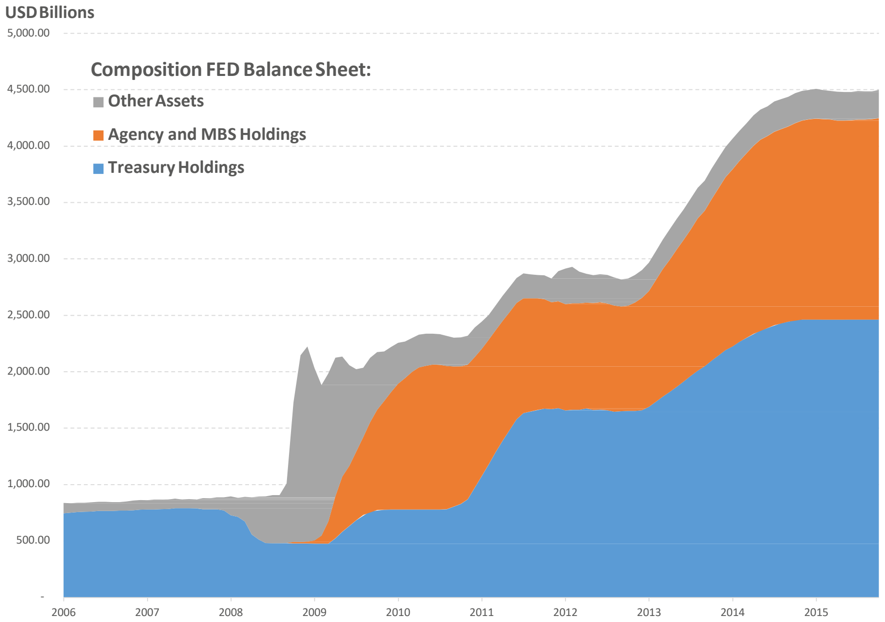
The Risk Channel of Unconventional Monetary Policy

Dejanir Silva

UIUC - Finance

March, 2017

Dramatic change in central bank portfolio



Stimulus and potential side effect

Goal: stimulate economy

Federal Reserve on objective of asset purchases

"... help to make broader financial conditions more accommodative through the purchase of longer-term securities."

Stimulus and potential side effect

Goal: stimulate economy

Federal Reserve on objective of asset purchases

> *"... help to make broader financial conditions more accommodative through the purchase of longer-term securities."*

Potential side effect: risk-taking

BIS, commenting on central bank policy:

> *"Extraordinarily low interest rates and compressed risk premia once again pushed investors into riskier assets in their search for yield [...]"*

Stimulus and potential side effect

Goal: stimulate economy

Federal Reserve on objective of asset purchases

"... help to make broader financial conditions more accommodative through the purchase of longer-term securities."

Potential side effect: risk-taking

BIS, commenting on central bank policy:

"Extraordinarily low interest rates and compressed risk premia once again pushed investors into riskier assets in their search for yield [...]"

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?

What are the effects of unconventional monetary policy on financial markets and the real economy?

1)Heterogeneous Risk-Aversion

2)Limited Asset Market Participation

What are the effects of unconventional monetary policy on financial markets and the real economy?

1)Heterogeneous Risk-Aversion

- Active traders: Savers more risk-averse than Bankers

2)Limited Asset Market Participation

What are the effects of unconventional monetary policy on financial markets and the real economy?

1) Heterogeneous Risk-Aversion

- Active traders: Savers more risk-averse than Bankers

Drop in share of wealth of bankers → ↑ Aggregate risk aversion → ↓ Price of risky asset and investment

2) Limited Asset Market Participation

What are the effects of unconventional monetary policy on financial markets and the real economy?

1)Heterogeneous Risk-Aversion

- Active traders: Savers more risk-averse than Bankers

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

- Active traders: Savers more risk-averse than Bankers

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

Asset purchases by the CB → ↓ Net supply of risk to active traders → ↑ Price of risky asset during crises

Main findings

1) Output growth rate: Crises vs normal times

- Asset purchases $\Rightarrow$ rise in output growth during crises
- Expectation of less severe crises $\Rightarrow$ less output growth in normal times

2) Risk concentration and probability of crises

- Asset purchases $\Rightarrow$ 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:

$$Y_t = AK_t$$

Firms

- Linear technology:

$$Y_t = AK_t$$

- Law of motion of capital:

$$\frac{dK_t}{K_t} = g_t dt + \sigma dZ_t$$

Firms

- Linear technology:

$$Y_t = AK_t$$

- Law of motion of capital:

$$\frac{dK_t}{K_t} = g_t dt + \sigma dZ_t$$

- Problem of the firm

$$S_t = \max_g E\left[\int_t^\infty \frac{\pi_s}{\pi_t}\big(A - \iota(g_s)\big)ds\right] \tag{1}$$

where $\iota' > 0, \iota'' > 0$.

