in banks' equity capital

As above, the IS-curve is represented by equation (9). The market clearing condition for the loan market is

$$L^f(i,r) = \tilde{\mu}(i,r)E\,. \tag{26}$$

Solving equation (26) for *r* yields

$$r = \tilde{\phi}(i,E)\,. \tag{27}$$

By first replacing μ with $\tilde{\mu}$ and *R* with *E* in equation (10) and then totally differentiating we obtain $\partial\tilde{\phi}(i,E)/\partial i > 0$ and $\partial\tilde{\phi}(i,E)/\partial E < 0$. The intuition regarding the signs of the partial derivatives of the function $r = \tilde{\phi}(i,E)$ is straightforward: First, if the bond rate, *i*, rises, an excess demand in the market for bank loans is the result. Thus, the loan rate, *r*, will increase. Second, when the banking sector's equity capital base, *E*, rises, the supply of bank loans is widened. An excess supply of loans immediately follows. Therefore, the loan rate, *r*, has to decline to restore an equilibrium in the market for bank loans.
Inserting $r = \tilde{\phi}(i,E)$ into equation (9) yields the CC-curve,

$$I\left(i,\tilde{\phi}(i,E)\right) + G = S(Y,i)\,. \tag{28}$$

The important point to note about the CC-curve according to equation (28) is that the position of CC in the (i,Y)-space does no longer depend on the volume of central bank reserves, *R*, but on the level of banks' net worth, *E*. An increase in the capital base, *E*, shifts the CC-curve to the right (as illustrated in figure 2). As the banking institutions posses more equity capital the supply of bank loans increases. The result is an excess supply in the market for loans, which has to be remedied by a decline in the loan rate, *r*. However, the decline in *r* makes firms' investment projects more profitable, so that *I* and, because *G* is exogenous, $I + G$ rise. For a given bond rate, *i*, real income, *Y*, has to rise in order to induce consumers to save more.

The increase in income will last until the commodity market is back in equilibrium, i.e. $I+G=S$. The central bank reserves, *R*, do no longer influence the position of the CC-curve in the (i,Y)-diagram because a change in reserves has no effects on the loan market equilibrium any longer.
In order for the capital adequacy constraint to bind, reserves, *R*, must be large relative to the banks' equity, *E*. Substituting from equations (13) and (15') in $R > \alpha D^b$ and rearranging terms yields

$$\beta(1-\alpha)R/\alpha(1-\beta) > E\,. \tag{22'}$$

It is important to note that the reaction of the bond rate, *i*, following a change in the monetary base, *R*, is no longer ambiguous. As can be seen from figure 2, an increase in reserves, *R*, unambiguously causes *i* to decline. The main results concerning monetary policy in the scenario of a binding capital adequacy requirement are summarised in the following proposition.

Proposition 3:
If $E < \beta(1-\alpha)R/\alpha(1-\beta)$*, then monetary policy is less effective than suggested by Bernanke and Blinder. The consequences regarding Y and i are unambiguous. An increase in the monetary base, R, raises real income, Y, and decreases the bond rate, i, and vice versa.*

Furthermore, as already explained above, the more net worth banks posses the higher is real income in the economy because an increase in equity capital, *E*, shifts to the right both LM and CC. There is therefore a positive relationship between *E* and *Y*. However, as for the new equilibrium value of the bond rate, *i*, no clear-cut statement can be made, i.e. *i* may rise or fall or remain constant depending on which curve shifts farther to the right. The consequences of a rise in banks' capital base are summed up in the next proposition.

Proposition 4:
A rise in banks' equity capital base, E, has expansionary effects, i.e. real income, Y, increases. Whether the bond rate, i, goes up or down is unclear.

4 Conclusion

In the real world, aside from reserve requirements banks have to meet capital adequacy requirements as well. Therefore, net worth constraints should be taken into account when modelling the conduct of monetary policy under symmetric as well as asymmetric information. In the present paper we have extended the Bernanke-Blinder-model of the bank lending channel of monetary policy under asymmetric information by adding a capital adequacy constraint. Taking the latter as given, the process of generating money in an economy can no longer easily be described by the conventional multiplier mechanism. Banking institutions can run down their excess reserves at the central bank only if they have a broad base of equity capital relative to the central bank reserves at their disposal. Banks with little net worth cannot exchange excess reserves for interest bearing assets like bonds and loans because if they did so, they could no longer meet the capital adequacy constraint, i.e. the assets would not be backed up with a sufficient amount of equity capital anymore. Thus, the efficacy of monetary policy is severely lessened when the banking institutions' capital base is low. Fortunately, in the intermediate run monetary policy may become more efficient again as a rising gross national product leads to increased profits in the banking sector which in turn increase banks' equity capital base.

