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Does monetary policy lose effectiveness during a credit crunch?

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ABSTRACT

This article investigates the effectiveness of monetary policy during a credit crunch by estimating a vector autoregression on the US economy. We present evidence that interest rate cuts have a diminished impact on growth, due to impairment in the relationship between monetary policy and the supply of intermediated credit.

1. Introduction

Recent events in financial markets have raised concerns about whether monetary policy has lost effectiveness during the ongoing global credit crunch. Although the role of intermediated credit in the monetary transmission mechanism has been examined extensively in the empirical literature, including Kashyap et al. (1993), Morgan (1998), and more recently Lown and Morgan (2006), this paper provides new insights by investigating whether the "credit channel" of monetary policy becomes less effective during periods in which shocks to the financial system impair the process of credit creation, i.e. "credit crunches".

We identify four credit crunches in the US during the past four decades. We test whether the impact of changes in policy rates on GDP growth was more muted during these episodes, by estimating a vector autoregression with four endogenous variables (output, inflation, real interest rates and credit). Our results provide supportive evidence of a weakening in the transmission mechanism, and point to impairment in the relationship between monetary policy and the supply of intermediated credit as the potential cause. We include the currently ongoing credit crunch in our estimation sample in order for our results to be of greater relevance to current events, but it needs mentioning that the current episode represents an incomplete cycle to date.

2. Classification of credit crunches

Following Bernanke and Lown (1991), we define a credit crunch as "a significant leftward shift in the supply curve for bank loans", i.e. a period of declining loan growth which is sharper than expected for the stage of the economic cycle — over and above any decline which can be attributed to falling loan demand and deterioration in borrower quality. Again following Bernanke and Lown (1991), we measure loan growth in nominal terms. What matters is the real value of new credit extensions, which is better approximated by the nominal growth rate of loans outstanding if the effective maturity of loans is relatively long.

Table 1 below compares growth in commercial and industrial (C&I) loans at all commercial banks with GDP growth during six economic downturns experienced in the US over the past four decades. Four of these episodes exhibit significant declines in loan growth relative to GDP growth and thus accord with our definition of a credit crunch: (1) the mid 1970s aftermath of the oil shock, (2) the early 1990s fallout from the Savings and Loans crisis, (3) the early 2000s fallout from the Dotcom Bust, and (4) the current credit crunch. During the two 1980s recessions, however, nominal loan growth remained relatively robust. We get similar results using total loans data, although the declines in loan growth during the credit crunch episodes are less pronounced. As further evidence that our credit crunches are driven by shifts in supply rather than demand for loans, we look at the Fed's Senior Loan Officer (SLO) credit standards series over the relevant periods. Credit standards were tightened more significantly during our four credit crunches compared to the two

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Table 1
Comparison of credit crunch episodes.

Period[a]	Loan growth	GDP growth	Credit standards[b]
1974Q3–76Q2	−2.4	−1.6	77
1979Q3–80Q3	7.6	−1.6	36
1982Q2–83Q2	4.4	−2.1	16
1989Q3–93Q4	−1.9	−1.0	57
2000Q3–04Q2	−5.0	0.7	60
2008Q4–09Q2	−12.9	−2.5	84

[a] We define each period from the onset of slowdown to the onset of recovery in loan growth. Given that in several cases the downturn in loan growth lags the downturn in GDP growth, we measure GDP growth over different start and end points, taking the quarter before growth falls below 0.4 pp to the quarter before it increases above 0.4 pp. All growth rates are calculated as the cumulative growth (pp) over the relevant period expressed at an annualized rate.

[b] We measure the peak in the SLO credit standards series for large firms, constructed as the net percentage balance of banks who tightened credit standards on C&I loans over the past three months.

1980s recessions, both in absolute terms and also relative to the severity of the downturn.

