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# Credit in the monetary transmission mechanism: An overview of some recent research using Swiss data

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## Credit in the monetary transmission mechanism: An overview of some recent research using Swiss data

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## **Abstract**

Studies on the role of the credit channel have flourished in recent years. This paper focuses on the work that has been carried out using Swiss data. It begins with some general features characterizing the credit channel and demonstrating its empirical implications. It then provides an overview of the empirical papers. For the most part, these papers test cross-sectional implications of the credit view. The overall evidence suggests that a credit channel exists but a precise assessment of the effects of monetary policy operating through this channel is still a long way off. Much work has yet to be done, not least on the data side, in order to obtain a clear view of the quantitative importance of the credit channel for Switzerland.

JEL classification: E44, E51, E52

Keywords: Monetary transmission, credit channel

## **Zusammenfassung**

Die Zahl der Untersuchungen zur Rolle des Kreditkanals im monetären Transmissionsmechanismus hat in den letzten Jahren stark zugenommen. Dieses Papier beschäftigt sich mit den Arbeiten, die mit Schweizer Daten durchgeführt worden sind. Es beginnt mit einer kurzen Darstellung des Kreditkanals und seiner empirischen Implikationen. Anschliessend gibt es einen Überblick zu den empirischen Papieren. Der Grossteil dieser Arbeiten testet Querschnittsimplicationen des Kreditkanals. Die Resultate deuten insgesamt darauf hin, dass ein Kreditkanal existiert; von einer präzisen Einschätzung der Wirkungen, welche die Geldpolitik auf diesem Wege ausübt, sind wir aber noch weit entfernt. Um ein klares Bild der quantitativen Bedeutung des Kreditkanals in der Schweiz zu gewinnen, bleibt vor allem auf der Datenseite viel zu tun.

## **Résumé**

Le nombre d'études traitant du rôle du canal du crédit dans le mécanisme de transmission de la politique monétaire a fortement augmenté dans les dernières années. Cet article se concentre exclusivement sur les travaux basés sur des données statistiques suisses. Il commence par une description succincte des caractéristiques du canal du crédit et de ses implications empiriques, et se livre ensuite à un survol de la littérature empirique. La plupart de ces travaux testent les implications en coupe transversale du canal du crédit. Les résultats obtenus suggèrent l'existence d'un canal du crédit, bien qu'une évaluation précise de la façon dont la politique monétaire exercerait un effet par ce biais ne soit pas encore faisable. Il reste notamment beaucoup de travail à réaliser du côté des données statistiques pour pouvoir évaluer l'importance quantitative du canal du crédit en Suisse.

## 1. Introduction

The standard textbook model of monetary policy is based on the view that the capital structures of lenders and borrowers do not affect their real decisions.<sup>1</sup> As a result, the economy can be modelled without making any distinction between different forms of financing (“money view”). Yet, the irrelevance of the capital structure depends on various assumptions which do not always hold in reality. In particular, it takes for granted that all financing forms are treated equally with respect to taxes, that securities can be issued without transaction costs, that the same information is available to both lenders and borrowers, and that conflicts of interest can be resolved without costs.

Since the 1970s, various authors have examined the consequences of relaxing the assumptions underlying the “money view”. Most of them focused on the information asymmetries faced by lenders and borrowers. This research has produced the “credit view” that distinguishes different forms of financing and hence different financial assets. Consequently, whereas the “money view” generally only makes a distinction between non-interest bearing “money” and interest-bearing “securities”, the credit view subdivides the “securities” further (e.g. bank loans, bonds and shares).

It has become usual to describe the difference between the money view and the credit view on the basis of the transmission mechanism of monetary policy and to differentiate a “money channel” and a “credit channel”. This convention is adopted here, even though it would also be possible to work on the assumption of a shock other than a monetary-policy one. What happens, then, if the central bank sells government securities on the open market, thus bringing about a reduction in the monetary base? In the money view, this action produces a rise in the open market interest rate and causes a fall in the demand for credit and in output and employment. In the credit view, the same action additionally results in a reduction in the credit supply, so that the credit interest rate rises in relation to the open market rate. The effects of monetary policy therefore are magnified.

