Credit and Crises

January 30, 2017

Aims of the research

1. Explore the relations between financial variables and standard macro time series, trying to establish "stylized facts".

2. Heading off the emergence of a spurious "stylized fact": credit growth predicts recession

Aims of the research

1. Explore the relations between financial variables and standard macro time series, trying to establish "stylized facts".

2. Heading off the emergence of a spurious "stylized fact": credit growth predicts recession

Methods

- multiple-equation,
- Bayesian,
- and weakly structural.

Why multiple equation?: Isolating monetary policy effects

We know monetary policy has effects on output and prices, and it may work in part through placing stress on the financial system. If we are reliably to locate independently arising financial stress, we need at least two shocks and equations.

Why multiple equation?: Positive links between credit and growth

- "Financial depth" is treated as a predictor of growth in development regressions.

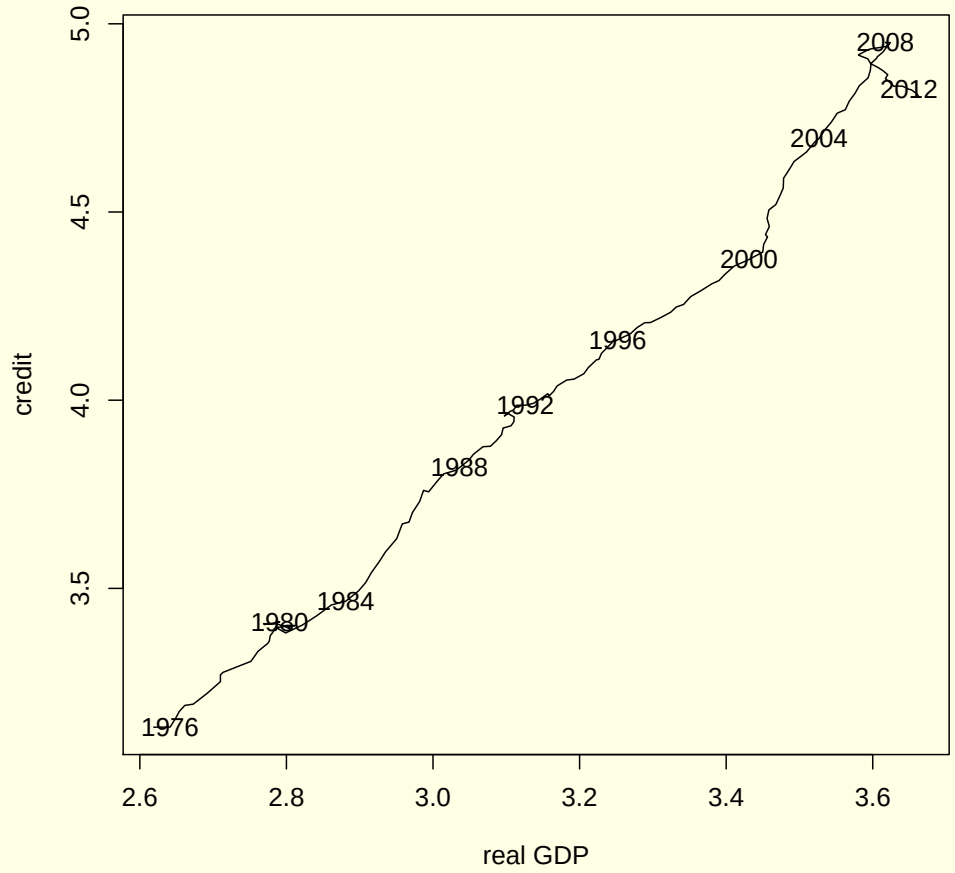
Why multiple equation?: Positive links between credit and growth

- "Financial depth" is treated as a predictor of growth in development regressions.
- Over long spans of time, credit grows relative to gdp as gdp increases.

