

# The Safety Trap

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# Safe Asset Shortage

	\$ bn		% of World GDP	
	2007	2011	2007	2011
<b>US Federal Government Debt held by the public</b>	5,136	10,692	9.20%	15.80%
Held by the Fed	736	1,700	1.30%	2.50%
Held by private investors	4,401	8,992	7.90%	13.30%
<b>GSE obligations</b>	2,910	<del>2,023</del>	5.20%	<del>3.00%</del>
<b>Agency- and GSE-backed mortgage pools</b>	4,464	<del>6,283</del>	8.00%	<del>9.30%</del>
<b>Private-issue ABS</b>	3,901	<del>1,277</del>	7.00%	<del>1.90%</del>
<b>German and French government debt</b>	2,492	3,270	4.50%	4.80%
<b>Italian and Spanish government debt</b>	2,380	<del>3,143</del>	4.30%	<del>4.70%</del>
<b>Safe assets</b>	<b>20,548</b>	<b>12,262</b>	<b>36.90%</b>	<b>18.10%</b>

Note: Numbers are struck through if they are believed to have lost their "safe haven" status after 2007.

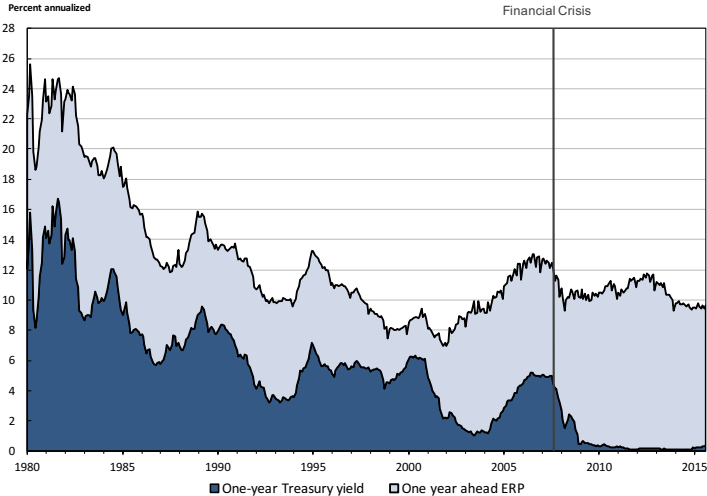
Source: Federal Reserve, Haver Analytics, Barclays Research

# Drop in Safe Interest Rate

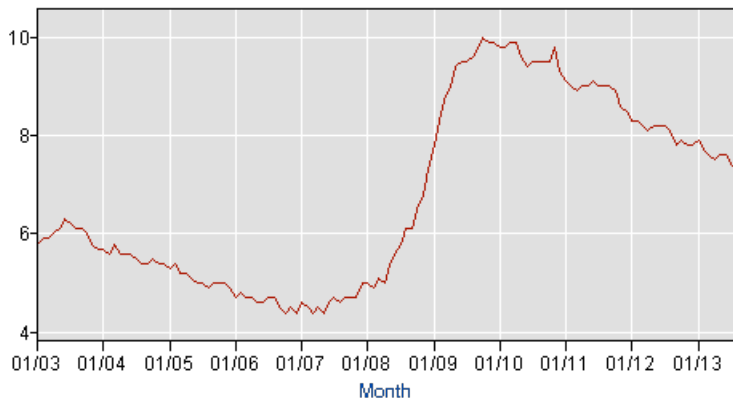


Source: Federal Reserve Bank of St. Louis.

# Risk Premia



## Increase in Unemployment



# Safe Asset Shortage

- ▶ Benign view: moving along demand curve
- ▶ Malign view: ZLB and recession
- ▶ Safety trap: reason behind decline in natural rate matters

## Kocherlakota (2013)

In my view, the biggest challenge for central banks is changes in the nature of asset demand and asset supply since 2007. Those changes are shaping current monetary policy, and are likely to shape policy for some time to come.

The demand for safe financial assets has grown greatly since 2007. At the same time, the supply of the assets perceived to be safe has shrunk over the past six years. Americans thought in 2007 that it was highly unlikely that American residential land, and assets backed by land, could ever fall in value by 30 percent. They no longer think that. Similarly, investors around the world viewed all forms of European sovereign debt as a safe investment. They no longer think that either.

The increase in asset demand, combined with the fall in asset supply, implies that households and firms spend less at any level of the real interest rate—that is, the interest rate net of anticipated inflation. It follows that the Federal Open Market Committee (FOMC) can only meet its congressionally mandated objectives for employment and prices by taking actions that lower the real interest rate relative to its 2007 level. The FOMC has responded to this challenge by providing a historically unprecedented amount of monetary accommodation.

