Asset Holdings, Information Aggregation in Secondary Markets and Credit Cycles

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Broad Motivation

- The criticism - (Akerlof and Shiller (2009), DeLong (2011)) - Macroeconomic theory overlooked important aspects of asset or financial markets in general, failing to analyze how they are linked to macro fluctuations.
- The response - contributions like Brunnermeier and Sannikov (2014), Boissay, Collard, and Smets (forthcoming), Gorton and Ordonez (2014) which look at nonlinear effects of financial frictions, moral hazard and adverse selection in interbank market, and production of information in collateralized markets add to our understanding of the relationship between finance and macro fluctuations.

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Still Missing

- Mispricing of risk/assets. (Originally stressed by Akerlof and Shiller (2009) and Lo (2008))

Mispricing of risk/assets

Prices $\neq$ True value/Fundamentals

- Due to learning - example Adam, Beutel, and Marcet (2014).
- Due to behaviour bias - example Bénabou (2009)
- Due to information in markets building on Grossman and Stiglitz (1980) - example Dasgupta and Prat (2008)

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Framework here is close to Grossman and Stiglitz (1980)...

- Mispricing of assets - when price of assets do not reflect all information available, and as such prices differs from "true" value.

Some Evidence of Mispricing of Risk

Do we observe instances in which a market does not fully reflect all available information?

- Coval, Jurek, and Stafford (2009) show that senior CDS index tranches are grossly undercompensated when compared to writing OTM put spreads on index market.
- Ivashina and Sun (2011) show spreads on institutional tranches and bank tranches of syndicated loans are priced differently for the same loan.

What this paper does...

- Develops a macroeconomic framework in which mispricing of credit assets is the key (possible) outcome.
- Does so by incorporating a set of key features of the banking sector that gained relevance since the 90's
  - Asset holdings of financial intermediaries have grown considerably since the early 90's, together with the increase in the securitization market (Aksoy and Basso (2015)).
  - Share of assets that are allocated to the trading book and thus are mark-to-market have increased significantly (US SEC - Study on Mark-To-Market Accounting - 2008).
  - Bankers compensation is heavily skewed towards short-term payoff (salary + bonuses + equity) - Fahlenbrach and Stulz (2009) and Bolton, Mehran, and Shapiro (2010).

Particularly...

- The combination of an active secondary market, mark-to-market re-valuation (affecting banks' asset holdings) and short-term payoff bias may provide incentives that in turn affect information aggregation in secondary markets.
- Lack of perfect information aggregation in secondary markets lead new credit assets issued in the primary market to be mispriced (not reflecting all available information). Credit spreads are incorrectly set.
- Our focus is
  - Study how those instances of imperfect information revelation in markets **affect economic activity**.
  - Analyze which **structural characteristics** of the macroeconomy and the banking sector **influence their likelihood**.
  - And look at macroprudential policy.

Main Findings

- Mispricing of risk generates more volatility in real variables and helps the model in matching the features we observe during a credit crisis (relative to model with risk shocks only).
- Mispricing is able to generate both a boom and a subsequent bust in output.
- Mispricing is more likely to occur when bank's asset holdings is higher, when banks are more leveraged, have more bargaining power or when risk is higher, on average.
- Procyclicality of profits induce mispricing while procyclical leverage reduces the possibility that mispricing occurs.
- As such, taxation of profits is a more effective macroprudential tool than counter cyclical leverage. Other important implications of policy related to MTM accounting in banking and the incentive structure in banking.

Model - Structure

- Model economy is populated by firms and households, which are themselves divided into workers, entrepreneurs and bankers.
- Households decide how much to consume and can save buying capital or making bank deposits.
- Firms produce consumption goods using capital, which resulted from entrepreneurs' projects, and labour, supplied by workers.
- Entrepreneurs are the main investors of the economy, undertaking long-term risky projects that transform consumption goods into capital goods. Investment Return ω_t is log-normally distributed with mean μ and variance σ_t.
- Bankers are responsible for financial intermediation, offering loan/funding contract to entrepreneurs.

Thus, so far we have a standard macroeconomic model with credit frictions.

