Money and Banking

- Lectures in weeks 1 to 4 focus on practical aspects of monetary policy
  - banks and the transmission of monetary policy
  - tools and targets for monetary policy
  - the inflation tax and hyperinflation
  - long rates and the yield curve
  - unconventional monetary policy since 2009

- Lectures by Richard Mash and James Forder focus on more theoretical topics

The Monetary Transmission Mechanism

• Monetary transmission in macro, e.g. *IS-PC-MR* model

– central bank raises interest rates

– banks pass this on to private sector (because higher CB deposit rate increases opp cost of private lending)

– rate rise discourages *C, I, NX*

• But this passive view of banks fails to explain

– 1% rise in CB interest rate causing banks to raise retail and corporate rates more than 1%

– differences in strength of monetary transmission across states (tightening vs loosening of policy), time (booms vs recessions) and firms/households (large vs small)

Banks and monetary transmission

• 2 main perspectives on how banks contribute to the key features of monetary transmission

• First, narrow lending/credit channel (a.k.a. bank lending channel) $\longrightarrow$ tight policy forces banks to shift from cheap funding to expensive funding

• Second, broad lending/credit channel (a.k.a. financial accelerator) $\longrightarrow$ tight policy increases wedge between cheap and costly sources of bank funding

• Other perspectives. Monetary policy can
– force banks towards regulatory capital limits at which they must limit their lending
– influence banks' risk attitudes

Approach to understanding these theories

• First build up some background in three key areas
– activities of banks as financial intermediaries
– importance of the inter-bank reserve market (access point for central bank)
– spectrum of funding costs on liability side of bank balance sheet

• With these ideas in hand, move to different theories of monetary transmission and their empirical assessment

Banks as financial intermediaries

• Banks transform liabilities (deposits, debt and equity) into assets (loans, security investments (bonds), cash (reserves))

• On liability side, deposits are cheapest source of bank funding, then debt, then equity (more on this funding hierarchy later)
– NOTE: Cost of equity is approx $\frac{dividend}{share\ price}$

• On the asset side, loans most risky, then bonds, then cash reserves

Banks as financial intermediaries

• Banks engage in short-term funding (esp. deposits) and long-term lending (e.g. 25 year mortgages), so always susceptible to cash flow problems

– reserve or liquidity ratio $\frac{reserves}{deposits}$ held at a level to minimize such problems

• Assets on balance sheet risky. Suppose all assets funded from deposits and debt. Then any asset going bad means bank is bust. So a fraction of assets must be funded from equity (roughly, the bank shareholders' own money) which can absorb losses

– regulators monitor $\frac{equity\ capital}{risk\ weighted\ assets}$

A very simplified bank balance sheet

ASSETS	=	LIABILITIES
Loans return = retail lending rate		Deposits cost = retail deposit rate
Securities return typically gov bond yield (lately also, yield on asset backed securities)		Debt (bank bonds) cost = yield paid on bonds
Reserves return = central bank deposit rate		Equity capital (s'holder funds) cost ≈ dividend/share price

Regulating the banks

- Maturity mis-match (short liabilities vs long assets) implies cash flow shocks
  - so target min reserve or liquidity ratio, **reserves/deposits**

- Risky assets (principally loans, to some extent securities) may go bad and cause insolvency
  - so target min capital ratio, **equity capital/risk weighted assets**