Why multiple equation?: Positive links between credit and growth

- "Financial depth" is treated as a predictor of growth in development regressions.
- Over long spans of time, credit grows relative to gdp as gdp increases.
- Countries with high gdp per capita tend to have high credit/gdp.

US real GDP and household credit (BIS quarterly `aha`)



Negative links between credit and growth

- Standard loan contracts are simple, easily verifiable, when the borrower can repay.

Negative links between credit and growth

- Standard loan contracts are simple, easily verifiable, when the borrower can repay.

- When the borrower can't repay, they throw ownership of assets into an uncertain state, to be resolved by an expensive and slow process, which hurts economic efficiency.

Negative links between credit and growth

- Standard loan contracts are simple, easily verifiable, when the borrower can repay.
- When the borrower can't repay, they throw ownership of assets into an uncertain state, to be resolved by an expensive and slow process, which hurts economic efficiency.
- Credit expansion might be associated with increased gross exposures, so that the risk of chains of loan contracts defaulting at once is increased.

How feedbacks affect policy issues

- Credit is not in itself bad, clearly, so policy that simply inhibits credit growth is a mistake.

How feedbacks affect policy issues

- Credit is not in itself bad, clearly, so policy that simply inhibits credit growth is a mistake.

- If policy-induced interest rate increases do inhibit credit growth (which seems likely), this does not mean interest rate increases are a good idea once it is clear that the financial system has become unstable.

How feedbacks affect policy issues

- Credit is not in itself bad, clearly, so policy that simply inhibits credit growth is a mistake.
- If policy-induced interest rate increases do inhibit credit growth (which seems likely), this does not mean interest rate increases are a good idea once it is clear that the financial system has become unstable.
- Increasing interest rates in response to credit growth while the system still seems stable amounts to simply inhibiting credit growth.

How feedbacks affect policy issues

- Credit is not in itself bad, clearly, so policy that simply inhibits credit growth is a mistake.
- If policy-induced interest rate increases do inhibit credit growth (which seems likely), this does not mean interest rate increases are a good idea once it is clear that the financial system has become unstable.
- Increasing interest rates in response to credit growth while the system still seems stable amounts to simply inhibiting credit growth.

Empirical negative links between credit and growth

1. Schularick and Taylor AER
2. Jorda-Schularick-Taylor
3. Mian-Sufi-Werner
4. BIS work on this, much if it by Claudio Borio

Some reasons I'm not fully convinced

- Except for Mian-Sufi-Werner, this work filters outcomes via a "crisis" classification scheme.

Some reasons I'm not fully convinced

- Except for Mian-Sufi-Werner, this work filters outcomes via a "crisis" classification scheme.
- They rely mainly on single-equation methods, mostly with a single "forecast horizon".
- MSW also use a panel VAR, but only with 3 variables — two credit quantity variables and gdp growth, no interest rates.

Credit and output: The need for a multiple equation approach

- Because the relation between credit and real activity is likely to have a different sign, according to what frequency or what source of disturbance to the economy we examine, any analysis useful for policy must take a multi-equation approach and address identification issues.

Credit and output: The need for a multiple equation approach

- Because the relation between credit and real activity is likely to have a different sign, according to what frequency or what source of disturbance to the economy we examine, any analysis useful for policy must take a multi-equation approach and address identification issues.

- This situation is similar to that in the 1970's and 80's when monetarists wielding single equations claimed policy-generated variation in money growth drove the business cycle.

Credit and output: The need for a multiple equation approach

- Because the relation between credit and real activity is likely to have a different sign, according to what frequency or what source of disturbance to the economy we examine, any analysis useful for policy must take a multi-equation approach and address identification issues.

- This situation is similar to that in the 1970's and 80's when monetarists wielding single equations claimed policy-generated variation in money growth drove the business cycle.

- We got this correctly sorted out only by recognizing the endogeneity of M and the need to separate policy-generated changes in r from other sources of variation in r.

