# Scarce Collateral, the Term Premium, and Quantitative Easing

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# Ideas

- Central banker's rationale for "quantitative easing" (QE)
  - short term nominal interest rate is at the zero lower bound (ZLB).
  - central bank wants to "ease," but can't do so in the conventional way.
  - nominal yield curve is upward sloping, so maybe the central bank can ease by buying long maturity government debt.
- What's the theory that supports the use of QE at the ZLB?
  - Market segmentation – portfolio balance/preferred habitat.
  - frictions limiting arbitrage across maturities + heterogeneous preferences for assets of different maturities.

# Market segmentation as a foundation for QE is dubious.

- Why?
  - At the ZLB, QE turns long-maturity debt into short maturity debt.
  - But the private sector can do that too.
  - What advantage does the central bank have in this activity, and what does that have to do with market segmentation?
- Take another approach - central bank's advantage in this model comes from being trustworthy.

# Pledgeability, the Term Premium, and QE

- Private banks – efficient liquidity allocation, which works like Diamond-Dybvig insurance.
- But private banks are not trustworthy – limited commitment.
- Banks can secure deposits with the assets they hold (collateral).
- Limited pledgeability – bank can abscond with part of the assets.
- But different assets have different degrees of pledgeability – greater for short-maturity assets, which implies a term premium.
- Given the term premium, QE matters.

# Literature

- Berentsen-Camera-Waller (2007), Kiyotaki-Moore (2005), Gertler-Kiyotaki (2011), Venkateswaran-Wright (2013), Williamson (2012).

# Model

- $t = 0, 1, 2, ...,$
- two sub-periods *CM*, *DM*.
- Continuum of buyers, continuum of sellers, each with unit mass.
- Buyers supply labor in *CM*, and consume in *DM*:

$$E_0 \sum_{t=0}^{\infty} \beta^t [-H_t + u(x_t)],$$

- Sellers consume in *CM* and supply labor in *DM*:

$$E_0 \sum_{t=0}^{\infty} \beta^t (X_t - h_t),$$

- Production: One unit labor supply produces one unit perishable consumption good.

# Model, Continued

- *CM* : Debts paid off, then a Walrasian market on which assets and consumption are exchanged.
- *DM* :
  - Random matches between buyers and sellers – each buyer matched with a seller.
  - Buyer makes take-it-or-leave-it offer to the seller.
  - no memory (recordkeeping) – i.e. no record of past defaults.
  - assets required to support exchange.
- Available assets:
  - currency – sells at price $\phi_t$ in the *CM* (in goods).
  - bank reserves – sell at price $z_t^m$ (in money) in the *CM*, pay off one unit of money in the *CM* at $t+1$.
  - short-maturity government bonds – sell at price $z_t^s$ in the *CM*, pay off one unit of money in the *CM* at $t+1$.
  - long-maturity government bonds (consuls) – sell at price $z_t^l$ in the *CM*, pay off one unit of money each period forever.

# DM Transactions

- Currency is portable and, if valued in the *CM*, will be acceptable in exchange by sellers.
- Bank reserves and government bonds are account balances – electronic records with the central bank and the fiscal authority – not portable.
- $\rho =$ Pr[buyer is in a meeting where only currency is accepted] – *currency transactions.*
- $1 - \rho =$ Pr[seller will accept secured credit] – *non-currency transactions.*
- Can't transfer bank reserves or government debt in *CM*, so buyer receives a loan, secured by these assets.
- Pledgeability: $\theta_m = \theta_s < \theta_l$.

# Banks

- In *CM* :
  - Before consumption and production take place, buyers don't know "type" (transaction in *DM*).
  - At the end of the *CM*, they do, but type is private information, and a buyer can contact only one other agent of his/her choice.
- Role for bank to efficiently allocate liquidity – like Diamond-Dybvig.
- *CM* of period $t$ :
  - Bank (could be any agent) writes deposit contracts with buyers.
  - Deposit contracts are options to withdraw cash at end of *CM*, or trade a claim on the bank.
  - Bank acquires assets – reserves, government debt.
- End of *CM* of period $t$ : Bank pays off on currency claims (withdrawals).
- *CM* of period $t+1$ : Bank pays off on deposit claims.

