Monetary Easing, Investment and Financial Instability

Viral Acharya[1] Guillaume Plantin[2]

[1]Reserve Bank of India

[2]Sciences Po

Introduction

- Unprecedented monetary easing in all major currencies post 2008
- "search for yield" among institutional investors has contributed to a sharp price increase in risky asset classes
- e.g., high-yield corporate bonds, emerging-market debt and equities

Disappointing impact on investment

- Investment has not returned yet to its pre-recession trends in advanced economies...
- ...despite a large wedge between historically low interest rates and historically high returns on capital...
- ...that have been largely paid out to shareholders, notably in the form leveraged share buybacks (see, e.g., Furman 2015, 2016)

This paper...

...offers a model in which three features jointly develop in equilibrium:

- accommodative monetary policy
- "excessive" financial risk taking
- an increase in the fraction of firms' profits that are paid out at the expense of investment despite a high marginal excess return on capital

These facts amplified during the 2007-8 crisis...

...but pre-dated it

- Gutierrez and Philippon (2016) trace back to the early 2000s:
  - decline in U.S. private fixed investment despite a high Tobin's q
  - increase in firms' share buybacks
- Taylor (2011, 2012) traces the start of a "Great Deviation" around the same time
  - monetary policy became relatively more accommodative
  - prudential regulation looser
  - contributed to the build-up of financial fragility leading to the 2008 crisis
- Contentious though (see, e.g., Bernanke, 2010)

(Very broad) intuition

- Consider the elementary situation in which an agent can borrow or lend at the risk-free rate in order both to smooth consumption and to invest in a storage technology with decreasing returns to scale
- As the risk-free rate becomes small, the agent borrows large amounts in order both to invest large quantities, and to borrow against his future profits for early consumption (leveraged share buyback)
- If a borrowing constraint binds at some point, then the agent will allocate his borrowing capacity between investment and share buybacks up to the point at which the returns are equal, both above the risk-free rate
- Endogenous lower bound below which leveraged share buybacks crowd out investment and create socially undesirable financial fragility

Roadmap

1. An elementary model of monetary easing (without maturity transformation)
2. General model and results

1. An elementary model of monetary easing

Setup

- Time is discrete
- 2 types of private agents:
  - Workers
  - Entrepreneurs
- Public sector

Setup

- 2 desirable goods:
  - A perishable consumption good that serves as numéraire
  - A capital or durable good. One unit of capital good produced at date t generates one unit of the consumption good at date $t+1$
- Bond market. There is a competitive market for one-period risk-free bonds denominated in the numéraire good

Workers

- Unit mass born at each date and live for two dates
- Supply one unit of labor when young
- Consume when old. Risk neutral
- Each worker owns a technology that transforms I units of labor into $g(I)$ contemporaneous units of the consumption good

Entrepreneurs

- Unit mass born at each date and live for two dates
- Risk neutral over consumption at each date. No discounting
- Each entrepreneur born at date t is endowed with a technology that transforms I units of labor at date t into $f(I)$ contemporaneous units of the capital good

Public sector

The public sector

- Does not consume and maximizes the total utility of the private sector, discounting that of future generations with a factor arbitrarily close to 1
- Monetary policy. The public sector announces at each date an interest rate at which it is willing to absorb any net demand for bonds
- Fiscal policy. The public sector can tax workers as it sees fit, and can, in particular, apply lump-sum taxes. It cannot tax entrepreneurs

Comments

Monetary model of a "cashless" economy where

- Money only serves as a unit of account
- The public sector sets the nominal interest rate
- and this affects the real interest rate in the presence of nominal rigidities

Simplification here: extreme nominal rigidity—fixed price level for one good—to abstract from price level determination and focus on controlling the real rate

Steady-state

- We study steady-states in which the public sector announces a constant interest rate r. Denote w the market wage, and l the quantity of labor that workers supply to entrepreneurs
- Entrepreneurs then borrow wl to pay wages. If $r < 1$, they borrow the additional amount $(f(l) - rwl)/r$ against their next-date profit $f(l) - rwl$
- Workers invest in bonds both their labor income w and their profit $g(1 - l) - w(1 - l)$
- Firms maximize profits

$$g'(1 - l) = w,$$
$$f'(l) = rw$$

Steady-state

The consumption of a given cohort is then:

$$\underbrace{\left[1+\mathbf{1}_{\{r<1\}}\left(\frac{1}{r}-1\right)\right](f(l)-rwl)}_{\text{Entrepreneurs' income}}+\underbrace{rwl+rg(1-l)}_{\text{Old workers' pre-tax income}}$$