Literature

(1) Bernanke, B. S. [1988], “Monetary Policy Transmission: Through Money or Credit?”, Federal Reserve Bank Philadelphia Business Review, Nov./Dec., S. 3 – 11.
(2) Bernanke, B. S. [1993], “Credit in the Macroeconomy”, Federal Reserve Bank of New York Quarterly Review, Spring, 92/93, S. 50 – 70.
(3) Bernanke, B. S., and Blinder, A. S. [1988], “Credit, Money and Aggregate Demand”, American Economic Review, Vol. 78, No. 2, S. 435 – 439.
(4) Bernanke, B. S., and Gertler, M. [1995], “Inside the Black Box: The Credit Channel of Monetary Policy Transmission”, Journal of Economic Perspectives, Vol. 9, No. 4, S. 27 – 48.
(5) Bernanke, B. S., Gertler, M., and Gilchrist, S. [1996], “The Financial Accelerator and the Flight to Quality”, Review of Economics and Statistics, Vol. 78, No. 1, S. 1 – 15.
(6) Bester, H., and Hellwig, M. [1987], “Moral Hazard and Equilibrium Credit Rationing: An Overview of the Issues”, in: Bamberg, G., and Spremann, K. (ed.), Agency Theory, Information and Incentives, Springer, Berlin, S. 135 – 166.
(7) Blum, J., and Hellwig, M. [1995], “The Macroeconomic Implications of Capital Adequacy Requirements for Banks”, European Economic Review, Vol. 39, No. 3/4, S. 739 –749.
(8) Cecchetti, St. G. [1995], “Distinguishing Theories of the Monetary Transmission Mechanism”, Federal Reserve Bank of St. Louis Review, May/June, Vol. 77, No. 3, S. 83 – 97.
(9) Cecchetti, St. G. [1999], “Legal Structure, Financial Structure, and the Monetary Policy Transmission Mechanism”, Federal Reserve Bank of New York Economic Policy Review, July, S. 9 – 28.
(10) Gertler, M. [1988], “Financial Structure and Aggregate Economic Activity: An Overview”, Journal of Money, Credit, and Banking, Vol. 20, No. 3, S. 559 – 588.
(11) Gertler, M., and Gilchrist, S. [1993], “The Role of Credit Market Imperfections in the Monetary Transmission Mechanism: Arguments and Evidence”, Scandinavian Journal of Economics, Vol. 95, No. 1, S. 43 – 64.
(12) Hu, Ch. X. [1999], “Leverage, Monetary Policy, and Firm Investment”, Federal Reserve Bank of San Francisco Economic Review, No. 2, S. 32 – 39.
(13) Hubbard, R. G. [1995], “Is There a ‘Credit Channel’ for Monetary Policy?”, Federal Reserve Bank of St. Louis Review, May/June, Vol. 77, No. 3, S. 63 – 77.
(14) Hubbard, R. G. [2000], Money, the Financial System, and the Economy, Third Edition, Addison-Wesley, Reading, Massachusetts.
(15) Hubbard, R. G. [2001], “Capital Market Imperfections, Investment, and the Monetary Transmission Mechanism”, in: Deutsche Bundesbank (ed.), Investing Today for the World of Tomorrow: Studies on the Investment Process in Europe, Springer, Berlin, S. 165 – 194.
(16) Kashyap, A. K., and Stein, J. C. [1997a], “Monetary Policy and Bank Lending”, in: Mankiw, G. N. (ed.), Monetary Policy, University of Chicago Press, Chicago, S. 221 – 256.
(17) Kashyap, A. K., and Stein, J. C. [1997b], “The Role of Banks in Monetary Policy: A Survey with Implications for the European Monetary Union”, Federal Reserve Bank of Chicago Economic Perspectives, Sept./Oct., S. 2 – 18.
(18) Mishkin, F. S. [1995], “Symposium on the Monetary Transmission Mechanism”, Journal of Economic Perspectives, Vol. 9, No. 4, S. 3 – 10.
(19) Mishkin, F. S. [1996], “The Channels of Monetary Transmission: Lessons for Monetary Policy”, NBER Working Paper No. 5464, Cambridge, Massachusetts.

(20) Mishkin, F. S. [2001], "The Transmission Mechanism and the Role of Asset Prices in Monetary Policy", NBER Working Paper No. 8617, Cambridge, Massachusetts.
(21) Stiglitz, J. E., and Weiss, A. [1981], "Credit Rationing in Markets with Imperfect Information", American Economic Review, Vol. 71, No. 3, S. 393 – 410.