The credit channel illustrates a possible way in which monetary policy is able to influence the economy even if the open market interest rate barely responds. An extreme example is where the short-term interest rate controlled by the central bank is zero. In this case, the money channel is closed and monetary policy can only take effect through other channels, such as the credit channel. Aside from such extreme examples, however, most economists tend to see the credit channel as an extension of, rather than an alternative to, the money channel.

The remainder of the paper is organised as follows. In Section 2 the two versions of the credit channel commonly distinguished in the literature are presented: the balance sheet channel and the bank lending channel. Section 3 deals with the empirical literature based on Swiss data. Section 4 concludes the paper.

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<sup>1</sup> See Modigliani and Miller (1958) for the theoretical background of this view.

## 2. Forms of the credit channel

### Balance sheet channel

The source of the credit channel is widely seen in financial market frictions caused by information asymmetries between lenders and borrowers. The borrower generally knows himself and his situation better than the lender. He is better able to judge the chances of his investment project being successful, and to some extent also influences these chances by his own behaviour. This asymmetry gives rise to a premium for all forms of external financing.

Expressed in rather more technical terms, the lender-borrower relationship is determined by a principal-agent problem, whereby the lender is the principal and the borrower the agent. This gives rise to the usual problems of “adverse selection” and “moral hazard”, which drive a wedge between the cost of external and internal funds.<sup>2</sup> Financing an investment project from external funds is more expensive than financing it from retained profits. The difference reflects the premium for external financing.

The premium depends primarily on the borrower’s financial situation. The lower the borrower’s net worth, the less security he can offer the lender and the higher the premium on the external funding. Moreover, the lower his cash flow, the smaller the proportion of the investment he is able to finance with internal funds and the higher again the premium on the external funding. These interactions are of particular relevance to the central bank if monetary policy is able to influence the net worth and the cash flow. Advocates of the credit channel argue that it is able to do both. A restrictive monetary policy reduces the value of collateralisable assets and thereby reduces the borrower’s net worth. At the same time, it weakens aggregate demand, the decline being reflected in lower cash flow.

This completes the “balance sheet channel”. A tightening of monetary policy leads to a deterioration of the borrowers’ balance sheets. Information costs rise and the premium demanded for external financing grows. The increase in credit interest exceeds the rise in the default-risk-free rate associated with the monetary policy tightening. Consequently, the effects on credit and the real economy are amplified.

It should be borne in mind that the credit channel, as we have described it here, does not imply any credit rationing. Its effect is exerted purely through interest rates. Of course there is also the possibility that the lenders may react to the information problems by rationing credit instead of raising credit interest, especially if they fear that the higher interest rates will increasingly attract only the poor credit risks (adverse selection). In other words, the credit channel can exist either with or without credit rationing.

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<sup>2</sup> “Adverse selection” refers to the incentive to look for outside funds for financing risky investment projects, while “moral hazard” refers to the incentive for those with externally financed investments to enter into major risks and not repay their loans. Adverse selection thus relates to the situation prior to the signing of a credit agreement, and moral hazard to the post-signing situation.

## **Bank lending channel**

Banks have not played a specific role so far. It actually would be true to say that the balance sheet channel could even exist in a world without banks. The idea of the balance sheet channel is based on the balance sheet of the borrower, i.e. generally a firm or a household. If the balance sheet deteriorates, the premium for external financing rises. Whether or not the credit comes from a bank does not matter.

However, banks also have to finance their activities. The arguments regarding the balance sheet channel thus also apply to the banks. If a bank's balance sheet worsens following a tightening of monetary policy, it generally becomes more difficult for the bank to procure sufficient external resources to continue its lending activities as before. If the bank is unable or unwilling to adjust its balance sheet purely by reducing its portfolio of securities, it will have to cut back its lending activities. In this way, the money channel and balance sheet channel of monetary policy may be augmented by a "bank lending channel".