# Outline

- ▶ Simple model
- ▶ Safety trap
- ▶ Policy
- ▶ Inflation
- ▶ Bubbles
- ▶ Securitization Externality
- ▶ Safety traps vs. Liquidity Traps



## Related Literature

- ▶ Safe asset shortage, savings glut and global imbalances  
Bernanke (05), Caballero (06,10), Caballero-Farhi-Gourinchas (08a,b), Caballero-Krishnamurthy (09), Farhi-Gourinchas-Rey (11), Bernanke (11), Obstfeld (12), Barclay's (12)
- ▶ Liquidity trap  
Keynes (36), Krugman (98), Eggertsson-Woodford (03, 04), Christiano-Eichenbaum-Rebelo (11), Correia-Farhi-Nicolini-Teles (12), Werning (12), Eggertsson-Krugman (12), Guerrieri-Lorenzoni (12)
- ▶ Secular stagnation  
Kocherlakota (13), Eggertsson-Mehrota (14)
- ▶ Macro liquidity  
Woodford (90), Holmtrom-Tirole (98)
- ▶ Incentives to create safe assets and systemic implications  
Gorton (10), Stein (12), Greenwood-Hanson-Stein (12), Woodford (12), Gennaioli-Shleifer-Vishny (12), Gorton-Ordonez (12)

## Basic Model

- ▶ Endowment  $X$  unless Poisson event:
  - ▶ good  $\mu^+ X > X$ , intensity  $\lambda^+$
  - ▶ bad  $\mu^- X < X$ , intensity  $\lambda^-$
- ▶ Study limit  $\lambda^+ \rightarrow 0$  and  $\lambda^- \rightarrow 0$
- ▶ OLG “perpetual youth” with birth/death Poisson rate  $\theta$
- ▶ Agents earn income at birth, save it, and consume at death
- ▶ Dividend  $\delta X$  and income of newborns  $(1 - \delta)X$

# Knights and Neutrals

- ▶ Fraction  $\alpha$  of Knights (infinite instantaneous risk aversion)
- ▶ Fraction  $1 - \alpha$  of Neutrals (risk neutral)
- ▶ Total and respective wealth  $W_t = W_t^K + W_t^N$

## Safe and Risky Assets

- ▶ Lucas trees (claims to dividends) managed by Neutrals
- ▶ Neutrals own risky assets and issue safe assets to Knightians
- ▶ Financial friction limits securitization: fraction  $1 - \rho$  of dividends non-pledgeable (can be stolen by tree manager)
- ▶ Value of risky and safe assets (assuming  $\rho > \alpha$ )

$$V_t = V_t^R + V_t^S$$

$$V_t^S = \rho \mu^{-\frac{X}{\theta}}$$

## Equilibrium Equations

$$r_t^K V_t^S = \delta_t^S X + \dot{V}_t^S$$

$$r_t V_t^R = (\delta - \delta_t^S) X + \dot{V}_t^R$$

$$\dot{W}_t^K = -\theta W_t^K + \alpha(1 - \delta) X + r_t^K W_t^K$$

$$\dot{W}_t^N = -\theta W_t^N + (1 - \alpha)(1 - \delta) X + r_t W_t^N$$

$$W_t^K + W_t^N = V_t^S + V_t^R$$

$$V_t^S = \rho \mu^{-\frac{X}{\theta}} \quad \text{and} \quad W_t^K \leq V_t^S$$

## Total Wealth and Assets

- ▶ Focus on steady states
- ▶ Goods market clearing  $W = \frac{X}{\theta}$
- ▶ Asset market clearing  $V = W$
- ▶ Explains why  $V^S = \rho \mu^{-\frac{X}{\theta}}$

## Safe and Risky Interest Rates

- ▶ Neutrals can hold safe and risky assets
- ▶ Knightians only hold safe assets  $W^K \leq V^S$
- ▶ Safe and risky interest rates  $r^K \leq r$

## Two Regimes

- ▶ Unconstrained regime if  $\alpha \leq \rho\mu^-$ :

$$r = r^K = \delta\theta$$

- ▶ Constrained regime if  $\alpha > \rho\mu^-$ :

$$r^K = \delta\theta - (1 - \delta)\theta \frac{\alpha - \rho\mu^-}{\rho\mu^-} < \delta\theta < \delta\theta + (1 - \delta)\theta \frac{\alpha - \rho\mu^-}{1 - \rho\mu^-} = r$$



