An Empirical Search for a Canadian Credit Channel

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Department of Finance Working Paper
2001-15

The author would like to thank Mostafa Askari, George Georgopoulos and especially Jean-François Fillion for their valuable insights and comments while still accepting full responsibility for the contents of this paper. The views expressed in this paper should not be attributed to the Department of Finance

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Abstract

In the traditional view of the transmission mechanism, monetary policy influences output through interest rates, with the policy stance measured by changes in short-term rates or the slope of the yield curve. In an alternative view, monetary policy affects economic activity through the credit channel. When financial institutions restrict lending, some clients can not obtain financing, which hampers economic activity, while others issue commercial paper, raising its share of business credit and the yield spread between commercial paper and Treasury Bills. A "broader" credit channel has financial conditions affecting the economy through changes in the net worth of borrowers or the balance sheets of financial institutions. This often results in a widening spread between corporate and government bonds yields and a reduced flow of credit in the economy. Credit crunches are associated with this view.

This paper examines these views in a VAR model of the Canadian economy. The results suggest that both monetary and credit channels, including a "broad" credit channel, have important effects. Further, the credit channel is important for investment growth while the monetary channel helps explain growth in non-investment spending.

Résumé

Du point de vue traditionnel du mécanisme de transmission, la politique monétaire influe sur la production par le biais des taux d'intérêt, l'orientation de la politique étant mesurée par les variations des taux d'intérêt à court terme ou par la pente de la courbe de rendement. D'un autre point de vue, la politique monétaire influe sur l'activité économique par le biais du circuit de distribution du crédit. Lorsque les institutions financières limitent les prêts, certains clients ne peuvent obtenir de financement, ce qui nuit à l'activité économique, tandis que d'autres émettent des effets de commerce, augmentant leur part du crédit des entreprises et l'écart de rendement entre les effets de commerce et les bons du Trésor. Dans un circuit « plus large » de distribution du crédit, les conditions financières influent sur l'économie en raison des variations des actifs nets des emprunteurs ou des bilans des institutions financières. Cela entraîne souvent un élargissement de l'écart entre les rendements des obligations des entreprises et des gouvernements et une réduction du flux de crédit dans l'économie. Les « étranglements » du crédit sont associés à ce point de vue.

Ce document examine ces points de vue à partir d'un modèle autorégressif vectoriel de l'économie canadienne. Les résultats laissent supposer que les circuits de distribution de la monnaie et du crédit, y compris un circuit « large » de distribution du crédit, ont des effets importants. De plus, le circuit de distribution du crédit est important pour la croissance de l'investissement, tandis que le circuit de distribution de la monnaie permet d'expliquer la croissance des dépenses autres que d'investissement.

1. Introduction

It is widely accepted that monetary policy impacts real output through two major channels. In the money view, monetary policy operates through changes in short-term interest rates, with those changes, in turn, influencing long-term rates and real output. Accordingly, the stance of monetary policy is often measured by the change in short-term interest rates (Duguay, 1994, Fung and Yuan, 1999) or by the slope of the yield curve (Clinton, 1994-1995, Delâge and Fillion, 2000).

In an alternative view of the transmission mechanism, monetary policy works mainly through the credit channel. Financial institutions develop relationships with their clientele and when they restrict their lending (because of a tightening in monetary policy for example), some clients are unable to obtain alternate financing, reducing economic activity. However, other clients issue commercial paper, raising the share of business credit in this form and increasing the yield spread between commercial paper and government Treasury Bills. Accordingly, in assessing the stance of monetary policy, one should take into account the movements in short-term interest-rate spreads and in the composition of business financing.

A "broader" view of the credit channel also allows the changes in financial conditions to affect the real economy, for example, through changes in risk tolerance and risk premiums or in the balance sheets of financial institutions, but not necessarily because of a tightening in monetary policy. Episodes of credit crunches, where the supply of credit is restricted below levels suggested by interest rates and profitability, are often associated with this "broader" view of the credit channel.

This paper examines the role of the monetary and credit channels in real output movements in Canada. Section 2 discusses the money and credit views of the transmission mechanism, including the "broader" credit channel and its relevance for credit crunches. Section 3 looks at the stylized facts and how they fit the credit view, while Sections 4, 5 and 6 use aggregate data and variants of an vector autoregression model (VAR) to investigate the existence of a credit channel in Canada. The model employed is similar to that of Montplaisir, Kasumovich, Thurlow and Gupta (MKTG, 1994). The major differences are the inclusion of more interest rate spreads than in the MKTG paper and the use of different business credit-mix and activity variables. While MKTG found little support for the existence of a credit channel, our results support the notion that monetary policy affects Canadian real economic activity through both a monetary and a credit channel. Moreover, we find evidence of a "broad" credit channel.

2. Analytical Framework: Transmission mechanism of monetary policy to real output

Economists have identified two basic mechanisms transmitting monetary policy to real activity. Hubbard (1995) and Cecchetti (1995) give good descriptions of them. These are the money channel and the credit channel. Within the credit view, there is the "narrow" view or the bank-loans channel and the "broad" view or the balance-sheet channel.

The money view

The first and most accepted is an indirect mechanism, referred to as the money channel, occurring through movements in interest rates. If monetary policy is tightened, liquidity is reduced and interest rates rise. Rising interest rates, in turn, reduce spending on interest-sensitive products, such as business investment, housing and consumer durables.[1] Since this channel includes only interest-rate or "price" effects, credit is supplied at a level consistent with prevailing interest rates and the profitability of investment projects.

The credit view

However, others suggest there is a more direct transmission mechanism, the credit channel (Bernanke and Blinder, 1990). In this view, not all forms of credit are perfect substitutes, with a major causal role in economic cycles given to movements in credit extended by financial institutions, such as chartered banks. The idea is that over the years they develop a working relationship with and build up information on their clients. Thus, financial institutions issue loans to some clients who otherwise are unable to obtain financing on the market for their projects. When monetary policy is tightened and liquidity is reduced, financial institutions restrict lending, denying credit to some clients. While large firms may still access the securities' market, say by issuing commercial paper or banker's acceptances, small firms (and consumers) are unable to follow this alternative path. Any inadequacy in internal financing requires them to postpone or cancel spending intentions.[2] With the supply of credit restricted below the range identified with prevailing interest rates and profitability, some viable economic projects do not receive financing and economic growth is negatively impacted.

One possible indicator of the existence of a credit channel is widening spreads between the rates on commercial paper and Treasury Bills (the short-risk spread). The rate increase for corporate securities exceeds that for government securities because financial institutions substitute government securities for private-sector credit and/or the private

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[1] In basic macro-economic models, this would be represented by a leftward shift of the LM curve and then an upward movement along the IS curve to a lower level of real output.

[2] In basic macro-economic models, the initial shock would be represented by a larger leftward shift of the LM curve than with simply a money channel (if extra reserves are held instead of loans made). But in addition, because of reduced credit to bank-dependent borrowers, spending is curtailed and the IS curve shifts left (Hubbard, 1995).

sector substitutes credit-market instruments for bank credit. There might also be a widening in the spread between the prime rate and the Treasury Bill rate, as banks raise their prime rate to restrict loans. Another possible indicator would be an increased share of commercial paper (or alternatively a lower share of bank loans) in business credit.

The "broad" credit channel and credit crunches

The "broad" credit channel of monetary policy works through the balance sheets of borrowers. Higher interest rates from tighter monetary policy can reduce the firm's net worth by decreasing expected earnings, lowering the value of assets, and increasing interest costs on short-term debt (often used to finance inventories). This worsens the firm's creditworthiness and lenders increase the risk premium on new financing (raising the gap between the costs of external and internal financing), making it more costly and sometimes more difficult for firms to finance new expenditures.[3] The "broad" credit view should be reflected in various interest rate spreads, in particular that between corporate and government bond yields (the long-risk spread).[4] Another indicator could be a reduced flow of credit in financial markets.