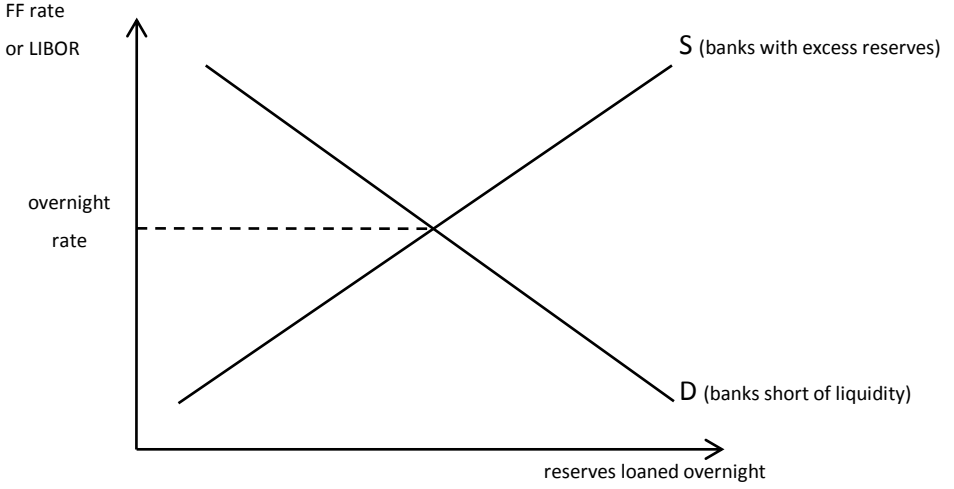
The reserve market

• Banks hold reserves as a liquidity buffer, but reserves the lowest yielding asset $\Rightarrow$ high opportunity cost

• To restrict such costs it is efficient to form an inter-bank market for lending reserves overnight
– allows banks with surplus cash to lend to those facing adverse cash flow shocks, so aggregate need for reserves reduced
– this is the Federal Funds market in the US
– UK equivalent is overnight LIBOR, Eurozone equivalent is EONIA market

• Version of this market on next slide

Overnight inter-bank market (FF in US, LIBOR in UK)



The reserve market

• Central bank participates in reserve market

– when Federal Reserve declares an increase in its target for the federal funds rate it engineers a left shift of reserve supply to raise the market interest rate some desired amount

– how does it shift supply? classically, sells government bonds for reserves $\Longrightarrow$ reserve supply shifts left $\Longrightarrow$ rise in inter-bank rate

– more recently, raises interest rate paid on reserves held as deposits at the CB (known as the bank rate in UK), so more bank reserves held at CB and fewer supplied to the market

• All acts of monetary policy start in this market

– or at least that's how it was until 2008/09! .... more in week 4

A hierarchy of bank funding costs

• Deposits cheapest, then debt, then equity

• At the bottom of the hierarchy liquid deposits pay a return very close to overnight inter-bank rate (FF in US)

• As such there is a direct effect of monetary policy on bank funding costs

– a 1% rise in mon pol rates brings about a roughly equal rise in cost of deposits

– and the same rise in the cost of debt and equity, since they are a markup on deposit costs

– this pass-through from monetary policy interest rates to bank financing costs accounts for the basic or one-for-one effect of monetary policy on retail lending rates (banks must pass on higher funding costs)

A hierarchy of bank funding costs (continued)

• Why should liquid deposits pay roughly the overnigh inter-bank rate?

– if a bank paid depositors less than the overnight rate then rival banks could steal those deposits through offering to pay closer to the overnight rate and covering the costs of that through lending the deposits overnight (and this forces deposit rates up to the overnight rate)

– if a bank paid more for deposits that it may have to return at short notice than it does for overnight loans due at similarly short notice, costs would be unnecessarily high (profit maximising banks will force deposit rates to roughly the overnigh rate)

• Why are debt and equity priced at a markup on deposits?

– a simple example from Walsh textbook illustrates why this is the case

– Walsh considers credit relationship in which banks lend to firms

– here, need to think about investors (households, pension funds, insurance companies) lending funds to banks

Assumptions

• Risk neutral investors/lenders, competitive markets, outside option for investors is risk-free return r, i.e. mon pol rate or yield on gov bonds

• Investors can make risky investments in banks, amount L, return r_l, collateral C
– could be deposits, bank debt or equities

• Bank converts investor funds into commercial loans
– return on loans is $R'+x$ with probability 0.5 and $R'-x$ with probability 0.5 $\longrightarrow$ x measures risk

• Assume $R' - x - (1 + r_l)L < -C$, i.e. in bad state bank is worse off paying out investor than it is defaulting and surrendering collateral
– so in bad state bank always defaults on investor
– assuming default investor gets $C + R' - x$, i.e. collateral plus what is left in insolvent bank (may be negative)

• Bank's expected profit is

$$E\pi^{BANK} = \frac{1}{2}(R' + x - (1 + r_l)L) - \frac{1}{2}C$$

• As the bank can lose no more than C in bad state, expected profits rise following increase in risk ($\uparrow x$)