Firms

- Linear technology:

$$Y_t = AK_t$$

- Law of motion of capital:

$$\frac{dK_t}{K_t} = g_t dt + \sigma dZ_t$$

- Problem of the firm

$$S_t = \max_g E\left[\int_t^\infty \frac{\pi_s}{\pi_t}\big(A - \iota(g_s)\big)ds\right] \qquad (1)$$

where $\iota' > 0, \iota'' > 0$.

- The SPD satisfies

$$\frac{d\pi_t}{\pi_t} = -\underbrace{r_t}_{int.rate} dt - \underbrace{\eta_t}_{mkt.price\ of\ risk} dZ_t$$

Active traders

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

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

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

$$\frac{dn_{j,t}}{n_{j,t}} = \left[r_t + \alpha_{j,t}(\mu_{R,t} - r_t) - \frac{c_{j,t}}{n_{j,t}} \right] dt + \alpha_{j,t}\sigma_{R,t} dZ_t$$

Active traders

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

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

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

$$\frac{dn_{j,t}}{n_{j,t}} = \left[r_t + \underbrace{\alpha_{j,t}\sigma_{R,t}}_{\equiv\sigma_{j,t}} \underbrace{\left(\frac{\mu_{R,t} - r_t}{\sigma_{R,t}}\right)}_{\eta_t} - \frac{c_{j,t}}{n_{j,t}} \right] dt + \underbrace{\alpha_{j,t}\sigma_{R,t}}_{\equiv\sigma_{j,t}} dZ_t$$

Active traders

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

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

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

$$\frac{dn_{j,t}}{n_{j,t}} = \left[r_t + \sigma_{j,t}\eta_t - \frac{c_{j,t}}{n_{j,t}} \right] dt + \sigma_{j,t} dZ_t$$

- Preferences: continuous-time EZ preferences
  - EIS $\psi > 1$ and risk aversion γ_j
  - Savers are more risk averse than bankers: $\gamma_s > 1 > \gamma_b$
  - Mortality risk ⇒ stationary distribution

Hand-to-mouth consumers and the Central Bank

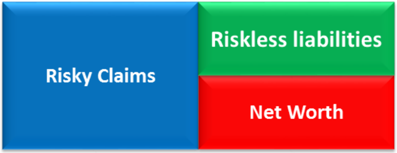
- Hand-to-mouth consumers: simply consume government transfers
    - Simplifying assumption

(7)

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

- Central bank is subject to No-Ponzi condition and

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



Central Bank

$(\sigma_{cb,t}, \ T_t)$ determined by policy rules

$\sigma_{cb,t} = \sigma_{cb}(x_t, w_t)$; $\qquad T_t = T(x_t, w_t)$

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 (σ_{cb}, T) and consider (σ^*, T^*).

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

Market price of risk

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

- **Aggregate risk aversion:**

$$\gamma_t = \left(\frac{x_t}{\gamma_b} + \frac{1 - x_t}{\gamma_s}\right)^{-1}$$

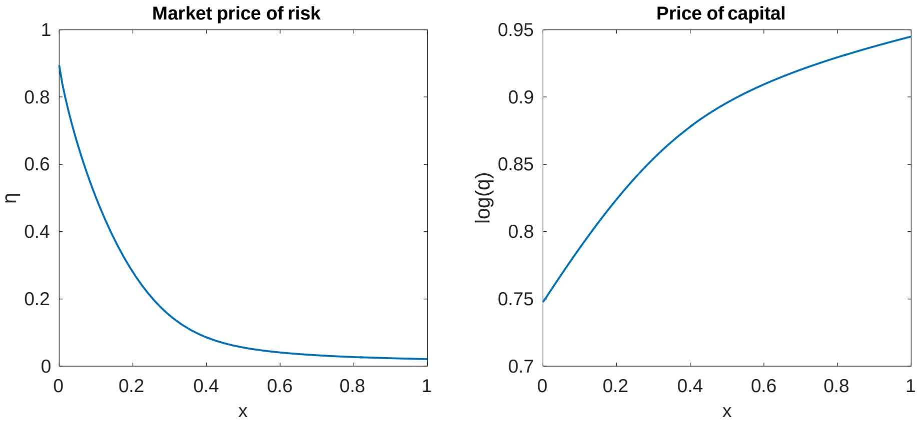
where x is the share of wealth of low risk version agent.