It is important to note that the reduction in the banks' supply of credit will only affect the economy if at least some of the borrowers are unable to resort to other sources of funding. In practice, this condition is unquestionably met. Only large companies have the option of procuring funds from the capital market. For small firms and households, banks are generally the only source of external financing.

## **Empirical issues**

The attempt to pin down the existence of a credit channel empirically is rather a difficult undertaking. The main reason for this difficulty is the fact that most variables move in the same direction after a monetary policy shock, regardless of the existence of a credit channel. A tightening of monetary policy can cause the credit volume to decline through a money channel or through a credit channel. In the former case, the fall in demand for credit caused by the higher open market interest rate is responsible for the drop in the credit volume, whereas in the latter case the decline in the supply of credit is responsible.

At first glance, the situation looks much the same with regard to interest rates. When rates rise after a tightening of monetary policy, this is consistent both with a money channel and a credit channel. But we have seen that – in the presence of a credit channel – credit interest rates probably raise faster than the default-risk-free interest rate. This suggests that interest rate spreads may help us to identify the credit channel. Unfortunately, such an approach places heavy demands on the data, which are hardly ever met. There is no secondary market for most forms of credit, for example. Moreover, two general points must be borne in mind. First, a tightening of monetary policy dampens economic growth and thus increases the probability of bankruptcies. Consequently, the spread between the credit interest rate and the default-risk-free rate widens even in the absence of asymmetric information. In this case, movements in the interest rate spread will indicate a credit channel even though amplification of the impact of the higher bankruptcy risk by asymmetric information – the crux of the credit channel – is absent. Secondly, there is the possibility of

credit rationing. If the lenders react to the tightening of monetary policy by rationing credit, the spread between credit and default-risk-free interest can remain unchanged. In this instance, a credit channel exists without this being evident from the interest rate spread.

Owing to the difficulty of identifying the credit channel with the aid of aggregate time series data, a large portion of the recent empirical literature has focused on the cross-sectional implications of the credit view. For example, the credit view suggests that a tightening of monetary policy should have disproportionately strong consequences for small, less liquid and poorly capitalised borrowers. They are expected to feel the brunt of the growing difficulty to finance themselves with external funds. The credit view thus predicts that monetary policy has distributive effects across companies (balance sheet channel) and across banks (bank lending channel). These predictions can be tested by cross-sectional analyses.

### 3. Empirical studies with Swiss credit data

This section reviews the empirical studies performed in recent years with Swiss credit data. We ignore the older literature, which consistently used aggregate data and failed because of the identification problem (cf. Hofmann, 1994, and the literature cited therein). We also ignore the literature that deals with the information content of credit variables (cf. Jordan, 1999). These studies generally find that credit variables may improve the inflation forecast. They are thus useful for monetary policy, but they do not tell us anything about the transmission mechanism and cannot provide an answer to the question of whether a credit channel exists or not.

As a starting point for our discussion of the literature, we take the influential empirical study by Bernanke and Blinder (1992), which focuses on the transmission of monetary impulses in the United States. In this study, the two authors estimate VAR models to investigate the timing relationship between monetary policy actions and bank lending. Data are monthly and the sample covers the period 1959-1978. The implied impulse-response functions show that a tightening of monetary policy, as reflected by a positive innovation to the Federal Funds rate, is followed by an immediate decline in bank deposits and in bank holdings of securities. Bank lending hardly responds at first. Only six to nine months after the shock, the bank loans start to decline, whereas the securities holdings are rebuilt gradually and unemployment begins to rise.

This pattern suggests that the banks use their securities portfolio as a buffer and only gradually adjust their credit portfolio following the decline in deposits. Such an interpretation is consistent with a credit channel story. But as Bernanke and Blinder themselves point out, other interpretations cannot be ruled out. In particular, it can still be argued that the decline in bank lending solely reflects the effect of monetary policy on the demand for credit.

