What are the Risks of Government Bonds?

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The Panic of 2008

- What assets have held their value best?
  - Short-term US Treasury bills (stable value)
  - Long-term Treasury bonds (increasing value)
- Why have government bonds been such good hedges?
  - “Flight to quality” helps safe assets, but why are Treasury bonds regarded as safe?
  - They have no credit risk, but nominal bonds do have inflation risk
- Have Treasury bonds always hedged investors against other risks?

Understanding Bond Risks

- This talk concentrates on long-term nominal government bonds
  - Inflation risk
  - No credit risk
- I ask how inflation risk affects the pricing of these bonds and their role in asset allocation
- Empirical analysis of US Treasuries
  - Ideas apply to other countries too

Understanding Bond Risks

I draw on several recent pieces of research:

- Luis Viceira, “Bond Risk, Bond Return Volatility, and the Term Structure of Interest Rates”, unpublished, 2007
- Campbell, Adi Sunderam, and Viceira, “Inflation Bets or Deflation Hedges? The Changing Risks of Nominal Bonds”, unpublished, 2008
- Campbell, Karine Serfaty-de Medeiros, and Viceira, “Global Currency Hedging”, forthcoming *Journal of Finance,* 2009

Why Hold Nominal Treasuries?

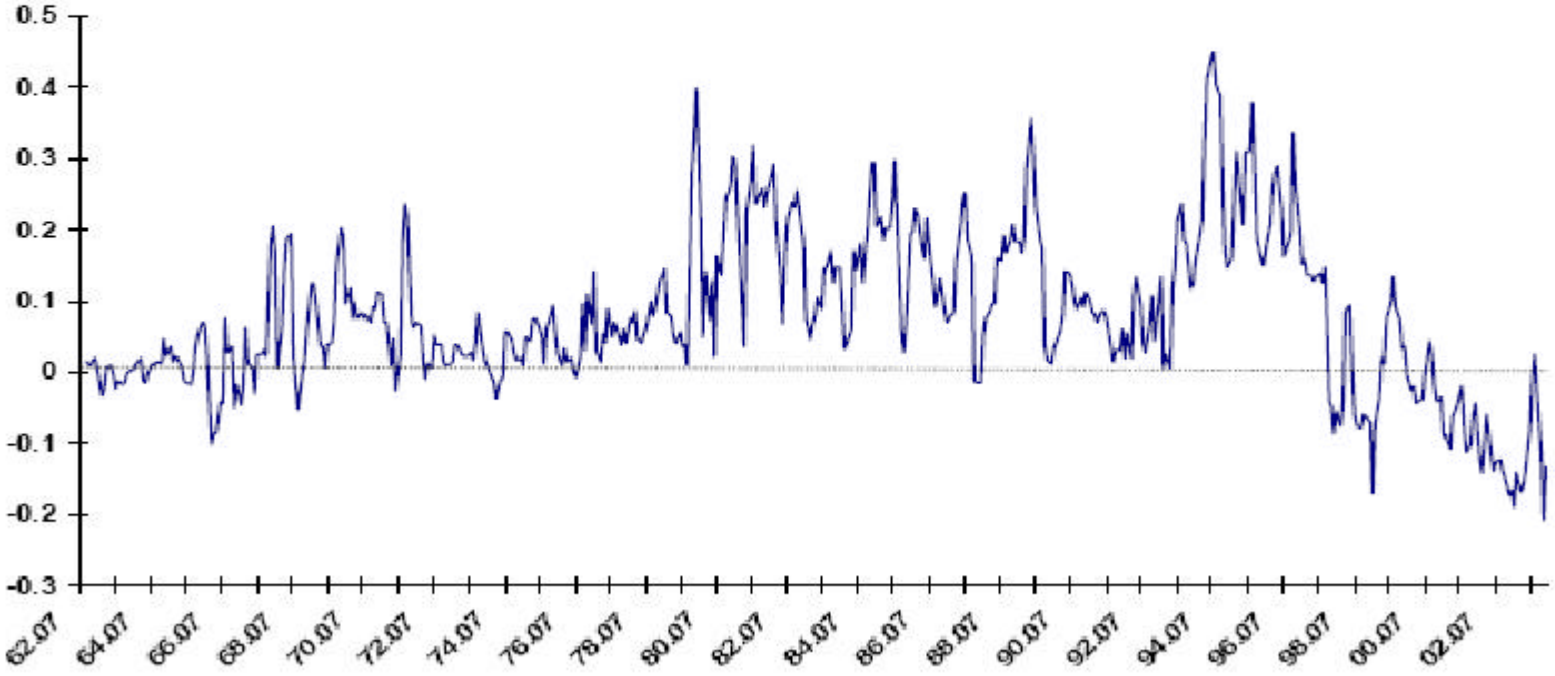
- Speculative motive
  - Higher yields than money market
- Hedging motive
  - They do well when other assets decline
- At different times, conventional wisdom has emphasized one or the other motive