- **Net supply of risk:** ω_t^r
  - Without a central bank, ω_t^r=1

- **Hedging terms:** h_t
  - Average hedging demand for

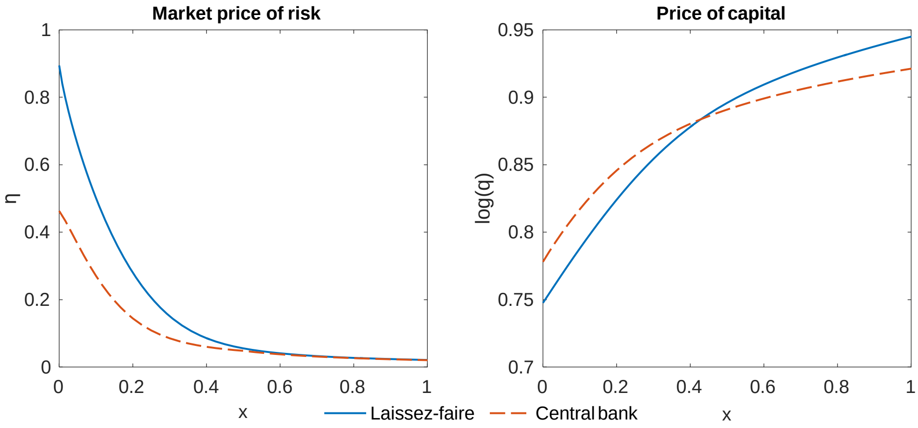
Balance sheet recession

$$q_t = \frac{A - \iota(g_t)}{r_t + (\sigma + \sigma_{q,t})\eta_t - \mu_{S,t}} \qquad \iota^{t}(g_t) = q_t$$

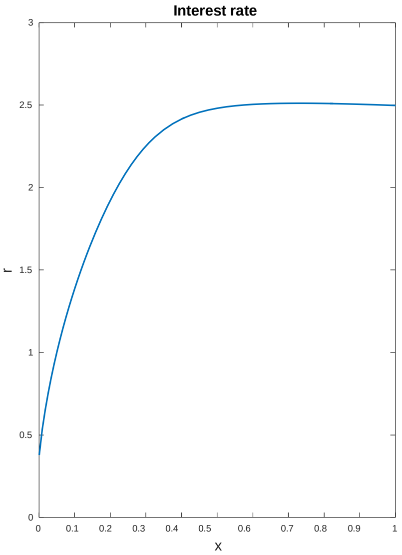


Balance sheet recession

$$q_t = \frac{A - \iota(g_t)}{r_t + (\sigma + \sigma_{q,t})\eta_t - \mu_{S,t}} \qquad i'(g_t) = q_t$$



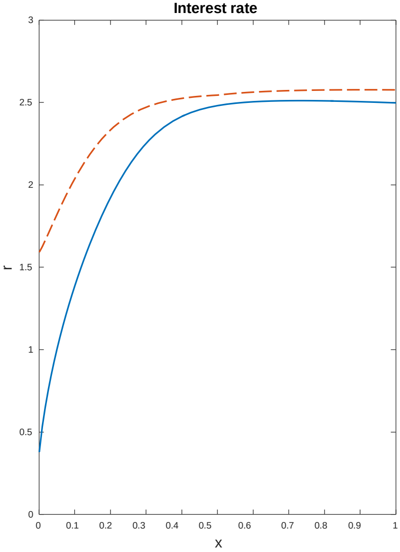
Effect on Interest Rates



Weak balance sheet of bankers:

- High aggregate risk aversion
- Precautionary savings

Effect on Interest Rates



Weak balance sheet of bankers:

