Unconventional Monetary Policy and Funding Liquidity Risk

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This Paper
- We investigate the efficiency of various monetary policy instruments to stabilize asset prices in a liquidity crisis.
- We build a macro-finance model featuring heterogeneous banks subject to funding liquidity risk.
- In normal times, well capitalized banks can only make money efficiently to mitigate funding shocks.
- In crisis, an endogenous haircut spiral between declining asset prices and funding risks emerges.
- The central bank can partially counter these dynamics with monetary policies:
  – Injecting more reserves and providing better conditions at the discount window decreases funding risks in the traditional banking sector but fails to reach to the shadow banking sector.
  – An asset purchase policy (or QE) reaches to all the banking sector as it decreases stock of funding risk through a general equilibrium effect.

The Model

Financial Frictions
- Undiversifiable Funding Shocks. Deposits are reshuffled between banks with intensity \( \lambda \) in a time interval \( \tau \) in which securities are illiquid and can only be sold at fire-sale price with a cost \( \gamma \).
- Imperfect Risk Sharing. Banks cannot fully offset risk exposure from securities to other agents.

Secured Money Markets
To mitigate funding shocks, banks use money markets. Trading in money markets requires the borrower to post securities as collateral subject to haircut. It is given by a value-at-risk constraint:

\[
F = \text{change in value of securities in } \Delta \leq \tau = \rho.
\]

Aggregate amount of available collateral may fall short of needs in money markets.

Shadow Bankers
- provide risk and liquidity transformation services to households,
- have no access to CB operations,
- maximize their (Epstein-Zin) life time utility:

\[
\mathbb{E}_i \left[ \int_0^\infty e^{-\rho s} f(s, \tau, V_i) ds \right],
\]

subject to the law of motion of wealth:

\[
d\bar{\mu} = \left( \left( -\eta \lambda + \nu \lambda \right) - \bar{\mu}^\alpha \right) d\tau + \left( \eta \lambda \right) d\nu + \left( \nu \lambda \right) \bar{\mu} d\bar{\mu} + \left( \eta \lambda \right) d\bar{\mu} d\nu + \left( \nu \lambda \right) \bar{\mu} d\bar{\mu} d\nu.
\]

Traditional Bankers
- provide risk and liquidity transformation services to households,
- have access to CB operations,
- maximize their (Epstein-Zin) life time utility:

\[
\mathbb{E}_i \left[ \int_0^\infty e^{-\rho s} f(s, \tau, V_i) ds \right],
\]

subject to the law of motion of wealth:

\[
d\nu = \left( -\eta \lambda + \nu \lambda \right) d\tau + \left( \eta \lambda \right) d\nu + \left( \nu \lambda \right) \bar{\mu} d\bar{\mu} + \left( \eta \lambda \right) d\bar{\mu} d\nu + \left( \nu \lambda \right) \bar{\mu} d\bar{\mu} d\nu.
\]

Central Bank
- sets monetary policy instruments:
  – the quantity of reserves available to banks \( \mu \),
  – the quantity of securities in its balance sheet \( \nu \),
  – the discount window conditions to traditional banks \( \lambda \),
- rebates any profits or losses to the private sector such that there is no redistribution effect.

Households
- maximize their lifetime (Epstein-Zin) utility,
- cannot hold securities directly.

Static Results

Without Central Bank

Proposition 1 [Prices Without Liquidity Risk] In the absence of money market frictions \( (\alpha = 1) \), equilibrium prices along the balanced growth path are given by:

\[
q = \frac{a}{\rho + (1 - \gamma) \eta \lambda \nu} \text{ where } \eta \text{ is the relative wealth of intermediaries.}
\]

Corollary [Neutrality of Monetary Policy Instruments without Liquidity Risk] In the absence of money market frictions \( (\alpha = 1) \), any change in the monetary policy decision set \( (\mu, \nu, \lambda) \) has no effect on any equilibrium variables.

Proposition 2 [Prices with Liquidity Risk and No Central Bank] In an economy without asset purchase \( \nu = 0 \) and without a discount window facility \( \lambda = 0 \), equilibrium securities prices along the balanced growth path are given by:

\[
q = \frac{a}{\rho + (1 - \gamma) \eta \lambda \nu} \text{ where } \eta (m) = \left( 1 - \alpha \right) \lambda \nu \frac{2(2 - \eta)^2}{\eta}
\]

Monetary Policy Interventions

Proposition 3 [Prices with Positive Supply of Reserves] In an economy without asset purchase \( \nu = 0 \) and without a discount window facility \( \lambda = 0 \), equilibrium securities prices along the balanced growth path are given by:

\[
q = \frac{a 

\text{where } m = \left\{ \begin{array}{ll}
1 - \alpha \lambda \nu \frac{2(2 - \eta)^2}{\eta} & \text{if } a \leq m^\star \\
(1 - \alpha \lambda \nu) & \text{otherwise.}
\end{array} \right.
\]

Proposition 4 [Endogenous Collateral Spiral] Without a discount window facility \( \lambda = 0 \), equilibrium securities prices along the balanced growth path are given by:

\[
q = \frac{a}{\rho + (1 - \gamma) \eta \lambda \nu} \text{ where } \rho (m) = \left( 1 - \alpha \right) \lambda \nu \frac{2(2 - \eta)^2}{\eta}
\]

Figures

Dynamic Results

Proposition 4 [Endogenous Collateral Spiral] Without monetary policy intervention, the endogenous volatility of the state variables \( \eta \) is given by:

\[
\sigma_\eta^2 \eta = \frac{(1 - \alpha \lambda \nu \frac{2(2 - \eta)^2}{\eta})}{(1 - \alpha \lambda \nu \frac{2(2 - \eta)^2}{\eta})}.
\]

Amplification Through Haircuts

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