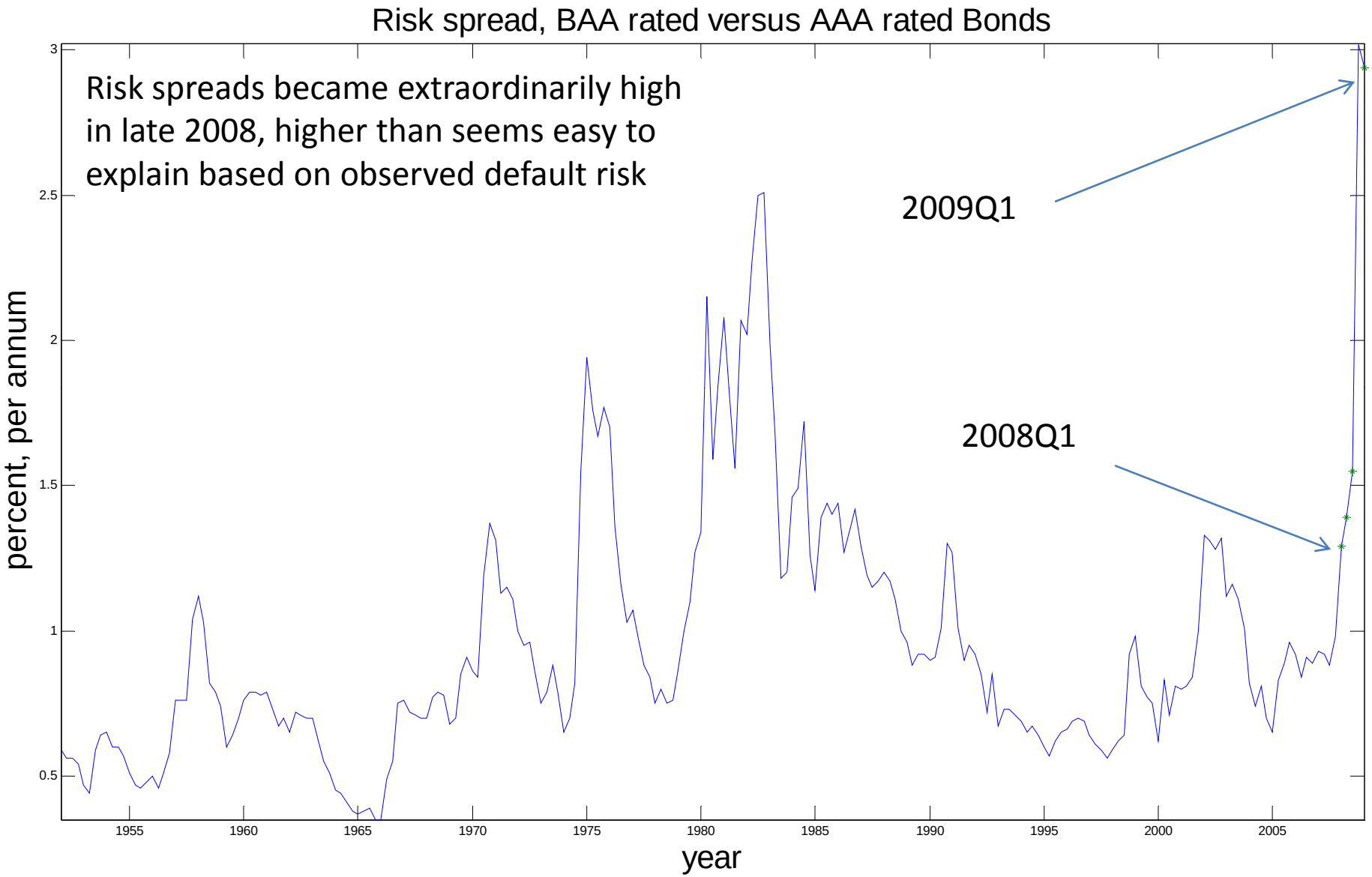
Two-period Version of Gertler-Kiyotaki Model


Risk spread, BAA rated versus AAA rated Bonds
Risk spreads became extraordinarily high in late 2008, higher than seems easy to explain based on observed default risk
2009Q1
2008Q1
percent, per annum
year
3
2.5
2
1.5
1
0.5
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005

Puzzle of Interest Rate Spreads

- Very high in late 2008, higher than seems explicable with default risk.