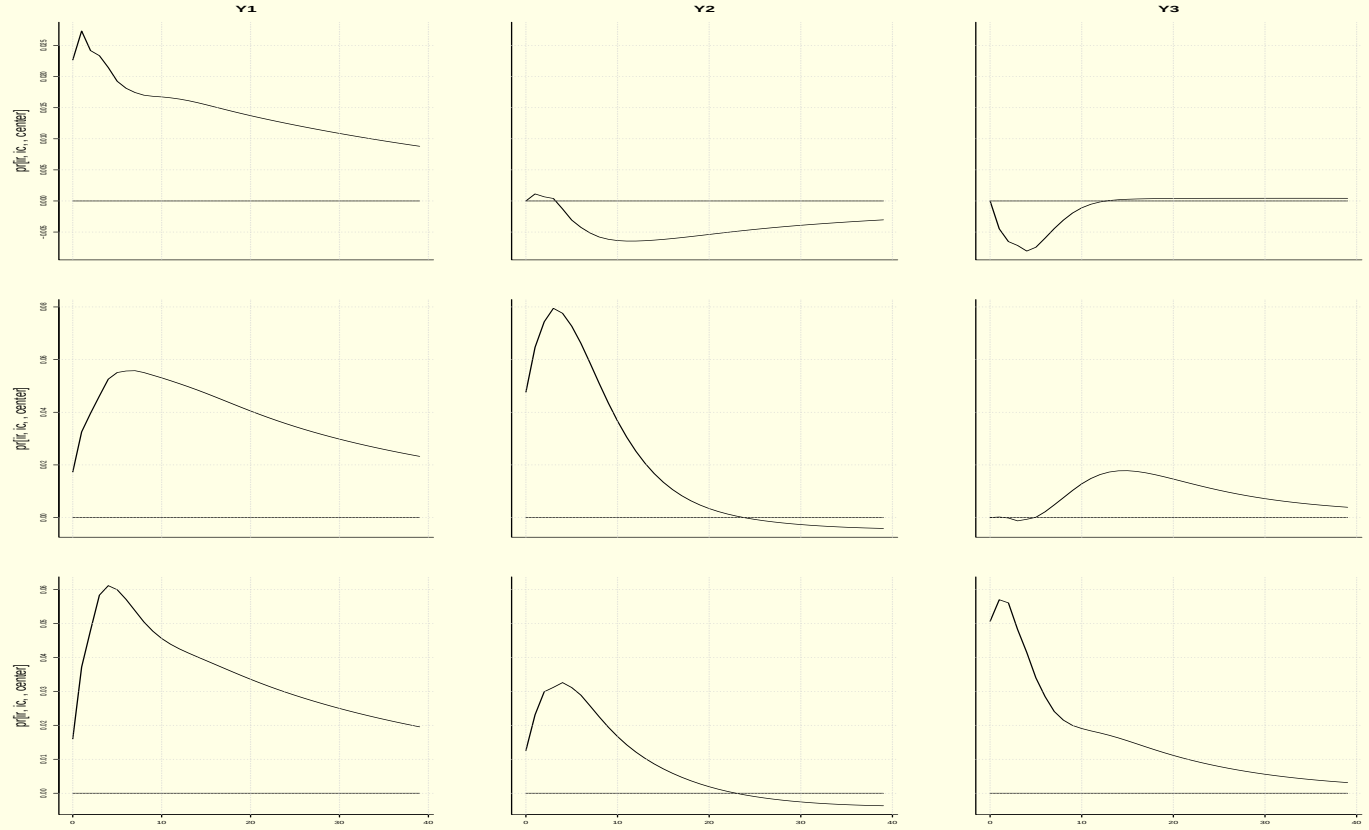
Why "semi-structural"

- DSGE's are story-telling devices; we know less restrictive models fit better.
- They're better than RBC or old Keynesian models, because they are formulated as explicit multivariate time series models that can be compared in fit to structural VAR's.
- SVAR's came first: DSGE's were built to match SVAR results.

