Monetary Easing and Financial Instability

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Introduction

- Since the financial crisis, central banks have embarked on unconventional monetary policy.
- These policies have been aimed at keeping interest rates low with large-scale purchases of Treasuries and MBS.
- The objective appears to be to restore loss in aggregate demand by "taxing storage".
- Institutional investors responded by "searching for yield".
  - They resorted to funding long-term assets with short-term claims, hoping to refinance these claims until maturity.

The Unintended Effects of Unconventional Policies

" If effective, the combination of the "low for long" policy for short term policy rates coupled with quantitative easing tends to depress yields... Fixed income investors with minimum nominal return needs then migrate to riskier instruments such as junk bonds, emerging market bonds, or commodity ETFs... [T]his reach for yield is precisely one of the intended consequences of unconventional monetary policy. The hope is that as the price of risk is reduced, corporations faced with a lower cost of capital will have greater incentive to make real investments, thereby creating jobs and enhancing growth."

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The Unintended Effects of Unconventional Policies

"There are two ways these calculations can go wrong. First, financial risk taking may stay just that, without translating into real investment. For instance, the price of junk debt or homes may be bid up unduly, increasing the risk of a crash, without new capital goods being bought or homes being built...
Second, and probably a lesser worry, accommodative policies may reduce the cost of capital for firms so much that they prefer labor-saving capital investment to hiring labor."

Rajan (23 June 2013, BIS)
"A step in the dark: unconventional monetary policy after the crisis"

Evidence on "searching for yield" (Stein, 2013)

- Junk Debt, Covenant-lite loans.
- Homes, MBS.
- Stock market, Margin lending.
- Capital outflows into Emerging Markets.

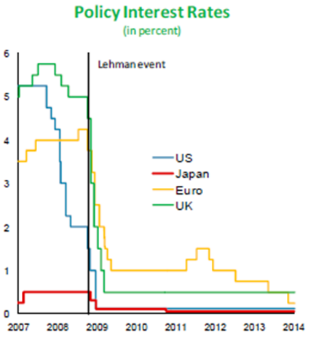
Implications:

- Credit booms.
- Exchange rate appreciation for Emerging Markets.
- Postponing of reforms by Emerging Market governments.

- Maturity transformation by financial institutions leads to private “carry” gains and transfers from savers to borrowers.
- Rollover risk arises when the size of future liquidity (to refinance claims) is uncertain and early liquidation is inefficient.
- **2013 “taper tantrum”**:
    - Federal Reserve announced a “taper” of expansionary monetary policy in May 2013.
    - Emerging market debt securities experienced liquidations by foreign institutional investors.
    - These liquidations ceased only when the Federal Reserve back-tracked on tapering.
- Earlier example: “blood bath” in U.S. bond markets following tightening in 1994.

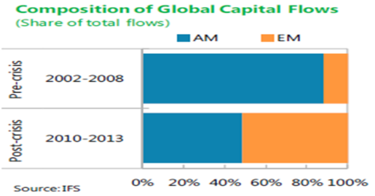
Monetary easing and EM capital flows

Rock-bottom interest rates...

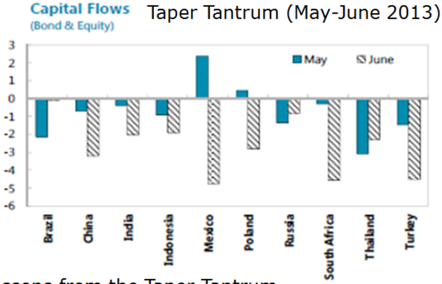


Source: IMF staff estimates.

Emerging markets received close to half of global inflows after the crisis compared with less than 20 percent before...