# Bank's Problem

(In stationary equilibrium with gross inflation rate $\mu$)

$$\max_{d,c,k,m,b^s,b^l} \left[ -k + \rho u\left(\frac{\beta c}{\mu}\right) + (1-\rho)u(\beta d) \right]$$

subject to

$$k - \rho c - z^m m - z^s b^s - z^l b^l - (1-\rho)\beta d + \beta\frac{b^s}{\mu} + \beta\frac{b^l}{\mu}\left(1+z^l\right) + \beta\frac{m}{\mu} \geq 0$$

$$-(1-\rho)d + \left(\frac{b^s+m}{\mu}\right)(1-\theta_s) + \left[\frac{b^l\left(1+z^l\right)}{\mu}\right](1-\theta_l) \geq 0$$

- Incentive constraint is key: Net payoff in future *CM* cannot be smaller than what the bank gets if it absconds.
- Binding incentive constraint implies that there is positive bank capital.

# The Government: Fiscal Authority and Central Bank

- Consolidated government budget constraints (in equilibrium):

$$\rho c + z^m m + z^s b^s + z^l b^l = \tau_0 = V$$

$$\tau = V(1 - \frac{1}{\mu}) + \frac{1}{\mu}\left[(z^s - 1)b^s + (z^m - 1)m - b^l\right]$$

- $V$ exogenous (stupid fiscal policy), $\tau$ endogenous.
- If $V$ is sufficiently small, collateral is scarce, and the Friedman rule is not feasible.

# Equilibrium

- Two alternative regimes:
  - Channel system: Think of this as zero interest on reserves – no reserves held in equilibrium.
  - Floor system: $z^m = z^b$, with reserves held in equilibrium – central bank has more options now, as it can effectively issue short-term debt.

# Nominal Bond Yields

- Short and long nominal bond yields

$$R^s = \frac{\mu}{\beta\left[u'(x_2)(1-\theta_s)+\theta_s\right]} - 1$$

$$R^l = \frac{\mu}{\beta\left[u'(x_2)(1-\theta_l)+\theta_l\right]} - 1$$

  - Note inflation premia and liquidity premia.

- Term premium

$$R^l - R^s = \frac{\mu[u'(x_2)-1](\theta_l-\theta_s)}{\beta\left[u'(x_2)(1-\theta_l)+\theta_l\right]\left[u'(x_2)(1-\theta_s)+\theta_s\right]}$$