DSGE limitations

- But they don't fit as well as SVAR's.
- We don't really believe the stories they tell. (e.g., K, I, C, L, W and P are fictions)
- They are awkward tools when, as now, we are uncertain as to whether and how we should be expanding the list of variables that enter our macro models.

A puzzle: Mian-Sufi-Verner results


irf's with logs of rgdp, aha, ana, no Turkey
Y1
Y2
Y3
phi[ic, , center]
phi[ic, , center]
phi[ic, , center]

Equations

$$A(L)y_i(t) = c_i + \Lambda_i^{-1}\varepsilon_i(t)$$

$y_i(t)$ $n \times 1$; $\varepsilon_i(t) \sim N(0, I)$, i.i.d.; Λ_i diagonal; sum of diagonal elements of Λ over i is a vector of 1's.

$A^{-1}(L)\Lambda_i$ represents impulse responses for country i, while $A^{-1}(L)$ by itself is a kind of harmonic average impulse response.

Identification through heteroskedasticity

Under the (strong) assumption that all differences across countries are captured in the c_i and Λ_i parameters, so long as there are even as many as two countries across which the ratios of the diagonals of Λ_i are all different, the system — and hence the responses to the structural shocks $\varepsilon_i(t)$, are identified.

We have to supply the names of the responses ourselves, but the quantitative decomposition of disturbances into independent sources of variation is unique.

We are relying on the idea that different countries have different relative sizes of disturbances to monetary policy, financial stability, productivity, fiscal disturbances, etc.

Identification through heteroskedasticity

- This is not "identification by sign restrictions on impulse responses". That does not produce exact identification, even in large samples.

Identification through heteroskedasticity

- This is not "identification by sign restrictions on impulse responses". That does not produce exact identification, even in large samples.

- Of course this may be too good to be true. It remains to be seen how well it works in practice.