Key ingredients

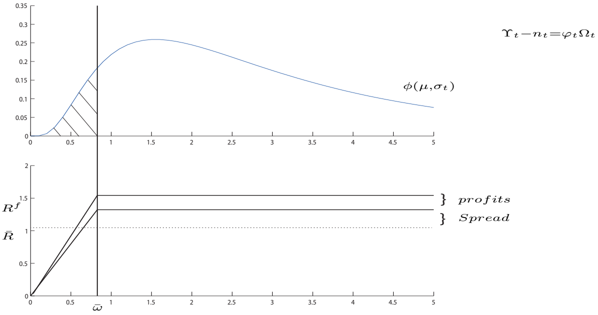
- Include a risk shock (σ_t) which alters the entire distribution of entrepreneurs returns (see Christiano, Motto, and Rostagno (2014) and Gilchrist, Sim, and Zacrajsek (2011) for similar models).
- This variable determines economic/credit conditions.
- Banks, have some internal capital (Ω_t), sets a leverage ratio (φ_t), which is exogenously linked to level of risk and have bargaining power (procyclical) thus make profits out of loans.
- We assume each banker may receive a signal on the degree of riskiness and participate in a secondary market where baskets of loan/debt contracts are (potentially) traded.
- Thus, their view on the economic conditions is formed as the outcome of the information aggregation in this market.

The two key features

- Financial Contract - Where we incorporate the key features of banking to our economy.

- Secondary Market of Credit Baskets - Which allows us to talk about information issues.

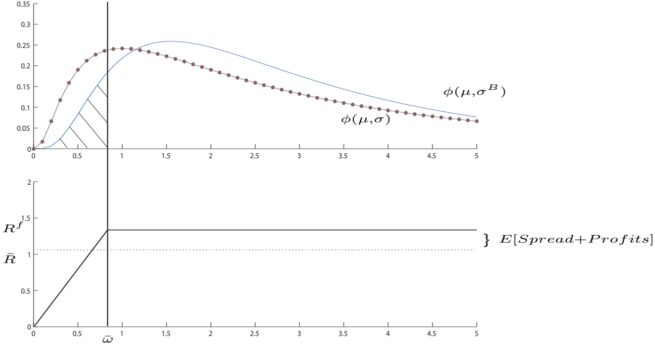
Financial Contract - Solution



- Key terms of contract then are the cutoff point ϖ_t, total investment Υ_t, and leverage ratio φ_t. Let $\Gamma_t = \{\varpi_t, \Upsilon_t, \varphi_t\}$.

See Detail of Financial Contract

Financial Contract - Change in σ



Secondary Market - Signal and Trade Decision

- Banks may receive (accurate) signal of σ_t.
- No trade theorem applies - only information differences $\Rightarrow$ Signalling Game between bankers and the 'market'.
- A banker problem is then, upon observing the signal to decide the probability (s)he will trade and reveal the signal to the market.

Bankers care about profits

- Bank portfolio valuation.
- $V_t^0(\Gamma_{t,\mathbb{N}_t}, \sigma_t^{mtm})$ - value of a new contract.
- $V_t^{mtm}(\Gamma_{t,\mathbb{Z}_{t-1}}, \sigma_t^{mtm})$ - new value of asset holdings.
- $V_{t-1}^F(\Gamma_{t-1,\mathbb{M}_{t-1}}, \sigma_{t-1})$ as the final valuation of the contract that matured at the end of last period.
- Bank's current mark-to-market value - $\Pi_t^B(V_{t-1,\mathbb{M}_{t-1}}^F, V_{t,\mathbb{Z}_{t-1}}^{mtm}, V_{t,\mathbb{N}_t}^0)$.

See Detail of Bank Profits

Secondary Market Equilibrium

- Player 1 - The Banker sets the probability of revealing signal to maximise the payoff from the her activity in the credit markets. We assume the payoff for bankers is given by

$$J_t^B = \Pi_t^B + \beta\alpha J_{t+1}^B = \sum_{t=0}^{\infty} (\beta\alpha)^t \Pi_t^B.$$

- Π_t^B - depends on $V_{t,\mathbb{Z}_{t-1}}^{mtm}$ or MTM conditions, while J_{t+1}^B depends on series of $V_{t+s,\mathbb{M}_{t+s}}^F$ for $s > 0$ or stream of realized profits. As such α indicates the relative importance of realized (long-term) payoff relative to MTM gains.
- Player 2 - The 'Market' updates believes upon signal given by each banker using Bayes rule.
- Perfect Bayesian Equilibrium (PBE) of the signalling game between bankers and the market determine σ_t^{mtm}.