**Figure 1: Conventional Monetary Policy**

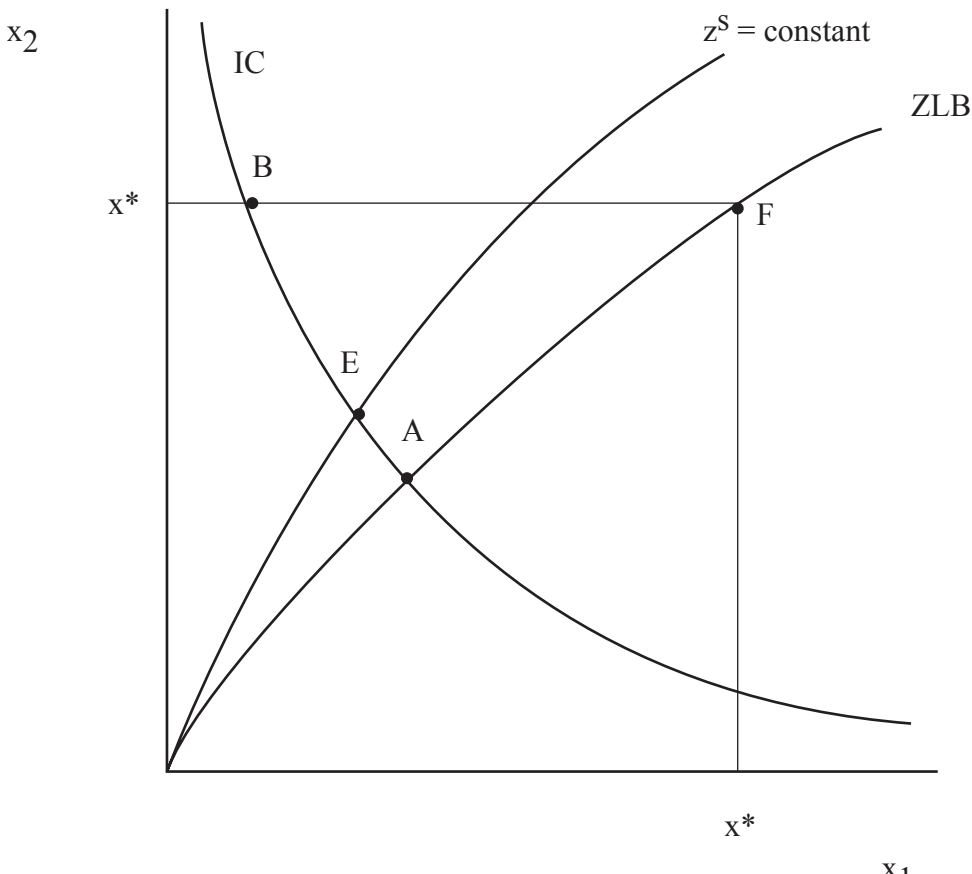
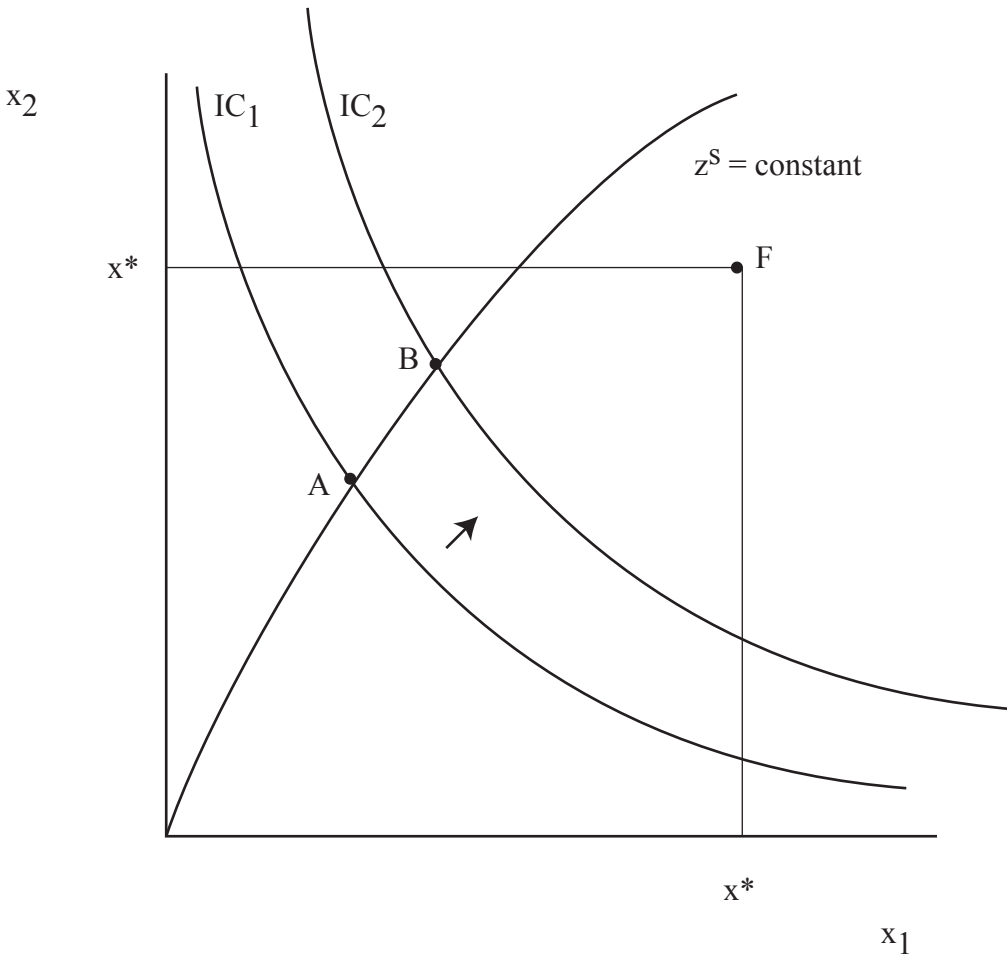