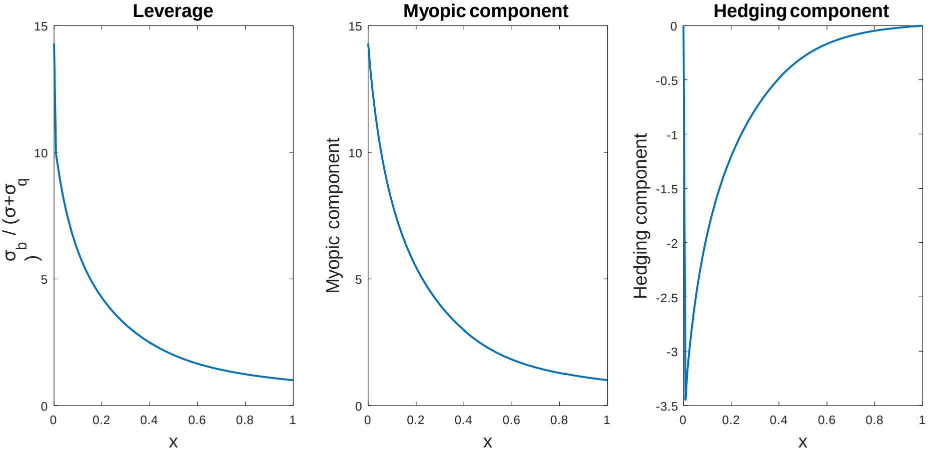
- High aggregate risk aversion
- Precautionary savings

Effect of asset purchases:

