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Discussion of „Real effects of the subprime mortgage crisis“ by Hui Tong and Shang-Jin Wei

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** Disclaimer: Duisenberg Research Fellow. The views expressed should not be attributed to the ECB or its staff.*

Outline

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5. Macro effects of a credit crunch
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7. Policy rules
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1. Overall Impression

- Very topical paper.
- Clever choice of experiments
- Thorough empirical work using up-to-date tools and measures.
- Interesting and relevant results.

➔ **Congratulations!**

2. Summary

- Questions that Tong and Wei (2008) address:
  - ➔ What is the effect of the 2007/8 financial crisis on the real economy?
  - ➔ If there is an effect, is it primarily via reduced consumer confidence and demand?
  - ➔ Is there also a supply side channel through a tightened liquidity constraint (a credit crunch) faced by non-financial firms?

Tong and Wei (2008) Strategy

- TW08 focus on real effects as reflected in the **stock-price declines** of firms with different characteristics, i.e. financial constraint and demand sensitivity.
- Get around **endogeneity problem** by following experiment:
  - ➔If firms are classified into baskets, based on their **ex-ante** degree of liquidity constraint and demand sensitivity, would this help forecast **ex-post** stock price performance?

Tong and Wei (2008) Experiment

- Answer: **Yes.** An increase in liquidity constraint by 1 sd is associated with an additional decline in stock price of 12.4 p.p. (7/07-3/08).
- Effect over time captured by comparing portfolios of HiConstrained-HiSensitive, HcLs, LcHs, LcLs stocks. Dynamic evolution indicates larger role of financial constraint in 2008.

Tong-Wei Regression Equation

$$(2)\ Stockreturn_{it} = \alpha_0 + \beta_1 DemandSensitivity_i + \beta_2 FinancialConstraint_{i,t-1} + \gamma_1 Size_{i,t} + \gamma_2 Market/Book_{i,t-1} + \gamma_3 Beta_{i,t-1} + \gamma_4 Momemtum_{i,t-1} + \varepsilon_{it}$$

- Financial constraint measure from Whited and Wu 2008 (75-01 WW sample extended to 2006).
- Demand sensitivity measure (authors' innovation) = sector-level stock price response to 9/11 shock from 9/10 to 9/28/08.
- Also, Fama-French factors + momentum as controls as in Whited and Wu (who also find that size is insignificant once financial constraint is included). And further sensitivity studies.

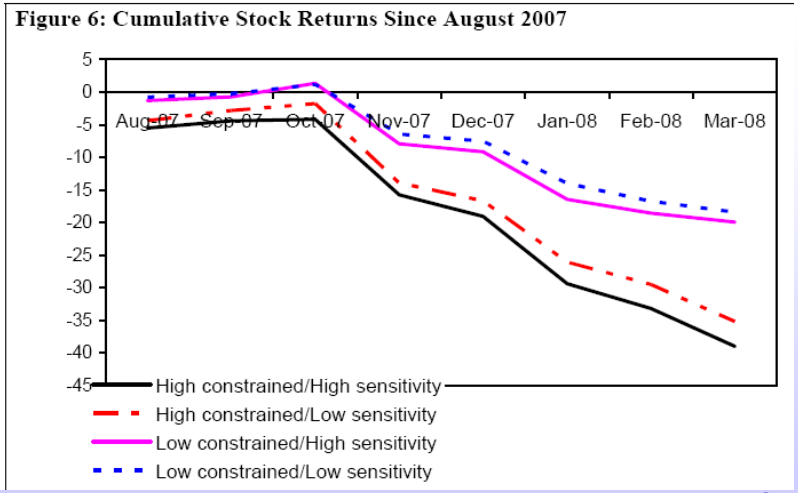
Tong-Wei findings

Table 2. Change in Stock Price during the Subprime Crisis
(July 31, 2007 – March 31, 2008)