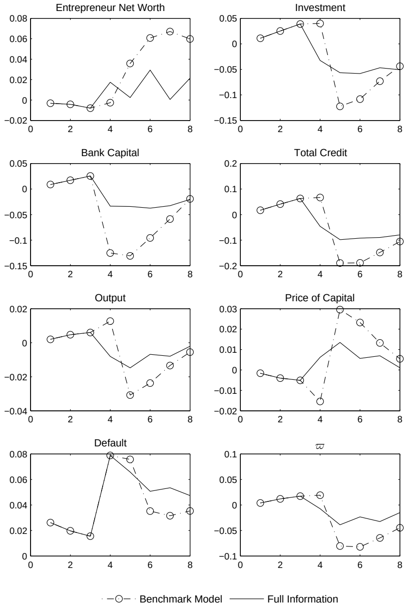
Formally - Secondary Market Equilibrium

Model in a nutshell

- Standard economy with credit frictions (costly state verification), households work and consume, firms produce, entrepreneurs make risky investments.
- Banks, have some internal capital, abide by a leverage constraint (leverage ratio is a function of risk in the economy) and give long-term loans to entrepreneurs. Banks have bargaining power thus make profits out of loans.
- Probability of default changes with risk (σ_t). Banks may receive (accurate) signal of σ_t .
- Secondary market activity determines σ_t^{MTM}.
- News loans given at every period depend on σ_t^{MTM}.
- Thus, if $\sigma_t^{MTM} \neq \sigma_t$ credit is mispriced.
- First - What are the consequences of mispricing?
- Second - When is $\sigma_t^{MTM} \neq \sigma_t$?

Calibration and Comp. Method

Boom and bust under partial information revelation



Discussion

- Shock under full information does not generate crisis.
- Pre-bust boom - low credit spread, high asset prices. Output is even greater than what banks expected although default rates are higher. This is due to high consumption boosted by gains of successful entrepreneurs from lower credit spreads and households gains from lower price of capital, freeing up resources previously assigned to savings.
- Output response in subsequent periods is lower due to credit supply problems. Ivashina and Scharfstein (2010) and Cornett, McNutt, Strahan, and Tehranian (2011) show that banks that were more exposed to default reduced credit more strongly.
- We obtain an inverted v-shape in output with the peak at the period before the bust (matching the empirical findings - Reinhart and Rogoff (2008)).
- In the period after the bust the recovery is creditless (Abiad, Li, and Dell'Ariccia (2011)).

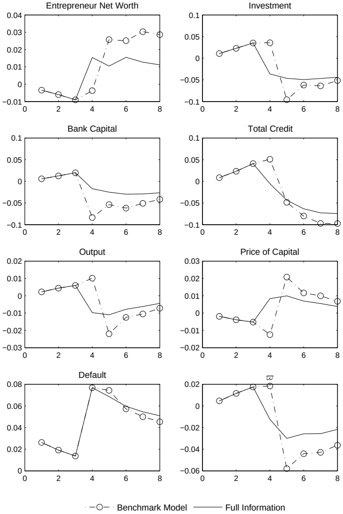


Figure: Boom and bust in the presence of partial information revelation - Two period

Results for longer maturity

When does mispricing occur?

- Banks who receive a signal decide to actively participate in the market and reveal the signal or not. They do it to maximize the value of the bank.