3. Data issues and model estimation

We estimate an unrestricted vector autoregression (VAR) with four endogenous variables, output, inflation, real interest rates and credit, on US quarterly data. Although admittedly simple, this model incorporates the key relationships for a closed macroeconomy. Variables are specified as follows: output (log GDP at constant prices), inflation (first differenced log GDP deflator), real interest rates (Federal Funds effective rate minus inflation rate), and credit (TED spread, defined as the difference between the 3-month Eurodollar deposit rate and the yield on 3-month Treasury bills). GDP and GDP deflator data are taken from the EcoWin database, and Federal Funds, commercial bank loans, SLO credit standards, Eurodollar and Treasury bill interest rates are taken from the Federal Reserve Board database. We estimate over sample period 1972Q2–2009Q2, given that Eurodollar deposit rates were only available from 1971, and 2009Q2 is the latest available data point. Augmented Dickey-Fuller (ADF) tests for unit roots indicated that all variables were non-stationary, hence all were first differenced with the effect that non-stationarity was no longer detected.

For our credit variable we use the TED spread rather than actual loans data — it shows a significant correlation with real loan growth, but we argue that it serves as a cleaner proxy for identifying shifts in the supply of credit. The problem with using actual loan volumes is that these are affected by shifts in loan demand as well as loan supply, for example, during a recession firms and households tend to reduce their demand for credit, resulting in lower lending volumes. Using raw loans data in the VAR could therefore potentially create an endogeneity bias. The TED spread is less prone to this sort of problem. It measures the credit risk premium between an unsecured deposit rate and a government-backed obligation — it is reasonable to assume that such premia are relatively unaffected by shifts in loan demand. Rather, movements in the TED spread are traditionally associated with shocks to the banking system. Such episodes are likely to experience shortages of credit availability, as has happened recently, with banks which have suffered credit losses retrenching from lending in order to replenish their depleted capital. Thus, we argue that the TED spread is more correlated with shifts in loan supply than loan demand.

We test whether monetary policy becomes less effective during a credit crunch by estimating whether the interest rate lag co-efficients in the GDP equation of the VAR become significantly smaller. Interactive dummies are included on all lags; these are set equal to 1 during time intervals denoted as credit crunches. Formally, we test the null $H_0 : \sum_{i=1}^{n} \delta_i^r \leq 0$ against the alternative $H_1 : \sum_{i=1}^{n} \delta_i^r > 0$, where δ_i^r represents the interactive dummies on the interest rate lags in the GDP equation and n denotes the number of lags. Since the interest rate lags are predicted to have negative signs, rejection of the null would imply that the cumulative lagged effect of interest rate changes on GDP growth is significantly smaller during credit crunches, holding constant all other variables. Furthermore, we shed light on whether this effect, if present, can be explained by impairment in the relationship between monetary policy and the supply of intermediated credit. Under normal conditions, one would expect tighter (looser) monetary policy to lead to tighter (looser) credit, through the operation of the credit channel, hence we predict a positive relationship between the Federal Funds rate and the TED spread. We test whether this relationship becomes weaker during credit crunches by testing whether the interest rate lags in the credit equation become significantly smaller, i.e. whether the sum of interest rate dummies is significantly negative.

Time dummies were included to account for the unexplained surge in activity in 1978Q2, and spikes in the TED spread due to financial shocks in 1974Q2–Q3, 1980Q3 and 1987Q4. The credit crunch subsample consists of 47 observations in total: 1973Q4–76Q3, 1990Q1–94Q3, 2000Q4–02Q4 and 2007Q4–09Q2. We believe this is sufficient to give reasonable power to the parameter estimates and avoid small sample bias. In our preferred specification we include four lags of each variable (Lagrange Multiplier (LM) tests for autocorrelation suggest this is sufficient), but re-estimate using three and five lags for robustness.

4. Results

Table 2 reports the main results of the VAR estimations. The results show consistent evidence of attenuation in the impact of interest rate changes on GDP growth in the credit crunch subsample. The sum of interest rate dummies in the GDP equation is positive, economically significant and statistically significant at the 1% level for all lag specifications. The results also show evidence of impairment in the relationship between monetary policy and credit, with the sum of dummy co-efficients in the credit equation being negative and highly significant in all three specifications. The results are robust to extending and shortening the start and end dates of each crunch period by one quarter. We also re-estimate using the SLO credit standards series for the credit variable. The findings on the relationship between interest rates and GDP growth remain robust, but the relationship between interest rates and credit becomes weaker, with the dummies in the credit equation retaining the correct sign but becoming less significant (Lown and Morgan (2006) suggest that alternative measures to the Federal Funds rate might be

Table 2
Sums of VAR dummy co-efficients.