	1	2	3
Demand Sensitivity	-3.69***	-3.27***	-3.37***
	[0.85]	[0.88]	[0.87]
Financial Constraint-WW	-11.67***	-13.72***	-12.35***
	[0.82]	[2.33]	[2.32]
Firm size		-0.31	0.10
		[1.15]	[1.14]
Book/Market ratio		-6.24***	-6.37***
		[0.64]	[0.63]
Beta		3.13**	3.01**
		[1.25]	[1.24]
Momentum			0.20***
			[0.03]
Constant	-52.35***	-52.75***	-51.93***
	[2.48]	[3.13]	[3.10]
Observations	2761	2410	2410
R-squared	0.07	0.12	0.14

Notes: Standard errors in brackets; ***, **, and * denote p-value less than 1%, 5%, and 10%, respectively. Stock return, financial constraint, and demand sensitivity are winsorized at the 2% level.

Tong-Wei findings



3. Credit Crunch: A Definition

Bernanke & Lown (1991):

According to many .., the severity of the recession that began in July 1990 was worsened by financial distress in a number of sectors of the economy.

Much of this discussion centered on the so-called „credit crunch“ in the banking sector. Some commentators have raised the possibility of a generalized credit crunch affecting all credit sources, not just banking.

Credit Crunch: A Definition

Bernanke & Lown (1991):

We define a bank credit crunch as a significant leftward shift in the supply curve of bank loans, holding constant both the safe real interest rate and the quality of potential borrowers.

On 90/91 recession:

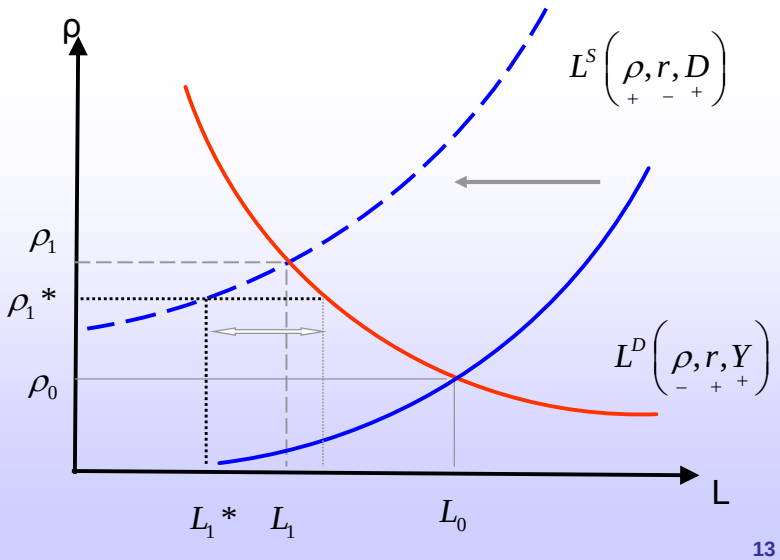
... probably demand factors, including the weakened state of borrowers balance sheets, caused much of the slowdown,

... also a shortage of equity capital has limited bank‘s ability to make loans.

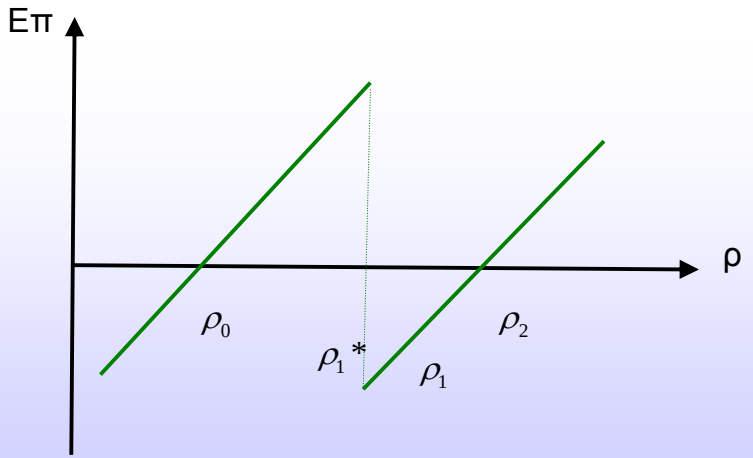
Credit Crunch: A Definition

- **B. Friedman:** I doubt a simple leftward shift of loan supply with perfect market-clearing – so that all would-be borrowers could still obtain credit, albeit at a higher market clearing interest – would qualify as a credit crunch in the mind of the typical market participant or monetary policy maker.
- Wide-spread anecdotal evidence includes many examples of borrowers who have been asked to wind up their loans despite having kept their accounts fully current, or new projects that lenders have simply declined to finance at any interest rate.