# Keynesian Model: NK+CIA

- ▶ Basic model: real endowment economy
- ▶ Keynesian model: add sticky prices and production
- ▶ Two key features:
  - ▶ demand-determined output (NK)
  - ▶ ZLB (CIA + cashless limit)

## NK: Monopolistic Competition

- ▶ Differentiated non-traded inputs indexed by  $k \in [0, 1]$  used to produce different varieties of goods  $x_k$ 
  - ▶ Index trees by  $i \in [0, \delta]$  so that each tree yields  $X$  units of non-traded input  $i$
  - ▶ Index newborns by  $j \in [\delta, 1]$  so that each newborn has  $X$  units of non-traded input  $j$
  - ▶ Each variety of goods  $x_k$ :
    - ▶ produced and sold by monopolistically competitive firm
    - ▶ firm posts price  $p_k$  in units of numeraire

## NK: Monopolistic Competition

- ▶ Differentiated goods value by consumers according to a Dixit-Stiglitz aggregator

$$\xi X = \left( \int_0^1 x_k^{\frac{\sigma-1}{\sigma}} dk \right)^{\frac{\sigma}{\sigma-1}}$$

- ▶ Consumption expenditure  $P\xi X = \int_0^1 p_k x_k dk$
- ▶ Price index  $P = \left( \int_0^1 p_k^{1-\sigma} dk \right)^{\frac{1}{1-\sigma}}$
- ▶ Resulting demand for good  $k$  is  $x_k = \left( \frac{p_k}{P} \right)^{-\sigma} \xi X$

## NK: Nominal Rigidities

- ▶ Extreme form of nominal rigidity  $p_k = P$  fixed ( $P = 1$ )
  - ▶ monetary authority sets safe nominal interest rate  $i$
  - ▶ because prices are rigid,  $r^k = i$
  - ▶ output demand-determined  $x_k = \xi X$

## CIA: Introducing Money

- ▶ Individuals with wealth  $w_t$  and money holdings  $m_t$  can only consume  $\min(w_t, \frac{m_t}{\varepsilon})$ 
  - ▶ zero lower bound  $i \geq 0$
  - ▶ When  $i > 0$ , money only held for transaction purposes
  - ▶ When  $i = 0$ , money also held as safe store of value
- ▶ Money supply is
  - ▶  $\varepsilon M^\varepsilon$  with  $M^\varepsilon = \frac{X}{\theta}$  before Poisson shock
  - ▶  $\varepsilon M^{\varepsilon+}$  with  $M^{\varepsilon+} = \mu^+ \frac{X}{\theta}$  after good Poisson shock
  - ▶  $\varepsilon M^{\varepsilon-}$  with  $M^{\varepsilon-} = \mu^- \frac{X}{\theta}$  after bad Poisson shock
- ▶ Cashless limit  $\varepsilon \rightarrow 0$

## Keynesian Model vs. Endowment Economy

- ▶ Flexible price (natural) allocation same as endowment economy
- ▶ Can be implemented with rigid prices as long as  $r^{K,n} \geq 0$

# The Safety Trap

- ▶ Decrease in supply ( $\rho\mu^-$  drops) or increase in demand for safe assets ( $\alpha$  increases)
- ▶ At unchanged  $r^K$ :
  - ▶ excess demand for safe assets
  - ▶ excess supply of goods
- ▶ How is equilibrium restored?
  - ▶ if  $r^K > 0$  reduction in  $r^K$
  - ▶ if  $r^K = 0$ , reduction in output  $\xi X < X$  (below potential)

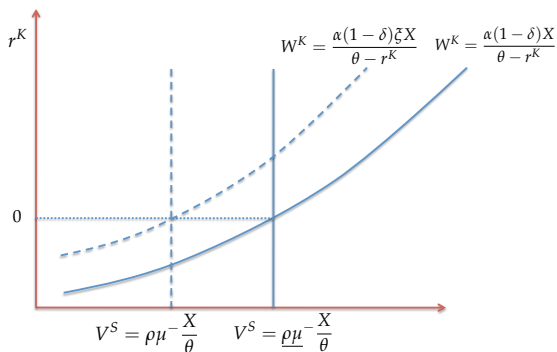


Figure: Safety trap.

Recession caused by a decrease in the supply of safe assets. The safe asset supply curve shifts left ( $\rho\mu < \underline{\rho\mu}$ ), the endogenous recession shifts the safe asset demand curve left ( $\xi < 1$ ), the safe interest rate remains constant at  $\underline{r^K}$ .