Dependent variable	(1)	(2)	(3)	(4)	(5)
GDP	6.14 (.000)	3.32 (.002)	5.29 (.000)	2.51 (.012)	3.54 (.003)
Credit	−2.45 (.003)	−2.92 (.000)	−2.80 (.003)	−0.04 (.476)	−1.55 (.037)

The table reports the sum of co-efficients on the dummies on interest rate lags in the GDP and credit equations. In brackets we report the p-value of a one-tailed Wald test on whether the sum of dummy co-efficients is significantly greater (less) than zero in the GDP (credit) equation. The first three columns refer to the original VAR estimation with four, three, and five lags respectively. Column (4) reports the results extending the credit crunch subsample to include the 1980s recessions (1979Q4–80Q3 and 1982Q3–83Q2), with 4 lags. Column (5) reports the results truncating the sample at 1990Q1, with 3 lags.

appropriate in uncovering the relationship between monetary policy and credit standards).

In order to investigate the possibility that the results are picking up asymmetric effects of interest rates during booms and recessions, as opposed to the impact of credit crunches, we also re-estimate including the two 1980s recessions in the credit crunch subsample. In the preferred specification with four lags, the sum of interest rate dummies in the GDP equation does become smaller (halving in size), but remains statistically significant. Furthermore, the sum of interest rate dummies in the credit equation is no longer statistically significant. These results suggest that the weakness in the transmission mechanism is being driven by two different effects: a “credit crunch” effect and a “recession” effect.

It also needs mentioning that the possibility of structural change within our estimation period might affect the results. For example, McConnell and Perez-Quiros (2000) find evidence of a structural break in output volatility in the 1980s, and argue that models estimated over periods which span the break point are potentially misspecified. However, we do not explicitly allow for this (and other potential) breaks in our VAR estimation, as to do so would reduce degrees of freedom in our (already constrained) credit crunch subsample and thus make it more difficult to identify the effects of interest.

A related concern is that, given that three of our four credit crunches occur post 1990, one might argue that our results are picking up recent improvements in monetary policy-making, for which Cecchetti et al. (2006) find supportive evidence. If pre-emptive changes in interest rates lead to smaller output fluctuations, then the observed impact of interest rates on GDP might appear smaller. However, re-estimating post 1990 (the break point chosen in Cecchetti et al. (2006)), and including only 3 lags in order to conserve degrees of freedom in the reduced sample size, the results appear relatively robust. The dummies retain the correct signs, and are of a similar magnitude in the GDP equation, but become smaller (although still significant at the 5% level) in the credit equation.

5. Conclusions

This paper tests whether the impact of cuts in policy rates on GDP growth has been more muted during episodes of shortages of credit in the US economy, by estimating a simple vector autoregression on key macroeconomic aggregates. We find that the impact of policy rate cuts on GDP growth becomes diminished, and the relationship between policy rates and credit becomes weaker. Our results suggest that monetary policy becomes less effective during a credit crunch, but also suggest that the weakness in the transmission mechanism is being driven by two different effects: a “credit crunch” effect and a “recession” effect. However, an attempt to disentangle these two effects is beyond the scope of the present article and is left for future work.

Although we do not investigate the specific mechanisms through which the credit channel becomes impaired, one possible explanation is based on Adrian and Shin (2008). Shocks to the banking system which result in depletion of capital can lead banks to retrench from lending, in order to adjust down their leverage ratios. Consequently, cuts in policy rates could be absorbed into banks' margins during the process of balance sheet restructuring, and thus have a diminished impact on the real economy. A more aggressive monetary policy response would therefore be warranted, combined with a potential role for fiscal stabilisation.

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