Changing Conventional Wisdom

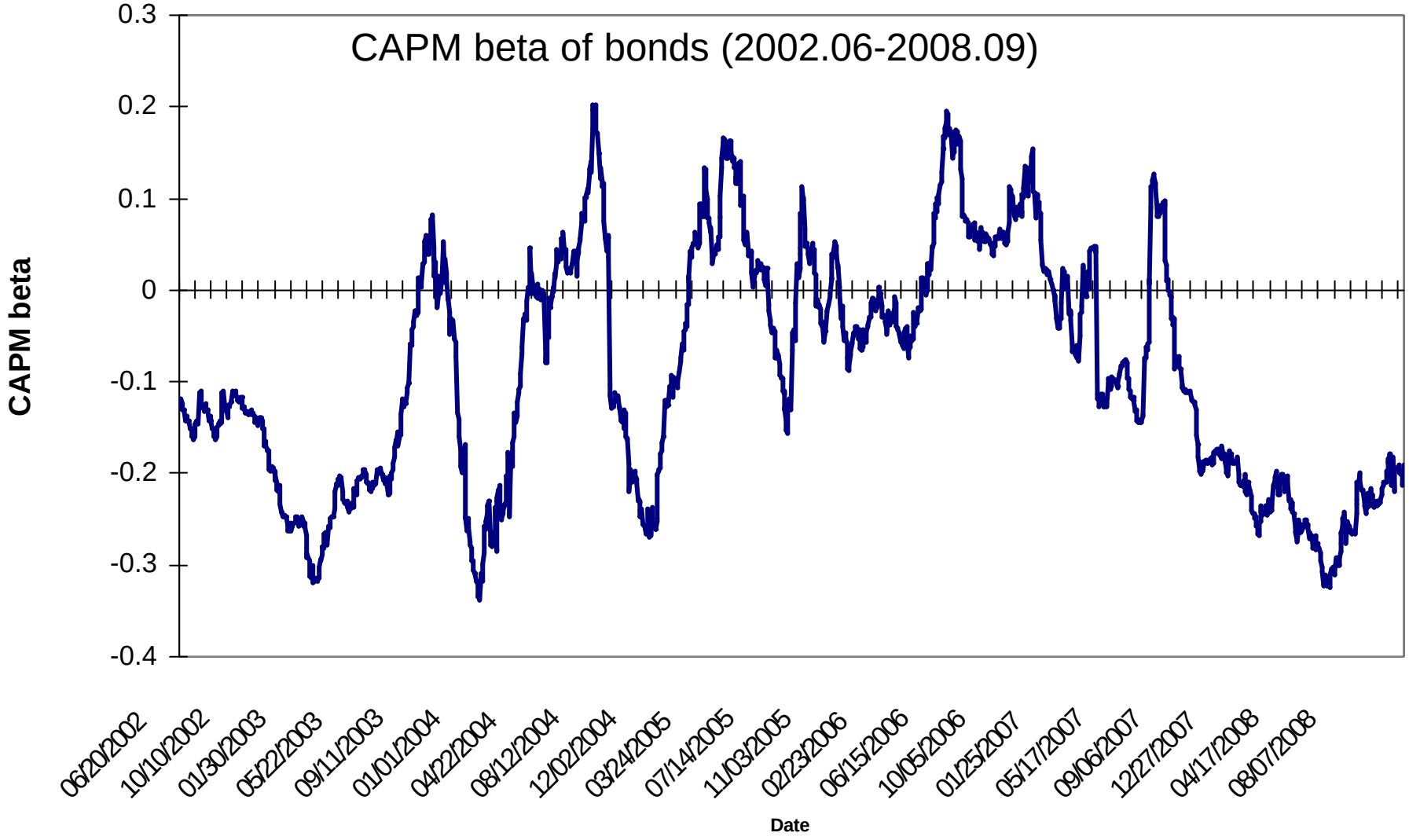
- Late 1970's and early 1980's:
  - Bonds are exposed to the risk of stagflation
  - Avoid them unless the term premium is high
- 2000's:
  - Bonds are hedges against the risk of deflation
  - "Anchor to windward"
  - Hold them even at a low term premium
- Changing CW reflects changing reality
  - Bonds as hedges in 2007-08