In his study of Swiss data, *Natal* (2002, 2003) extends the approach taken by Bernanke and Blinder in three directions. For one thing, the model is estimated with Bayesian methods so that a relatively large VAR can be used in spite of rather short time series. For another, monetary policy shocks are identified while taking due account of the special role played by the exchange rate and international factors in a small open economy like Switzerland's. And finally, the spread between the mortgage rate and the yield on Confederation bonds is used as a proxy for the external finance premium. This spread is not ideal, but data availability precludes a more appropriate measure of the premium. Overall, the model has a total of 13 variables.<sup>3</sup> The data are monthly and cover the period 1976-2002.

The impulse-response functions of the estimated model exhibit the pattern familiar from Bernanke and Blinder (1992). Following a tightening of monetary policy, the money

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<sup>3</sup> The set of foreign variables includes the oil price, German industrial production, German producer prices and the German 3-month interest rate. The Swiss variables are the 3-month Swiss franc interest rate, M2 money stock, the securities holdings of the big banks, total bank credits, the difference between the mortgage rate and the yield on Confederation bonds, gross domestic product, consumer prices, the unemployment rate and the Swiss franc exchange rate of the D-mark (or euro as of 2000).

supply immediately starts contracting.<sup>4</sup> The banks' holdings of securities also promptly contract, whereas the decline in bank loans only sets in after about twelve months. At about the same time, the spread between the mortgage rate and the yield on Confederation bonds shows a statistically significant widening. This response is consistent with the existence of a credit channel.<sup>5</sup>

Another way of expanding the Bernanke-Blinder approach is to distinguish bank groups that can be assumed to react in different ways to a monetary policy shock. A separate VAR for each of these bank groups can then be estimated, and the impulse-response functions can be compared. Kashyap and Stein (1995) argue that small banks have more difficulties compensating for an outflow of deposits with funds from other sources. Small banks may therefore react more strongly than large banks in terms of cutting back their loan portfolio, but less strongly in terms of cutting back their securities portfolio.

*Stuedler and Zurlinden* (1998) have tested this prediction for Switzerland. Balance sheet figures for the individual banks would be the ideal basis for forming groups according to size. But these micro data are only available as of 1987. For the time before 1987, only semi-aggregated data for the traditional classification of big banks, cantonal banks and regional banks are available. The authors resort to this classification and combine the published data series for the period 1976-1987 with new series calculated on the basis of micro data for the period 1987-1996; from 1987 onwards, the time series are adjusted for the effects of mergers, takeovers and closures.<sup>6</sup>

For each of the three bank groups, *Stuedler and Zurlinden* estimate a VAR model with quarterly data for five variables: real GDP, the 3-month Swiss franc interest rate, and three bank balance sheet items (deposits, loans and securities; each CPI-deflated). Although the implied impulse-response functions indicate that the securities of all three bank groups react to an interest rate shock faster than loans, the relative effects do not fall into the pattern that the hypothesis of Kashyap and Stein would have led us to expect. In particular, not only securities but also loans react more strongly at the big banks than at the cantonal or regional banks.

These results are confirmed by VAR models with three variables which, in addition to real GDP and the 3-month Swiss franc interest rate, include a single balance sheet item (alternately deposits, loans and securities). Only when the VAR models are estimated using bank deposits in place of the interest rate, and only with bank loans split up into secured and unsecured loans, do the results look more favourable for the credit view. In this case, loans

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<sup>4</sup> Natal (2002, 2003) describes his results based on the example of an expansionary monetary policy shock. For the sake of simplicity, the results of all papers reviewed in this section are expressed as responses to a tightening of monetary policy.

<sup>5</sup> It is not possible to discriminate between the balance sheet channel and the bank lending channel on the basis of the interest spread chosen. A widening of the interest spread between bank loans and government securities may be due to a deterioration in bank balance sheets or to a deterioration in companies' balance sheets.