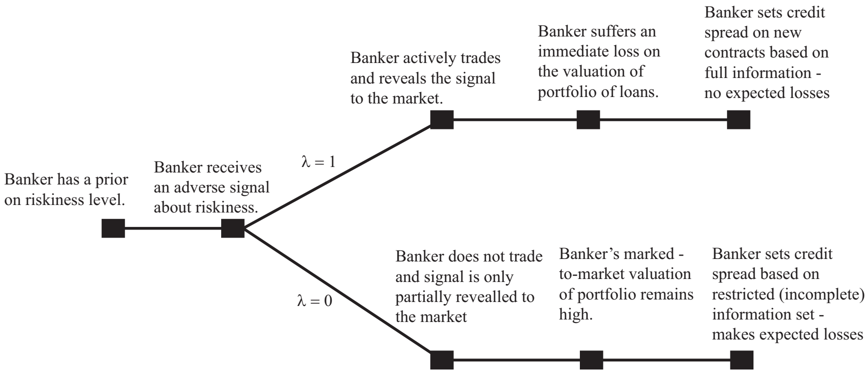


Figure: Banker's trade-off after adverse signal

α_{lim} = bias such that bankers are indifferent.

Bank Profit - one period loans for simplicity or setting $\zeta = 1$

- Generally

$$J_t^B = V_t^0 + (V_t^{mtm} - V_{t-1}^0) + (V_{t-1}^F - V_{t-1}^{mtm}) + \alpha\beta\left[(V_{t+1}^{mtm} - V_t^0) + (V_t^F - V_t^{mtm}) + J_{0,t+1}\right]$$

- Full Information - $(V_{t+1}^{mtm} - V_t^0) = (V_t^F - V_t^{mtm}) = 0$

$$J_t^B(\sigma_t) = V_t^0(\sigma_t) + (V_t^F - V_{t-1}^0) + \alpha\beta[J_{0,t+1}^F]$$

- Partial Information

$$\begin{aligned} J_t^B(\sigma_t^{mtm}) &= V_t^0(\sigma_t^{mtm}) + (V_t^{mtm} - V_{t-1}^0) \\ &+\alpha\beta\left[(V_{t+1}^{mtm}(\sigma_t) - V_t^0(\sigma_t^{mtm})) + (V_t^F(\sigma_t) - V_t^{mtm}) + {J^P}_{0,t+1}\right] \end{aligned}$$

- Difference

$$\begin{aligned} J_t^B(\sigma_t^{mtm}) - J_t^B(\sigma_t) &= \underbrace{(V_t^0(\sigma_t^{mtm}) - V_t^0(\sigma_t))}_{\text{Gain - new positions in primary markets}} + \underbrace{(1-\alpha\beta)(V_t^{mtm} - V_t^F)}_{\text{Gain - postponing MTM valuation}} + \\ &+ \underbrace{\alpha\beta(V_{t+1}^{mtm}(\sigma_t) - V_t^0(\sigma_t^{mtm}))}_{\text{Loss - Primary Markets under Partial Information}} + \underbrace{\alpha\beta({J^P}_{0,t+1} - J_{0,t+1}^F)}_{\text{Loss - Lower Bank capital}} > 0 \end{aligned}$$

Partial Information - Short-term Payoff Bias

$$\alpha_{lim} = \frac{\overbrace{(V_t^0(\sigma_t^{mtm}) - V_t^0(\sigma_t)) + (V_t^{mtm} - V_t^F)}^{\text{Total period } t \text{ gains from partial revelation}}}{\underbrace{\beta[(V_t^F - V_t^{mtm}) + (V_{t+1}^{mtm}(\sigma_t) - V_t^0(\sigma_t^{mtm})) + ({J^P}_{0,t+1} - J^F_{0,t+1})]}_{\text{Expected losses from postponing MTM, mispricing and banking capital effects}}}$$

α_{lim} - Cutoff point

- Higher $\alpha_{lim} \Rightarrow$ mispricing is more likely.

Table: α_{lim} for different structural parameters

	maturity	bench	$\bar{\chi}$ (bank profits)	$\bar{\varphi}$ (leverage)	$\bar{\sigma}$ (var. returns)	Φ_{χ}	Φ_{LT}
α_{lim}	1	0.34	0.39	0.39	0.45	0.36	0.28
α_{lim}	4	0.65	0.68	0.7	0.74	0.67	0.58

Mispricing is more likely to occur when maturity of asset holdings is higher, when banks are more leveraged, have more bargaining power or when risk is higher, on average (at steady state).