Loan Market



Credit Rationing (Stiglitz-Weiss)



Returns to lender: lender will choose $\rho < \rho_1^*$ which results in credit rationing.

4. Comments on TW 08

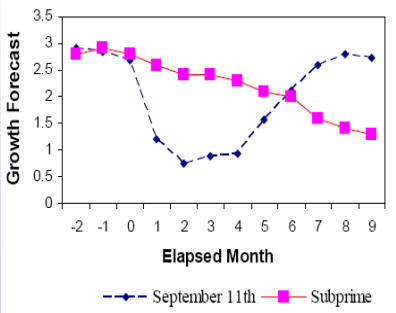
- Presumably TW08 capture the effect of a leftward-shift of loan supply as well as rationing together.
- For forecasters and policymakers the rationing effect may be particularly important because there is no signal from credit spreads they can adjust for.
- The **endogeneity problem:** It is normal for the demand for credit to fall during a recession, reflecting declines in demand for new construction, producers investment goods and consumer durables.
- **How good are the demand-sensitivity and financial constraint measures really?**

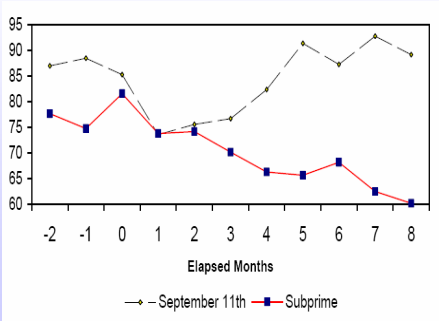
9/11 measure of demand-sensivity?

- The sector-average stock price decline simply measures the sensitivity to a type of 9/11 event.
- The authors' find that firms that belong to sectors that suffered a lot in September 2001, did not suffer so much in 2008 (relatively).
- Well, maybe this is not a good measure of demand sensitivity and the demand effect is absorbed by other variables in the regression (financial constraint).

9/11 measure of demand sensitivity?

- The authors' appeal to differential behavior of consensus GDP forecast and consumer confidence.

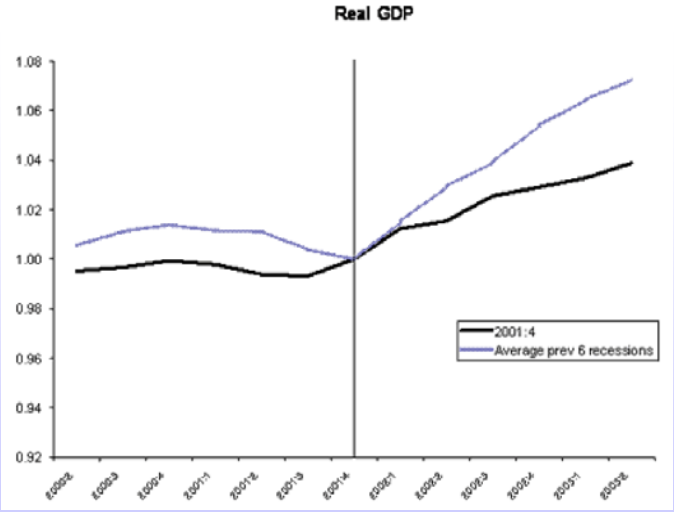




But ...

- All that says, is that in 9/2001 forecasts of a recession were incorrect.
- Remember NBER-dated recession began in March 2001 and ended November 2001.
- Thus, 9/11 happened towards the end of a recession, and in this one GDP was already rising before the NBER trough date.
- Since GDP was already rising, demand was already rising for demand-sensitive industries. So this may not be a good example of demand-sensitivity.