The impact of the "broad" credit channel could also originate in financial markets without a tightening in monetary policy. Possible sources include a deterioration in asset values or capitalization at financial institutions, say from loan failures, and decreases in risk "tolerance" in financial markets. In the former case, the negative shock may come from loan losses at financial institutions that induce a shift in their supply of funds.

During the economic turbulence in the late 1990s, which spread from South East Asia to Russia and Latin America, some commentators argued there was a risk of a Canadian or even a global credit crunch.[5] The term credit crunch is widely used despite no general agreement on a precise definition. The Council of Economic Advisers (1992) says that "a credit crunch occurs when the supply of credit is restricted below the range usually identified with prevailing interest rates and the profitability of investment projects." In other words, a credit crunch occurs if, for non-price related reasons, there is a significant drop in the <u>supply</u> of credit (the supply curve of credit shifts left at each interest rate). The description of a credit crunch is consistent with the "broad" credit view but not with the money view. A "broad" credit channel then is necessary for a credit crunch; but its existence does not imply a credit crunch every time monetary policy is tightened.

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[3] In basic macro-economic models, in addition to a leftward shift of the LM curve, tighter monetary policy shifts the marginal efficiency of investment curve and thus the IS curve shifts leftward because of reduced credit to borrowers (Cecchetti, 1995).

[4] Banks, as borrowers, may also need to raise the rates they pay on certificates of deposit, boosting the spreads between certificates of deposit and Treasury Bills and commercial paper and Treasury Bills. This indicator is not used in this study due to problems with data availability.

[5] The exposure of financial institutions in the industrial world to those regions was to cause a global credit crunch, with the transmission of the crisis largely through Europe. European banks had massive exposure to these trouble spots. A credit crunch in Europe would have produced a sharp slowdown in North America.

3. Stylized facts

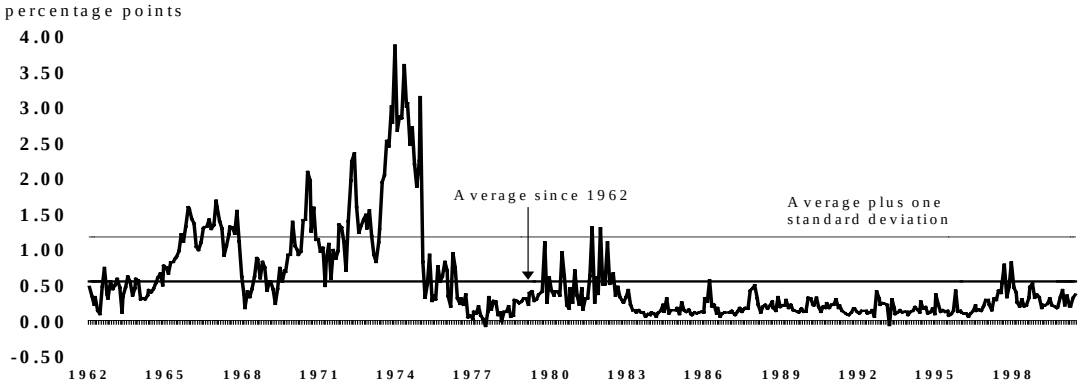
In this section, we visually examine historical developments in some variables commonly used in work on the credit channel. We search for periods of sharply widening interest-rate-risk spreads, a falling share of bank loans in business credit, and a declining flow of business credit in financial markets. This type of visual evidence can be compelling; but movements in any variable can have alternative institutional and economic explanations, which is often the case for Canada. Nonetheless, this provides a foundation for the selection of variables for a vector autoregresion model (VAR) that accounts for interactions among variables.

3.1. Interest rate spreads in Canada

This section examines the short-risk spread (Chart 1), the spread between banks' prime rate and the 3-month Treasury Bill rate (which generally increased with the short-risk spread - Chart 2), and the long-risk spread (Chart 3). The focus is on the short-risk spread.

As shown in Chart 1, the short-risk spread exhibited large changes from the late 1960s to the mid 1970s. These changes were likely caused by institutional factors not directly related to the credit channel. The spike in 1970 resulted from greater demand for Treasury Bills due to the increase in the secondary reserve requirement that raised their price, lowered their yield, and boosted the risk spread.[6] The spread narrowed when the reserve ratio was lowered. Also, during the period from 1971 to 1974, with the federal government moving to a fiscal surplus and virtually no financing requirements, the

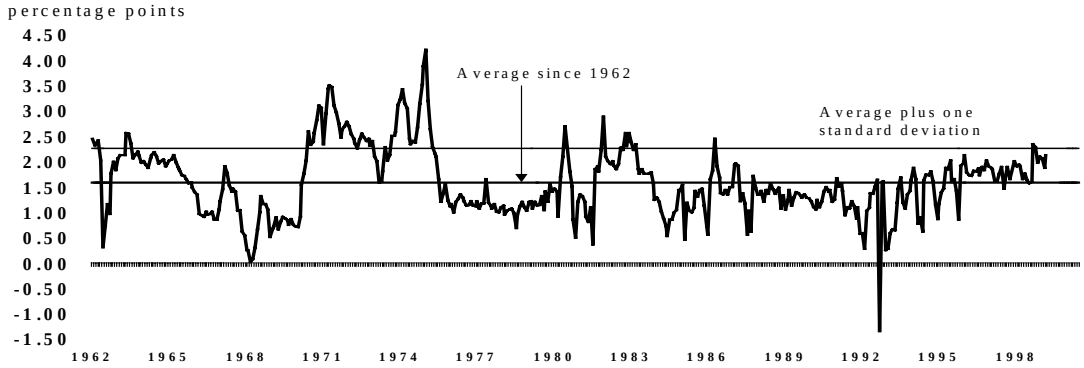
Chart 1: Spread between corporate and government paper yields: Canada



Rate for 3-month government Treasury Bills and the average of 90-day prime corporate paper.

[6] The requirement to hold Treasury Bills and day loans as a percentage of deposits replaced a voluntary 7% secondary reserve ratio agreed to by banks in 1956. This official reserve ratio was set at 6% in March 1968 and climbed to 9% by July 1970. It was lowered to 8½% in December 1971 and then in stages to 4% in December 1981. The 1991 Bank Act phased out this requirement by July 1994.

Chart 2: Spread between prime rate and 3-month government T-Bill yields



The September 1992 observation is -1.35. This is an anomaly. Monthly observations are for the last Wednesday of the month, which happened to be September 30, 1992. The T-Bill rate rose sharply that day but the prime rate, which banks change at their discretion, followed the next day/month.