<sup>6</sup> The combination of the unadjusted data for 1976-1987 with the adjusted data for 1987-1996 can be justified on the grounds that structural change in the banking sector was much more intensive during the second period.

of big banks respond relatively slowly to a deposit shock. At the same time, the relatively strong impact on big banks' holdings of securities is still there.

*Perrez and Bichsel* (2003) go one step further and use a panel approach to investigate the micro data on bank balance sheets available as of 1987. In this way, they avoid the efficiency losses that result from the formation of groups with varying degrees of heterogeneity. Moreover, they are able to examine the influence of characteristics other than the size of banks. They are primarily interested in the role played by the banks' liquidity and capital. The prediction examined by the two authors is that the lending activities of less liquid and less capitalised banks respond more sensitively to monetary policy than that of more liquid and better capitalised banks. Under the assumption of a homogeneous reaction of loan demand across banks, such a pattern can be interpreted as evidence supporting the existence of a bank lending channel.

Perrez and Bichsel present results for various specifications. In their basic equation, they regress loan growth on the change in the short-term interest rate (which serves as the indicator of monetary policy), on a bank-characterising variable (either liquidity or capitalisation), on GDP growth, on CPI inflation and on the interaction terms (GDP growth, inflation, and either liquidity or capitalisation; each weighted by the change in the short-term interest rate). The main focus is on the coefficient of the bank-characterising variable (liquidity or capitalisation) weighted by the change in the short-term interest rate. The results show that the lending activity of poorly capitalised banks responds to a monetary policy tightening more strongly than that of better capitalised banks. Liquidity, however, does not influence the effect of monetary policy on bank lending.

Perrez and Bichsel also produce results indicating that the evidence is not very robust. Estimates with the two-stage procedure proposed by Kashyap and Stein (2000), for example, do not yield any evidence that monetary policy influences the effect of liquidity or capitalisation on lending activity. They merely suggest that capitalisation itself has an effect on loan growth, while liquidity has not.

*Amstad and Kaufmann* (2003) adopt an approach that differs from that of Perrez and Bichsel (2003) or Steudler and Zurlinden (1998). Whereas the latter examine whether a particular characteristic of a bank affects its reaction to monetary policy, Amstad and Kaufmann attempt to form bank groups whose lending activity reacts differently to a change in the interest rate, and then describe the characteristics of these banking groups. Moreover, the two authors research asymmetries of the credit reactions over time, allowing for the possibility that the bank lending channel might only be effective temporarily.

The model calls for estimates of two latent variables: group affiliation, which assigns all banks as homogeneously as possible to groups according to their reaction to interest rate changes; and regime affiliation, which corresponds to the probability of the credit channel occurring. Both are estimated simultaneously: group affiliation on the basis of cluster analysis, and regime affiliation using a Markov-switching model. The quarterly data, which have been adjusted for bank mergers, cover the period 1989-2001.

The estimates show that two bank groups can be distinguished. In only one of these groups does lending activity react to monetary policy actions. The banks in question are

characterised by smaller size, lower liquidity and – above all – lower capitalisation than those that do not react. All three characteristics are consistent with the existence of a bank lending channel. Furthermore, the results suggest that the bank lending channel is open only temporarily. The periods in which it is open often coincide with recessions.

All papers we have described so far are based on bank credit data. They shed light either on the credit channel in general (Natal) or on the bank lending channel specifically. By contrast, there is only one study on the balance sheet channel, namely that by *Kalt* (2001). Kalt's study is based on confidential balance sheet and income statement data on over 5,000 corporate clients of a major Swiss bank. The data are annual and cover the period 1988-1997. They appear to be of very good quality since the balance sheet figures are adjusted for hidden reserves.

Following Gilchrist and Himmelberg (1998), Kalt estimates a panel VAR with three variables – investment rate (growth in capital stock), marginal product of capital, and cash flow divided by capital stock. The implied impulse-response functions show that investments react to a one-standard-deviation cash flow shock with an oscillating pattern, and react positively on balance. The effects are slight, however. The significantly positive reaction of the investment rate is confined to a single period (2nd period after the shock) and is about five times weaker than with a productivity shock.