- Two explanations:
  - Liquidity: Kiyotaki-Moore/Moore
    - Banks with cash reluctant to use it to buy firm assets
    - Afraid they'll need the cash themselves, and the resale market for firm assets would dry up.
    - Classic financial market multiple equilibrium phenomenon (Bagehot)
  - Fear of out-of-equilibrium default (Gertler-Kiradi, Gertler-Kiyotaki).

Two-period Version of GK Model

- Many identical households, each with a unit measure of members:
  - Some members are ‘bankers’
  - Some members are ‘workers’
  - Perfect insurance inside households…workers and bankers consume same amount!
- Period 0
  - Workers endowed with *y* goods, household makes deposits in a bank
  - Bankers endowed with *N* goods, take deposits and purchase securities from a firm.
  - Firm issues securities to finance capital used in production in period 1.
- Period 1
  - Household consumes earnings from deposits plus profits from banker.
  - Goods consumed are produced by the firm.

Problem of the Household		
	period 0	period 1
budget constraint	$c + d \leq y$	$C \leq R^d d + \pi$
problem	$\max_{d,c^h,c^H}[u(c) + \beta u(C)]$	

Solution to Household Problem	
$\frac{u'(c)}{\beta u'(C)} = R^d$	$c + \frac{C}{R^d} \leq y + \frac{\pi}{R^d}$
$u(c) = \frac{c^{1-\gamma}}{1-\gamma}$	$c = \frac{y+\frac{\pi}{R^d}}{1+\frac{\left(\beta R^d\right)^{\frac{1}{\gamma}}}{R^d}}$

Efficient Benchmark

Problem of the Bank	
period 0	period 1
take deposits, d	pay dR^d to households
buy securities, $s = N + d$	receive sR^k from firms
problem: $\max_d [sR^k - R^d d]$	

Properties of Efficient Benchmark

Equilibrium: R^d, c, C, d, π

(i) household problem solved

(ii) bank problem solved

(iii) market clearing

- Properties:
  - Household faces true social rate of return on saving:

$$R^k = R^d$$

  - Equilibrium is 'first best', i.e., solves

$$\max_{c,C,k,} u(c) + \beta u(C)$$

$$c + k \leq y + N,\ C \leq kR^k$$

Friction

- bank combines deposits, *d*, with net worth, *N*, to purchase *N+d* securities from firms.

- bank has two options:
  - ('no-default') wait until next period when $(N+d)R^k$ arrives and pay off depositors, $R^d d$, for profit:

$$(N+d)R^k - R^d d$$

  - ('default') take $\theta(N+d)$ securities, leave banking forever, refuse to pay depositors and wait until next period when securities pay off:

$$\theta(N+d)R^k$$

Incentive Constraint

- Bank will choose 'no default' iff

$$\overbrace{(N+d)R^k - R^d d}^{\text{no default}} \quad \geq \quad \overbrace{\theta(N+d)R^k}^{\text{default}}$$

- Rewriting the above expression, the no default condition is equivalent to:

$$(1-\theta)(N+d)R^k \geq dR^d$$

  - i.e., banker doesn't default if defaulting implies the return for depositors goes up.

- Default will never be observed, because depositors would never put their money in a bank that violates the deposit condition.

Collapse in Net Worth

- No default condition:

$$\overbrace{(N+d)R^k - R^d d}^{\text{no default}} \quad \geq \quad \overbrace{\theta(N+d)R^k}^{\text{default}}$$

- When condition is non-binding, then $R^k = R^d$ and

$$NR^k \geq \theta(N+d)R^k.$$

- If *N* collapses, then constraint may be violated for *d* associated with $R^d = R^k$

  - Equilibrium requires lower value of *d*
  - Lower *d* requires a spread: $R^d < R^k$
  - Lower *d* is not efficient

Policy Implications

- Inject equity into banks
  - Government raises taxes and uses equity to become part-owner in the bank.
  - This directly increases intermediation, plus may allow additional deposits if households less afraid of default option with government in charge.
- Make direct loans to non-financial firms
  - Hard to interpret in the model, because unique advantage of banks doing the intermediation is not made explicit.
- Make loans to banks.
  - Government may have an advantage here because it's harder for banks to 'steal' from the government

Directions

- Gertler-Kiyotaki place model inside dynamic DSGE model.

- Nominal frictions could be added to the model.