Figure 1
CAPM beta of bonds
(1962.07-2003.12)

Realized beta of bonds based on 3-months of daily returns on stocks and bonds.



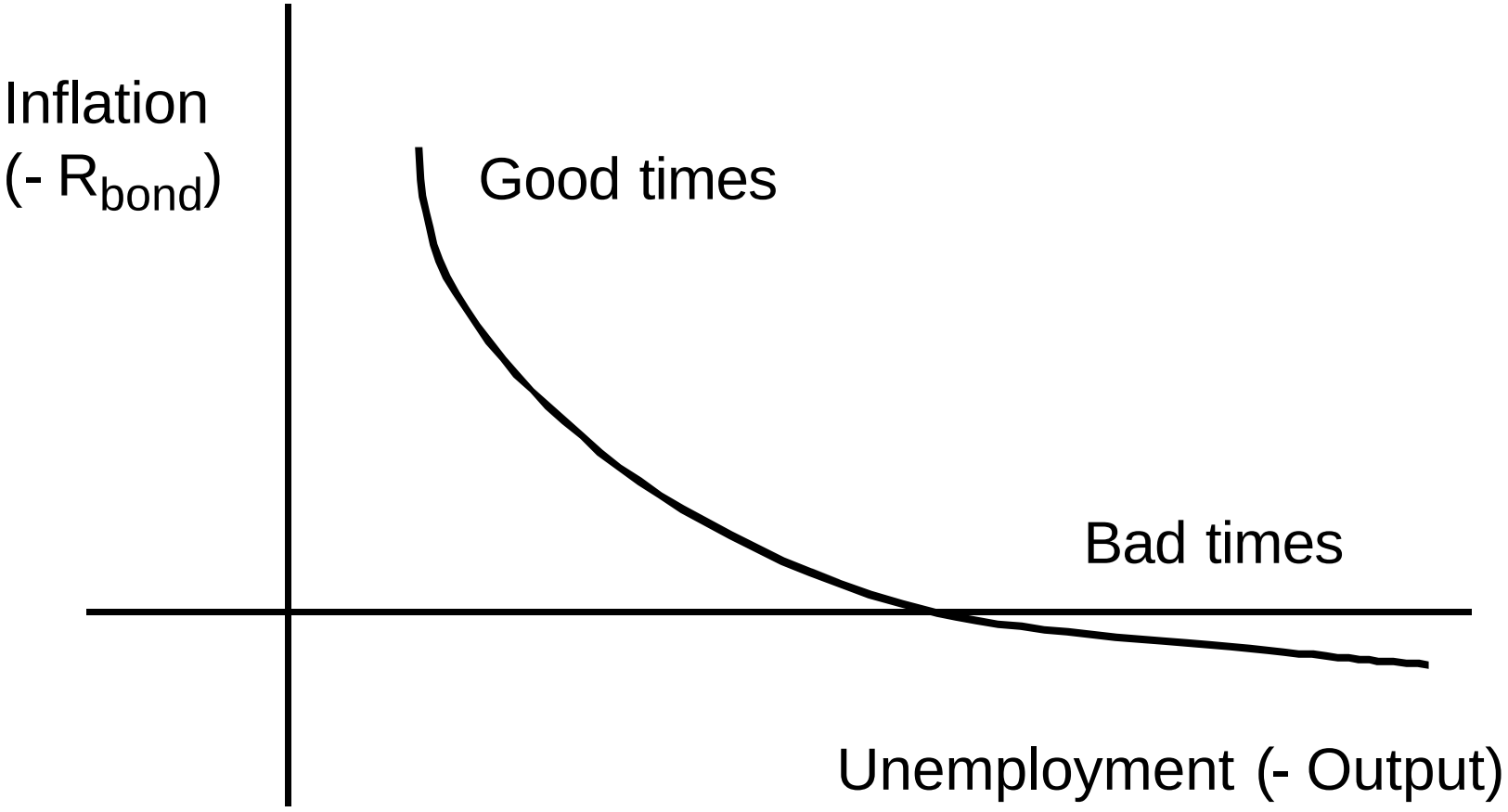
Luis Viceira, “Bond Risk, Bond Return Volatility, and the Term Structure of Interest Rates”, 2007


