Lecture 5
Monetary policy and financial stability

Rhys Bidder

KBS/QCGBF

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Financial frictions

Financial frictions

- Before discussing monetary policy's effect on financial stability, we need models that take the financial sector seriously
- These models are explicit about 'frictions' that lead to market failures and explain why the financial markets we observe today take the form that they do
- Once we move abandon Econ 101 'classical' models (no frictions and market outcomes are always efficient), we enter a jungle!

Every happy family is the same but every unhappy family is unhappy in its own way

- Tom Sargent (adapting Leo Tolstoy)

Classical models without distortions

Classical models with no distortions or market failures $\Rightarrow$ everything is 'simple'

- Even the *existence* of banks and other financial intermediaries, isn't strictly necessary
  - Whether a bank, a non-financial firm, or investment project gets funding, is simply a question of cash-flows, discounted at a rate invariant to the source of funding
  - A 'good' project or firm would get funding even if this required external finance, or if health of the firm (captured by 'net worth') was parlous
  - Even if a firm has not been profitable in the past (has little 'net worth' to contribute), a good project would still get funding

- Models of this simplicity have little to say about the richness of the economy - and financial sector - that we observe in reality
  - The Modigliani-Miller result is an example of this indeterminacy
  - Financial sector is a 'veil' over the real underpinnings of the economy

Importance of financial frictions to macro models

Why emphasize these rather abstract points?

- Unless we model the endogenous formation of the financial sector, we are cannot really hope to model how monetary policy interacts with and influences it
- Walsh has an **excellent** discussion on these points - Ch. 10 (section 10.6 onwards)

Important models of financial frictions were developed prior to the GFC

- But most macro models treated the financial sector, as an afterthought
- Financial regulation was focused on 'microprudential' policy, rather than envisaging banks as part of the broader economy ('macroprudential')

Key sources of financial frictions

Financial frictions models emphasize:

- Informational asymmetries (unknown/costly observed types, behavior or outcomes)
  - Is this a good firm or entrepreneur or project?
  - How has the project performed / how much profit is there to be divided
  - Will the manager or entrepreneur or bank behave as the (external) investor would wish?

- Regulatory distortions
  - Perceived support for 'too big to fail' institutions
  - Deposit insurance?
  - Unintended consequences from imperfect risk-weighting

We will focus on the former (and leave the latter to Prof. Aikman!)

Key implications of models with financial frictions

Themes that emerge in such models:

- Source of funding matters
  - Internal funds are cheaper than external funds (borrowing from banks, markets are expensive)
  - Some firms may have limited access to funds (no market access, dependence on banks)
- Net worth matters (from accumulated profits, retained earnings)
  - Allows firms to have 'skin in the game' when seeking external finance
  - Good projects at good firms may not be funded if they lack net worth
  - This doesn't only apply to non-financial firms!
- Credit might be rationed
  - Those who want credit are unable to get it
  - Even if willing to pay higher rates / accept tighter conditions
- Effect of shocks (incl. mon. pol. shocks) can be changed, amplified
  - Much richer variety of transmission channels for CBs to consider
  - Can be very state dependent (dynamics in normal times may be v. different from those in crises)

BG (1995) model

We examine a simplified version (see Freixas and Rochet (2008)) of a framework developed in Bernanke and Gertler (1995)

- Bernanke and Gertler (1995) are examples of profs who were emphasizing the importance of the financial sector (banks especially) in monetary transmission
  - Big focus of Bernanke's work is the Great Depression
- This model shows how collateral constraints (which arise from deeper financial frictions) might influence the impact of interest rate changes
  - Collateral may be required to alleviate a lack of trust, originating from asymmetries of information
  - The simple model points to several important channels that appear in richer frameworks
  - External finance premium, role of wealth, impact of asset price variations...