NBER Recessions and GDP



Further Comments

- What about other measures of demand sensitivity, for example, firms that produce goods that always face very pro-cyclical demand. Or other shocks. Give demand another chance in explaining more of the decline in 2008.
- Also, this is about perceptions, which were mistaken. Perhaps the same investors and forecasters error-corrected in 2007 and did therefore not forecast an immediate recession. The real economy may again differ.

Further Comments

- July 90 – March 91: The „Credit Crunch“ Recession
  - ➔It would be useful to compare the relative performance of demand sensitive and financially constrained firms portfolios during this recession.
  - ➔After all commentators such as B&L concluded that both effects were present.

Financial Constraints Measure from Whited and Wu (2006)

- Estimate Euler equation of firm that maximizes discounted value of expected dividends s.t. constraints on outside finance (lower limit on dividends, d*, and upper limit on stock of debt, B*).
- Lagrange multiplier λ on d* represents shadow cost of raising new equity. Unobserved but estimated from regression on measures such as:
  - ➔Firm-level and industry level debt-to-asset ratios, analyst coverage, sales growth, Indicator of cash dividends payment, total assets.

Euler Equation and Shadow Cost of New Equity in Whited and Wu

$$M_{t,t+1}\left(\frac{1+\lambda_{i,t+1}}{1+\lambda_{it}}\right)\{\pi_K(K_{i,t+1},v_{i,t+1})-\psi_K(I_{i,t+1},K_{i,t+1}) +(1-\delta_i)[\psi_I(I_{i,t+1},K_{i,t+1})+1]\}=1+\psi_I(I_{it},K_{it})+e_{i,t+1}.$$

$$\lambda_{i,t+1}=b_0+b_1TLTD_{i,t+1}+b_2DIVPOS_{i,t+1}+b_3SG_{i,t+1} +b_4LNTA_{i,t+1}+b_5ISG_{i,t+1}+b_6CASH_{i,t+1} +b_7CF_{i,t+1}+b_8NA_{i,t+1}+b_9IDAR_{i,t+1}.$$

Financial Constraints Measure

- From Whited and Wu (2006). Some info:

The firm maximizes the expected present discounted value of future dividends, which are given by

$$V_{i0}=E_{i0}\sum_{t=0}^{\infty}M_{0,t}d_{it}. \quad (1)$$

$$d_{it}=\pi(K_{it},v_{it})-\psi(I_{it},K_{it})-I_{it}+B_{i,t+1}-(1+r_t)B_{it}.$$

$$K_{i,t+1}=I_{it}+(1-\delta_i)K_{it}, \quad (2)$$

Financial Constraints Measure

The firm also faces two constraints on outside finance:

$$d_{it} \geq d_{it}^{*} \tag{3}$$

$$B_{i,t+1} \leq B_{i,t+1}^{*}. \tag{4}$$

Here, d_{it}^{*} is the firm- and time-varying lower limit on dividends, and B_{it}^{*} is the firm- and time-varying upper limit on the stock of debt. Since this

$$E_{it}\left(M_{t,t+1}\left(\frac{1+\lambda_{i,t+1}}{1+\lambda_{it}}\right)\{\pi_K(K_{i,t+1},v_{i,t+1})-\psi_K(I_{i,t+1},K_{i,t+1})\right.$$
$$\left.+(1-\delta_i)[\psi_I(I_{i,t+1},K_{i,t+1})+1]\}\right)=\psi_I(I_{it},K_{it})+1.$$

Whited and Wu Measure

- WW show already that financial constraints affect stock returns. They are a source of priced risk. They also show that the size effect then disappears.
- Note, their measure also includes demand-side effects.
- WW also show that the cumulative return to this financial constraints factor is counter-cyclical, it is high before or during recessions.
- This is quite similar to the behavior of external finance premia computed in macro models.