$$+\underbrace{(1-r)\left[g(1-l)-\mathbf{1}_{\{r<1\}}\left(\frac{f(l)}{r}-wl\right)\right]}_{\text{Rebate to old workers}}$$

$$=f(l)+g(1-l)$$

Steady-state

$$f(l) + g(1 - l)$$

Maximized by setting the interest rate at $r^* = 1$. In this case, the market wage w^* solves

$$w^* = g'(1 - l^*) = f'(l^*) = r^* w^*$$

Remarks

1. Absence of borrowing constraints. Does the public sector always has the sufficient tax capacity to accommodate bond trading by private agents? Yes, if $r \geq 1$. Not necessarily when r is sufficiently small, because young entrepreneurs' borrowing might exceed the income that young workers and the public sector (via taxation of old workers) can lend. Ignore this constraint for now, will be important later

2. Irrelevance of leveraged share buybacks. Borrowing against their future profit $(f(I) - rwI)/r$ by young entrepreneurs when $r < 1$ in order to consume admits a straightforward interpretation as a leveraged share buyback. If they do not create borrowing constraints, they are immaterial (purely redistributive)

Monetary easing

- Suppose now that the date-0 cohort of workers have a less productive technology than that of the others
- Transforms x units of labor into $\rho g(x)$ contemporaneous units of the consumption good, where $\rho \in (0, 1)$

Monetary easing - Flexible wage

- With a flexible wage, the interest rate $r^* = 1$ is still optimal at all dates
- The date-0 wage decreases to $w_0 < w^*$ such that

$$w_0 = \rho g'(1 - l_0) = f'(l_0)$$

Monetary easing - Rigid wage

- **(Downward rigid wage)** The wage cannot be smaller than w^* at any date
- The public sector can make up for the absence of appropriate price signals in the date-0 labor market by setting the date-0 policy rate at

$$r_0 = \frac{w_0}{w^*}$$

- Entrepreneurs invest up to the optimal level I_0 since

$$f'(I_0) = r_0 w^* = w_0.$$

- Each worker accommodates by applying in his own firm the residual quantity of labor that the other firms are not willing to absorb at the prevailing market wage w^*

Relationship to new Keynesian models/Interpretation

- In NK models optimal monetary policy anchors inflation expectations and sets the real interest rate at the natural level that would prevail under flexible prices
- Here only latter role: Monetary policy in our framework plays the very same latter role of mitigating distortions induced by nominal rigidities by gearing real variables towards their "natural" levels
- The natural level is not defined by an intertemporal rate of substitution here, but rather by the relative marginal productivities of two sectors

2. Monetary policy and financial instability

Liquidity risk

- Modify the modelling of entrepreneurs and capital-good technology so that both investment and share buybacks involve taking on liquidity risk
- Rest unchanged

Liquidity risk

- Entrepreneurs live for three dates, and value consumption at the initial and last dates of their lives
- A unit of capital good produced at date t yields one unit of consumption good at date $t+2$. Alternatively, can be liquidated at date $t+1$, generating $1/(1+\lambda)$ units of consumption at this date
- Liquidity risk. An entrepreneur born at date t has access to the bond market at date $t+1$ with probability q only. (Diamond 1997)
- LOLR. In addition to monetary and fiscal instruments, the public sector can act as a lender of last resort or emergency lender, offering credit to the entrepreneurs who are excluded from the bond market at whichever conditions he sees fit

Analysis

Now entrepreneurs need to rollover short-term debt to finance wages and share buybacks. Liquidity risk. Again, 2 steps

1. Steady-state with constant productivity at each date
2. Productivity shock ρ on the consumption-good technology at date 0

- Steady-state: same $r^* = 1$, I^*, w^*, and unlimited emergency lending at $r^* = 1$ as well
- The public sector fully insures entrepreneurs against liquidity risk at no cost

Date-0 productivity shock

- Productivity shock ρ on the consumption-good technology at date 0 and downward-rigid wage
- Unanticipated for expositional simplicity
- It is still optimal to set the policy rate at 1 at all other dates than 0. Only $r_0 \times r_1$ matters for the date-0 cohort and distorting the behavior of the date-1 cohort cannot be optimal
- It is still optimal to set the emergency rate at 1 at all other dates than 1
- Only need to characterize the date-0 policy rate and emergency-lending policy at date 1