- Precautionary savings
- Intertemporal substitution

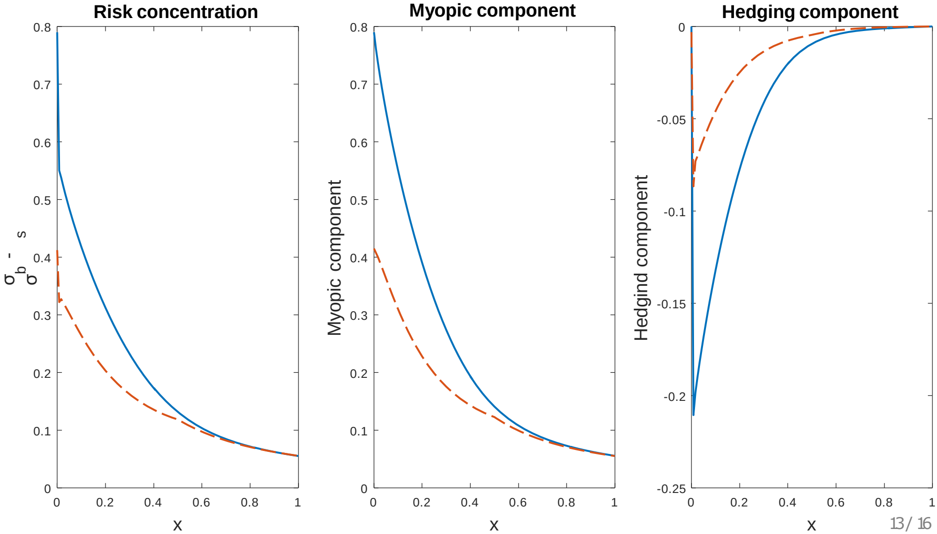
Myopic and Hedging Demands

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



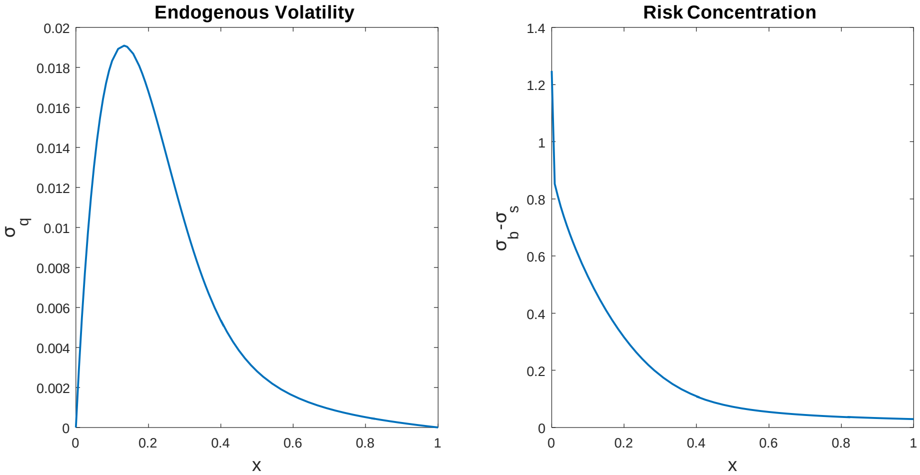
UMP and Risk Concentration

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



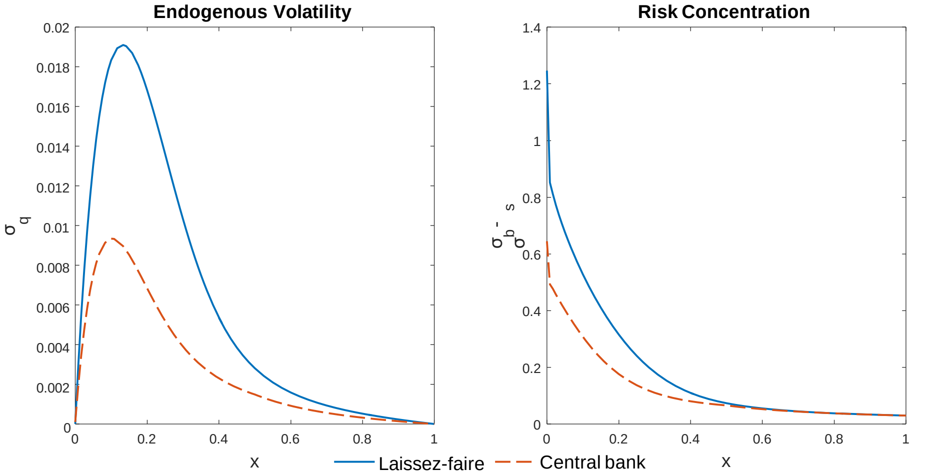
Endogenous volatility

$$\sigma_{q,t} = \frac{q_{x,t}}{q_t}\sigma_{x,t} + \frac{q_{w,t}}{q_t}\sigma_{w,t} \qquad \sigma_{x,t} = x_t\,(1 - x_t)\,(\sigma_{b,t} - \sigma_{s,t})$$

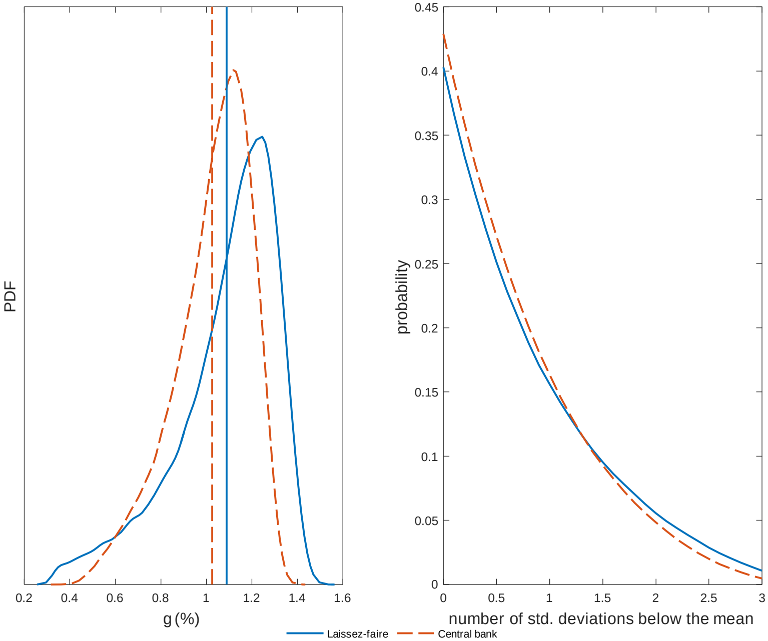


Endogenous volatility

$$\sigma_{q,t} = \frac{q_{x,t}}{q_t}\sigma_{x,t} + \frac{q_{w,t}}{q_t}\sigma_{w,t} \qquad \sigma_{x,t} = x_t(1 - x_t)(\sigma_{b,t} - \sigma_{s,t})$$



UMP and Financial Stability



Thanks.