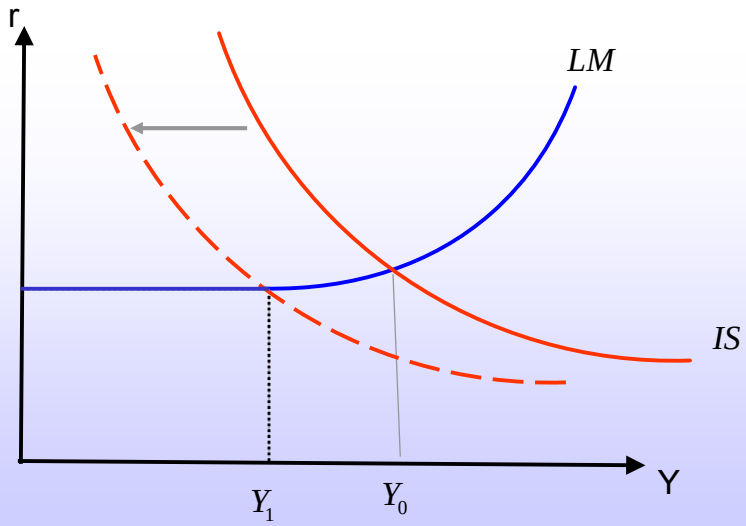
5. Macro Effects of Credit Crunch

- **B&L 91 quote B&B 88:** in IS-LM diagram an exogenous decline in bank lending (due to shortage of capital) is a negative IS shock. This requires only that bank loans are imperfect substitutes for other assets, no credit rationing as in Stiglitz and Weiss.
- **B. Friedman**:.. In terms of B&B not only is the IS channel of influence not active, but if credit rationing is involved, then part of the LM curve effect is not operative either.

Macroeconomic Effects

- Bernanke&Lown 91:
  - ➔Some have worried that an unwillingness by banks to lend can render monetary policy impotent, this concern is misplaced unless a traditional liquidity trap also exists.

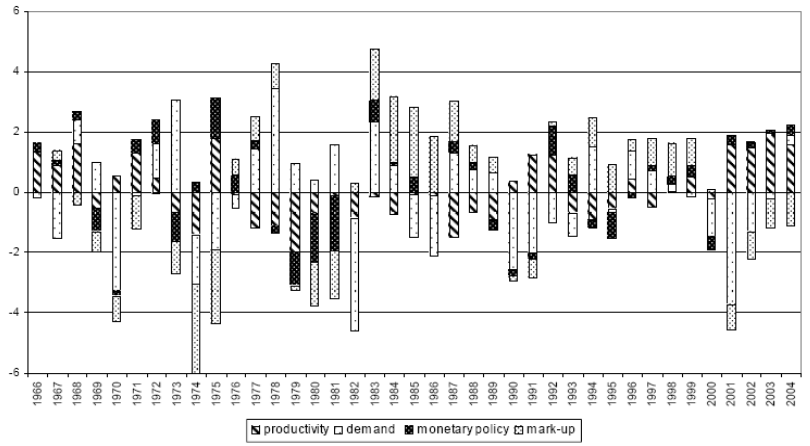
IS-LM



6. Historical Shocks from Structural Models: Smets and Wouters (2007)

Figure 4: Historical decomposition of GDP growth and inflation

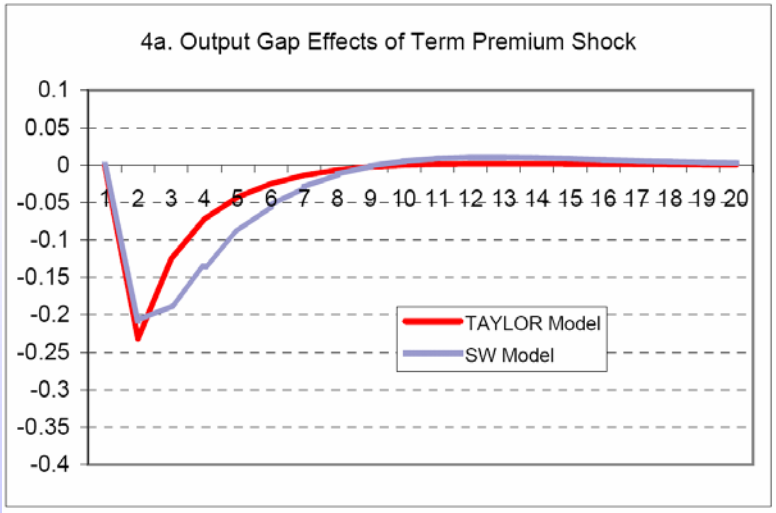
Annual per capita GDP growth (deviation from trend growth)



Historical Shocks: SW US-Model

- In 1991 output growth primarily driven largely by negative demand shocks,
- In 2001 output growth primarily driven by negative demand shocks.
- But, among these shocks is a financial/risk premium shock.
  - ➔SW07: a positive shock increases the required return on assets and reduces the value of capital and investment. It has similar effects as net-worth shocks in BGG99, which explicitly model the external finance premium.