• For a given amount of risk $\uparrow r_l \Rightarrow$ less risky projects become unprofitable

• Investor's expected profit is

$$E\pi^{INV} = \frac{1}{2}((1+r_l)L) + \frac{1}{2}(C + R^{'} - x) - (1+r)L$$

• Investor expected profit decreases with risk (x)

• Suppose $r_l = r$ then in good state investor makes 0 and in bad state makes $C + R^{'} - x - (1+r)L$
– bad state return negative given we assumed $R' - x - (1+r_l)L < -C$
– so $r_l = r$ implies overall loss; to avoid loss must set $r_l > r$
– $r_l - r$ is external finance premium (EFP), i.e. additional cost paid by bank for external funding from investors compared to risk free rate (r is opp cost of bank using own (internal) funds, hence the label EFP)

• EFP increases with project risk relative to loan size $(\frac{x}{L;})$, but decreases with collateral and fixed returns relative to loan size $(\frac{C}{L}, \frac{R'}{L})$

A spectrum of funding costs

• State insures bank deposits up to some threshold, i.e. $x \approx 0$
– so EFP on deposit finance minimal $\Longrightarrow$ deposits cheapest source of funds for banks (proportional to mon pol rate or a gov bond yield, as above)

• Debt finance for banks (e.g. mortgage backed securities) more expensive since uninsured and investor faces losses in bad state since collateral fails to cover opp cost of investor funds

• Equity finance most expensive, e.g. junior shareholders face the downside risk but potentially get no collateral payment
– to cover losses a large EFP is needed to generate good state returns

EFP exacerbated by adverse slection under aymmetric information

• Introduce 2 types of bank. For type G, $x = x_g$, for type B, $x = x_b$, and $x_g < x_b$ (B more risky)

• **Asymmetric information** $\rightarrow$ investors cannot distinguish good and bad banks $\Rightarrow$ same r_l required of all banks

• If both types in market in equal number investor exp profit is

$$E\pi^{INV} = \frac{1}{4}((1+r_l)L+C+R'-x_g)+\frac{1}{4}((1+r_l)L+C+R'-x_b)-(1+r)L$$

Adverse selection

• But as r and hence r_l increase $E\pi^{BANK} = \frac{1}{2}(R' + x - (1 + r_l)L) - \frac{1}{2}C$ falls and turns negative first for G types
– beyond this point no type G takes a loan i.e. there is adverse selection of bad banks in mkkt

• Lender's expected profit collapses to

$$E\pi^{INV} = \frac{1}{2}((1 + r_l)L + C + R' - x_b) - (1 + r)L$$

• This increases the EFP, $r_l - r$ and stretches out funding spectrum

• Problem of moral hazard (from unobserved actions) leads to a similar effect (see additional notes on webpage)

Narrow lending channel

i. CB tightens monetary policy through shifting reserve supply left in overnight mkt

ii. A smaller supply of reserves means banks risk violating reserve/deposit ratios, so deposits have to be scaled back

iii. Banks have 2 options: (a) scale back lending to reflect lower deposit funding; (b) maintain lending but switch to more expensive funding

iv. In either case supply of commercial loans from banks contracts, i.e. mon pol starting in overnight mkt transmitted to real economy

– suppose supply shift in (i) raises overnight rate 1%

– cost of deposit finance rises 1% and so does cost of debt and equity given they are priced at a markup on risk-free deposits

– NLC says average cost of bank funding rises more than this 1%, since banks must switch into even more expensive debt/equity and pass this on to customers

Second pillar of narrow lending channel

• For more costly bank loans to propagate to lower consumption, production, employment etc. it must be that private sector cannot perfectly substitute bank loans with corporate bonds, equity issues, trade credit

• Such alternative known as 'shadow banking'

• Arguably a credible alternative for multi-national corporations, but not for small firms and households who do not participate in shadow banking

• Instead small firms and households cut spending in response to contraction of bank loans

How plausible is the NLC?