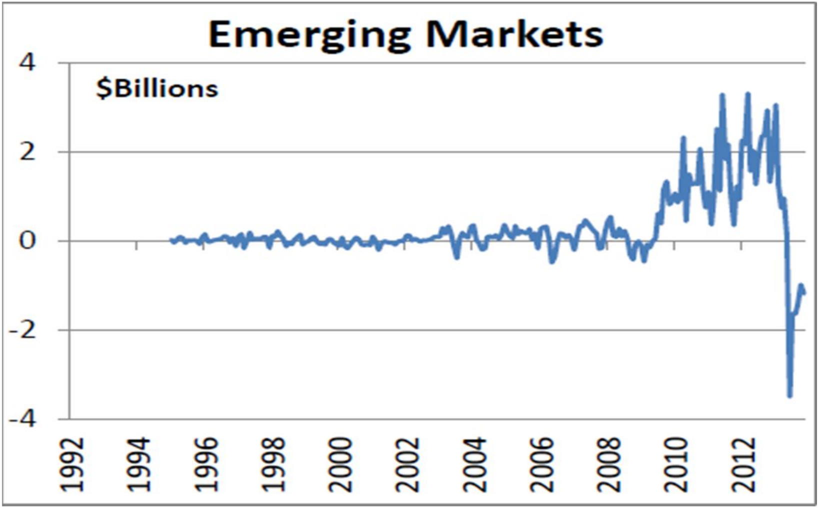


Taper Tantrum (May-June 2013)



Source: Emerging Market Volatility – Lessons from the Taper Tantrum, IMF Staff Discussion Note, September 2014

QE, Taper Tantrum, EM MF Flows

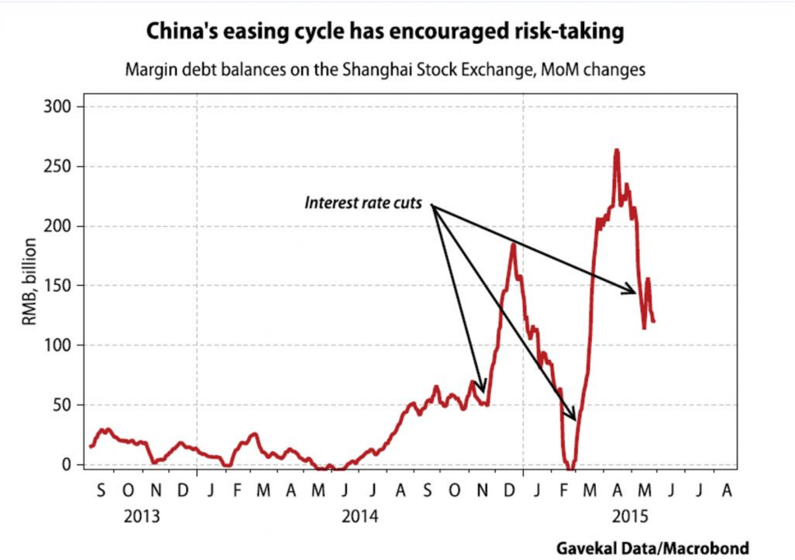


Source: Market Tantrums and Monetary Policy by Feroli, Kashyap, Schoenholtz and Stein (Feb 2014)