BG (1995) model - Perfect financial markets

- A firm produces output, y, with input, x, according to production function f

$$y = f(x)$$

- Normalize price of output to be equal to 1 unit of inputs
- We are laying out a real model - though ultimately such a model can be incorporated in monetary models
- The firm needs a loan, L, to supplement its wealth, W, in funding the purchase of inputs

$$x = L + W$$

- The gross interest rate on the loan is R

BG (1995) model - Perfect financial markets

In this context, 'perfect' means that there are no collateral constraints

- Implicitly, we should think of this as a world where there were no deeper frictions ('primitives') that would have necessitated collateral as part of an optimal contracting framework

Then the firm's problem is simple

$$\max_{L} f(L + W) - R \cdot L$$

BG (1995) model - Perfect financial markets

Differentiate with respect to L and set equal to zero (first order condition)

$$f'(L+W) = R$$

So we have

$$L = g(R) - W$$

where g is the inverse of f (i.e. $g(f(x)) \equiv x$)

We don't really have to specify what f is, other than the fact it's an increasing function

- Often production functions are chosen to be increasing, but at a decreasing rate so f' is positive, but declining towards zero
- f' is the **marginal product** of the input x in our case
- A common example would be $f(x) = x^{\alpha}$ for $0 < \alpha < 1$

BG (1995) model - Perfect financial markets

$$L = g(R) - W$$

The key point is that the sum of L and W depend only on the interest rate

- Since W is already pre-determined, the loan is a residual
- R determines (via the optimality condition) the scale of operation
- If the firm already has a lot (little) of W then they need a small (large) loan
- But the scale of operation - the amount of input and thus output - is unrelated to W

So, to the extent that monetary policy influences R, the transmission to output is unaffected by the health of the firm (W)

BG (1995) model - Imperfect financial markets

Imagine an extreme degree of informational asymmetry means that banks will only lend if the loan is fully collateralized

- Suppose the loan must satisfy

$$R \cdot L \leq q \cdot K$$

  where q is the price of capital ('machines') in the market, and K is the amount of capital the firm possesses
- Collateral must cover principal plus interest

BG (1995) model - Imperfect financial markets

The firm's problem then becomes

$$\max_{L} f(L + W) - R \cdot L$$

subject to

$$L \leq \frac{q \cdot K}{R}$$

Now - we will use the concept of a Lagrangian to solve this problem

- You don't need to know how to do this!
- It is a convenient way of deriving first order conditions in optimization problems subject to constraints
- There are various guides on the web

BG (1995) model - Imperfect financial markets

In the Lagrangian approach, the solution of the problem involves an extra variable, λ - the 'Lagrange multiplier' that captures **'how binding'** is the constraint

- Binding in the sense of reducing the maximized value of your objective (in this case, profit))
- If the value of capital is so enormous that $\frac{q \cdot K}{R}$ is way above the L one would choose in the perfect, then the constraint isn't binding (and $\lambda = 0$)
- If the constraint does bind, then $\lambda > 0$ indicates how much more 'profit' you could get if you were to be able to slightly loosen the constraint
- Sometimes it's referred to as the shadow **price** of the constraint (as it captures what you would **pay**, on the margin, to relax it)

BG (1995) model - Imperfect financial markets

Optimality (i.e. profit maximization) requires

$$f'(L + W) = R + \lambda$$

We assume the world is such that the constraint is binding, so $\lambda > 0$ and

$$R \cdot L = q \cdot K$$

Combining these, we have

$$f'\left(\frac{q \cdot K}{R} + W\right) = R + \lambda > R$$

BG (1995) model - Imperfect financial markets

We had a condition determining the 'unconstrained' scale of operation in the 'perfect markets case', x_U

$$f'(\underbrace{L+W}_{x^U}) = R$$

and now - with frictions - we have an 'constrained' optimal scale, x_C

$$f'\left(\underbrace{\frac{q \cdot K}{R} + W}_{x^C}\right) = R + \lambda$$

- Effectively λ captures the price / cost of the collateral constraint - see that it enters the expression like a higher cost of funding or **external finance premium**
- Given our assumptions on f this means $x^C < x^U$

