Basle Accord and Financial Intermediation: The Impact of Policy

Martin Berka

UBC

Christian Zimmermann

UQAM → UConn / Bank of Canada

Channels of Monetary Policy

Channels of monetary policy transmission (summary in Mishkin, JEP 1995):

- Interest rate channel: $M \downarrow \Rightarrow i \uparrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$
- Exchange rate channel: $M \downarrow \Rightarrow i \uparrow \Rightarrow e \downarrow \Rightarrow NX \downarrow \Rightarrow Y \downarrow$
- Equity price channel I: $M \downarrow \Rightarrow p^e \downarrow \Rightarrow q \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$
- Equity price channel II: $M \downarrow \Rightarrow p^e \downarrow \Rightarrow W \downarrow \Rightarrow C \downarrow \Rightarrow Y \downarrow$
- Bank lending channel: $M \downarrow \Rightarrow D \downarrow \Rightarrow L \downarrow \Rightarrow I \downarrow \Rightarrow Y \downarrow$
- Balance-sheet channel I: $M \downarrow \Rightarrow p^e \downarrow \Rightarrow$ adv. select. $\uparrow$ & mor. haz. $\uparrow \Rightarrow L \downarrow \Rightarrow Y \downarrow$
- Balance-sheet channel II: $M \downarrow \Rightarrow i \uparrow \Rightarrow CF \downarrow \Rightarrow$ adv. select. $\uparrow$ & mor. haz. $\uparrow \Rightarrow L \downarrow \Rightarrow Y \downarrow$
- Balance-sheet channel III: $M \downarrow \Rightarrow p^e \downarrow \Rightarrow$ fin. ass. $\downarrow$ prob(fin. distress) $\uparrow \Rightarrow C^{dur} + I^{res} \downarrow \Rightarrow Y \downarrow$

“Newly discovered”:

- Stock market channel:
  $\Delta M \uparrow \Rightarrow \Delta p \uparrow \Rightarrow \tau_y A \uparrow \Rightarrow A \downarrow \& B \uparrow \Rightarrow Y \uparrow$
  (Chami, Cosimano & Fullenkamp, IMF 1999)
- Bank balance-sheet channel (Chami & Cosimano, IMF 2001)
- Bank capital channel (Van den Heuvel, Wharton 2001)

Chami & Cosimano (2001)

Assumptions:

- Capital regulation (Basle style)
- imperfect competition in banking industry
- increasing marginal cost of loans
- reduced form demand for loans
- infinite supply of deposits

$r^b \uparrow \Rightarrow D^S \downarrow \Rightarrow r^d \uparrow \Rightarrow \pi \downarrow \Rightarrow E \downarrow \Rightarrow L \downarrow$

van den Heuvel (2001)

Assumptions

- Capital regulation (Basle style)
- maturity transformation
- bank equity influenced by retained earnings and dividends, infinite cost to raise equity
- tax advantage of bank debt over bank equity
- reduced form demand for loans and supply of deposits
- bank heterogeneity

$r^d \uparrow \stackrel{t+1}{\Rightarrow}$ pr(reg. binds) $\uparrow \Rightarrow L \downarrow$

Here:

- competitive markets
- closer to general equilibrium: household and firm problems
  - houshold: consumption smoothing = saving/investment motive due to idiosyncratic and aggregate shocks
  - the bank's concerns: loan returns, bad loans
- model failures/bankruptcies
- show the role of endogenous heterogeneity of firms and households
- show effects of various policy measures
- use dynamic setup

Model Assumptions

- Household
  - endowed with one project with a stochastic return
  - external financing necessary
  - loan screening by net worth
  - idiosyncratic unemployment and retirement shocks
- Bank
  - collects deposits and issues equity
  - allocates assets to loans and government bonds
  - maximizes profits subject to regulatory and balance sheet constraints

Model Assumptions (continued)

- Household portfolio allocation
  - chooses deposit/equity mix to maximize risk-adjusted return
- Central bank
  - determines safe return
  - determines capital adequacy ratio
  - supplies riskless bonds

Households / Firms types

- Employed workers ($m < m^*$)
- Unemployed workers ($m < m^*$) with prob u
- Entrepreneurs ($m \geq m^*$)
- Retirees with prob τ
- Death with prob δ

m^* = minimum net worth eligible for external financing

Workers

For a worker, $V^W(m) =$

$$\max_{\{c^i, m^{i'}\}} \quad \{U_W(l_W, c^i) + \beta[(1-\tau)[(1-u)V_W(m^{i'}) +$$

$$uV_U(m^{i'}) + E_{r'}V_E(m^{i'}, r^{i'})] + \tau V_R(m^{i'})]\}$$

$$\text{s.t.} \quad c^i + m^{i'} = (1 + r^{port})m^i + y - \xi$$

$$V_W(m^i) = 0 \text{ if } m^i \geq m^*$$

For an unemployed worker, $V^U(m) =$

$$\max_{\{c^i, m^{i'}\}} \quad \{U_U(l_U, c^i) + \beta[(1-\tau)[(1-u)V_W(m^{i'}) +$$