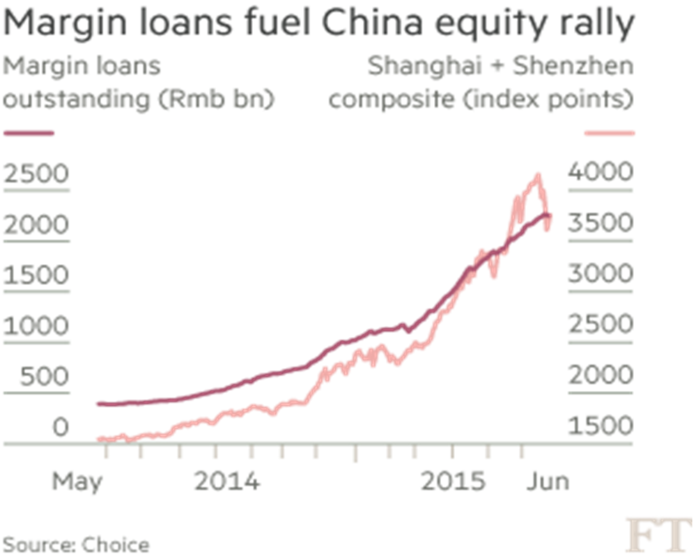
Taper Tantrum and EM Currencies

Source: CAFRAL, India

Interest-rate cuts and margin lending



Rise in margin lending in stocks



This paper

- Builds a model to integrate the stimulative effects of monetary easing with the instability risks that arise from carry trades.
- **(Nominal) price rigidity:** The relative price of output is fixed and cannot immediately reflect shocks to production costs.
- With positive productivity shocks and no moral hazard, monetary easing modeled as a tax on storage can restore the first-best allocation.
- However, financial institutions can issue short-term debt against long-term cash flows.
- Such maturity transformation - while privately beneficial to financial institutions - is socially costly in the event of inefficient liquidation.

Preview of Results

- When the positive productivity shock is large, monetary easing is optimal.
- Counter-intuitively, easing should be more aggressive in the presence of financial instability to stimulate demand and lower the funds available for the carry trade.
- However, when the productivity shock is weak, the stimulative gains from monetary policy are small relative to the risks of carry trades.
- Optimal monetary policy should in this case be tight - "lean against the wind".
- Monetary tightening is more desirable when the assets funded by the carry trade are illiquid and future liquidity is uncertain.
- In sum, excessive maturity transformation commands a steeper monetary response to fundamental shocks.

Related Literature

- Farhi and Tirole (2012): Central bank cannot commit not to lower rates when banks' maturity transformation goes awry. Banks exploit central banks' "put".
- Diamond and Rajan (2012): Inability of central bank to commit to "bailing out" short-term claims induces excessive illiquidity-seeking by banks.
- Acharya and Naqvi (2012a, 2012b): Develop model of internal agency problem in banks where insiders' and outsiders' incentives are aligned if there are liquidity shortfalls. Abundant liquidity exacerbates agency issues.
- Plantin and Shin (2015): International arbitrageurs use FX carry trades to exploit asynchronous monetary policies and this destabilizes financial markets in the target economies

Relative to existing literature...

In this paper, monetary policy induces excessive maturity transformation:

- Without agency problems within financial institutions.
- Under full commitment by the central bank.

Benchmark Model

- There are three dates - 0, 1 and 2, and three agents - households, capital owners and a central bank.
- A unit mass of households (possibly) born at date $t \in \{0; 1\}$ and endowed with W have utility from consumption

$$U(c_t, c_{t+1}) = ln(c_t) + E_t[c_{t+1}]$$

- *Uncertain Liquidity assumption: The probability that households are born at date* 1 *is* $q < 1$.
- There is a linear storage technology that transfers one unit of consumption at date t to date $t + 1$.
- Capital owners are risk neutral and produce output valued only by young households. Their willingness-to-pay for the output is 1.
- Capital owners produce output at a cost $\mu \in (0, 1]$ per unit.
- Profit per unit $= (1 - \mu)$.

Benchmark Model - First best

- If capital owners are competitive, price of output, p equals cost of production, μ.
- Households born at date t choose consumption c_t to solve

$$
\begin{aligned}
c_t &= \underset{c}{Argmax} \{\log c + (W - p \times c)\} \\
&= \frac{1}{\mu} \text{ (for } p = \mu).
\end{aligned}
$$

- Household utility: $log(1/\mu) + W - 1$.
- Capital owners make no profit.
- Social surplus: $(1+q)\left[log(1/\mu) + W - 1\right]$.

Model with price rigidity and without financial instability

- *Sticky output price assumption: The output price is fixed, equal to* 1.
- The central bank imposes a linear tax on return from storage, and rebates the proceeds as a lump sum to savers.
- Let the tax on storage be $\tau = 1 - r$. Then, the return on storage equals $r \in (0, 1]$.
- Households born at t choose consumption c_t to solve

$$\begin{aligned} c_t &= \underset{c}{Argmax} \left\{ \log c + r(W - c) \right\} \\ &= \frac{1}{r}. \end{aligned}$$

- Total household utility (including lump sum rebate): $\log(1/r) + W - 1/r$.
- Capital owners' profit: $(1 - \mu)/r$.