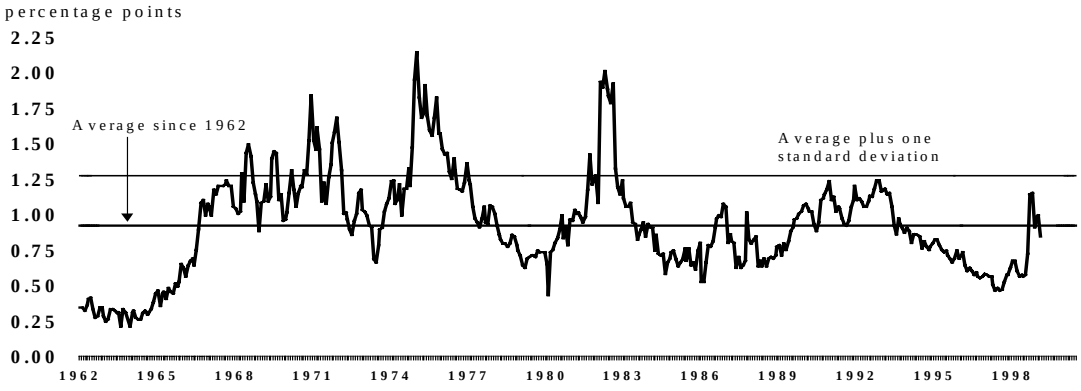
supply of Treasury Bills was limited, boosting their price and lowering their yields. At the same time, chartered banks were issuing loans at a rapid pace, raising rates on certificates of deposit (CDs) to attract funds. This boosted rates on corporate paper, which compete with CDs, and the short-risk spread.[7]

But with the nature of the risk spread changing as of the middle of the 1970s (becoming smaller and less volatile), several other episodes should be noted. One was the 1981-1982 recession, with potential roles for the monetary and credit channels. Monetary policy was tightened to reduce inflation. Interest rates rose sharply, reducing interest-sensitive spending and possibly the supply of bank loans. Loan losses at financial institutions and possibly increased risk aversion may have activated the credit channel. Two other episodes were the sharp spikes in March 1986 and October 1987 (coinciding with Black Monday on world stock exchanges). The next one was from mid-1997 to the beginning of 1998, coinciding with a reduced supply of Treasury Bills, as the federal government again moved towards a fiscal surplus and began to change its debt financing strategy to reduce its reliance on Treasury Bills. The final episode occurred with the spreading Asian crisis in September and October 1998. The short-risk spread widened to over 75 basis points in early October from under 15 basis points in mid July.

Chart 3 shows the long-risk spread. Spikes generally coincided with those in the short-risk spread but with more persistence in the shocks. Also, the spikes in the long-risk spread coincided with the recessions or economic slowdowns of 1974-1975, 1981-1982, and 1990-1991. This points to the possibility of there being a “broad” credit channel since the long-risk spread is one indicator considered in the “broad” credit view.

[7] In June 1972, the banks agreed with the Bank of Canada to limit their use of domestic CDs (the Winnipeg Agreement). The spread temporarily declined but the banks then used foreign currency deposits to attract funds.

Chart 3: Spread between corporate and government long-term yields: Canada



Rate for 10-year and over government bonds and the Scotia McLeod corporate/industrial average.

3.2. The credit mix and the amount of business credit in Canada

Another indicator of the credit channel is the composition of short-term business financing. The existence of a credit channel suggests that bank loans' share of business credit declines as financial institutions restrict their loans.[8] To demonstrate this, we use the share of bank credit (domestic and foreign) in total short-term business credit.[9] One could instead use the share of commercial paper in total short-term business credit.

The credit-mix measure can vary with the classification of banker's acceptances. Studies at the Bank of Canada (MKTG, 1994 and Thurlow, 1994) included banker's acceptances with bank loans. While Chart 4 shows a long-run shift from bank loans to bankers' acceptances, this study includes them with commercial paper, believing that to be a more consistent allocation for the short-run analysis of the credit channel.[10] There is a close substitutability between commercial paper and bankers' acceptances as firms need a bank's stamp to issue bankers' acceptances and they require a bank line of credit to issue commercial paper. And these instruments trade at similar yields and in the same markets. Their allocation is important, as banker's acceptances have dominated movements in short-term paper and including them with bank loans camouflages this. Chart 4 also reveals a declining share of bank loans around the times of (or prior to) the 1975 and

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[8] An examination of data on bank lines of credit also would have been useful here since they are likely more reflective of supply changes than say the outstanding amount under lines of credit. Further, data by size of corporation would be helpful. (See Kuszczak and Orcheson, 1994.) But adequate time series on variables such as these are not easily obtained.

[9] Short-term business credit includes loans from banks (including foreign currency loans), finance companies and other institutions, bankers' acceptances and commercial paper.

[10] The abrupt drop in banks' share of short-term business credit in the early 1980s was likely associated with a changing bankers' acceptances' market, with the major change being foreign banks entering Canada.

Chart 4
Share of total short-term business credit

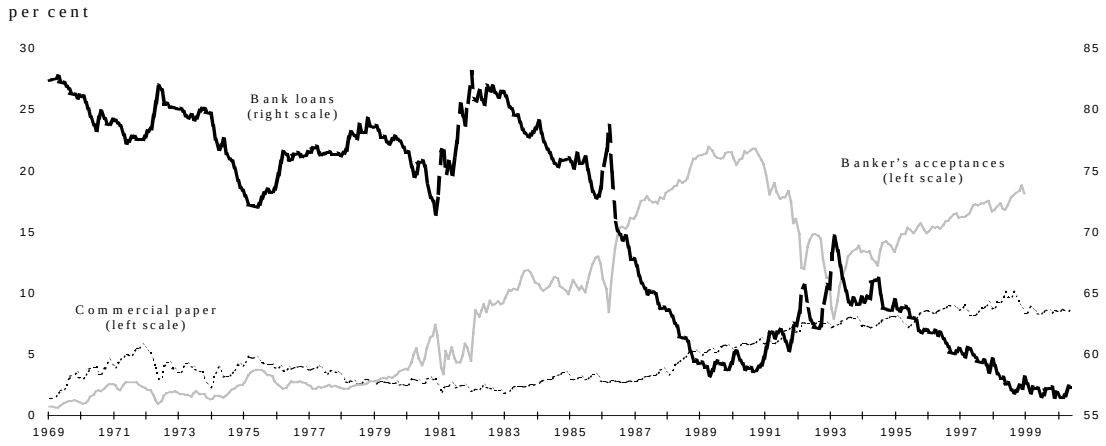
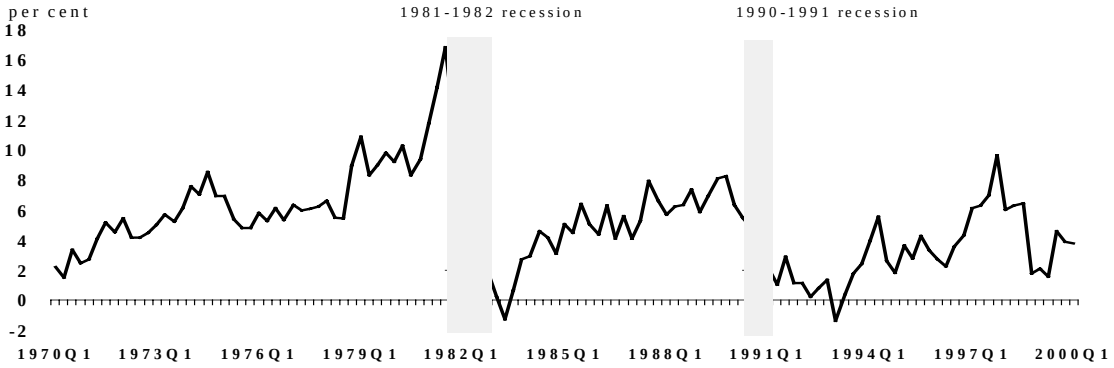


Chart 5
Net Flow of Total Business Credit as a Percentage of Nominal GDP



1981-1982 economic slowdowns or recessions, consistent with the existence of a credit channel.