Mispricing is more likely when bank profitability is more procyclical but less when leverage is more procyclical (due to the effects on the price of capital)

Additional Results

- Boom and bust is robust to different parameter choices - Go to

- Imperfect information aggregation increases volatility of output, investment, consumption and labour - Go to

Macro Prudential Policy Making

- Counter-cyclical leveraging controls the boom by restricting bank lending and helps in the recovery by relaxing the leverage constraint.
- ...but counter-cyclical leverage increases the α_{lim}, since due to its effect on the price of capital, avoiding MTM adjustment becomes more beneficial.
- Progressive taxation curbs the increase in banking capital, controlling the expansion of credit, and boosts output during the recovery by aiding the recapitalization of banks.
- High profit tax rates in booms reduce the incentive to maintain mark-to-market valuation high, but also reduces the punishment from mispricing of risk (as long as profits are still positive). α_{lim} decreases as the first effect is stronger.
- Both policies are effective in curbing boom and bust, tax on profits is effective in preventing partial information revelation that occurs due to the bias on short-term payoffs in banking.

Conclusions

- Asset holdings in the banking sector has increased substantially, together with the secondary market of credit products and the importance of mark-to-market payoff to bankers.
- These features may generate lack of perfect information revelation, which in turn lead to mispricing of risk.
- Mispricing of credit risk generates initially a boom (low credit spreads benefits investors) and subsequently a sharp recession due to credit supply problems.
- The work explores one consequence of banks' asset holdings and MTM revaluations that affect their decision making, leading to important macro effects. Current debate on low interest rates and and how they affect could be analyzed by slightly modifying the framework developed in the paper.
- Taxation of profits is a more effective macroprudential tool than counter cyclical leverage.

THANKS FOR YOUR ATTENTION!

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Appendix - Additional Details and Results

Financial Contract - Problem

$$q_{t+s}\Upsilon_{t,j}\left[\int_{\varpi_{t,j}}^{\infty}\omega\phi(\sigma_{t+s})d\omega-\varpi_{t,j}(1-\Phi(\varpi_{t,j};\sigma_{t+s}))\right]\equiv q_{t+s}\Upsilon_{t,j}f(\varpi_{t,j};\sigma_{t+s}),\ \text{and}$$

$$q_{t+s}\Upsilon_{t,j}\left[\int_{0}^{\varpi_{t,j}}\omega\phi(\sigma_{t+s})d\omega-\delta\Phi(\varpi_{t,j};\sigma_{t+s})+\varpi_{t,j}(1-\Phi(\varpi_{t,j};\sigma_{t+s}))\right]\equiv q_{t+s}\Upsilon_{t,j}g(\varpi_{t,j};\sigma_{t+s}).$$

$$\max_{\{\Upsilon_{t,j},\varpi_{t,j}\}}\quad E\left[\sum_{s=1}^{\infty}\zeta(1-\zeta)^{s-1}q_{t+s}\Upsilon_{t,j}f(\varpi_{t,j};\sigma_{t+s})|\Xi_{1,t}\right]$$

$$\begin{array}{llll}\text{s.t} & E\left[\sum_{s=1}^{\infty}\zeta(1-\zeta)^{s-1}q_{t+s}\Upsilon_{t,j}g(\varpi_{t,j};\sigma_{t+s})|\Xi_{1,t}\right] & \geqslant & E\left[\sum_{s=1}^{\infty}\zeta(1-\zeta)^{s-1}(R^{*}_{t,d}(\Upsilon_{t,j}-n_{t,j})+\chi_t q_{t+s}\Upsilon_{t,j}f(\varpi_{t,j};\sigma_{t+s}))\right] \\ & \int_{j\in\mathbb{N}_t}(\Upsilon_{t,j}-n_{t,j})dj & \leqslant & \varphi_t\Omega_{t,\mathbb{N}_t}.\end{array}$$

Solution - investment, Υ^{*}_{t} and cutoff point, ϖ^{*}_{t}.
These are equal across entrepreneurs investing at time t (independent of networth). Back