Social Surplus

The total social surplus, $S_1(r)$ is given by

$$S_1(r) = (1+q)\left[\underbrace{\log\left(\frac{1}{r}\right) + W - \frac{1}{r}}_{\text{Households' utility}} + \underbrace{\frac{1}{r}(1-\mu)}_{\text{Capital owners' profit}}\right]$$

- $S_1(r)$ is maximized at $r = \mu$.
- Under flexible prices, the output price equals μ.
- With sticky prices, monetary policy aligns the real rate with the natural rate so that the first-best allocation is still achieved.
- Monetary policy effectively stimulates consumption for young households.
- Consumption is now $1/r > 1$.

General Model with financial instability

- We modify the preceding framework to incorporate financial instability to capture the risks associated with monetary policy.
- Young households now entrust capital owners with their entire endowment: all savings are delegated.
- Capital owners have direct access to a unit-return storage technology, which may be taxed.
- Capital owners are endowed with a claim to date-2 consumption that can be liquidated at a cost.
- Liquidation of 1 unit of date 2 consumption is only converted to $1/(1+\lambda)$ units at date 1.

Capital owners' choices

- Capital owners can offer competitive one-period risk-free storage contracts to households.
- They may invest households' savings in storage technology and not bear any risk.
- Alternately they may consume savings today (date 0) and refinance liabilities at date 1 with endowment from households born at time 1.
- The risk is that with probability $(1 - q)$, new households are not born at time 1 resulting in a liquidity shortfall and inefficient liquidation.
- As before, the central bank sets return r on storage.

Assumption (Moral hazard in maturity choice): Whether a capital owner invests households' savings in the short-term storage or consumes them and pledges his date-2 cash flow is not observed by the central bank.

General Model with financial instability - Analysis

- If capital owners invest households' savings in the competitive storage technology, their return equals 0.
- If they consume today and do carry trades at date 0, their return is $(1 - r)$ per unit of carry trade.
- But, if capital owners cannot refinance at date 1, the liquidation cost incurred is $r\lambda$ per unit of carry trade.
- Therefore, capital owners engage in carry trade when

$$(1 - r) - (1 - q)r\lambda \geq 0$$

$$\iff r \leq \frac{1}{1 + \lambda(1 - q)}$$

- Private storage contracts are offered at $t = 2$ generating return $(1 - r)$ without any liquidation costs.

Rent extraction by private sector

- Household utility: $(1+q)\left[log(1/r)+r(W-1/r)\right]$.
- Capital owners' utility:
$(1+q)(1-\mu)/r+\underbrace{(1+q)(1-r)(W-1/r)}_{\text{Carry trade rents}}-\underbrace{(1-q)\lambda r(W-1/r)}_{\text{Expected Liquidation costs}}$
- Private sector makes rents by issuing safe storage claims.
- If rents from carry trades are not taxed, then there are distributional consequences.
- If rents are taxed (lump-sum) then there is pure financial instability.
- Regardless, the output with carry trades is

$$S_2(r)=S_1(r)-\lambda r(1-q)\left(W-\frac{1}{r}\right).$$

Optimal Policy

- Recall that in the first-best case, $r = \mu$.
- If $\mu > 1/\left(1 + \lambda(1-q)\right)$, then the central bank sets $r^* = \mu$. There is no maturity transformation. Total social surplus $= S_1(\mu)$.
- If $\mu \leq 1/\left(1 + \lambda(1-q)\right)$, then the central bank has two options.
  - It can set $r = \overline{r}$ where $\overline{r}$ solves

$$\overline{r} = \frac{1}{1 + \lambda(1-q)}$$

    $\overline{r}$ is the optimal rate conditional on no maturity transformation.
  - Alternately, it can set $r = \underline{r}$ where $\underline{r}$ solves

$$\underline{r} = \underset{r}{Argmax} S_2(r) = S_1(r) - \lambda r(1-q)\left(W - \frac{1}{r}\right)$$

  - $S_2(r)$ is the social surplus in the presence of liquidation risks.

