Adverse Selection and Financial Crises

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Introduction

To study the channels by which financial disturbances affect macroeconomic outcomes, we propose a macroeconomic model in which adverse selection in investment:

- amplifies the business cycle
- generates occasional financial crises

Most existing models of financial frictions drive fluctuations in the marginal efficiency of investment (*investment wedge*), our model generates movements in TFP. This is supported by the business cycle accounting approach of Chari et al. (2007) who find movements in TFP (*efficiency wedge*) important during crises.

Key Results

Adverse selection works through both *investment wedge* and *efficiency wedge*

- Former introduces financial accelerator distinct from balance sheet channel
- Latter due to misallocation of capital on the extensive margin
- More likely to happen in low interest rate environments

Model Environment

We extend a standard RBC model so that households have access to risky projects requiring:

- Household member (entrepreneur)
- Labour paid at market wage rate
- A fixed amount of external/internal finance

Furthemore, following Stiglitz & Weiss (1981), projects differ in their risk but this is hidden information to the lender.

Household members allocated to one of

- Entrepreneurs
- Workers
- Unemployed

Household allocates capital to either

- Equity – fund their own entrepreneurs
- Debt – lend to entrepreneurs from other households

At the end of period t, entrepreneurs are endowed with required internal finance, draw a project and seek external finance for production at $t+1$.

Remaining household members allocated to workers or unemployed at start of $t+1$. This leads to:

- Labour supply condition and Euler equation analogous to standard RBC model.
- Additional condition determining allocation of capital to debt/equity:

$$\mathbb{E}_t\left(\text{Discounted profits}\right) = \mathbb{E}_t\left(\text{Wage Rate} + \text{Return from Debt}\right)$$

Entrepreneurs draw an (iid) privately observed project with type $\theta \in \{s, r\}$ (safe/risky)

- A proportion λ of projects are safe, and $1-\lambda$ risky
- Safe projects yield return R_t^S
- Risky projects yield:
  - $R_t^R \equiv \omega_t R_t^S$ with probability p_t^r, $\omega_t \geq 1$
  - 0 with probability $1-p_t^r$
- Lenders can observe whether project succeed

We abstract from the balance sheet channel — is it possible for the lender to screen borrowers without size of loan and collateral as instruments?

When screening with only the repayment rate τ:

- Risky borrowers will pretend to be safe
- Could result in credit rationing
- Higher interest rates exclude safer borrowers, worsening effects of adverse selection

We find the lender can also screen using the *probability of approval*

- Risky borrowers will accept a higher rate if have a higher probability of being financed.
- Lenders post two contracts

$$\mathcal{C}_t^i = \{\tau_t^i, x_t^i\}, \quad i \in \{s, r\}$$

x is probability of being financed, τ is loan repayment rate.

Contract maximises lender surplus subject to individual rationality and incentive compatibility constraints

- Safe IR constraint binds — safe borrowers earn no surplus
- Risky IC constraint binds — risky borrowers earn information rents
- Risky borrowers always more likely to get finance

Analytical Results

The left panel in figure 1 shows that information rents increase in the default rate, $1-p^r$. If $p^r < p^{r*}$:

- There is misallocation of capital on the extensive margin
- Lenders restrict funding to safe projects so to charge risky borrowers higher interest rates
- The threshold shifts left with more risky borrowers; i.e., as λ increases, a lower default rate is required to cause credit restrictions.

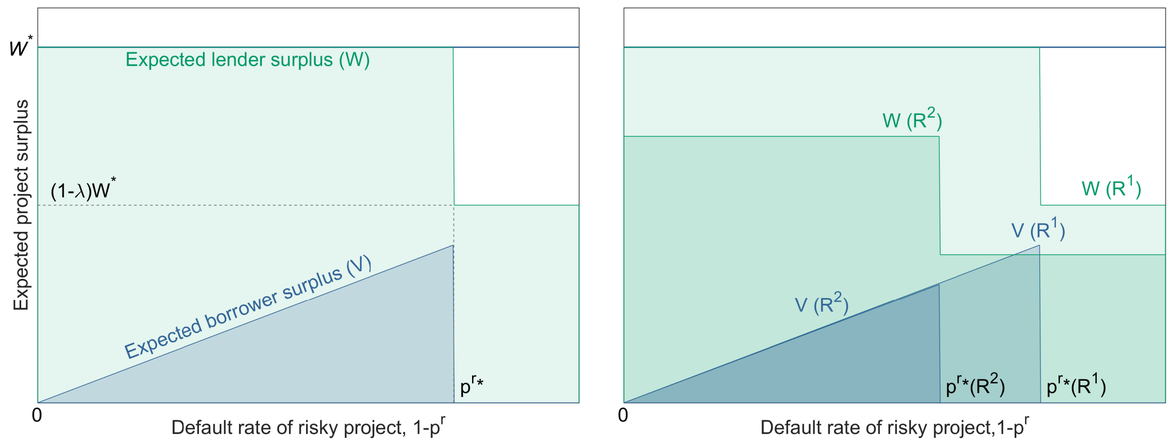

Figure 1: Contract in partial equilibrium for range of p^r, keeping the NPV constant, so $p^r\omega = 1$. W^* is first best surplus to lender. Right panel compares high interest rate, R^1 with low interest rate, R^2.