A credit channel implies a fall in credit supplied while a credit crunch occurs when total credit supplied is below the amount consistent with prevailing interest rates and profitability. Following Kliesen and Tatom (1992), Chart 5 shows the net flow (the change in the stock) of total business credit as a percentage of nominal GDP. During the two most recent recessions in 1981-1982 and 1990-1991, the net flow of credit as a percentage of GDP decreased, consistent with the existence of a credit channel. However, most of the decline in this ratio occurred simultaneously with real GDP, implying the cause was perhaps weakening demand for credit. The Asian, Russian and Latin American crises of 1998 also aroused concerns of a credit crunch. The temporary reduction in financial market activity during this period was not necessarily the result of a decreasing supply of credit. It may also have reflected declining demand from those who believed an economic slowdown was on the way.

In general, it appears that the ratio of the net flow of credit to GDP is very sensitive to the economic cycle and changes in the demand for credit. Thus, to measure the credit channel, the credit mix is probably more appropriate since it is less sensitive to changes in demand conditions.[11]

4. The vector autoregression model

While visual evidence can be compelling, we showed in the previous section that interest-rate spreads, the shares of credit and the amount of credit outstanding can change for reasons other than the existence of a credit channel. Thus, more sophisticated methods are needed to investigate this issue. In this paper we use a VAR model.

A VAR is commonly used for forecasting systems of inter-related time series and for analyzing the dynamic impact of random shocks on a system of variables. It is in this latter capacity that a VAR is useful in examining the transmission mechanism of monetary policy shocks and to establish the possible existence of a credit channel, with monetary policy perhaps first influencing intermediate variables, such as risk spreads and banks' share of credit, and then real economic activity. A credit channel can also be identified in the VAR by the independent shocks of the credit variables since this permits us to observe whether or not the other variables respond in a manner consistent with the credit view. Moreover, the model can identify the effects of real output shocks on the credit variables.

Consider the following model

(1) $Az_t = C(L)z_{t-1} + e_t$

where z_t is a vector of endogenous policy and non-policy variables and e_t is a vector of white noise. The elements of the matrix A are the structural parameters on the contemporaneous endogenous variables and C(L) is a polynomial matrix in the lag operator L. To obtain an unrestricted VAR, multiply each element by the inverse of matrix A, giving

(2) $z_t = A^{-1} Az_t = A^{-1} C(L)z_{t-1} + A^{-1} e_t$

This avoids constructing separate structural equations for each endogenous variable by modelling every endogenous variable as a function of the lagged values of all the endogenous variables in the system.[12]

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[11] If a negative shock originates in the demand for credit, the decreased share of financing in bank loans need not occur, as reduced demand impacts both loans from financial institutions and the issuance of short-term paper and presumably in a manner consistent with their current shares.

[12] This is adequate when there is no intention of retrieving the structural parameters of matrices A and C.

MKTG (1994) used a similar model and assumed matrix A was lower triangular to restrict the contemporaneous nature of the feedback among the variables in z_t.[13] In this paper, we use the Choleski factorisation that imposes a "semi-structural" interpretation of the shocks that depends on the ordering of the variables. When ordered by causal priority, there is no contemporaneous influence on the first variable from others. The second is influenced only by the first while the third is influenced by the first and second variables.

4.1. Selecting variables for the model

Because we wish to examine the transmission mechanism of monetary policy to the real economy, the policy variable should be a measure of the policy stance. In their work, Bernanke and Blinder (1990) found that the Federal Funds rate (or the spread between that rate and some market rate) records shocks to the supply of bank reserves, making it their preferred choice as a monetary-policy variable for the United States. For Canada, MKTG (1994) tried three variables: the overnight loan rate; the spread between the overnight rate and yield on government bonds of ten years and over; and a quantity measure – excess reserves in the banking system.[14] MKTG also included the yield curve or term spread as a measure of the transmission of monetary policy.

We followed MKTG by using a term spread, which we defined as the difference between the 3-month Treasury Bill rate and the yield on 10-year and over government bonds (*shortlesslong*).[15] But we diverged from their work by employing the term spread in a dual role, both as a measure of the stance of monetary policy and as a measure indicating the existence of the monetary channel. This allowed us to obtain the dynamic response of the economy to monetary policy.

The selection of non-policy variables should provide information about the transmission mechanism of policy and the impact on the economy. That involves the "credit channel" variables examined in Section 3:

- the spread between the yields on prime corporate paper and Government of Canada 3-month Treasury Bills (*shortriskspread*);[16]

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[13] More precisely, they assume no feedback from non-policy variables to policy actions within the period (see also Bernanke and Blinder, 1990). Alternatively, one could assume no feedback in the long-run to the real economy from policy variables because monetary policy is neutral.

[14] One might argue that an interest-rate term is unacceptable as a monetary policy variable because interest rates are affected by changes in policy and in demand. But one may simply assume that short run fluctuations in the "monetary term" are dominated by the changes in policy rather than non-policy variables.

[15] MKTG used the overnight rate for the short rate in the term spread. We preferred to use the T-Bill rate because of changes in the official use of the overnight rate over the estimation period.

[16] It is interesting to note here that Bernanke (1990) found the short risk spread in the United States to be an indicator of the stance of monetary policy more so than a measure of the credit channel.

- the spread between the banks' prime lending rate and the yield on 3-month Treasury Bills (*primbillspread*) to again focus on the role of chartered banks in the credit channel of the monetary policy transmission mechanism;[17]

- the spread between the yields on long-term corporate bonds and Government of Canada bonds of 10-years and over (*longriskspread*);

- bank loans' share of short-term business credit. As this term abruptly declined in the early 1980s (Chart 4), a Hodrick-Prescott filter was applied and the gap between the actual and filtered measures was used (*gapblratio*).

The first measure of economic activity was the annualized growth rate in real business output at factor cost (*pcbusgdp*). This activity measure is preferred to total real GDP at factor cost (used by MKTG) because government output is less sensitive to changes in monetary policy or to a credit crunch. But a credit channel could influence real business investment, the focus of Gertler, Hubbard and Kashyap (1990). Thus, a second measure was growth in real business investment in plant and equipment (*pcinvestment*). A third option is the inclusion of two activity variables together, *pcinvestment* and growth in the other components of real GDP (*pcnoninvestment*).

5. Empirical results for real GDP growth of the business sector

Quarterly observations were used beginning in 1974, as we preferred to exclude the period prior to that because large movements in the risk spread in those years had more to do with institutional changes than with a credit channel. When examined for a unit root at the 5% level of significance using the augmented Dickey-Fuller and Phillips-Perron tests, all variables were found to be stationary (although there was uncertainty about the long-risk spread). The evidence suggested 4 as an appropriate number of lags.[18] The estimation period then was from the first quarter of 1975 to the first quarter of 2000.

5.1. Causality tests

The results of pairwise Granger causality tests are presented in Table 1. The term spread variable significantly Granger-causes other interest-rate spreads, except the short-risk spread, and GDP growth, generally consistent with the money and credit views of monetary policy. Among the other indicators of the credit channel, only the credit-mix term causes (in a Granger sense) real economic activity while the influence of the risk-

[17] The unusually large negative spread seen in September 1992 (Chart 2) was largely revised away by making the September prime rate equal to the rate on the first Wednesday in October.

[18] The tests on lag length were not definitive. The Schwarz criterion suggested one lag; but it tends to a parsimonious lag structure. The Akaike information criterion (AIC) declined to a local minimum at 5 lags and then rose until 6 lags and then fell to ever decreasing levels. But, the AIC tends to suggest an overly long lag structure. So 4 lags were used. And since this pattern generally re-appeared in other VARs used in this paper, 4 lags were used throughout this exercise.