BG (1995) model - Imperfect financial markets

$$f'\left(\frac{q \cdot K}{R} + W\right) = R + \lambda$$

There are more insights to glean from this expression:

- Firstly, qK actually appear to begin with
  - They weren't even relevant in the absence of collateral constraints
- Reductions in qK (from a drop in asset prices, q, or from, theft/natural disaster hitting K) will be associated with a reduction in the loan amount
  - Recall, the constraint is binding, so L drops 1:1 with value of capital
  - Flip side is a higher λ
- Alternatively expressed, the FOC implies $L = G(R + \lambda) - W$
  - Since W is fixed, the response of L to R is the same as response of x
  - More complicated transmission of monetary policy (than in earlier case)
  - Especially if q is affected by changes in R (likely in a richer model)

Financial accelerator

$$f'\left(\frac{q \cdot K}{R} + W\right) = R + \lambda$$

Even more insights to glean from this expression...

- If firm net worth (W) deteriorates, then the amount of funding and scale of inputs will also (1:1)
  - $x = L + W$ and L is assumed to be pinned by collateral value
  - Note that the funding wedge (λ) will rise also
- We see the scope for feedbacks and the 'financial accelerator'
  - Imagine that investments unlock future profitable opportunities
  - May raise the value of capital today and (relatedly) profits in the future, leading to greater W in the future
  - Relaxes constraint today, and elicits persistent movements (cycles) in borrowing capacity
  - **Dark side:** What happens when there is a damaging shock?

The inverse relationship of the external finance premium and the financial condition of borrowers creates a channel through which otherwise short-lived economic shocks may have long-lasting effects. In the hypothetical case that Gertler and I analyzed, an increase in productivity that improves the cash flows and balance sheet positions of firms leads in turn to lower external finance premiums in subsequent periods, which extends the expansion as firms are induced to continue investing even after the initial productivity shock has dissipated.

This 'financial accelerator' effect applies in principle to any shock that affects borrower balance sheets or cash flows. The concept is useful in that it can help to explain the persistence and amplitude of cyclical fluctuations in a modern economy.

- Ben Bernanke (2007)

Financial accelerator

See also the seminal work of Kiyotaki and Moore (1997)

- Covered nicely in Walsh Ch. 10 (section 10.7.1)

Risk-taking channel of monetary policy

According to a growing stream of opinion, the 2007 financial crisis originated from misincentives in the financial markets leading to excessive leverage and risk-taking by financial institutions. High liquidity and persistently low interest rates, combined with lenient bank supervision, allegedly induced banks to finance an increasing volume of risky assets — largely in the real estate sector — by means of cheap short-term funding.

- Angeloni and Faia - JEDC (2015)

Risk-taking channel of monetary policy

There are a few mechanisms that comprise the RTC, the key ones being:

- Search for yield in response to lower rates
- Effects on valuations, income and balance sheet risk measures

Search for yield

Search for yield is associated with investment that takes on 'excessive' risk out of desperation to hit a certain targeted return

- An important primitive is an **environment of low rates**
- If all rates decline and spreads remain unchanged, then returns previously 'promised' contractually or which have become regarded as 'normal' become harder to generate
- Elicits a substitution of investments (especially managed investments) towards assets with higher spreads - to offset the effect of lower risk free rates on overall portfolio returns

Search for yield

Extra demand for risky assets allowed greater amounts of risky projects (narrowed spreads at which funds could be raised)

- Arguably also manifested within 'supposedly' riskless assets (according to regulators and credit raters)
- People started investing in 'AAA' MBS etc. to get the slightly higher yield ('chasing yield')

The risk wasn't necessarily purely 'credit' risk

- Lower rates could induce a movement towards longer maturity, less liquid assets and projects
- Liquidity mismatches may have intensified as a result
- See Ajello et al (2022 for a good conceptual survey