CAPM beta of bonds (2002.06-2008.09)
CAPM beta
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
-0.4
06/20/2002
10/10/2002
01/30/2003
05/22/2003
09/11/2003
01/01/2004
04/22/2004
08/12/2004
12/02/2004
03/24/2005
07/14/2005
11/03/2005
02/23/2006
06/15/2006
10/05/2006
01/25/2007
05/17/2007
09/06/2007
12/27/2007
04/17/2008
08/07/2008
Date
3-month centered beta, 10-year Treasury on S&P500

Changing Inflation Behavior

- The changes in measured bond risks appear to be related to changing behavior of the Phillips Curve
- When the Phillips Curve is stable (early 1960's, 2000's), inflation falls when unemployment rises
  - Then bonds do well in bad times and hedge macroeconomic risk
- When the Phillips Curve is unstable (1970's and early 1980's), inflation and unemployment move together (stagflation)
  - Then bonds do badly in bad times and are risky

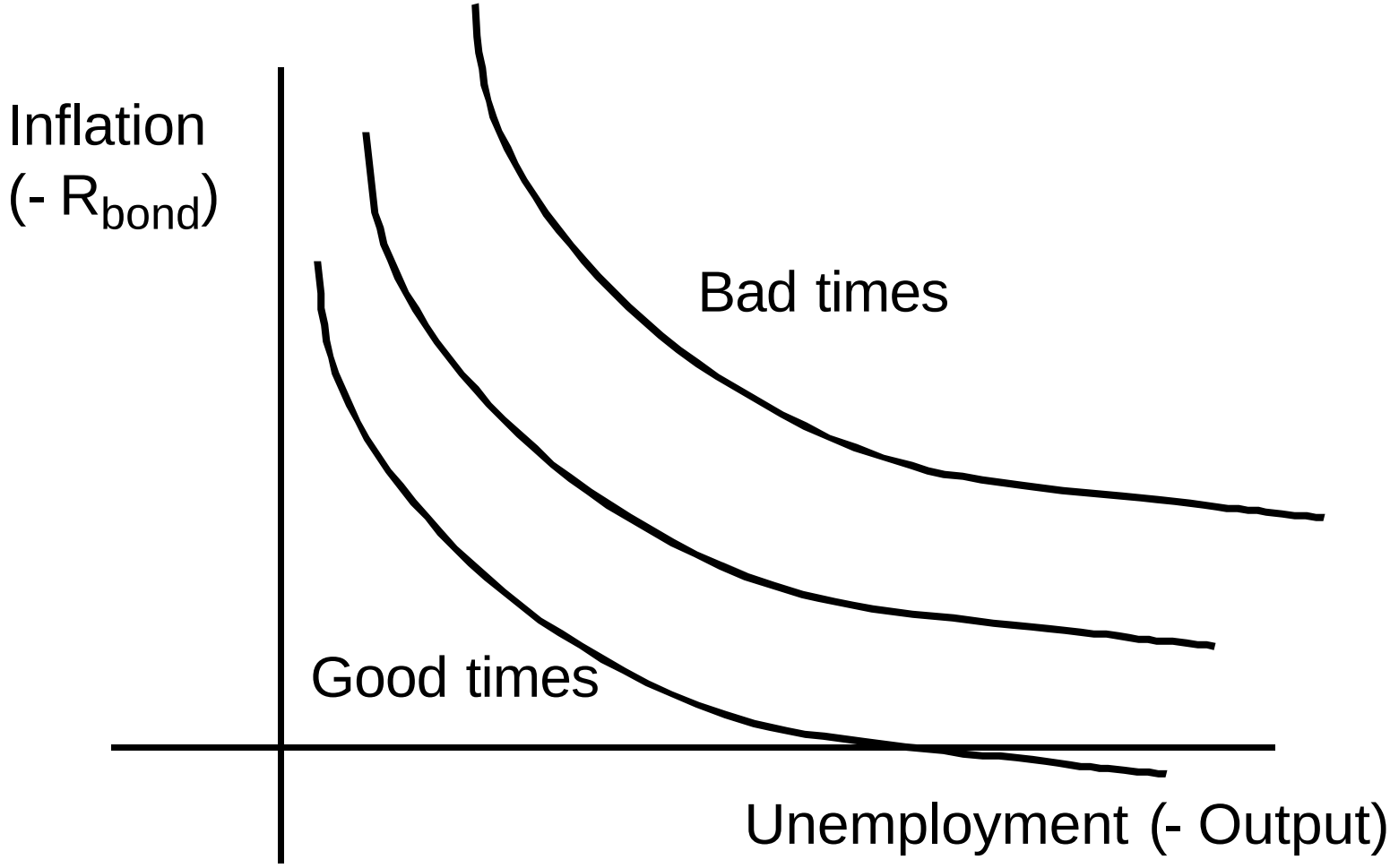
Stable Phillips Curve



Stable Phillips Curve

- The Phillips Curve is stable when
  - Supply conditions are stable while demand varies
  - The public's expectations of inflation are stable because the central bank is credible
- Downside risk is weak demand
  - Extreme examples: deflation in the US during the Great Depression, in Japan during the 1990's
- Bonds hedge investors against deflation risk
- Accordingly, investors are willing to accept low rates of return on bonds
- The yield curve tends to be flat
  - An explanation of the "Greenspan conundrum"