Effect of Financial Shock (Risk Premium)



Increase in risk premium by 1 percentage point.

Historical Shocks from SW 07

	tech	riskprem	govforeign	mon	markup	invest	wage
std.dev.	0.45	1.86	0.52	0.24	0.14	0.46	0.25
2001.1	0.83	1.95	0.14	-0.07	0.15	-0.51	-0.24
2001.2	0.21	2.15	-0.53	0.09	0.01	0.01	-0.24
2001.3	0.58	-0.34	-0.37	-0.27	0.14	-1.14	0.06
2001.4	0.21	1.77	0.43	0.08	-0.12	-0.08	0.23

	tech	riskprem	govforeign	mon	markup	invest	wage
std.dev.	0.45	1.86	0.52	0.24	0.14	0.46	0.25
1990.2	0.41	-1.84	-0.56	0.15	-0.08	-0.04	0.05
1990.3	-0.38	1.34	-0.01	0.22	-0.02	-0.42	-0.09
1990.4	0.25	3.63	0.59	-0.02	0.31	-0.40	-0.01
1991.1	0.37	-1.41	-0.10	0.02	-0.20	-0.07	0.26
1991.2	0.01	0.40	0.11	0.09	-0.01	-0.13	0.07

De Graeve (JEDC 2008)

- External Finance Premium
  - ➔De Graeve uses a model with financial frictions a la BGG 1999 to compute an endogenous measure of the external finance premium for firms.
  - ➔He notes also that the variance of a risk premium shock as in SW 07 goes towards zero in estimation in such a model.
  - ➔In other words, the exogenous shock process in SW07 and Taylor 1993 proxies for the external finance premium.

De Graeve (JEDC 2008): Historical External Finance Premium from DSGE Model with Financial Frictions

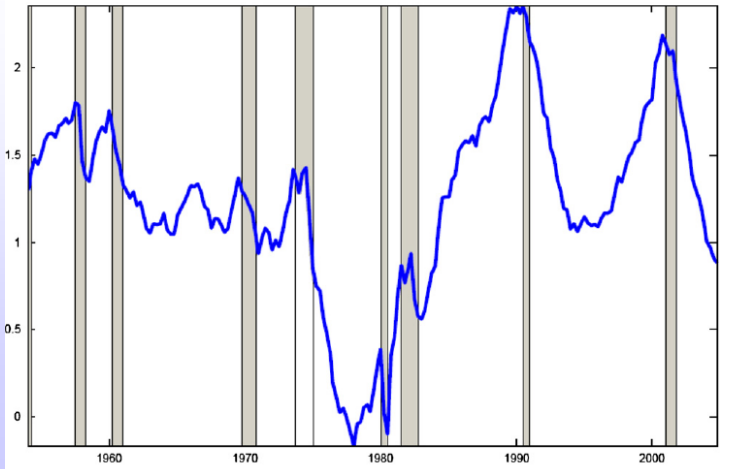
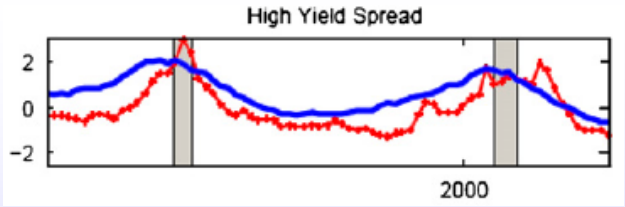
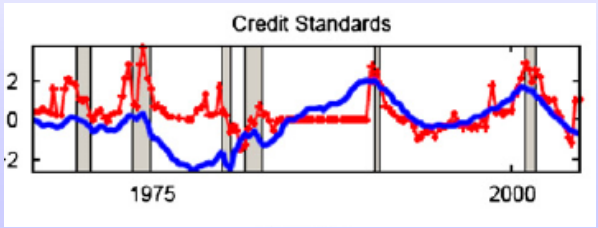


Fig. 2. The external finance premium.