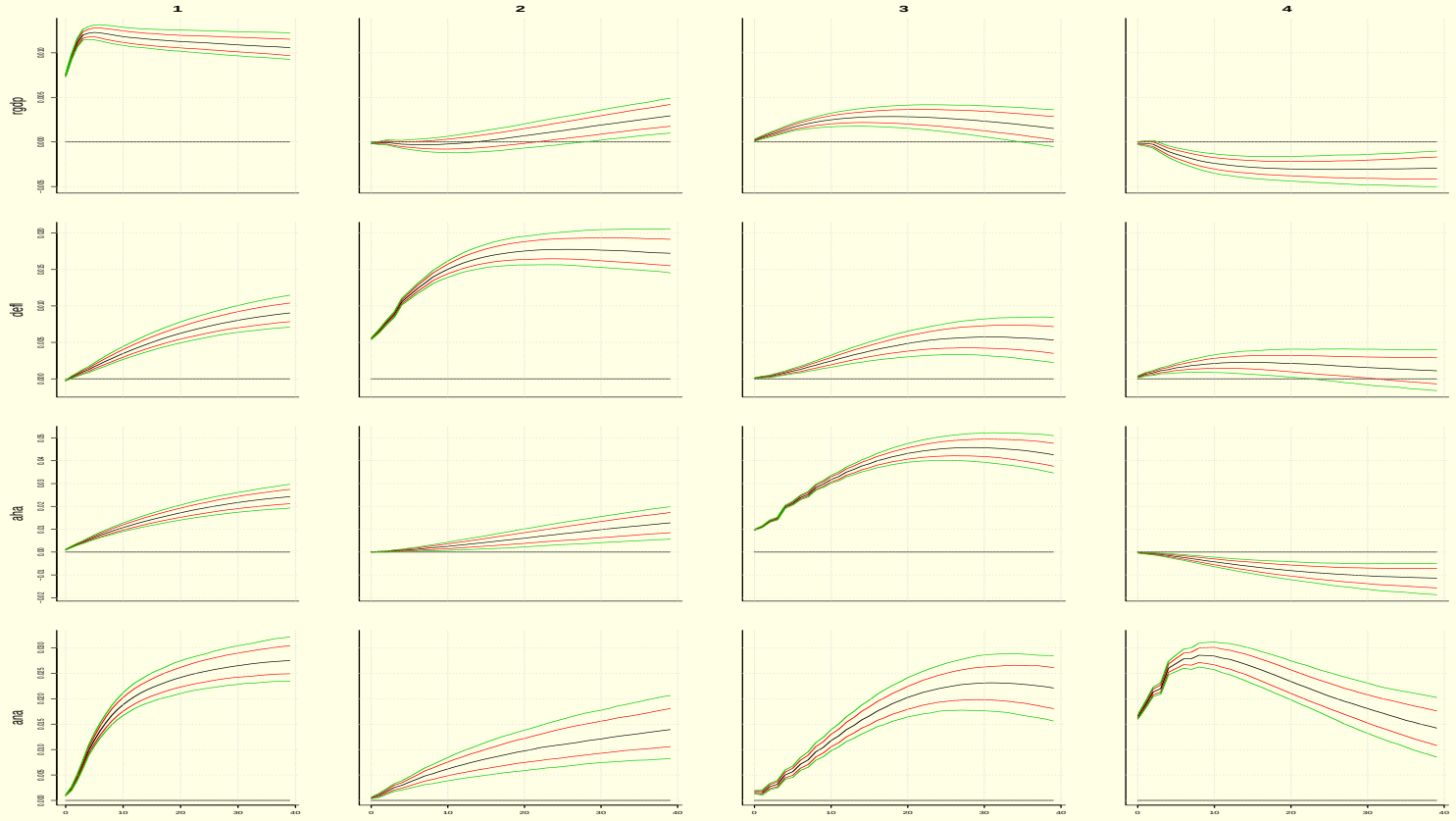
Identification proof

$$\Sigma_1 = A^{-1}\Lambda_1(A')^{-1}\,, \qquad \Sigma_2 = A^{-1}\Lambda_2(A')^{-1}$$
$$\therefore \Sigma_1^{-1}\Sigma_2 = A'\Lambda_1^{-1}\Lambda_2(A')^{-1}$$

This last matrix has the columns of A' as eigenvectors and the diagonal of $\Lambda_1^{-1}\Lambda_2$ as eigenvalues. As long as the diagonal elements of $\Lambda_1^{-1}\Lambda_2$ are all distinct, the columns of A' (rows of A) are uniquely determined up to their ordering.

CAS semi-replication with prior, quarterly data, ID through heteroskedasticity

Modal responses to shocks, 30 countries



Remarks on the replication

- The variables are real gdp and nominal credit to households and to firms, all logged.
- A positive and persistent shock to prices would increase the nominal credit variables, generate a restrictive monetary policy response, and thereby dampen GDP growth.
- In MSV's original VAR, ratios of the credit variables to nominal GDP are used, which are not directly affected by inflation.
- But as we'll see, credit-to-gdp ratios do rise with a shock that generates inflation and subsequent monetary contraction.