Table 1
Critical Values from Granger Causality Tests*

	SHORTLESSLONG causes	PRIMBILLSPREAD causes	SHORTRISKSPREAD causes
SHORTLESSLONG	-	3.215 (0.016)	0.301 (0.876)
PRIMBILLSPREAD	3.450 (0.011)	-	7.617 (0.000)
SHORTRISKSPREAD	0.437 (0.782)	5.635 (0.000)	-
LONGRISKSPREAD	2.753 (0.033)	0.374 (0.827)	3.683 (0.008)
GAPBLRATIO	0.829 (0.510)	1.103 (0.360)	0.674 (0.612)
PCBUSGDP	5.151 (0.001)	1.584 (0.185)	1.809 (0.133)
	LONGRISKSPREAD causes	**GAPBLRATIO causes**	**PCBUSGDP causes**
SHORTLESSLONG	0.495 (0.740)	7.845 (0.000)	5.992 (0.000)
PRIMBILLSPREAD	0.600 (0.663)	2.340 (0.061)	2.553 (0.044)
SHORTRISKSPREAD	1.526 (0.201)	3.468 (0.011)	2.695 (0.035)
LONGRISKSPREAD	-	2.359 (0.059)	0.842 (0.502)
GAPBLRATIO	0.879 (0.479)	-	0.740 (0.567)
PCBUSGDP	0.897 (0.469)	3.072 (0.020)	-

* Significance levels in parentheses

spread variables is marginal. We also note that the prime-bill spread significantly Granger-causes the short-risk spread and the short-risk spread significantly causes (in a Granger sense) the prime-bill spread and the long-risk spread, which suggests that a "combination" of the risk-spread variables may influence real economic activity, perhaps through the "broad" credit channel. Finally, it is worth noting that the prime-bill spread, the credit mix and GDP growth all significantly Granger-cause the term spread.

5.2. Impulse response functions

A six-equation VAR was estimated and identified with the following ordering: *shortlesslong*, *primbillspread*, *shortriskspread*, *longriskspread*, *gapblratio*, and *pcbusgdp*.[19] The easiest way to present the results of a VAR is to examine impulse response functions. When innovations of one standard deviation are introduced, the

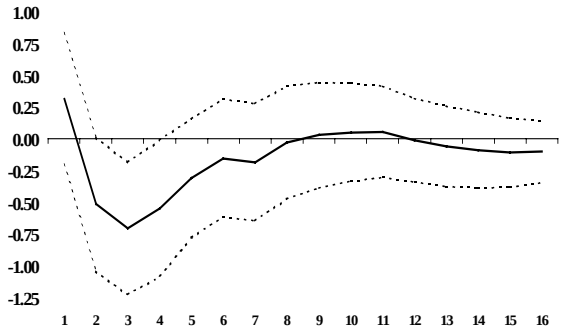
[19] We tested the sensitivity of the results; but different orderings did not greatly change them.

impulse response functions trace the effect on the current and future values of the endogenous variables. Chart 6 (on page 22) shows the impulse response functions for shocks to all variables.

Innovation to the term spread variable

With an innovation in the term spread (an increase in the short rate raises the term spread), the prime rate increases to (more than) offset the rise in short rates and the prime-bill spread widens for about two years. Both short- and long-risk spreads generally rise but not significantly. The share of bank loans is higher for about the first year and then falls below the level it otherwise would have achieved during the second and third years, although not significantly. Growth in business output declines significantly after two quarters and remains lower than its initial value for about two years (Chart 6a).

Chart 6a
Response of real GDP growth to a monetary policy shock



Response to one standard deviation shock +/- 2 standard errors

The results suggest monetary policy temporarily affects the real economy. The initial impact during the first four quarters is mostly through the monetary channel. But there appears to be a credit channel as well, or at least one cannot rule out its existence. All risk spreads increase and the banks' share of business credit declines in the medium term. This implies the credit channel occurs with a lag, consistent with findings in the United States that bank loans adjust downward after six months (Bernanke and Blinder, 1990) and in Canada (Barker and Lafleur, 1994) that banks slowly adjust their portfolios.[20]

Innovation to the spread between the Prime and the T-Bill rates

In general, the direction of movements in this variable supports the existence of both a monetary and a credit channel, with noticeable impacts on the short-risk spread and economic growth. But the effects are more or less trivial, suggesting that the prime-bill spread may not be a useful indicator of the credit channel.[21]

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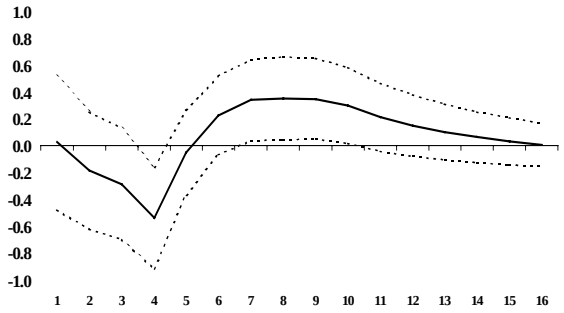
[20] The initial rise in the share of bank loans may reflect a slower response by banks because they see loans as quasi-contractual commitments. They wait for loans to mature rather than calling them while those issuing commercial paper simply leave the market. Thus, the share of credit from bank loans adjusts down later as banks cut-off some customers who then use the commercial paper market to obtain financing.

[21] This may be because the prime rate is for the best borrowers and those dependent on banks for credit may not be in that group.

Innovations to short-risk and long-risk spreads

Shocks to the short- and the long-risk spreads produce similar dynamic effects on the other variables of the model, although the effects of the long-risk spread are slightly more pronounced. In general, the results support the existence of a "broad" credit channel in financial markets and might be suggestive of occasional credit crunches at work. Moreover, they indicate that the monetary authority often responds to credit tightening in financial markets by loosening monetary policy.

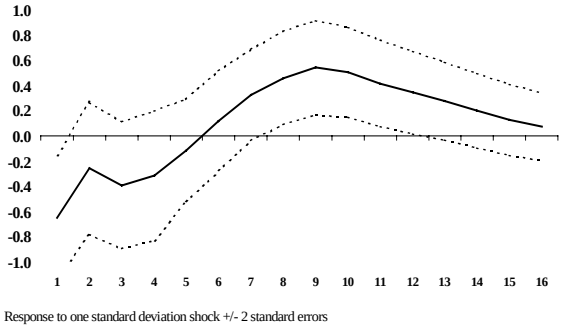
Chart 6b
Response of real GDP growth to a shock to the short risk spread



Response to one standard deviation shock +/- 2 standard errors

A shock to the risk spreads between corporate securities and government securities significantly *increases* the share of bank loans in the business credit mix, likely reflecting the reduction in the supply of credit in financial markets, and the resulting increase in the demand for bank loans. The initial rise in the risk spreads slows growth during the first year (Charts 6b and 6c), but the easing of monetary policy facilitates a return to higher economic growth in subsequent years.

Chart 6c
Response of real GDP growth to a shock to the long risk spread

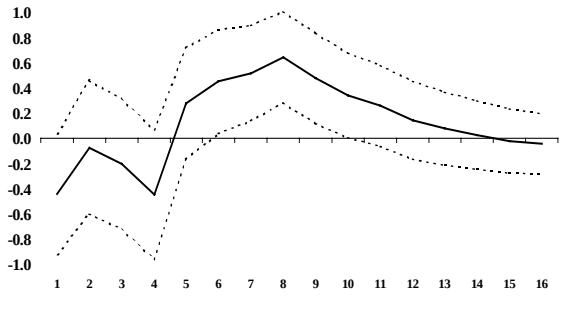


Response to one standard deviation shock +/- 2 standard errors

Innovation to the credit mix

An innovation to the share of banks in total short-term business credit yields significant declines in the spread between short and long rates (the indicator of monetary policy). Real business output growth declines in the first year, but eventually the growth rate rises significantly (Chart 6d). A positive shock to the credit mix appears to reflect an expansionary monetary policy, which is consistent with the credit channel for monetary policy. Moreover, declines in the risk spreads are consistent with the credit view, although they seem to occur with a relatively long lag.