Unstable Phillips Curve

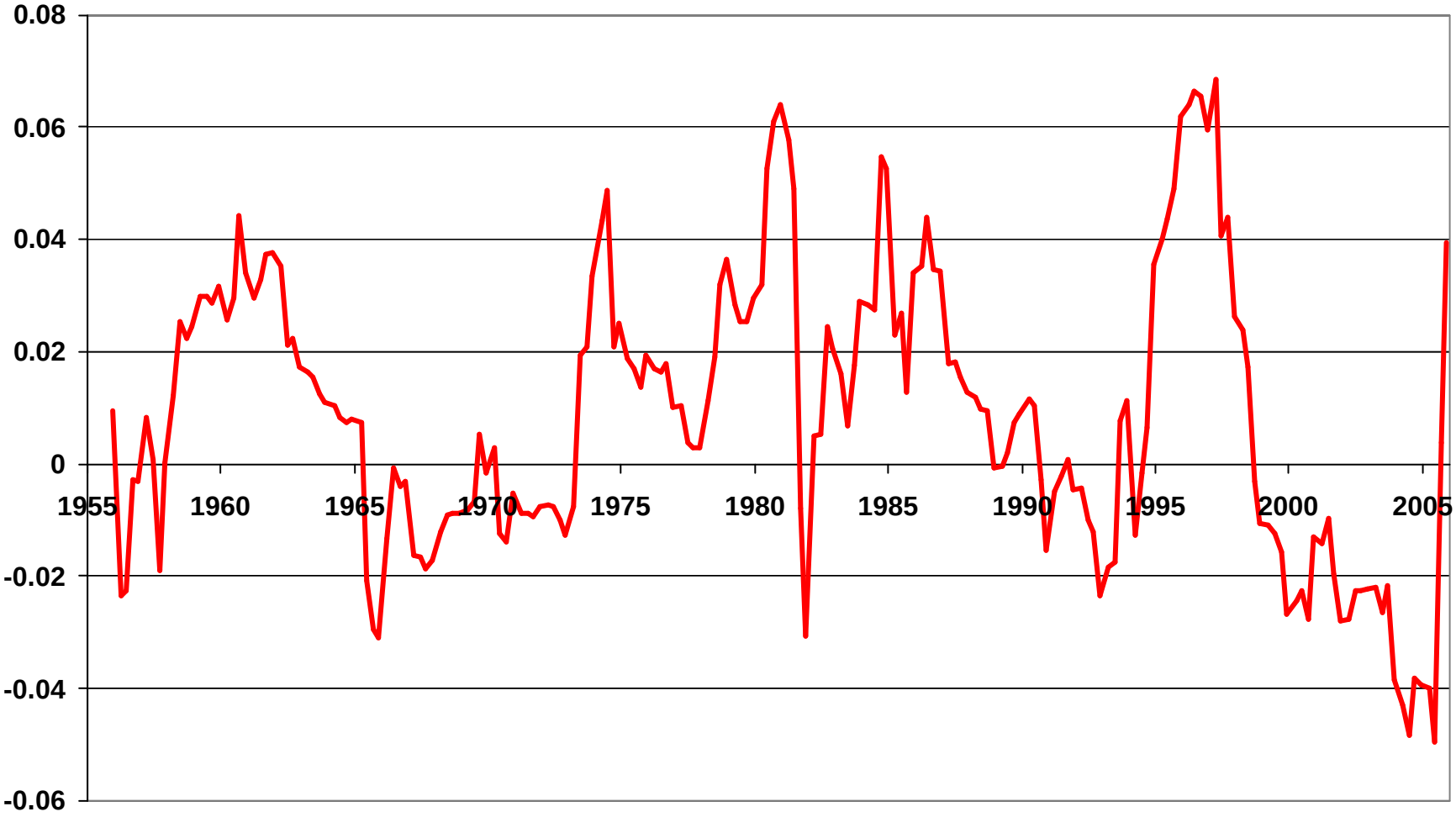


Unstable Phillips Curve

- The Phillips Curve is unstable when
  - Supply shocks hit the economy
  - Public expectations of inflation are unstable because the central bank has lost credibility
- The downside risk is stagflation
  - Examples: worldwide stagflation of the 1970's and early 1980's
- Bonds fail to protect investors
  - Henry Kaufman, "Dr. Doom"
- When investors catch on, they demand high rates of return on bonds
- The yield curve tends to be steep

CAPM Beta of Deflation

(3-yr rolling window of Shocks to -Log(Inflation) and Stock Returns)