Optimal Policy

- There are two possible policy rates chosen by the central bank : $\overline{r}$ and $\underline{r}$.
- Optimal rate is determined by whether $S_1(\overline{r})$ is larger than $S_2(\underline{r})$.
- $\underline{r} < \mu < \overline{r}$.
- $r = \overline{r}$ is chosen when the central bank wants to eliminate carry trades by reducing profitability.
- $r = \underline{r}$ corresponds to the case of monetary easing.
- $r = \underline{r}$ is chosen when the central bank wants to increase welfare by stimulating demand and reducing the supply of deposits to fund carry trades.

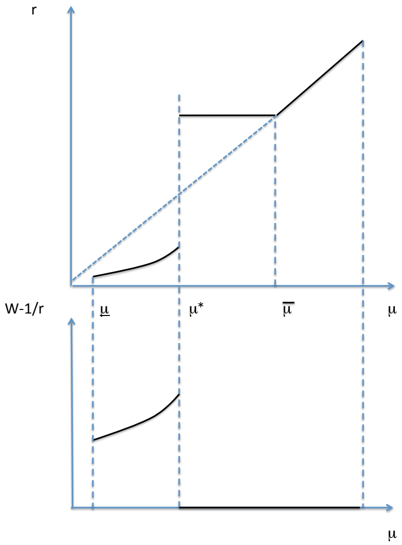
Comparative Statics

Proposition

(Monetary easing and financial instability – I) *There exists $\mu^* < \overline{r}$ such that the policy rate $\underline{r}$ is optimal for $\mu < \mu^*$ whereas $\overline{r}$ is optimal for $\mu \geq \mu^*$.*

- When the productivity shock is large (μ small), it is optimal to conduct aggressive monetary easing to reduce supply of funds for carry trades.
- When the productivity shock is small (μ large), it is optimal to set a high rate to reduce the unit return on carry trade and thus the demand of funds for carry trades.

Policy rate and carry-trade size as functions of μ



Policy rate and carry-trade size as functions of μ

- As μ increases, the need for monetary easing decreases.
- The carry trade increases to a peak at $\mu = \mu^*$ before collapsing.
- If $\mu > \mu^*$, the gains from stimulating demand are lower than the cost of carry-trades. Tight monetary policy becomes optimal.
- The carry-trade size is highly sensitive to μ around the point μ^*.
- At this point, small hints at improvements in the economy ("tapering") may trigger a dramatic unwinding of the carry trade.
- Future research: Explicitly model this carry-trade sensitivity.
  - For example, assume capital owners - observing an imperfect signal of μ at date $t = -1$ - decide on an amount of long-term cash flows to back carry trades. This amount may be adjusted at a cost at date 0 once the true value of μ is revealed.

Comparative Statics - liquidity and rollover risk

How does the optimal policy rate r vary with liquidity risk (λ) and rollover risk $(1-q)$?

Proposition

(Monetary easing and financial instability – II) *There exists $\lambda^* \in (0,1]$ such that the policy rate $\underline{r}$ is optimal for $\lambda \in (0, \lambda^*]$ whereas $\overline{r}$ is optimal for $\lambda \geq \lambda^*$ (as long as $r^* = \mu$ triggers carry trades).*

Similarly, there exists $q^* \in [0,1]$ such that the policy rate $\underline{r}$ is optimal for $q \in (q^*, 1]$ whereas $\overline{r}$ is optimal for $q \leq q^*$ (as long as $r^* = \mu$ triggers carry trades).

If liquidation and rollover risks are mild (λ small and q large), then aggressive monetary policy is optimal. The welfare risks associated with carry trades are offset by the boost in consumption.

Conclusion and future work

- This paper illustrates how stimulative monetary policy can induce banks to undertake maturity transformation exposing them to rollover and liquidation risks.
- Monetary tightening is optimal when the gains from stimulating demand are low, and when rollover and liquidity risks are high.
- In future work, we aim to:
  - Write down a full-fledged model of nominal rigidities.
  - Endogenize liquidation cost λ by introducing market for asset sales.
  - Allow some maturity transformation to be productive for the economy, but let capital owners choose illiquidity of long-term assets.
  - Model the choice of government bond supply as storage.
  - Clear markets and study asset prices.