Chart 6d
Response of real GDP growth to a shock to the bank loan ratio



Response to one standard deviation shock +/- 2 standard errors

Innovation to economic growth

A shock to the growth rate of business output raises short-term interest rates, consistent with the monetary authority having moved to reduce the inflationary effect of higher output growth at least sometimes during the period examined. The prime-bill spread, the two risk spreads and the share of banks in business credit do not react significantly to the shock. These results suggest that credit variables do not react much to aggregate demand shocks but they do indicate that monetary policy at least sometimes reacts to those shocks.

5.3. Variance decomposition

A variance decomposition breaks down the variations in endogenous variables into their component shocks. Table 2 (pages 18 and 19) shows the results found with the model described in the previous section.

The variance decomposition indicates that monetary policy (the term spread), the long-risk spread and the credit mix have noticeable effects on real business output growth (Table 2f). This provides support for the existence of both a monetary channel (the indicator for monetary policy has an important impact) and a credit channel for monetary policy (the credit mix has an important impact) and the "broader" view of the credit channel through financial markets (the long-risk spread has an important effect). Moreover, these four variables have strong effects on one another, as shown in Tables 2a, 2d and 2e.

The prime-bill spread has very little effect on output growth and a limited impact on the other variables in the system; but the short-risk spread has some effect on the other risk spreads and thus can influence real economic activity indirectly.

Three other credit-mix terms were tried in the VAR: (i) the change in the share of bank loans in total short-term business credit; (ii) the change in the net flow of business credit as a percentage of nominal GDP; and (iii) the change in the ratio of the sum of short-term intermediated lending and bankers' acceptances to the total of short-term credit to businesses. This is a variation of the MKTG measure.[22] When used, the importance of the "narrow" credit channel of monetary policy is reduced while that of the monetary channel generally is enhanced and the "broad" credit view is generally maintained. This is evident in the variance decompositions of growth in business output in Tables 3, 4 and 5. Clearly, the choice of the credit-mix term matters if one wants to identify a role for the credit channel.

[22] The ratio is short-term business credit excluding commercial paper divided by short-term business credit. MKTG found this term and all but one of their other variables to be I(1). They also found a co-integrated relationship among their I(1) variables, making a vector error-correction model (VECM) appropriate. But since we do not use cointegration techniques in this paper, we use the first difference of the MKTG ratio.

6. Empirical results for components of real GDP

To investigate further the role of the monetary and the credit channels, total real GDP was divided into business investment and all else (including inventory accumulation).[23] Growth rates were calculated for both terms and both were used as activity variables (*pcinvestment* and *pcnoninvestment*) in the VAR model. But before discussing these results, a few comments are necessary.

First, growth in real business profits (calculated by deflating nominal profits by the implicit price index for GDP) - *pcrealprofits* - was included in the VAR since profits likely influence the pace of investment. In particular, according to the credit channel, higher profits might reduce the liquidity constraints of firms and contribute to higher investment (See Schaller, 1993).

Further, since the short-term interest rate spreads, *primbillspread* and *shortriskspread*, rarely showed direct significance on real economic activity, separate VARs were run excluding one or both of these terms. Generally, that reduced the importance of the measure of the "broader" credit channel, the long-risk spread. In particular, whether or not the short-risk spread was included mattered for the importance of the long-term spread. In the results discussed below, the short- and the long-risk spreads are included, but *primbillspread* is not.

Variance decompositions for *pcinvestment* and *pcnoninvestment* (the two activity variables) are given in Tables 6 and 7.[24] The results show the yield curve (the measure of the monetary channel of monetary policy) is important for non-investment activity but not for investment growth, while the measure of the "broader" credit channel is important for investment growth but not for the other activity variable.[25] Also, the results indicate that the measure for the credit channel in monetary policy (the banks' share of business credit) is important for growth in both investment and the other activity variable (with inventory accumulation possibly significantly affected). Shocks to profits and aggregate demand also influence investment, with the importance of the variables not dependent upon ordering. Overall, investment growth is mostly affected by the long-risk spread, the credit-mix term and profit growth, while the non-investment activity term is influenced by the yield curve and the credit mix.

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[23] In this section, the credit-mix term is limited to the use of *gapblratio*.

[24] The results of the impulse response functions (Chart 7) are not discussed in detail in this section.

[25] Growth in the other activity variable initially rose significantly after a monetary tightening before dropping (Chart 7 on page 23). This is consistent with Thurlow (1994). In his model, inventory increases initially when monetary policy is tightened. And this is consistent with the existence of a credit channel.

7. Conclusions

The purpose of this study was to examine the role of the monetary and credit channels in real output movements in Canada. In particular, the objective was to determine whether or not the data indicate that a significant credit channel exists. Overall, the results tend to support the notion that the transmission of monetary policy to the real economy comes through both the monetary channel and the credit channel. The impulse response functions in the VAR and the variance decompositions of output show significant roles for both the monetary and credit channel variables; that is the yield curve (or spread between long- and short-term interest rates) and the bank share of business credit appear to have important effects on real economic activity. Moreover, the long-risk spread (the difference in yields between corporate and government long bonds) that represents a "broader" view of the credit channel is found to be important. The other two variables examined (the yield spreads between corporate and government short-term securities and the difference between the prime rate at banks and the yield on short-term T-Bills) do not appear to have significant effects in this system, but the short-risk spread seems to move with the long-risk spread and thus also captures the impact of the "broad" credit channel.

There is also evidence that the "broad" credit channel, represented by the long-risk spread and by the growth rate of corporate profits, is important for investment growth but not other forms of economic activity while the yield curve (the measure of the monetary channel of monetary policy) has the opposite effect, being important for growth in the non-investment economic activity term but not for investment growth. Also, the credit channel of monetary policy, when measured by our credit-mix term, seems to be an important explanatory factor in the growth of both investment and non-investment economic activity.

It could be argued that some of the results were influenced by data problems that have not been adequately resolved. For example, the share of commercial paper and banker's acceptances in total short-term business credit clearly has been affected by institutional developments, such as the entry of foreign banks into Canada. And perhaps the Hodrick-Prescott filter did not adequately capture these developments. Other measures of the credit channel for monetary policy do not reveal an important role for that channel.

Further, it has been argued (Racette, Raynauld and Sigouin, 1994) that the globalization of financial markets should be taken into account if possible. The openness of the Canadian economy and the access to foreign credit markets makes the information from Canadian interest rate levels and spreads less relevant because funds are available internationally. This might have caused some of the results from our empirical analysis to be less conclusive than otherwise.