# The Safety Trap

- ▶ Two phases:
  - ▶ instantaneous fire sale (immediate adjustment in  $W^K$ )
  - ▶ permanent recession (adjustment in growth of  $W^K$ )
- ▶ AS-AD Keynesian cross representation (with  $r^K = 0$ )

$$AS(\xi X) = \xi X$$

$$AD(\xi X) = (1 - \alpha)(1 - \delta)\xi X + \delta\xi X + (\theta - r^K)V^S$$

- ▶ Keynesian multiplier

$$d(\xi X) = \frac{\xi X}{\theta V^S} \theta dV^S$$

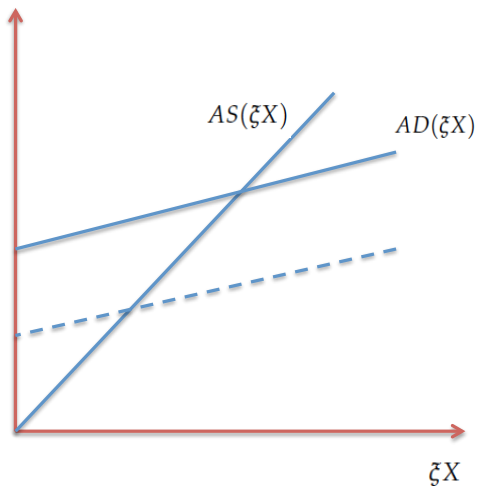


Figure: AS-AD and Keynesian cross.

$$AS(\xi X) = \xi X$$

$$AD(\xi X) = (1 - \alpha)(1 - \delta)\xi X + \delta\xi X + (\theta - r^K)V^S$$

# Secular Stagnation

- ▶ Secular stagnation?
- ▶ Safety trap can be very persistent...even permanent
- ▶ Permanent ZLB...despite long-dated assets (risk premia)

## Forward Guidance

- ▶ Low interest rates after good Poisson shock with  $\lambda^+ > 0$
- ▶ Increases output and asset values after good Poisson shock
- ▶ No effect on output before Poisson shock in safety trap
- ▶ Failed attempt to stimulate AD by reflating risky assets
- ▶ Increase in  $r$  without change in  $V^R$  or  $V = V^R + V^S$
- ▶ Rationalizes “forward guidance puzzle”

## Short-Term Public Debt

- ▶ ST public debt  $D$  financed by taxes on dividends

$$V^S = [\rho(\tau^-) + \tau^-] \mu^- \frac{X}{\theta}$$

$$\rho(\tau^-) = \min\{\rho, 1 - \tau^-\}$$

$$\tau^- = \frac{\theta D}{\mu^- X}$$

- ▶ Maps into basic model with  $\rho$  replaced by  $\rho(\tau^-) + \tau^-$
- ▶ Resulting supply of safe assets  $V^S(D)$

## Short-Term Public Debt: Crowd Out

- ▶ Crowd out of private safe assets by public safe assets

$$-\frac{d(V^S(D) - D)}{dD} = -\frac{d\rho}{d\tau^-}$$

- ▶ Crowd out is
  - ▶ 0 if  $\rho < \tau^-$  (non-Ricardian)
  - ▶ 1 if  $\rho > \tau^-$  (Ricardian)
  - ▶  $1 - F(1 - \tau^-) \in [0, 1]$  with distribution  $F(\rho)$
- ▶ Link with Ricardian equivalence (taxes capitalized)

## Short-term Public Debt and Helicopter Drops

- ▶ Issue safe ST public debt  $\hat{D} > D$  and rebate lump sum
- ▶ Increases supply of safe assets to  $V^S(\hat{D}) > V^S(D)$  (more if less crowd out)
- ▶ Stimulates output in a safety trap  $\hat{\xi} = \frac{V^S(\hat{D})}{V^S(D)}\xi > \xi$  (more if less crowd out)

# Helicopter Drops of Money

- ▶ Print money and give to households
- ▶ Equivalent to short term debt issuance at ZLB
  - ▶ money and short-term public debt perfect substitutes at ZLB
  - ▶ issuing either requires spare fiscal capacity after bad shock
- ▶ Stimulate output, contrast with traditional irrelevance
  - ▶ standard IS/LM analysis (out-shift IS and LM vs. only LM)
  - ▶ standard in standard NK analysis (non-Ricardian vs. Ricardian)



- ▶ Issue safe ST public debt and buy private risky assets (risky tranches of trees)
- ▶ Same effect as issuing ST public debt and rebating lump sum:
  - ▶ increases supply of safe assets
  - ▶ stimulates output
- ▶ Government comparative advantage in “safety transformation” arising from taxation power as long as spare fiscal capacity and securitization sufficiently impaired