Kalt then examines a number of other hypotheses, all derived from the credit view. He first divides the firms into two groups according to size in order to test the hypothesis that small firms have more difficulty obtaining external finance than large ones. Second, he classifies the firms according to the percentage of total assets accounted for by real estate in order to test the hypothesis that a firm's creditworthiness rises with the proportion of assets held as real estate. And third, he classifies the firms according to the external funds spread to explore the argument that firms with relatively high borrowing costs are more restricted in their investment behaviour. In all three cases, the difference in reactions is consistent with the balance sheet channel.

#### 4. Concluding remarks

The bulk of the empirical results summarised in this survey are consistent with the existence of a credit channel in Switzerland. The evidence is not overwhelming, however. As was to be expected, significant effects more readily appear when the impulse is relatively close to the lending or investment activity in question, i.e., when a deposit shock (Steudler and Zurlinden) or a cash flow shock (Kalt) is observed rather than a proper monetary policy action. Moreover, some of the results do not appear to be very robust (as pointed out by Perrez and Bichsel, for example).

It must be borne in mind that the data series underlying the studies are relatively short. Only the studies by Natal and by Steudler and Zurlinden are based on data going back as far as the 1970s. The other studies use data which, in the main, only go back to the end of the 1980s. It will therefore be interesting to see whether the results can be confirmed as more data become available. In this context, it is worth mentioning that, as of 2004, the SNB is expanding the range of interest rate statistics it gathers. In time, this will improve the options for constructing suitable interest rate spreads.

Despite these reservations, the empirical results allow comparison with those of other countries. The international literature has grown considerably in recent years.<sup>7</sup> On the one hand, it shows that a strong case can be made for the existence of a balance sheet channel (see Bernanke, Gertler and Gilchrist, 1999, for the United States; and Châtelain et al., 2001, for the large euro countries). The evidence presented by Kalt for Switzerland is thus consistent with that provided for other countries. On the other hand, there is less agreement with regard to the bank lending channel. Some studies also suggest that the factors causing the banks to react in different ways are not the same in all countries. In the US, small and poorly capitalised banks exhibit a disproportionately strong reaction to monetary policy (Kashyap and Stein, 2000). In the euro countries, however, the less liquid banks react more strongly than those with ample liquidity, whereas size and capitalisation have no effect (Ehrmann et al., 2003). According to the results presented by Perrez and Bichsel (single-step approach) and by Amstad and Kaufmann, the Swiss bank lending channel therefore bears a closer resemblance to the US case.

In line with the international literature, the empirical studies for Switzerland focus on the existence of a credit channel. The results thus do not say much about the quantitative importance of this channel. Also, a glance at the macroeconomic models used in most countries for economic forecasts suggests that recent literature on the credit channel has not yet substantially affected the way the economy is typically modelled. This reflects the widespread belief that models which disregard the refinements based on the modern credit view still provide adequate results in most circumstances.

It is likely, however, that the credit view will increasingly have a bearing on micro-based dynamic general equilibrium models. These models can be used to address specific

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<sup>7</sup> See Angeloni et al. (2003) for the results of a comprehensive research project completed jointly by the ECB and the central banks of the euro area.

issues regarding the influence of the financing structure on macroeconomic variables. Early examples are Bernanke, Gertler and Gilchrist (1999) and Carlstrom and Fuerst (2001).

Finally, it is important to reiterate that the benefits of the credit view extend beyond the issue of a credit channel for monetary policy. As mentioned at the outset, the information asymmetry between lender and borrower underlying the credit view is a prerequisite for the financing structure to play a macroeconomically relevant role. The credit view is thus important and useful in all discussions concerning the macroeconomic effects of changes in the financing structure (new capital adequacy rules, banking crises, etc.). Since the SNB's mandate extends not only to macroeconomics (price stability) but also to the financial sector (stability of the financial system), it should be kept in mind that the credit view gives us the tools to analyse and discuss the interaction between these two tasks.

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