Table 2
Variance decompositions

Table 2a
Variance decomposition of monetary policy (shortlesslong)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	100.000	0.000	0.000	0.000	0.000	0.000
2	74.740	5.871	0.072	0.066	12.399	6.852
4	64.127	4.619	0.965	1.914	15.043	13.332
6	52.904	5.841	2.446	5.600	19.636	13.574
8	44.492	6.064	3.623	11.680	21.647	12.495
10	41.019	5.699	4.449	15.212	21.729	11.892
12	39.924	5.553	4.580	16.798	21.329	11.817
14	39.604	5.631	4.542	17.178	21.065	11.979
16	39.438	5.811	4.511	17.122	21.027	12.092

Table 2b
Variance decomposition of prime-bill spread

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	4.149	95.851	0.000	0.000	0.000	0.000
2	2.824	84.419	3.980	2.096	3.943	2.738
4	5.629	69.870	12.786	2.541	5.311	3.862
6	7.576	66.109	12.868	2.630	6.043	4.774
8	7.619	65.720	12.746	2.632	6.180	5.104
10	7.697	65.235	12.675	3.137	6.198	5.058
12	8.094	64.523	12.582	3.434	6.186	5.181
14	8.326	63.949	12.453	3.454	6.557	5.263
16	8.371	63.433	12.344	3.486	7.082	5.285

Table 2c
Variance decomposition of the short-risk spread

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	3.615	4.893	91.492	0.000	0.000	0.000
2	2.794	4.401	90.398	0.278	0.237	1.891
4	3.674	8.314	79.521	0.863	0.551	7.076
6	4.188	7.585	71.563	3.229	6.721	6.714
8	4.033	7.204	67.948	6.906	7.530	6.379
10	3.926	7.016	66.276	8.665	7.907	6.210
12	3.867	7.039	65.225	9.894	7.797	6.178
14	3.863	7.210	64.820	10.105	7.810	6.192
16	3.842	7.412	64.417	10.060	8.093	6.177

Table 2d

Variance decomposition of long-risk spread

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	1.038	0.000	0.308	98.654	0.000	0.000
2	0.678	0.038	3.916	94.549	0.006	0.813
4	1.308	0.428	11.550	83.464	1.437	1.813
6	5.303	0.639	11.820	73.256	6.729	2.253
8	6.451	1.612	10.567	65.061	13.909	2.401
10	6.060	2.673	9.699	59.561	19.686	2.321
12	5.654	3.009	9.275	56.981	22.717	2.366
14	5.561	2.875	9.224	56.293	23.474	2.574
16	5.657	2.742	9.109	56.429	23.175	2.889

Table 2e

Variance decomposition of the credit mix (gapblratio)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	0.198	0.140	7.437	0.693	91.532	0.000
2	2.042	0.260	10.857	10.391	75.522	0.928
4	1.582	1.064	10.942	23.031	61.547	1.835
6	1.844	1.219	9.852	29.502	55.722	1.861
8	2.734	1.759	9.374	31.450	52.043	2.640
10	3.388	2.345	9.024	31.999	49.764	3.479
12	3.558	2.967	8.833	31.908	48.882	3.851
14	3.535	3.437	8.739	31.597	48.762	3.930
16	3.513	3.721	8.687	31.291	48.891	3.897

Table 2f

Variance decomposition of economic growth (pcbusgdp)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix	Growth in output
1	1.442	5.901	0.009	6.148	2.834	83.665
2	4.581	5.250	0.439	6.184	2.534	81.012
4	12.091	4.521	4.219	7.718	4.607	66.843
6	12.315	4.776	4.406	7.385	6.943	64.174
8	10.939	6.454	5.800	9.029	11.672	56.106
10	9.960	6.687	6.842	12.356	13.193	50.961
12	9.633	6.666	7.096	14.052	13.370	49.183
14	9.601	6.599	7.113	14.724	13.257	48.706
16	9.703	6.658	7.077	14.791	13.193	48.577

Table 3

Variance decomposition of economic growth (pcbusgdp)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix*	Growth in output
1	1.991	5.955	0.102	6.240	3.112	82.600
2	4.420	5.304	0.240	6.212	2.762	81.062
4	16.018	5.087	4.223	6.688	6.818	61.165
6	19.199	6.881	3.996	5.855	6.269	57.800
8	20.568	7.888	4.206	6.580	6.357	54.401
10	20.005	7.878	4.776	7.534	7.431	52.376
12	19.739	7.862	5.088	7.771	7.999	51.540
14	19.596	7.795	5.236	7.971	8.364	51.039
16	19.520	7.755	5.341	8.009	8.613	50.761

*The mix term here was the change in the bank loan share of short-term business credit.

Table 4

Variance decomposition of economic growth (pcbusgdp)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix*	Growth in output
1	0.430	5.965	0.112	8.295	0.037	85.161
2	1.770	5.263	1.148	8.558	1.229	82.031
4	9.645	4.590	3.027	10.298	4.139	68.301
6	14.105	6.015	3.127	9.090	5.779	61.884
8	15.641	8.217	3.711	9.822	5.356	57.253
10	15.180	8.425	4.042	11.669	5.195	55.489
12	15.056	8.403	4.119	12.225	5.183	55.014
14	15.019	8.382	4.117	12.360	5.253	54.868
16	15.014	8.404	4.119	12.364	5.266	54.832

*The mix term here was the change in the net flow of total business credit as a percentage of nominal GDP.

Table 5

Variance decomposition of economic growth (pcbusgdp)

	Short less long	Prime/Bill Spread	Short spread	Long spread	Credit mix*	Growth in output
1	0.442	7.397	0.003	8.841	2.461	80.856
2	2.371	6.104	0.752	9.269	9.759	71.746
4	7.785	6.020	3.891	11.235	11.110	59.959
6	10.220	8.288	3.986	10.099	9.831	57.575
8	12.000	9.019	5.002	11.603	8.761	53.616
10	12.216	9.195	5.320	13.406	8.360	51.503
12	12.149	9.245	5.463	13.888	8.303	50.951
14	12.108	9.210	5.500	14.103	8.339	50.741
16	12.090	9.220	5.515	14.164	8.346	50.665

*The mix term here was the change in intermediated credit plus banker's acceptances as a percentage of total short-term business credit.

Table 6

Variance decomposition of investment growth (pcinvestment)

	Short less long	Short spread	Long spread	Credit mix	Growth in other GDP components	Growth in profits	Growth in investment
1	2.515	2.212	9.073	1.759	8.419	0.489	75.533
2	3.079	3.075	9.843	2.795	15.809	2.473	62.927
4	5.847	2.808	10.109	5.167	12.918	11.458	51.692
6	5.544	3.316	10.849	8.871	12.131	11.152	48.137
8	5.651	3.367	10.600	10.824	11.775	11.055	46.728
10	5.515	3.431	10.608	12.661	11.573	11.041	45.172
12	5.595	3.403	10.787	13.260	11.368	11.247	44.340
14	5.843	3.393	10.895	13.598	11.188	11.336	43.749
16	5.937	3.402	11.007	13.706	11.093	11.435	43.421

The mix term here is *gapblratio*.

Table 7

Variance decomposition of non-investment growth (pcnoninvestment)

	Short less long	Short spread	Long spread	Credit mix	Growth in other GDP components	Growth in profits	Growth in investment
1	7.310	1.018	1.251	0.754	89.667	0.000	0.000
2	7.548	0.875	1.631	0.619	73.422	0.393	15.511
4	17.466	1.374	1.735	5.546	60.107	1.516	12.255
6	17.436	1.566	2.878	6.878	55.514	3.031	12.697
8	16.523	1.915	3.504	8.921	52.156	4.601	12.381
10	15.559	2.487	4.843	10.706	49.770	4.952	11.683
12	15.210	2.655	5.406	11.515	48.639	5.151	11.424
14	15.187	2.699	5.608	11.496	48.459	5.175	11.377
16	15.157	2.697	5.603	11.526	48.479	5.179	11.359

The mix term here is *gapblratio*.