Portfolio Valuation

$$
\begin{aligned}
V_t^0(\Gamma_t^*, \sigma^{E1,t}) &= E\left[\sum_{s=1}^{\infty} \zeta(1-\zeta)^{s-1} q_{t+s} \Upsilon_t^* g(\varpi_t^*; \sigma_{t+s}) - R_{t,d}^*(\Upsilon_t^* - n_t^*) \mid \Xi_{1,t}\right] \\
V_{t,\mathbb{N}_t}^0 &= \int_{j\in\mathbb{N}_t} V_t^0(\Gamma_t^*, \sigma^{E1,t}) dj \\
V_t^{mtm}(\Gamma_z, \sigma^{E1,t}) &= E\left[\sum_{s=0}^{\infty} \zeta(1-\zeta)^{s} q_{t+s} \Upsilon_z g(\varpi_z; \sigma_{t+s}) - R_{z,d}(\Upsilon_z - n_z) \mid \Xi_{1,t}\right], \\
V_{t,\mathbb{Z}_{t-1}}^{mtm} &= \int_{z\in\mathbb{Z}_{t-1}} V_t^{mtm}(\Gamma_z, \sigma^{E1,t}) dz \\
V_{t-1}^F(\Gamma_m, \sigma_{t-1}) &= q_{t-1}\Upsilon_m g(\varpi_m; \sigma_{t-1}) - R_{m,d}(\Upsilon_m - n_m) \\
V_{t-1,\mathbb{M}_{t-1}}^F &= \int_{m\in\mathbb{M}_{t-1}} V_{t-1}^F(\Gamma_m, \sigma_{t-1}) dm
\end{aligned}
$$

$$
\begin{aligned}
\Pi_t^B &= V_{t,\mathbb{N}_t}^0 + V_{t,\mathbb{Z}_{t-1}}^{mtm} + V_{t-1\mathbb{M}_{t-1}}^F - V_{t-1,\mathbb{Z}_{t-1}\cup\mathbb{M}_{t-1}}^{mtm} \\
&= V_{t,\mathbb{N}_t}^0 + V_{t,\mathbb{Z}_{t-1}}^{mtm} + V_{t-1\mathbb{M}_{t-1}}^F - V_{t-1,\mathbb{Z}_{t-2}}^{mtm} - V_{t-1,\mathbb{N}_{t-1}}^0 \\
&= V_{t,\mathbb{N}_t}^0 + (V_{t,\mathbb{Z}_{t-1}}^{mtm} - V_{t-1,\mathbb{Z}_{t-2}\cap\mathbb{Z}_{t-1}}^{mtm} - V_{t-1,\mathbb{N}_{t-1}\cap\mathbb{Z}_{t-1}}^0) + (V_{t-1,\mathbb{M}_{t-1}}^F - V_{t-1,\mathbb{Z}_{t-2}\cap\mathbb{M}_{t-1}}^{mtm}),
\end{aligned}
$$

Aggregation

Given that there is a continuum $[0, 1]$ of entrepreneurs undertaking projects in stage 2 and that the arrival of the maturity is memoryless across all projects, we have that $\int_{m\in\mathbb{M}_t}(\Upsilon_m)dm = \zeta\int_0^1 \Upsilon_{t,i}di$ and $\int_{l\in\mathbb{L}_t}(\Upsilon_l)dl = (1-\zeta)\int_0^1 \Upsilon_{t,i}di$, and therefore as $\mathbb{Z}_{t-1} = \mathbb{L}_{t-1}\cup\mathbb{N}_{t-1} = \mathbb{L}_t\cup\mathbb{M}_t$

$$\int_0^1 \Upsilon_{t,i}di = \int_{z\in\mathbb{Z}_{t-1}} \Upsilon_z dz \equiv \Upsilon_t = \int_{j\in\mathbb{N}_{t-1}} \Upsilon^*_{t-1}dj + \int_{l\in\mathbb{L}_{t-1}} \Upsilon_l dl = \zeta\Upsilon^*_{t-1} + (1-\zeta)\Upsilon_{t-1} \tag{1}$$

Equivalently

$$\int_0^1 n_{t,i}di \equiv n_t = \zeta n^*_{t-1} + (1-\zeta)n_{t-1} \tag{2}$$

$$\int_0^1 \varpi_{t,i}di \equiv \varpi_t = \zeta\varpi^*_{t-1} + (1-\zeta)\varpi_{t-1} \tag{3}$$

$$\int_0^1 R_{i,t,d}di \equiv R_{t,d} = \zeta R^*_{t-1,d} + (1-\zeta)R_{t-1,d}. \tag{4}$$