The data

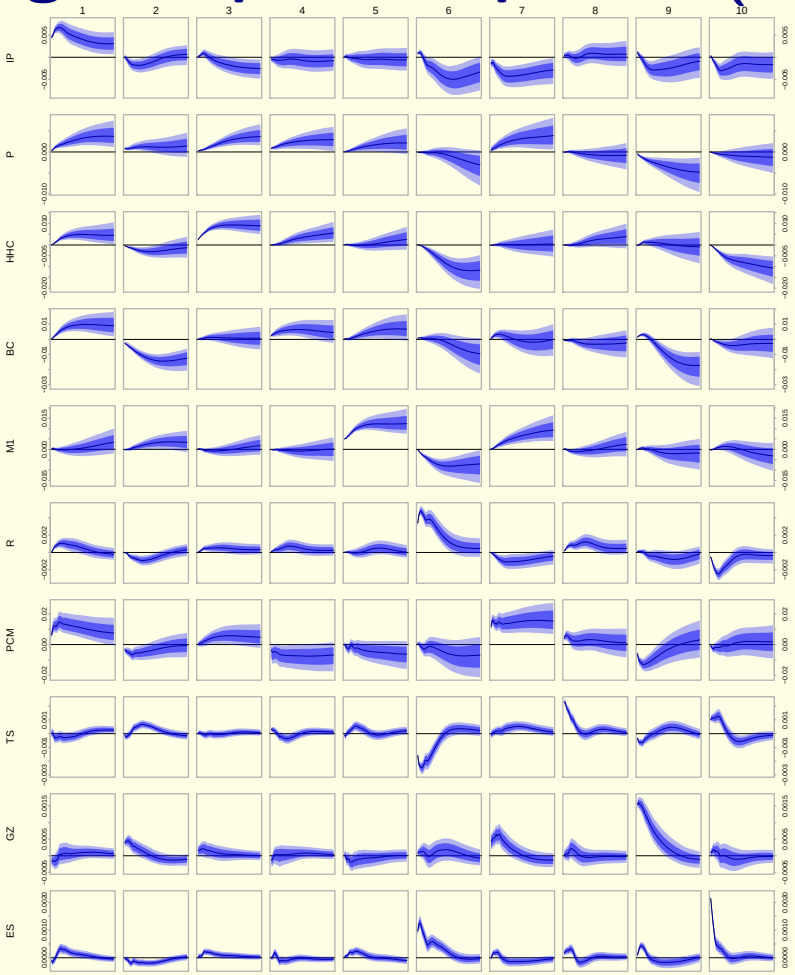
Abbv.	Description
IP	Industrial production
P	Personal consumption expenditures price index
HHC	Sum of commercial bank real estate and consumer loans
BC	Commercial bank commercial & industrial loans
M1	M1 money supply
R	Federal funds rate
PCM	CRB/BLS spot (commodity) price index
TS	Term spread of 10 year over 3 month Treasuries
GZ	Gilchrist/Zakrajšek bond spread
ES	"TED spread" of 3-month Eurodollars over 3 month Treasuries

Monthly, January 1973 to June 2015

Prespecified break dates

	Start	End	Description
1	Jan 1973	Sep 1979	Oil crisis, stagflation, and Burns Fed
2	Oct 1979	Dec 1982	Volcker disinflation
3	Jan 1983	Dec 1989	Recovery from Reagan recession
4	Jan 1990	Dec 2007	Great Moderation, Greenspan Fed
5	Jan 2008	Dec 2010	Great Recession
6	Jan 2011	Jun 2015	Zero Lower Bound, Recovery from Great Recession

"Average" impulse responses (t errors)



Comments on the responses

- There's a clear monetary policy shock (column 6)
- There are two "financial stress" shocks, with different impacts (9-10)
- There is one "household credit" shock (3) that raises household credit and is associated with a modest, statistically significant, later decline in output.
- Shock 3 is a relatively small contributor to GDP variance, and even to household credit variance. All other shocks that move household credit much move output in the same direction.

Fitting only through 2007?

Leaves impulse responses very similar, particular the aspects singled out for discussion in the last slide.

It does shift the responses of PCM (commodity prices) to the monetary policy and GZ spread shocks, perhaps because the identification of monetary policy shocks is distorted by the ZLB period.

Whisker plots?

Conclusion

- Financial stress does have an impact on inflation and growth.
- Financial stress is not one-dimensional.
- Surprise credit expansion ahead of output growth does predict later contraction, but this effect is modest.
- Identification through heteroskedasticity works surprisingly well.