Chart 6: Impulse response functions (Using shortlesslong, primbillspread, shortriskspread, longriskspread, gapblratio, pcbusgdp)

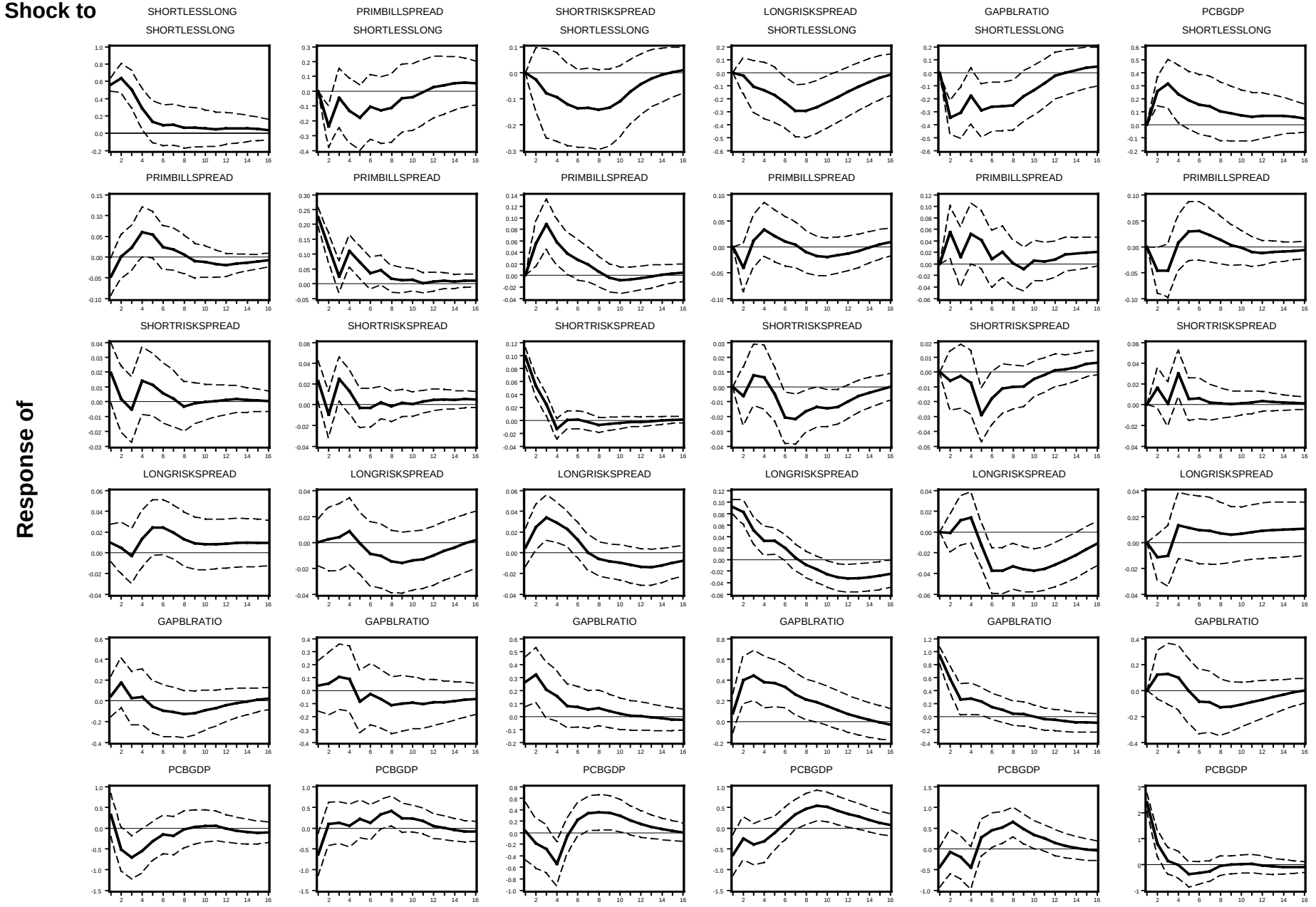
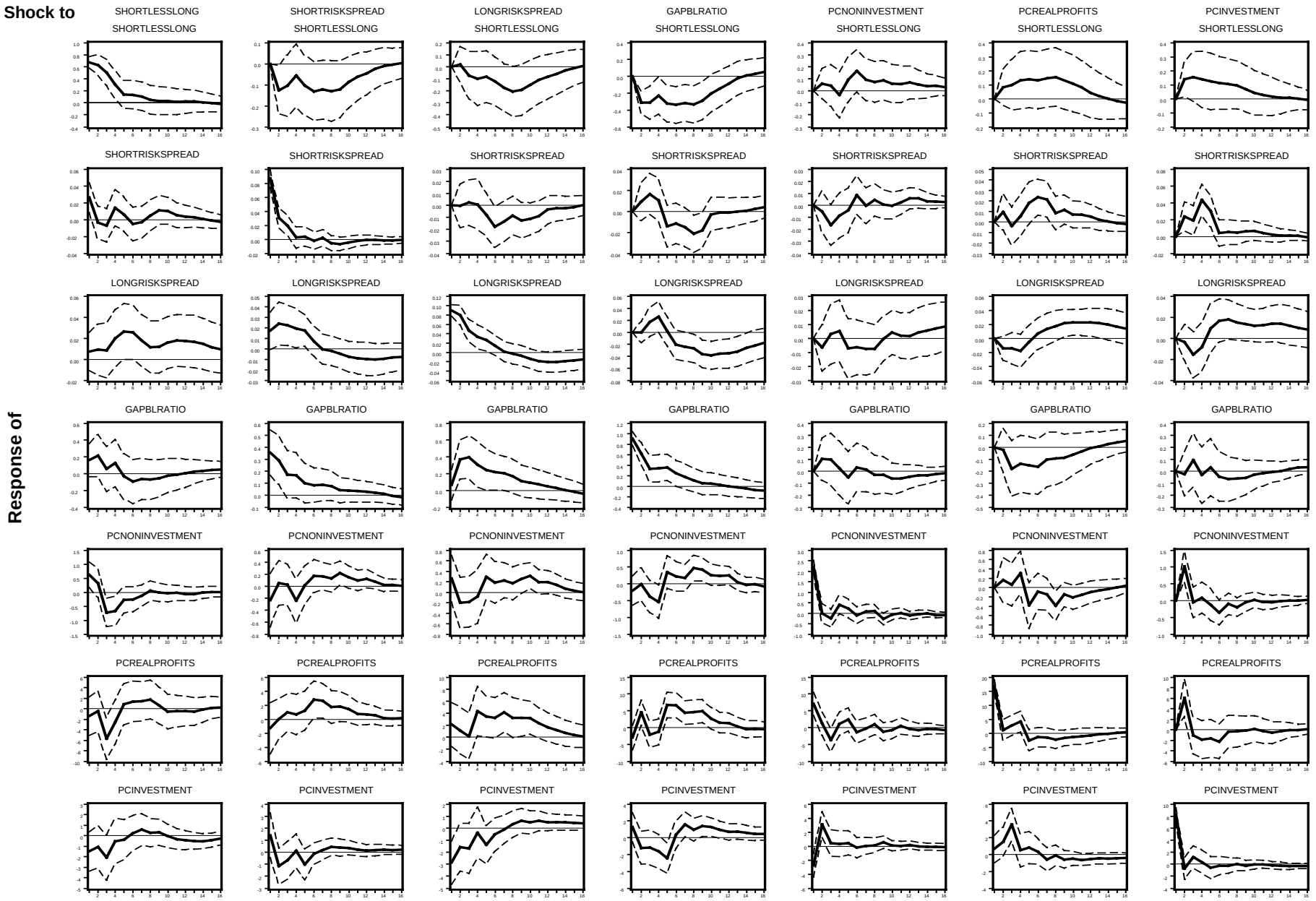


Chart 7: Impulse response functions (Using shortlesslong, shortriskspread, longriskspread, gapblratio, pcnoninvestment, pcrealprofits, pcinvestment)



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