• Works best when there is legal floor to $\frac{R}{D}$ at which $\downarrow R$ necessitates $\downarrow D$

– but regulatory $\frac{R}{D}$ floors largely abolished in practice

– any floors voluntary, e.g. to satisfy auditors and markets bank well run

– plausible but more flexiblie than regulatory minima

• Furthermore, emergence of large and internationally diversified banking groups means reserve requirements can be met through switching funds across banks in group $\Longrightarrow$ lower voluntary reserve holdings (less precautionary behaviour by banks)

Is deposit funding still special?

• Globalization of the banking system has made for more diversified bank assets
– in theory this reduces the risk in funding a bank through debt/equity and cuts cost of such finance relative to deposits
– so hierarchy of funding costs compressed and monetary tightenings that work through driving banks out of deposit funding gain less traction

• Similarly, instruments for risk-sharing such as asset backed securities mitigate project risk and make debt a better substitute for deposits
– in the US and UK private lending boomed around the turn of the century despite relatively low savings/deposits because money markets had displaced deposits as the main source of funding

Is deposit funding still special?

• Globalization of banking system and legal changes (removal of Glass-Steagall act) allowed emergence of universal super banks (known as SIFIs, Systemically Important Financial Institutions)

– due to their size governments know (and banks themselves and the markets know) they are Too Big To Fail (TBTF)

– bankruptcy will always be averted via bail-out, but as investors know this they perceive lower x on their debt and equity and set a lower EFP

– Robert Peston and others argue that in this way global banks have been subsidised, and, worse, that such easy money leads to poor lending decisions prior to the crisis (ring-fencing options under consideration are in part intended to reverse TBTF and eliminate funding distortions)

But some arguments less applicable post-crisis

• Internationally diversified banks no less risky when there is a global downturn in output and asset prices

– some international banks perceived as more risky as exposed to loess in US sub-prime market

– and banks that had used instruments introduced after globalization of banking such as asset backed securities, credit default insurance, derivatives, etc. had particularly opaque balance sheets leading to more of the information problems that lead to adverse slection and a widening of the EFP

• So reason to think deposits still special

– in summer 2011 the 4 largest UK building societies (more deposit oriented than banks) were upgraded by the debt ratings agencies

Will a narrow lending channel operate at the aggregate level?

• Ashcraft (2006) notes that NLC always presented as idea that there are some 'constrained banks' that must limit their lending because they are being forced out of cheap deposits due to a shortage of reserves

• This may well be but surely there are some unconstrained banks who need not act like this

– and surely such banks will benefit from an influx of deposits and will be able to take up the slack in lending supply through making loans to customers turned away by constrained banks

– result could be that at the aggregate level the NLC does not add up to much

– Ashcraft presents some evidence this effect is relevant in United States

Evidence concerning the narrow lending channel

• Studies typically focus on first pillar of lending channel $\longrightarrow$ do monetary policy contractions affect bank loan supply?

• Find some bank characteristic that determines deposit dependence, then ask if dependent banks reduce lending more following policy contraction

• Ashcraft exploits info on **bank holding companies.** In US state laws often set upper limit on number of branches an one bank may operate $\Rightarrow$ upper limit on bank size

• Scale economies in banking can be exploited through the formation of bank holding companies (BHCs), which pool funds across many smaller banks

– **Implication:** Small banks in BHC have access to more liquidity than banks outside BHC $\Rightarrow$ measure lending channel as difference in response of bank lending to changes in mon pol across banks that do (not) belong to BHCs

- Ashcraft's regressions take the following form:

$$L_{it} = \alpha L_{it-1} + \beta \triangle r_{it} + \gamma \triangle r_t * BHC_{it} + \textit{other controls}$$

where L_{it} denotes lending growth, $\triangle r_t$ is the change in the federal funds rate and BHC_{it} is 1 if a bank belongs to a bank holding company and 0 otherwise

- Expect $\beta < 0, \gamma > 0 \Rightarrow \gamma$ measures extent of NLC

- Estimates $\widehat{\beta} = -0.84$, $\widehat{\gamma} = 0.96$

The properties of BHC status

• Ashcraft notes that bank characteristics such as the composition of assets and liabilities do not vary systematically according to BHC status
$\Rightarrow$ unlikely that BHC networks pick up other effects such as access to the best customers
– BHC status considered a random treatment