Liquidity risk and share buybacks

- Suppose no emergency lending. Date-0 entrepreneur with one unit of capital can borrow against $1/(1+\lambda)$, and consume from the residual at date 2 if he has not been excluded from the market and forced to liquidate his unit at date 1
- Dominates waiting until date 2 if:

$$\frac{1}{r_0(1+\lambda)} + \frac{\lambda(1-q)}{1+\lambda} > 1,$$

or

$$r_0 < \frac{1}{1+\lambda q}$$

- Define $\underline{\rho}$ as

$$r_0(\underline{\rho}) = \frac{1}{1+\lambda q}$$

Optimal policy with mild productivity shocks

(Monetary response to mild productivity shocks) If $\rho \geq \underline{\rho}$, then the public sector optimally sets the policy rate at $r_0(\rho)$ at date 0. It acts as a lender of last resort at date 1 by lending up to $r_0(\rho)l_0(\rho)w^*$ at a unit rate to each entrepreneur at date 1. There are no leveraged share buybacks in equilibrium, and the marginal date-0 return on capital is equal to the interest rate:

$$\frac{f'(l_0)}{w^*} = r_0$$

This implements optimal production. Only need to discourage buybacks by rationing emergency lending

Optimal policy with severe productivity shocks 1/2

(Monetary response to severe productivity shocks) Suppose $\rho < \underline{\rho}$. There exists $\rho_\lambda \leq \underline{\rho}$ such that:

- If $\rho \in [\rho_\lambda, \underline{\rho}]$, then the public sector can implement productive efficiency, there are leveraged share buybacks at date 0, and emergency lending prevents inefficient liquidation of capital. The optimal policy consists in setting a date-0 rate $r_\lambda(\rho) < r_0(\rho)$. Emergency lending takes place at a rate $1 + \lambda$ without any restriction on quantities. The marginal return on capital is strictly above the date-0 rate:

$$\frac{f'(I_0)}{w^*} = r_0 > r_\lambda$$

Optimal policy with severe productivity shocks 2/2

(Monetary response to severe productivity shocks)

- If $\rho < \rho_\lambda$, then the public sector cannot implement productive efficiency. It cannot spur more investment than the optimal level $f(I_0(\rho_\lambda))$ corresponding to ρ_λ. Again, there are leveraged shares buyback and emergency lending at a punitive rate $1 + \lambda$
- If the public sector mistakenly sets the date-0 rate at a level below $r_\lambda(\rho_\lambda)$, then investment snaps back to the steady-state level $f(I^*)$

Intuition

- If the date-0 rate is below $r_0(\underline{\rho}) = 1/(1+\lambda q)$, then date-0 entrepreneurs find leveraged share buybacks attractive even absent any emergency funding in case of market exclusion
- The best the public sector can do in this situation is to avoid the deadweight loss of inefficient liquidations due to the share buybacks by offering emergency lending. Highest possible rate at which it can grant emergency loans is $1+\lambda$
- Still, borrowing by young entrepreneurs may be constrained. There is a level ρ_λ of ρ below which it is impossible to implement productive efficiency, because this would imply a date-0 rate at which the borrowing constraint binds
- If this constraint binds, then investment snaps back to the steady-state level $f(I^*)$