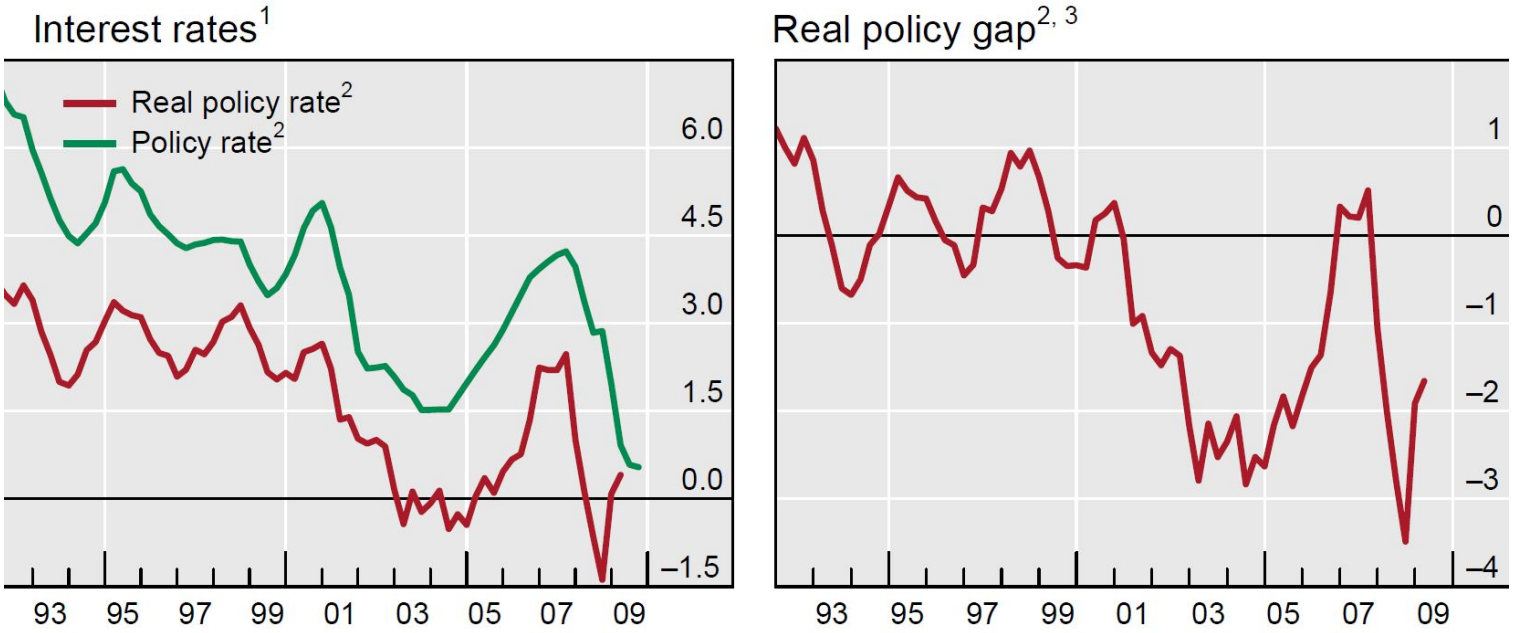
The inertia in nominal targets at a time of lower interest rates may reflect a number of factors. Some are psychological, such as money illusion: investors may ignore the fact that nominal interest rates may decline to compensate for lower inflation. Others may reflect institutional or regulatory constraints. For example, life insurance companies and pension funds typically manage their assets with reference to their liabilities. In some countries, liabilities are linked to a minimum guaranteed nominal rate of return or returns reflecting long-term actuarial assumptions rather than the current level of yields.