Back

Formally - Secondary Market Equilibrium

- $$\ln \sigma_t = (1-\rho^S)\ln\bar{\sigma} + \rho^S \ln \sigma_{t-1} + \iota_t \varepsilon_t^S,$$
- ε_t^S is known. ι_t takes the value of 1 with probability $1-p$ and the value of -1 with probability p. Bankers may get a signal of the true value of ι_t. Thus, bankers who received signal know σ_t.
- Player 1, the bank, sets $\lambda_t^{S_t} = \Pr(A_t = \iota_t | S_t = \iota_t)$.
- Player 2, the market, updates believes upon signal using Bayes rule

$$r^{\tilde{\iota}_t}(\lambda_t^{\iota_t}) = \Pr(\tilde{\iota}_t | A_t = \tilde{\iota}_t) = \frac{\Pr(\tilde{\iota}_t)}{\Pr(\tilde{\iota}_t) + (1-\Pr(\tilde{\iota}_t))(1-\lambda_t^{\iota_t})}.$$

- Perfect Bayesian Equilibrium (PBE) of the signalling game between bankers and the market is the pair $(r^{*,\tilde{\iota}_t}, \lambda^{*,\iota})$ and

$$\begin{aligned} \ln \sigma_t^{mtm} &= (1-\rho^S)\ln\bar{\sigma} + \rho^S \ln\sigma_{t-1} + \\ &\left(\lambda^{*,\iota}\iota_t + (1-\lambda^{*,\iota})(r^{*,\tilde{\iota}_t}\tilde{\iota}_t + (1-r^{*,\tilde{\iota}_t})\iota_t)\tilde{\iota}_t\right)\varepsilon_t^S. \end{aligned}$$

Back

Calibration and Computational Methodology

- Follow Carlstrom and Fuerst (1997) and Christiano, Motto, and Rostagno (2014) closely. Set leverage and profits at steady state to match data in the US. Perform sensitivity on cyclical properties of leverage and bank profits.
- The main computational challenge we face is to account for the two different information sets
- The system of equations can then be represented in matrix form by

$$\mathcal{E}[\alpha_0 \Psi_{t+1} + \alpha_1 \Psi_t + \alpha_2 \Psi_{t-1} + \beta_0 s_t + \beta_1 s_{t+1}] = 0.$$

- Ψ_t is the vector of endogenous variables and $s_t = [\hat{\sigma}_t \quad \hat{\sigma}_t^{mtm}]^T$ is the vector of shocks (both in deviations to the steady state).
- The expectation operator $\mathcal{E}$ is non-standard since it involves 2 traditional expectation operators, one in which the information set is $\Xi_{t,1}$ and one with the information set being $\Xi_{t,2}$.
- We adapt Christiano (1998) methodology. The final solution to our system of equation is given by

$$\Psi_t = A\Psi_{t-1} + \begin{bmatrix} \mathbf{0} & \frac{B_2}{\rho_S} \\ \breve{B}_1 s_t & \end{bmatrix} [\hat{\sigma}_t \quad \hat{\sigma}_t^{mtm}]^T$$

Short-term Payoff Bias - setting $\zeta < 1$

$$J_t^B(\sigma_t^{mtm}) - J_t^B(\sigma_t) = \underbrace{(V^0_{t,\mathbb{N}_t}(\sigma_t^{mtm}) - V^0_{t,\mathbb{N}_t}(\sigma_t))}_{\text{Gain - new positions in primary markets}} +$$

$$\underbrace{V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t^{mtm}) - V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t) + \alpha\beta\left[V^{mtm}_{t+1,\mathbb{L}_t\cap\mathbb{Z}_{t-1}}(\sigma_t) + V^F_{t,\mathbb{M}_t\cap\mathbb{Z}_{t-1}}(\sigma_t) - V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t^{mtm})\right]}_{\text{Gain - postponing MTM valuation}}$$

$$+\underbrace{\alpha\beta\left[V^{mtm}_{t+1,\mathbb{Z}_t\cap\mathbb{N}_t}(\sigma_t) - V^0_{t,\mathbb{N}_t}(\sigma_t^{mtm})\right]}_{\text{Loss - Primary Markets under Partial Information}} + \underbrace{\alpha\beta(J^P{}_{0,t+1} - J^F_{0,t+1})}_{\text{Loss - Lower Bank capital}} > 0$$