The right panel in figure 1 shows the effect of lowering the return on projects.

- For a given default rate, p^r, total surplus shrinks, but borrower surplus is constant
- This causes the threshold to shift left; i.e., a lower default rate causes credit restrictions

A credit tightening is more likely in a low interest rate environment.

We can define the *investment* and *efficiency* wedges as follows:

- With $Y_t = A_t K_t^{\alpha} H_t^{1-\alpha}$, efficiency wedge (TFP):

$$A_t \equiv z_t \left(\frac{\text{Average productivity of equity} \times \text{Required capital per project}}{\text{Total capital per entrepreneur}} \right)^{\alpha}$$

  The numerator captures misallocation on the extensive margin when lenders restrict credit, and any misallocation on the intensive margin; the denominator captures misallocation on the extensive margin if the number of borrowers and loans do not match.

- The investment wedge:

$$\Delta_t \equiv \mathbb{E}_t\left[\text{Average rate of return on financed } (t+1) \text{ projects} - \textit{Ex post} \text{ return on debt}\right]$$

  This captures the information rents earned by risky borrowers.

Numerical Analysis

We use typical parameters from RBC literature and set the additional model parameters to target average commercial loan default rate, interest spread, firm leverage ratios and the average number of workers per firm.

Figure 2 shows IRFs to a default rate (risk) shock, as seen e.g. after the onset of the 2008 crash. To consider the roles of the investment and efficiency wedge, we compare

- *Investment wedge* model: an RBC model with the investment wedge from the full adverse selection economy
- *Adverse selection* model

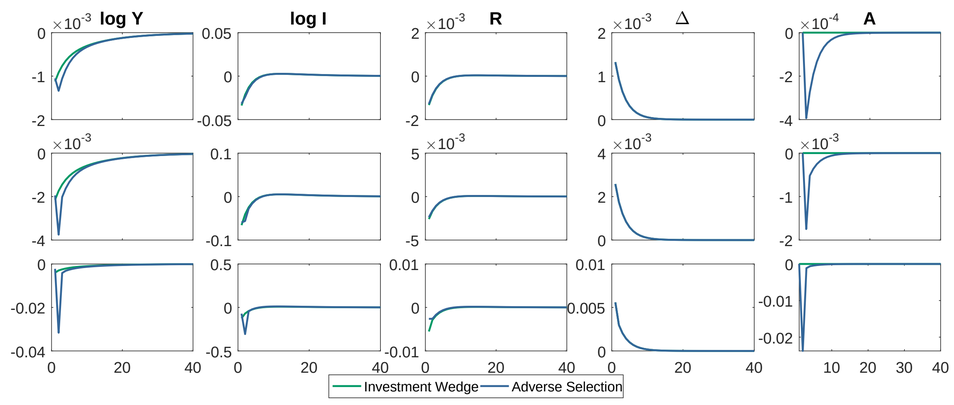

Figure 2: IRFs to a transitory risk shock. Top panel: p_t^r falls by ≈ 1 percentage pt. Middle panel: p_t^r falls by ≈ 2 percentage pts. Bottom panel: p_t^r falls by ≈ 3 percentage pts. Relative deviation for A, level deviation for all other variables.

Whereas small shocks work through the investment wedge, larger shocks work through the efficiency wedge.

Conclusions

- Adverse selection in investment can generate endogenous movements in TFP (*efficiency wedge*) and the marginal efficiency of investment (*investment wedge*)
- The latter acts as a financial accelerator distinct from balance sheet channel
- Misallocation of capital on extensive margin leads to large drops in TFP, as observed during financial crises
- Effects of shocks are asymmetric and non-monotonic
- Replicates observed negative skewness in investment
- Modest increases to the default rate can generate sharp downturns
- More likely to occur in low return environments

References

Chari, V. V., Kehoe, P. J. & McGrattan, E. R. (2007), 'Business cycle accounting', *Econometrica* **75**(3), 781–836.

Stiglitz, J. E. & Weiss, A. (1981), 'Credit Rationing in Markets with Imperfect Information', *American Economic Review* **71**(3), 393–410.