• Furthermore, Ashcraft shows that movements in uninsured debt (essentially transfers of funds across banks with BHCs) move to offset changes in deposits arising from shifting loan demand, a finding consistent with the lending channel hypothesis

Further evidence concerning the lending channel

• Loutskina (2005) shows that banks that are able to securitise a larger fraction of their loans are less affected by monetary tightening (no analysis of whether loan demand drives this relationship)

• Cetorelli and Goldberg (2008) provide similar evidence for banks with foreign affiliates

• Such evidence for constraints on bank lending is consistent with the existence of a narrow lending channel

The Broad Credit/Lending Channel (BLC)

• BLC is an alternative theory of monetary policy transmission
– relies on same framework as NLC
– explains same type of outcome, namely greater that one-for-one effect of monetary policy on commercial lending rates
– but presumes effects of policy in changing composition of bank funding are modest, e.g. flexible reserve/deposit requirements mean policy contractions do not force banks out of deposits

• Instead, in BLC tight policy widens EFP so debt and equity even more costly relative to deposits
– with endogenous EFP a tightening of monetary policy then raises average cost of bank finance even for a constant funding composition
– banks pass this on as higher rates on commercial loans

BLC overview

• Policy tightening $\Longrightarrow \uparrow$ risk free rate (r)

• Banks pass this on and effect in real economy is decline in asset prices (gov bond prices, equities, property values etc.)
– more shortly on mechanisms behind this

• Lower asset valuations mean banks offer less collateral to investors on debt, equity

• This worsens bad state returns for investors $C+R'-x-(1+r)L \Longrightarrow \uparrow$ EFP for non-deposit finance

• Banks pass on to customers an increase in interest rates greater than the rise in risk-free rates
– effect known as **financial accelerator**

Why does $\uparrow r \Longrightarrow \downarrow C$?

• Contractionary monetary policy starts with sales of gov bonds that raise mkt supply and lower the price of such assets
– important for banks as they are major investors in gov bonds and use them to collateralise debt, e.g. see how falling prices for Greek govt bonds quickly weakened Greek banks

• As banks pass on increases in risk-free rates, debt service costs for households and firms rise and net cash flow falls
– some households/firms then default on bank loans and these are written off bank balance sheets
– as a result pool of net assets banks can offer as collateral on securities is diminished and financial accelerator kicks in

Other BLC channels

• Financial accelerator from monetary policy to collateral values and the cost of finance is classic description of BLC

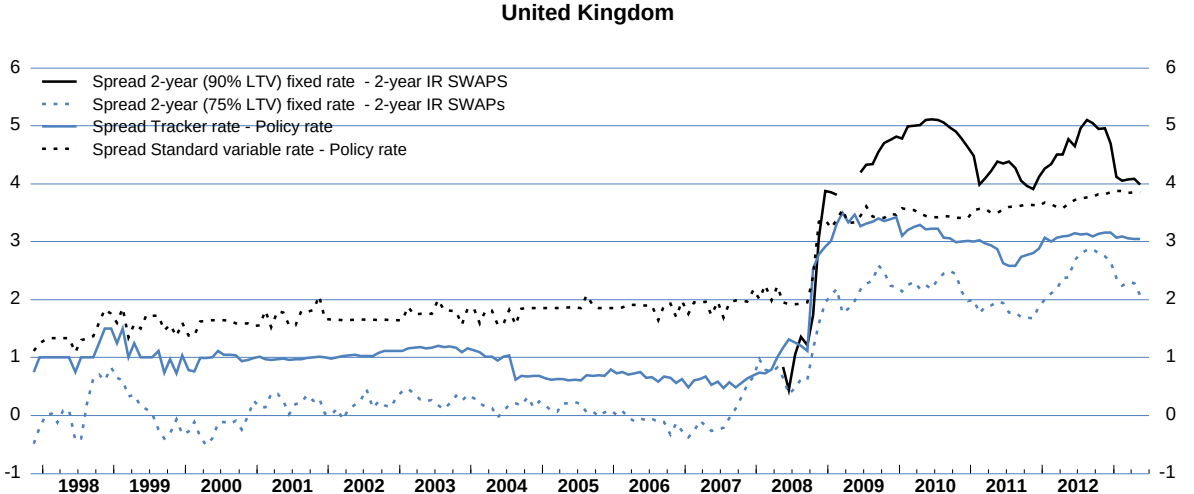
• But some literature treats BLC as a a catch all for any mechanism which sees EFP rise as a result of tight policy
– could be that $\uparrow r$ triggers adverse selection that raises average x in market $\Longrightarrow \uparrow r_l - r$