$$\alpha_{lim,\zeta<1} = \frac{\overbrace{(V^0_{t,\mathbb{N}_t}(\sigma_t^{mtm}) - V^0_{t,\mathbb{N}_t}(\sigma_t)) + (V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t^{mtm}) - V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t))}^{\text{Total period } t \text{ gains from partial revelation}}}{\underbrace{\beta\left\{\left[V^{mtm}_{t+1,\mathbb{L}_t\cap\mathbb{Z}_{t-1}}(\sigma_t) + V^F_{t,\mathbb{M}_t\cap\mathbb{Z}_{t-1}}(\sigma_t) - V^{mtm}_{t,\mathbb{Z}_{t-1}}(\sigma_t^{mtm})\right] + \left[V^{mtm}_{t+1,\mathbb{Z}_t\cap\mathbb{N}_t}(\sigma_t) - V^0_{t,\mathbb{N}_t}(\sigma_t^{mtm})\right] + (J^P{}_{0,t+1} - J^F_{0,t+1})\right\}}_{\text{Future losses from postponing MTM, mispricing and banking capital effects}}}$$

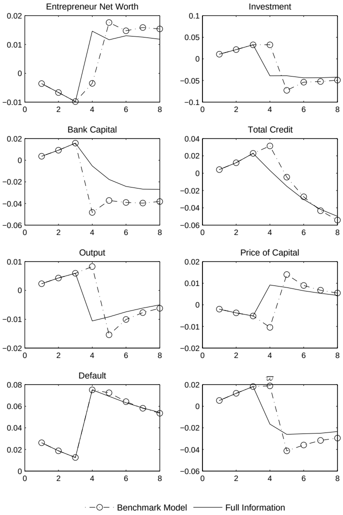

Figure: Boom and bust in the presence of partial information revelation - ζ=0.25

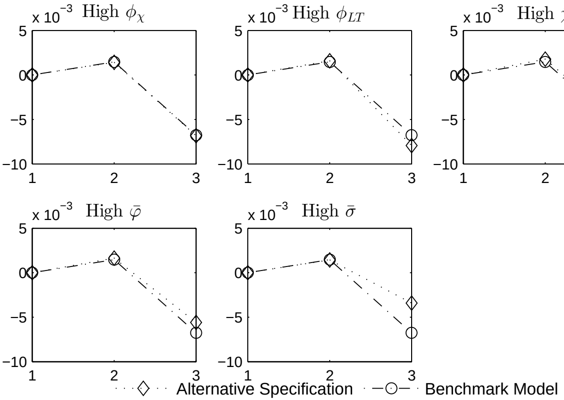

Figure: Output Response - Boom and bust for different structural parameters

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Macroeconomic Volatility

Set $\alpha_t = \mathfrak{w}\alpha_{t-1} + (1-\mathfrak{w})\frac{1}{1+e^{-\phi_\alpha \hat{Y}_t}}$, where $\hat{Y}_t = \frac{Y_t - \bar{Y}}{\bar{Y}}$

Table: Relative Volatility and Partial Revelation in Secondary Markets

	$\phi_\alpha = 100$, $\mathfrak{w} = 0.5$ $\zeta = 1$	$\phi_\alpha = 200$, $\mathfrak{w} = 0.5$ $\zeta = 1$	$\phi_\alpha = 100$, $\mathfrak{w} = 0.8$ $\zeta = 1$	$\phi_\alpha = 100$, $\mathfrak{w} = 0.5$ $\zeta = 0.5$	$\phi_\alpha = 100$, $\mathfrak{w} = 0.5$ $\zeta = 0.25$
Consumption	1.009	1.013	1.005	1.012	1.001
Labor	1.014	1.021	1.006	1.023	1.009
Output	1.040	1.074	1.017	1.058	1.041
Investment	1.012	1.019	1.005	1.017	1.016
Bank Profits	1.042	1.086	1.016	1.099	1.137
Partial Inf.	3.7%	7.7%	1.4%	10.8%	18.8%

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