- Gambacorta (2009)

Search for yield - empirical evidence

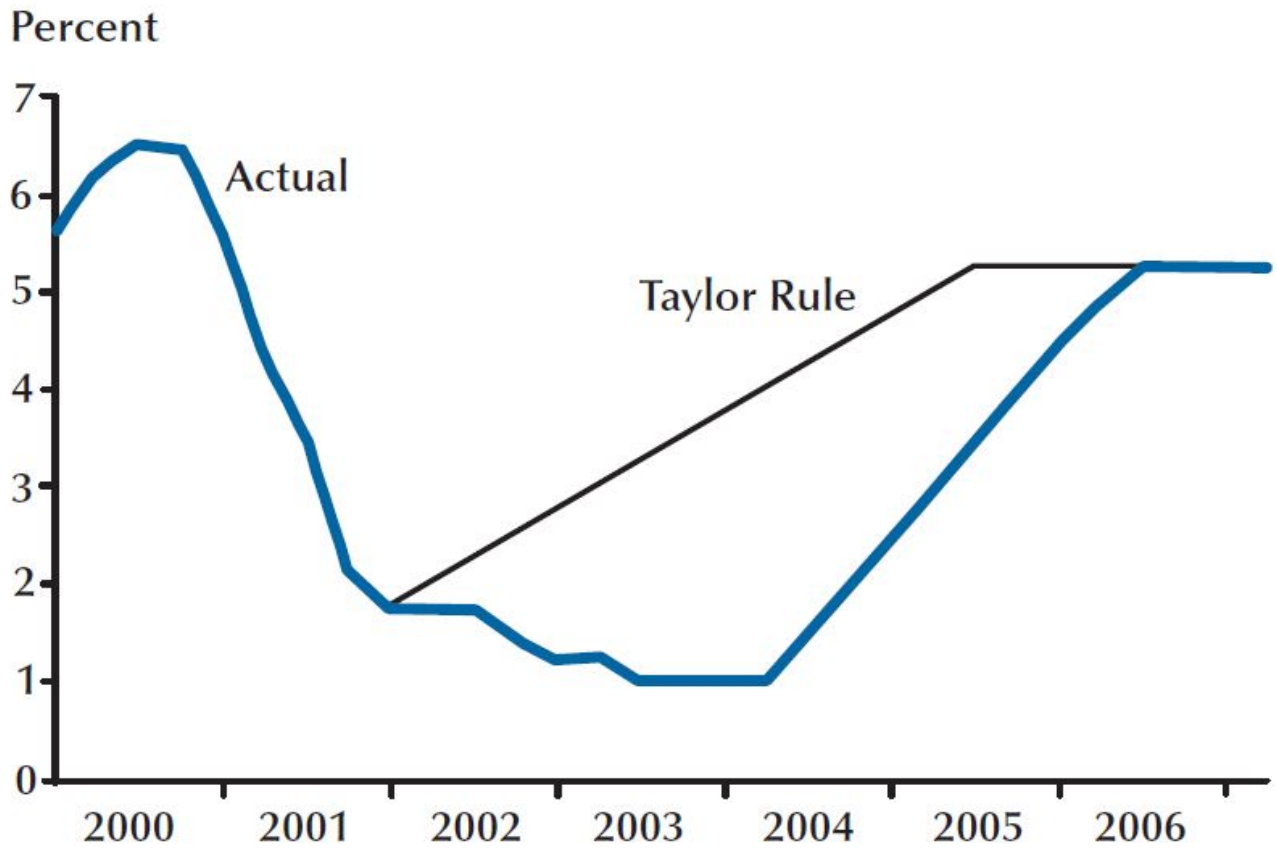
The story is plausible and fits in with what we have already discussed about r^* and the 'success' of inflation targeting

- Riskless rates declined (for various reason), as did inflation, in the period leading up to the GFC
- Some might argue (see John Taylor) that policy errors exacerbated the decline in rates - pushing them even lower
- Evidence that banks loosened credit standards and funds sought riskier asset classes
- However, it is difficult to separate the role of CBs from the general impact of declining real rates and inflation
- See Boyarchenko et al (2022) for an empirical survey accompanying Ajello et al (2022)



2 Weighted average of major OECD countries, based on 2005 GDP and PPP exchange rates. 3 Real policy rate minus natural rate. The real rate is the nominal rate adjusted for four-quarter consumer price inflation. The natural rate is defined as the average real rate in 1985–2000 (for Japan, 1985–95; for Switzerland, 2000–05) plus the four-quarter growth in potential output less its long-term average, in percentage points. Source: Gambacorta (2009)