Banks, firms and households

• Above illustration is for a financial accelerator on banks

• Original work by Bernanke and others highlighted the financial accelerator on firms, which will amplify effects described above

• Once cost of bank loans increased corporate/household cash flows squeezed and their asset values fall
– but then collateral offered to banks falls
– banks then must charge customers a larger premium for bank loans (relative to their own cost of finance), just as investors imposed higher financing costs on banks



Note: The *Barclays FNMA 30-year fixed rate* is the 30-year fixed rate on a mortgage-backed security of the Federal National Mortgage Association; and Barclays FHFB is the fixed-rate 30-year rate on non-jumbo loans (all homes).

Source: Datastream and Bank of England.

Some Implications of the Financial Accelerator Principle

• Distribution of wealth across firms/households/banks affects strength of transmission mechanism

– larger net asset values offer larger collateral bases more resilient to monetary policy

– after policy tightening finance flees low collateral agents in favour of those with ample collateral (**flight to quality effect**)

• Monetary policy efficacy limited in deep recessions (Keynes redux)

– asset prices depressed in recessions $\Longrightarrow \uparrow EFP$ offsets $\downarrow r$ from policy

– likewise $\uparrow x$ (e.g. bad loan fears) $\Longrightarrow \uparrow EFP$

– these effects may partly explain weak recovery despite loose monetary policy (King – bank rate increases conditional on fall in EFP)

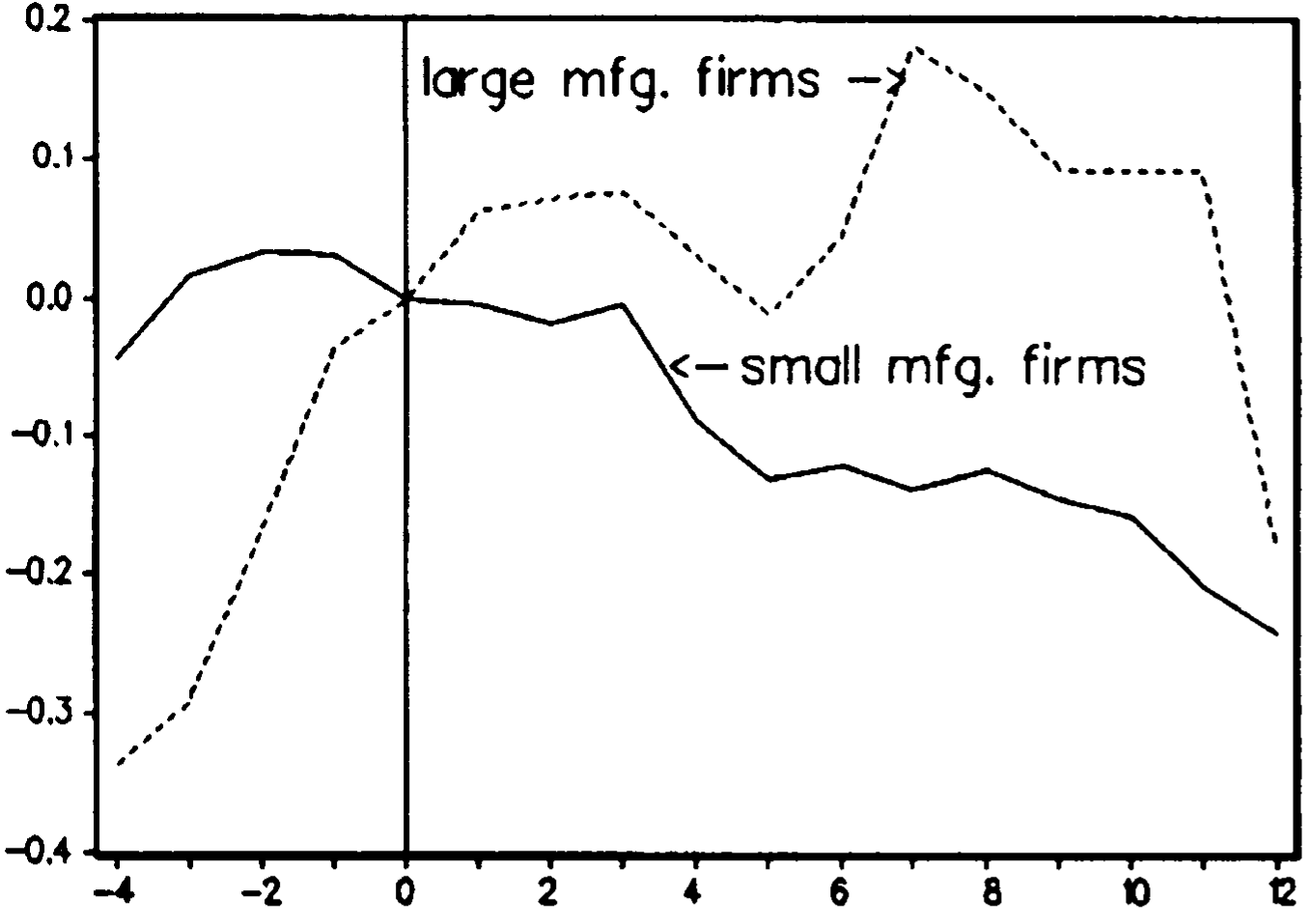
Evidence Concerning the Financial Accelerator