Summary

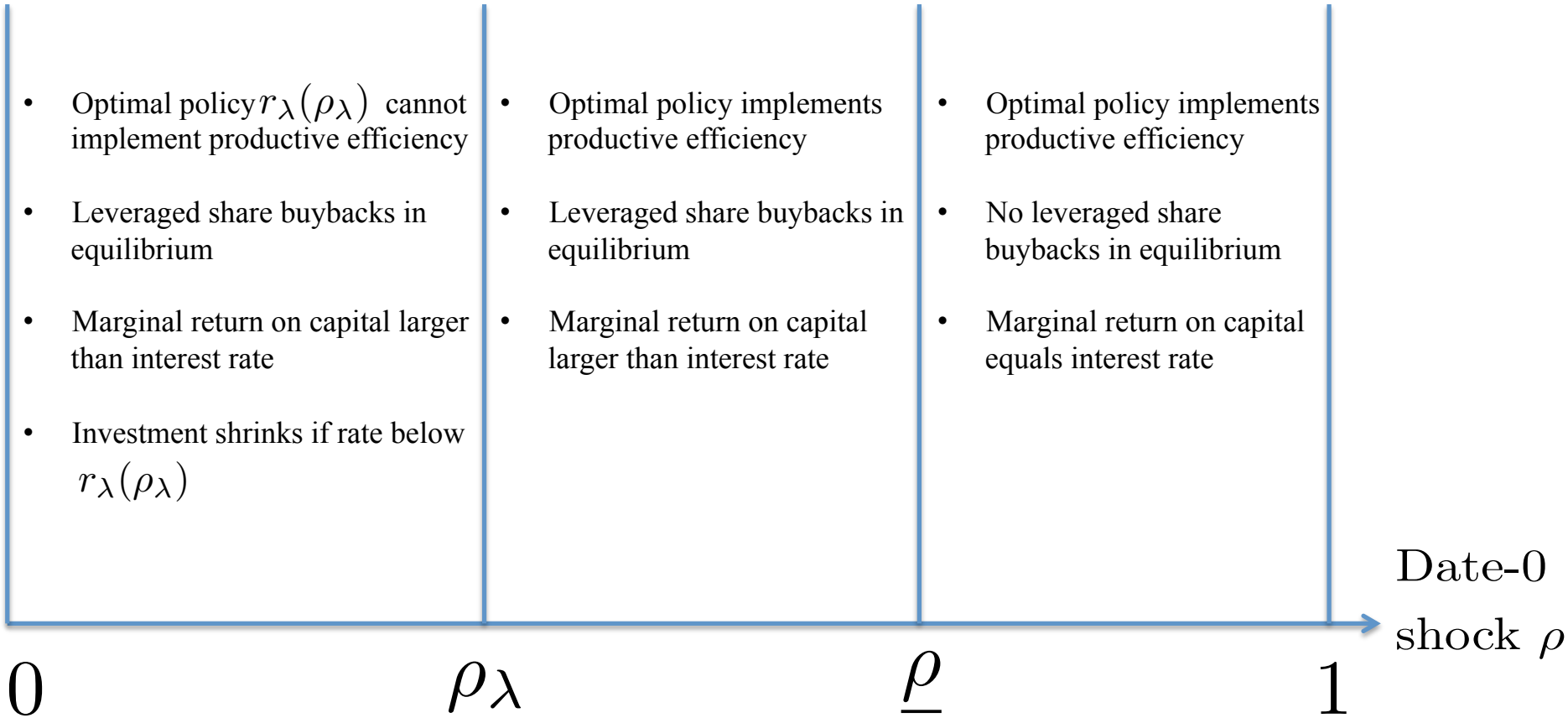

Figure 1: Optimal policy and equilibrium patterns as the date-0 shock varies

So,

- As claimed in the introduction, we predict that monetary accommodation can induce excessive maturity transformation, and marginal indifference between share buybacks and investment in the use of corporate funds despite a wedge between interest rate and marginal return on capital. (Case $\rho \leq \underline{\rho}$)
- These patterns may arise even if investment is at the efficient level and entrepreneurs are not constrained in equilibrium. (Case $\rho \in [\rho_\lambda, \underline{\rho}]$)
- These patterns are more pronounced if monetary accommodation is excessive, with an interest rate below the endogenous lower bound $r_\lambda(\rho_\lambda)$. In this case investment stays at the non-stimulated level $f(I^*)$ and monetary easing only spurs socially undesirable carry trades

Aggregate borrowing constraint

- Our setup suggests that the patterns we seek to explain are foremost the symptoms of the limited supply of private or/and public investable funds that can accommodate the reduction in interest rates
- It is worthwhile stressing that the relevant measure of public spending capacity here is relative to the value of the outstanding assets that can back carry trades
- Admittedly, financial deregulation, innovation and globalization over the last 30 years have significantly expanded the set of such assets, thereby weakening the link between monetary policy and investment (Reduction in λ)

Shadow banking and maturity transformation outside banks

- Excessive maturity transformation in line with the rapid growth of an important shadow-banking system that accompanied the "Great Deviation" identified by Taylor (2011) and collapsed in 2008
- Following post-2008 unconventional monetary policy, unregulated maturity transformation has moved over to asset management industry flows into
  - junk bonds and collateralized leveraged loans (Stein, 2014)
  - emerging market government and corporate bonds (Feroli et al. 2014 and IMF, 2014)
  - funding of residential mortgage-backed assets by real estate investment trusts (REITs) using short-term repo (sale and repurchase agreements). Stein (2013)

Extensions

- Taxing entrepreneurs
- Interim consumption by entrepreneurs
- Anticipated productivity shock