$$uV_U(m^{i'}) + E_{r'}V_E(m^{i'}, r^{i'})] + \tau V_R(m^{i'})]\}$$

$$\text{s.t.} \quad c^i + m^{i'} = (1 + r^{port})m^i + \theta y - \xi$$

$$V_U(m^i) = 0 \text{ if } m^i \geq m^*$$

Entrepreneurs

- one project x^i with return r^i
- external financing, $x_t^i = \phi m_t^i$ ($\phi > 1$)
- returns are risky – possibility of bankruptcy

$$
\begin{aligned}
&V^E(m,r) = \\
&\max_{\{c^i, m^{i\prime}\}} \quad \{U_E(l_E, c^i) + \beta[(1-\tau)[(1-u)V_W(m^{i\prime}) + \\
&\qquad uV_U(m^{i\prime}) + E_{r'}V_E(m^{i\prime}, r^{i\prime})] + \tau V_R(m^{i\prime})]\} \\
&\text{s.t.} \quad c^i = \max\{c_{min}, m^i + y + (1+r^i)x^i - \\
&\qquad r^l(x^i - m^i) - m^{i\prime} - \xi\} \\
&\qquad x^i = \phi m^i \\
&\qquad V_E(m^i, r^i) = 0 \text{ if } m^i < m^*
\end{aligned}
$$

Banks

- are identical $\Rightarrow$ represented by a single bank
- liabilities: collect deposits and issue equity
- assets: provide loans and buy riskless bonds
- maximize profits:

$$\begin{aligned}
\max_{\{L,B,D,E\}} \quad & r^l L + r^b B - r^d D - r^e E - \delta\left(\frac{D}{E}\right)^{\gamma} D \\
& -(1+l_c)\epsilon L \\
\text{s.t.} \quad & B + L = D + E \\
& \frac{E}{L} \geq \alpha \\
& D + E \geq L
\end{aligned}$$

- instruments: minimum collateral m^* (L), lending rate r^l which clears the market

Losses

- it is costly to liquidate
- if all projects of a household go bankrupt, the household gets minimal consumption

Household portfolio decision

savings split to maximize risk-adjusted return:

$$\max_{\omega_R} \omega_R r^e + (1-\omega_R) r^d - \frac{1}{2}\lambda \omega_R^2 \sigma_E^2$$

the optimal share of equity in portfolio ω_R^* is

$$\omega_R^* = \frac{r^e - r^d}{\lambda \sigma_E^2}$$

Central Bank

Decides on Treasury bond interest rate

Central bank's actions

- affect lending conditions: lending rate and minimum collateral
- affect bank funding also through (an opposite) change in equity prices
- affect saving decisions of workers

Equilibrium

- households solve their utility maximization problems (heterogenous part)
- banks solve their profit maximization problem (homogenous part)
- markets for loans, bonds, deposits and equity clear
- expected equal realized losses

Solution procedure

- can not apply the usual solution strategies because non-linearities here are crucial
- two-state Markov process for transitional states between High and Low states due to aggregate shocks
- explicit solution for financial sector variables as functions of total assets in the economy
- value function iteration to get optimal decisions over an asset grid and aggregate states
- invariant distribution iteration (defined over aggregate states as well)
- equilibrium is reached by finding a set of R^L and m^* that balance all markets and satisfy all optimality conditions.

Calibration

- average real deposit rate: 0.9% (real GIC and saving rate)
- capital adequacy ratio for loans $\alpha = 0.08$
- deposit insurance premium corresponds to 0.0417% of deposits
- retirement, minimum consumption and UI benefits: 30%
- ϕ=2.2 (debt/equity ratio)
- auditing fee 3%, loan administration cost 0%
- equity market: $\sigma_E^2 = 0.24$, implies $\lambda = 16$
- 9% prob of unemployment
- 5% prob of retirement, 10% prob of death

Calibration (continued)

- distribution of returns:

High:	-50%	5.2%	60%
	0.71%	98.48%	0.81%

Low:	-50%	2.57%	60%
	1.79%	97.42%	0.79%

- High states in the Markov transition matrix correspond to 75% of best quarters in the sample, Low states occur 25% of times.

$$S = \begin{pmatrix} 50.2 & 16.7 & 5.6 & 1.9 & 0.6 \\ 16.7 & 5.6 & 1.9 & 0.6 & 0.2 \end{pmatrix}.$$

Results

- benchmark (with a credit crunch ?)
- see what monetary policy can do
- see what regulatory policy can do

Cyclical behavior

Correlations of Y_t with X_{t+i} (differenced quarterly data):

i	-4	-3	-2	-1	0	+1	+2	+3	+4
Canada									
Deposits	0.19	0.18	0.20	0.19	0.06	0.06	0.03	-0.14	-0.21
Equity	0.27	0.31	0.17	0.10	0.08	0.08	0.05	0.03	0.15
Loans	0.11	0.07	0.24	0.21	0.03	0.09	0.05	-0.15	-0.16
US									
Deposits	0.19	0.11	0.13	-0.12	0.22	0.07	-0.09	-0.20	0.01
Equity	0.10	0.12	-0.10	0.09	-0.15	-0.39	-0.15	-0.25	-0.27
Loans	0.00	0.00	0.26	0.23	0.38	0.12	0.12	0.00	-0.19

Conclusions

- Credit crunch found, but small
- Timing of monetary policy is crucial
- Impact of monetary policy is asymmetric
- Do not relax capital requirements in bad times!

The road ahead

With Césaire Meh (Bank of Canada):

Full GE model for welfare analysis