# OT

- ▶ Buy LT public debt and issue ST public debt
- ▶ LT debt risky, but risk is covariance, not variance
- ▶ If LT debt decreases in value after bad shock (positive beta), then OT acts like QE
- ▶ If LT debt increases in value after bad shock (negative beta):
  - ▶ OT reduces supply of safe assets
  - ▶ in a safety trap, reduces output

# Inflation

- ▶ Inspired by Eggertsson-Mehrota (2014)
- ▶ Capture downward wage rigidity
- ▶ Add Philipps curve

$$\begin{aligned}\pi_t &= -(\gamma + \beta(1 - \xi_t)) \quad \text{if } \xi_t < 1 \\ \pi_t &\in [-\gamma, +\infty) \quad \text{if } \xi_t = 1\end{aligned}$$

- ▶ Truncated Taylor rule ( $r_t^{K,n}$  natural safe interest rate)

$$i_t = \max\{0, r_t^{K,n} + \pi^* + \phi(\pi_t - \pi^*)\}$$

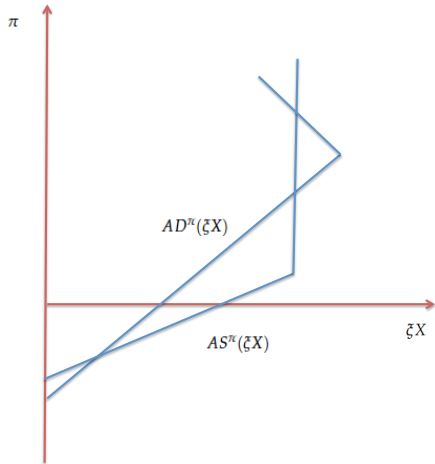


Figure: Aggregate supply and aggregate demand with inflation.

# Inflation

- ▶ Inflation increases Keynesian multiplier through output inflation-feedback loop
- ▶ No qualitative change in policy conclusions:
  - ▶ public debt and QE effective
  - ▶ forward guidance ineffective
- ▶ Increase in inflation target:
  - ▶ creates good equilibrium with no recession and inflation...
  - ▶ ...if large enough...
  - ▶ does not eliminate bad equilibrium with recession and deflation

# Bubbles

- ▶ Introduce growth and bubbles
- ▶ Risky bubbles do not stimulate output in safety traps (limited expansions associated with financial bubbles in secular stagnation environments)
- ▶ Safe bubbles stimulate output in safety traps
- ▶ Government debt as safe bubble...can create safe assets without mobilizing fiscal capacity

## Securitization Externality

- ▶ Endogenize securitization capacity  $\rho(j_t)$  from investment  $j_t$
- ▶ Equilibrium securitization

$$(r_t - r_t^K) \frac{\rho'(j_t) \mu^-}{\theta} = 1$$

- ▶ Too little or too much securitization?
- ▶ Introduce tax/subsidy on securitization
- ▶ Study constrained Pareto efficiency
- ▶ Ramsey planning problem indexed by Pareto weights

# Securitization Externality

- ▶ Can find Pareto weights s.t. competitive equilibrium coincides with planning solution?
  - ▶ no safety trap: yes
  - ▶ safety trap: no
- ▶ Need Pigouvian subsidies on securitization to correct for aggregate demand externality
- ▶ Distinct rationale for intervention in safe asset market



## Safety Traps vs. Liquidity Traps

- ▶ Simple model of liquidity trap
- ▶ Assume unconstrained regime (or only Neutrals)
- ▶ Allow for  $\lambda^- > 0$ , maintain  $\lambda^+ \rightarrow 0$  for now
- ▶ Interest rate  $r = \delta\theta - \lambda^-(1 - \mu^-)$
- ▶ Difference with safety traps
  - ▶ generic shortage of assets vs. safe asset shortage
  - ▶ no risk premia vs. endogenous risk premia

## Safety Traps vs. Liquidity Traps

- ▶ If zero lower bound binds, output  $\xi X$  below potential
- ▶ Forward guidance: stimulates output in a liquidity trap
- ▶ QE: no effect on output in a liquidity trap
  - ▶ essentially Ricardian despite OLG structure
  - ▶ caveat...other specification of taxes...non-Ricardian effects
- ▶ Risky bubbles stimulate output in liquidity trap

# Conclusion

- ▶ Problems associated with scarcity of safe assets
- ▶ ZLB, safety traps and secular stagnation
- ▶ Differences with standard liquidity trap analyses:
  - ▶ forward guidance
  - ▶ QE and OT
  - ▶ bubbles
- ▶ Ongoing work: international aspects