• A lot of literature tests for the flight to quality effect

• Kashyap, Stein & Wilcox (1993) compare patterns in short-term debt held by U.S. manufacturing firms post 1979q4 (October 1979 saw largest post-war tightening of US mon pol)
– see next slide

• Following monetary contraction large firms increase debt to smooth effects of recession from tight policy

• In contrast small firms cannot follow suit and instead cut debt, consistent with the supply of finance being cut for agents least able to offer collateral


0.2
0.1
0.0
−0.1
−0.2
−0.3
−0.4
−4
−2
0
2
4
6
8
10
12
large mfg. firms →
← small mfg. firms

Evidence from banks (Kashyap & Stein, 2000)

• Estimate extent to which bank lending growth over a 3 month period is linked to internal banks funds available that period
– idea is that when monetary policy is tightened external finance harder to get so measured linkage should intensify

• Estimates confirm this effect of policy
– furthermore, the effect is statistically significant amongst the bottom 95% of banks ranked according to total assets, but not amongst the top 5%
– KS take this as evidence that tight policy generates financial accelerator effects, but that large banks are able to avoid such effects since although the collateral they can offer is diminished it is still sufficient to secure funding with the same EFP as before the policy tightening

Assessment of the BLC

• Events in financial markets indicate ample evidence of a variable EFP and a flight to quality

– the unknown is whether monetary policy causes such fluctuations through its effect on asset prices and collateral

– it could simply be the that asset price changes unrelated to monetary policy cause the EFP movements that are important for economic fluctuations

Other perspectives – the bank capital channel

• Tight policy erodes bank capital: (i) narrow and broad channels slow the real economy and raise loan defaults and bad debts, which must be set against equity in the accounts; (ii) maturity mis-match between long-term assets and short-term liabilities can mean banks accept lower margins on loans for a period; (iii) after sufficient time risk weightings may be adjusted up

• Once $\frac{equity\ capital}{risk\ weighted\ assets}$ hits the regulatory minimum (e.g. Basel III requires banks to work towards a min of 12% capital), or approaches it, banks pare down net lending in order to boost the numerator, e.g. add profits from existing loans to retained earnings and shrink the denominator (smaller loan book)

The risk-taking channel

• For given bank risk (x) and collateral (C) EFP will be negatively related to investor risk appetite – greater risk aversion will raise EFP for banks and force them to raise the price of bank loans

• Tight policy can erode bank profits and limit risk appetite, triggering such effects

• Lax monetary policy may force an effective increase in risk appetite if rate of return targets are sticky relative to the policy rate – this is Rajan's 'search for yield' which many observers cite as a factor in the unsafe lending practices prior to the financial crisis