**Figure 2: Quantitative Easing**



# Policy Experiments

- Channel system away from ZLB: Open market purchase (short or long debt) reduces nominal nominal rate and real rate, reduces inflation rate, reduces term premium.
- Channel system at ZLB, or floor system:
  - open market purchases of short debt irrelevant (liquidity trap).
  - QE (holding constant the short nominal rate) lowers the nominal long bond yield, but *increases* real bond yields, and lowers inflation.

# Optimal Monetary Policy

- Treat fiscal policy as given – in general, fiscal policy is suboptimal here.
- Under a floor system, it is always optimal for the central bank to purchase all of the long-maturity government debt – may not be feasible in a channel system.
- Welfare measure:

$$W = \rho[(1-\omega)u(x_1) - x_1] + (1-\rho)[u(x_2) - x_2]$$

- Floor system relaxes a constraint on monetary policy – can't be worse than a channel system, and can be better.

**Figure 3: Policy Choices Under a Floor System**

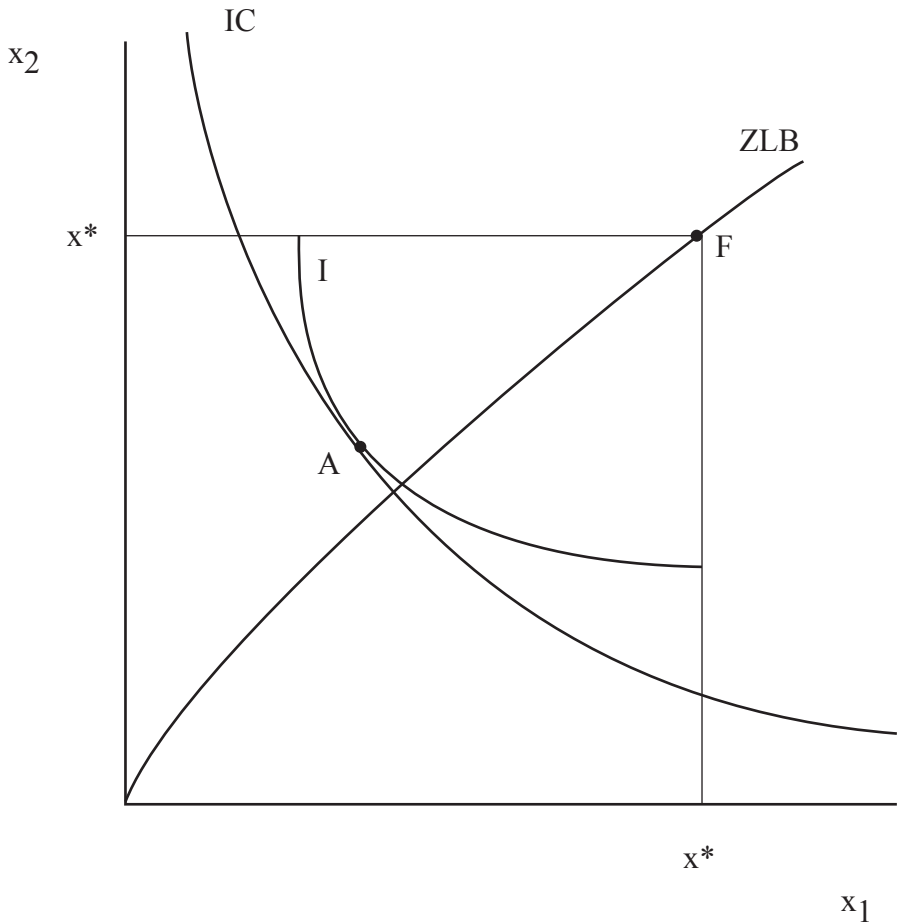
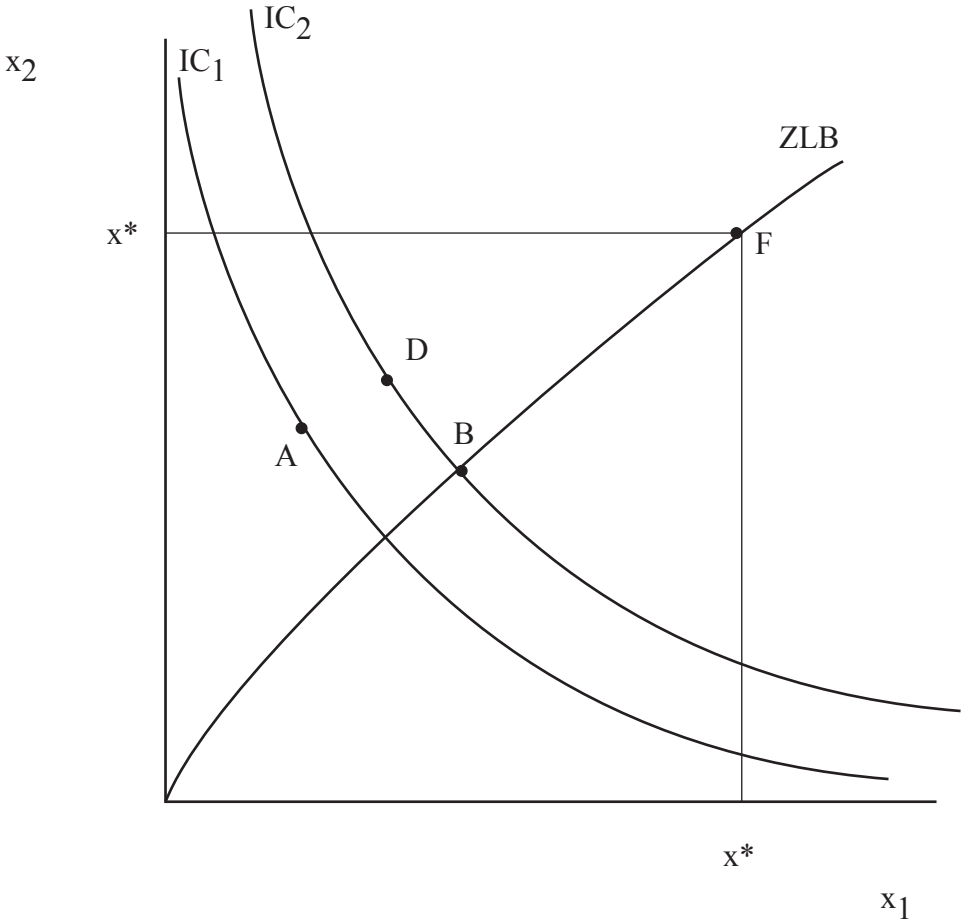


**Figure 4: Policy Choices Under a Channel System**



# Conclusion

- In the model, QE matters.
- No market segmentation/preferred habitat.
- Term premium arises for two reasons: (i) aggregate scarcity of collateral; (ii) short-maturity assets are better collateral.
- Given this, central bank purchases of long-maturity government debt are always beneficial, if feasible.
- Floor system dominates a channel system because it permits expansion of the central bank's balance sheet when that is appropriate.
- Questions:
  - Should the Fed be allowed to issue circulating short-maturity interest-bearing debt (Fed bills)? The Peoples Bank of China does this.
  - Is it appropriate for the central bank to manage the maturity composition of the government debt?