- *Side note:* Unclear how much this 2009 analysis allowed for a declining natural rate (might exaggerate the gaps)



Deviations from Taylor rule. Source: Taylor (2010)

Monetary policy's effect on 'risk measures'

Low rates and a willingness to loosen policy in downturns (or to ease market disruption), can interact with some of the financial frictions and VaR-based stories we have discussed (above and in pre-rec)

- Can start a financial accelerator
  - Inflating prices of assets used as collateral
  - Promoting accumulation of net worth (is this a bad thing?)
- Stability in markets from plentiful liquidity and cheap financing can help reduce day-to-day volatility
  - Feeds into VaR models estimate on historical data
  - Can lead to greater leverage of intermediaries, helping stimulate investment and asset prices (recall VaR rules)
- Perceived 'Too-Big-To-Fail' status and the 'Fed Put' removed tail risk
  - Leads to an endogenous change in behavior *ex ante*
  - Why some (e.g. Mervyn King) were so concerned with bailouts promoting moral hazard

Lean vs clean

Lean vs clean

Simple expression of the 'lean vs clean' debate (see the Mishkin (2011))

- Should central banks **'lean against the wind'** and tighten policy in response to financial stability concerns (more than medium-term inflation prospects would suggest)?
- Or should they focus on inflation and 'clean up' after any financial disruption occurs

Financial cycles ('boom and bust') operate at a lower frequency than standard business cycles

- Slow build-up, before sudden crises (with slow recoveries)
- Inflation targeters are usually focused at 2 year horizons

Lean vs clean

Why **not** lean against the wind?

- One tool (interest rate) one target (inflation)
- If other variables are targeted, then intuitively the main targeted variable may be less well controlled
- There are *already* difficult tradeoffs between inflation and real activity even before considering responding to asset prices
- Some models suggest that the cost of tight policy in normal times (lower output, investment) might offset cost savings from trying to prevent financial crises
- Difficult to identify bubbles anyway!

See Bernanke and Gertler (2001) and Svensson (2018) for classic and more recent 'clean not lean' analyses

Lean vs clean

Maybe the most obvious argument against 'lean' is that we have other bodies tasked with promoting financial stability

- Note: Here I am identifying central banks with 'monetary authority' but, of course, many central banks also have FS departments

Why not leave the job to financial regulators and the regulations they generate?

Lean vs clean

Financial regulation is always failing!

- It is hard to deal with **known** risks in regulated institutions
- It is **even harder** to deal with **new and unknown** risks - especially if they emerge from opaque and unregulated sectors
- If we rely on regulations then the chances are that loopholes will be exploited and ultimately lead to a new type of crisis
- *'This time is different'*

Jeremy Stein (an especially brilliant Fed governor) has identified monetary policy as an important element of robust 'financial' policy, given these concerns

Lean vs clean

[W]hile monetary policy may not be quite the right tool for the job, it has one important advantage relative to supervision and regulation–namely that it gets in all of the cracks. The one thing that a commercial bank, a broker-dealer, an offshore hedge fund, and a special purpose ABCP vehicle have in common is that they all face the same set of market interest rates. To the extent that market rates exert an influence on risk appetite, or on the incentives to engage in maturity transformation, changes in rates may reach into corners of the market that supervision and regulation cannot.

- Jeremy Stein (2013)

Lean vs clean

Another reason that the GFC has shifted (somewhat) in favor of 'lean' is concern about ZLB and price stability

- Obviously, low inflation is not *right now* the main concern
- But during (and for several years after) the GFC, the concern was that inflation was 'too low'
- With low r^* and in the case of *financial* recessions, it may be quite hard to satisfy the price stability mandate
- So even an inflation targeter - with a long enough horizon - should be worried about financial fragility (recall John Williams' arguments for FAIT)