The Risk Channel of Unconventional Monetary Policy

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Dramatic change in central bank portfolio

USD Billions

Composition FED Balance Sheet:
- Other Assets
- Agency and MBS Holdings
- Treasury Holdings
Stimulus and potential side effect

Goal: stimulate economy
Federal Reserve on objective of asset purchases

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”Extraordinarily low interest rates and compressed risk premia once again pushed investors into riskier assets in their search for yield [...]”
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Policy evaluation:
• Integrated view: effects on the real economy and on financial risk-taking
What are the effects of unconventional monetary policy on financial markets and the real economy?
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1) Heterogeneous Risk-Aversion

2) Limited Asset Market Participation
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   \[ \text{Drop in share of wealth of bankers} \xrightarrow{1} \text{Aggregate risk aversion} \xrightarrow{1} \text{Price of risky asset and investment} \]

2) Limited Asset Market Participation
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1) Heterogeneous Risk-Aversion
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   ![Diagram]
   - Drop in share of wealth of bankers
   - Aggregate risk aversion
   - Price of risky asset and investment

2) Limited Asset Market Participation
   - Passive traders who hold market portfolio
What are the effects of unconventional monetary policy on financial markets and the real economy?

1) Heterogeneous Risk-Aversion
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   Drop in share of wealth of bankers $\rightarrow$ Aggregate risk aversion $\rightarrow$ Price of risky asset and investment

2) Limited Asset Market Participation
   • Passive traders who hold market portfolio

   Asset purchases by the CB $\rightarrow$ Net supply of risk to active traders $\rightarrow$ Price of risky asset during crises
Main findings

1) Output growth rate: Crises vs normal times
   - Asset purchases ⇒ rise in output growth during crises
   - Expectation of less severe crises ⇒ less output growth in normal times

2) Risk concentration and probability of crises
   - Asset purchases ⇒ fall in risk concentration and endogenous volatility
   - Stationary distribution: Probability of future crises falls
Overview of the environment:

- Continuous-time. Two goods: consumption and capital.

- **Firms** produce final goods using capital
  - Investment adjustment costs

- **Active traders** (bankers and savers) trade risky and riskless assets
  - Heterogeneity: savers are more *risk averse* than bankers.

- **Hand-to-mouth households** consume government transfers

- **Central bank** issues riskless liabilities and buy risky assets
  - Rebates the proceeds to hand-to-mouth consumers
Firms

• Linear technology:

\[ Y_t = AK_t \]
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• Problem of the firm

\[ S_t = \max_g E \left[ \int_t^\infty \frac{\pi_s}{\pi_t} (A - \iota(g_s)) ds \right] \]  

where \( \iota' > 0, \iota'' > 0 \).
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- Problem of the firm
  \[ S_t = \max_g E \left[ \int_t^{\infty} \frac{\pi_s}{\pi_t} (A - i(g_s)) ds \right] \]
  \[ (1) \]
  where \( i' > 0, i'' > 0 \).

- The SPD satisfies
  \[ \frac{d\pi_t}{\pi_t} = -r_t dt - \eta_t dZ_t \]
  \( \text{int.rate} \quad \text{mkt.price of risk} \)
Active traders

• Decision problem of active traders (bankers $j = b$, savers $j = s$):

$$V_j = \max_{(c_j, \alpha_j)} U_j(c_j)$$ (2)

subject to $n_{j,t} \geq 0$ and

$$\frac{dn_{j,t}}{n_{j,t}} = \left[ r_t + \alpha_{j,t}(\mu_{R,t} - r_t) - \frac{c_{j,t}}{n_{j,t}} \right] dt + \alpha_{j,t}\sigma_{R,t}dZ_t$$
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- Preferences: continuous-time EZ preferences
  - EIS $\psi > 1$ and risk aversion $\gamma_j$
  - Savers are more risk averse than bankers: $\gamma_s > 1 > \gamma_b$
  - Mortality risk $\Rightarrow$ stationary distribution
Hand-to-mouth consumers and the Central Bank

- Hand-to-mouth consumers: simply consume government transfers
  - Simplifying assumption

- Important is the presence of investors who don’t continuously rebalance their portfolio

- Central bank is subject to No-Ponzi condition and

\[
\frac{dn_{cb,t}}{n_{cb,t}} = \left[ r_t + \sigma_{cb,t} \eta_t - \frac{T_t}{n_{cb,t}} \right] dt + \sigma_{cb,t} dZ_t
\]  \hspace{1cm} (8)

\[(\sigma_{cb,t}, T_t) \text{ determined by policy rules}\]

\[
\sigma_{cb,t} = \sigma_{cb}(x_t, w_t); \quad T_t = T(x_t, w_t)
\]

where \((x_t, w_t)\) is the vector of state variables.
Two benchmarks

1) Homogeneous risk-aversion \((\gamma_b = \gamma_s)\): 

- No risk concentration 
  \[ \sigma_{b,t} = \sigma_{s,t} \]
- Balanced growth path
- No variation in returns/growth rates
- No balance sheet recession

2) Full participation benchmark:
No hand-to-mouth/passive traders. Fix initial \((\sigma_{cb}, T)\) and consider \((\sigma^*, T^*)\).