De Graeve (JEDC 2008)

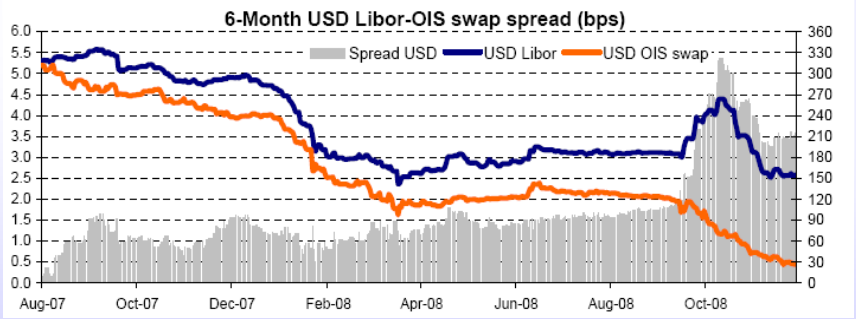




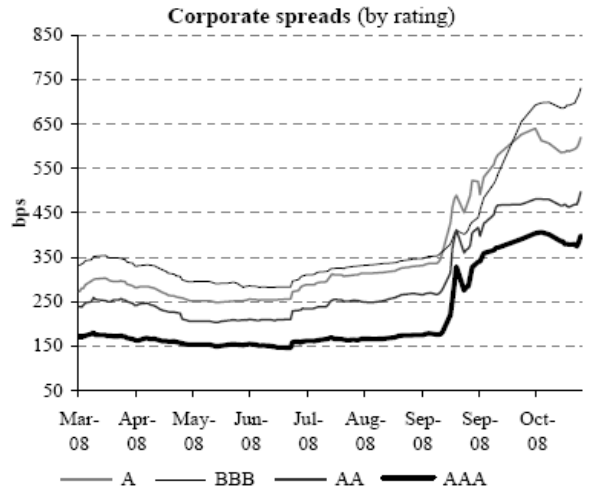
De Graeve (2008)

- Credit standards pertain to non-price terms (summary measure of availability of credit.). De Graeve shows that they move with the model-identified external finance premium.
- The BGG model incorporated in De Graeve excludes credit rationing. If rationing were important, it would be absorbed by a rise in the model-identified premium.
- In SW07 or Taylor 93 all that would be absorbed in the exogenous shock process.

These Days



These Days



7. Policy Rules

- Suppose you have information on the risk premium shock (say credit spreads are up).
- Does it help stabilization performance if you add it to an optimized Taylor-style rule?

$$r_t = \theta r_{t-1} + \alpha \pi_t + \beta_0 y_t + \beta_1 y_{t-1} + \gamma \varepsilon_t^{rp}$$

- Chose coefficients to mimimze:

$$Var(\pi_t) + Var(y_t) + 0.5 Var(\Delta i_t)$$

Policy Rules

rho	alpha	beta	beta1	gam
1.0659	0.141	1.296	-1.279	0
1.1588	0.15	1.7055	-1.683	0.091
0	2.894	0.5962	0	0
0	3.066	0.6848	0	0.061

- Rather small, even though increase in var (RP).

8. Concluding Comments

- What about extension of analysis to Oct 2008, effect on stock prices of financial constraint, should be very visible.
- Can it be a signal of a credit crunch with rationing effects?
- Should GDP forecasters incorporate an adjustment based on portfolio differential of the authors?
  - ➔Should policymakers accordingly lower interest rates more?

Concluding Comments

- Differential stock-price declines incorporate investors‘ perceptions regarding firms‘ future performance, and might give additional information beyond the financial constraints factors/external finance premia identified in other studies.
- If it is financial constraint and a component of credit rationing then forecasters may be looking for information to quantify adjustments to their forecasts. But how would they use the information from Tong and Wei?