- Investors exactly offset policy change
- Neutrality result: no changes in consumption, prices, and investment
  - Modigliani-Miller / Ricardian Equivalence type of result (see Wallace (1981)).
Market price of risk

\[ \eta_t = \gamma_t \left[ \omega_t^r (\sigma + \sigma_{q,t}) + h_t \right] \]

- **Aggregate risk aversion:**
  \[ \gamma_t = \left( \frac{x_t}{\gamma_b} + \frac{1 - x_t}{\gamma_s} \right)^{-1} \]
  where \( x \) is the share of wealth of low risk version agent.

- **Net supply of risk:** \( \omega_t^r \)
  - Without a central bank, \( \omega_t^r = 1 \)

- **Hedging terms:** \( h_t \)
  - Average hedging demand for
\[ q_t = \frac{A - \lambda(g_t)}{r_t + (\sigma + \sigma_{q,t})\eta_t - \mu} S_{t,t} \]

\[ \lambda^t(g_t) = q_t \]

**Market price of risk**

**Price of capital**

\[ \eta \]

\[ \log(q) \]
Balance sheet recession

\[ q_t = \frac{A - i(g_t)}{r_t + (\sigma + \sigma_{q,t})\eta_t - \mu} \]

\[ i'(g_t) = q_t \]

Market price of risk

Price of capital
Effect on Interest Rates

Weak balance sheet of bankers:
- High aggregate risk aversion
- Precautionary savings
Effect on Interest Rates

Weak balance sheet of bankers:
- High aggregate risk aversion
- Precautionary savings

Effect of asset purchases:
- Precautionary savings
- Intertemporal substitution
Myopic and Hedging Demands

\[ \sigma_{b,t} = \frac{\eta_t}{\gamma_b} + \frac{1 - \gamma_b}{\gamma_b} \sigma_{\zeta,t} \]

\( \sigma_{b,t} / (\sigma + \sigma_q) \)

Leverage

Myopic component

Hedging component

\( \sigma_{b,t} = \eta_t + \frac{1}{\gamma_b} \sigma_{\zeta,t} \)
UMP and Risk Concentration

$$\sigma_{b,t} = \underbrace{\frac{\eta_t}{\gamma_b}}_{\text{myopic}} + \underbrace{\frac{1 - \gamma_b}{\gamma_b}}_{\text{hedging}} \sigma_{\zeta,t}$$

Risk concentration

Myopic component

Hedging component
Endogenous volatility

\[
\sigma_{q,t} = \frac{q_{x,t}}{q_t} \sigma_{x,t} + \frac{q_{w,t}}{q_t} \sigma_{w,t}
\]

\[
\sigma_{x,t} = x_t \left(1 - x_t \right) (\sigma_{b,t} - \sigma_{s,t})
\]
Endogenous volatility

\[ \sigma_{q,t} = \frac{q_{x,t}}{q_t} \sigma_{x,t} + \frac{q_{w,t}}{q_t} \sigma_{w,t} \]

\[ \sigma_{x,t} = x_t (1 - x_t) (\sigma_{b,t} - \sigma_{s,t}) \]
UMP and Financial Stability

![Probability Density Function (PDF) of g(%) for Laissez-faire and Central bank policies.](image)

- **PDF**
  - **g(%)**
  - **number of std. deviations below the mean**

**Laissez-faire**

**Central bank**

- **Probability**
  - **0.45**
  - **0.4**
  - **0.35**
  - **0.3**
  - **0.25**
  - **0.2**
  - **0.15**
  - **0.1**
  - **0.05**
  - **0.0**

- **number of std. deviations below the mean**
  - **0**
  - **0.5**
  - **1**
  - **1.5**
  - **2**
  - **2.5**
  - **3**

### Equations

- $f(x) = \frac{1}{\sigma \sqrt{2\pi}} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$

### Parameters

- **$\mu$**: Mean
- **$\sigma$**: Standard deviation

Laissez-faire and Central bank policies are compared in terms of their deviation from the mean, with the Central bank showing lower probabilities of deviations.
Thanks.