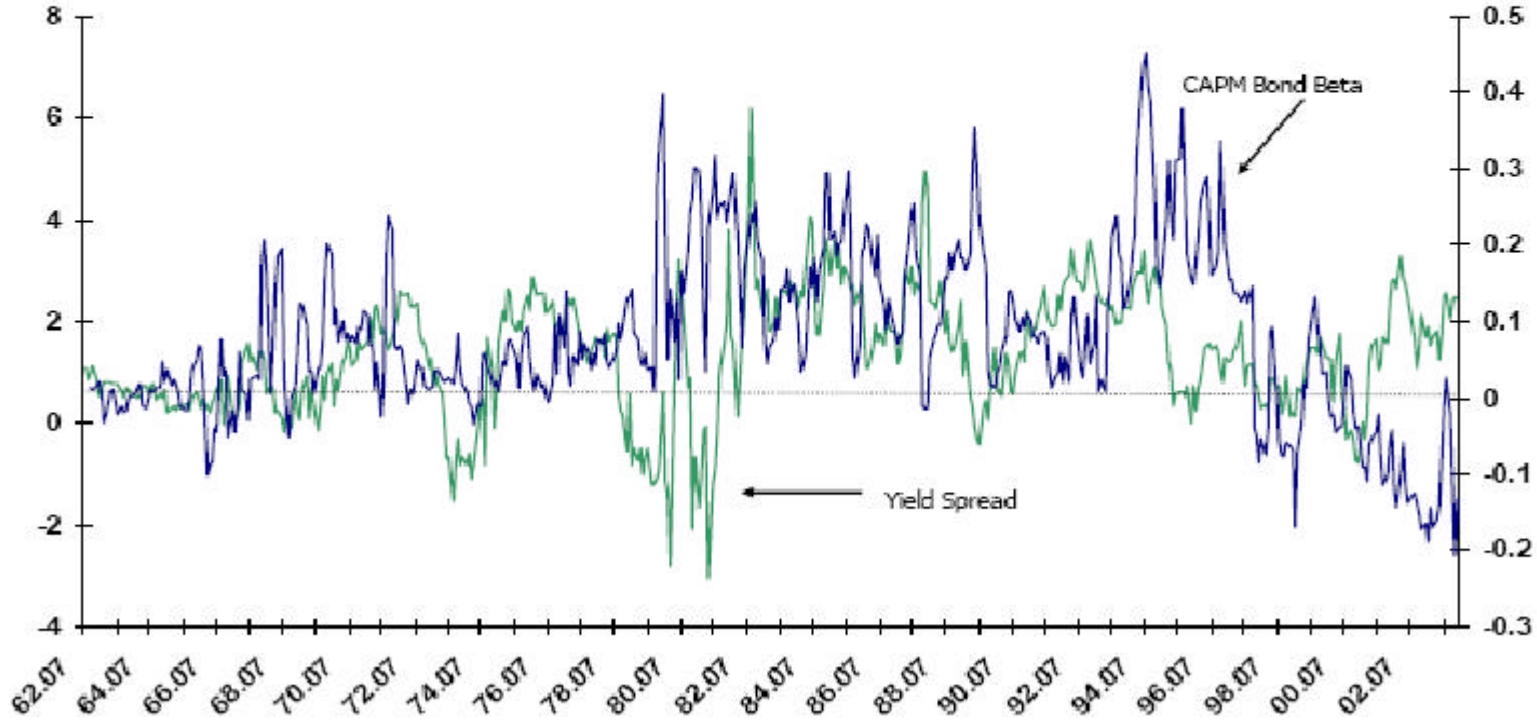


Modelling the Yield Curve

- How well does this story explain the history of Treasury yields?

Figure 3
CAPM beta of bonds and the yield spread
(1962.07-2003.12)

Realized beta of bonds based on 3-months of daily returns on stocks and bonds (right axis), and annualized log yield spread (right axis)



Luis Viceira, “Bond Risk, Bond Return Volatility, and the Term Structure of Interest Rates”, 2007

Modelling the Yield Curve

- Changing bond risk does seem to matter over the long run
- In the short run, however, there are other influences on the yield curve
- To capture its movements, we need to consider more traditional factors as well:
  - The real interest rate
  - Investor attitudes towards risk
  - The level of inflation
- Campbell, Sunderam, and Viceira, 2008, undertakes this project

A Bond Pricing Model

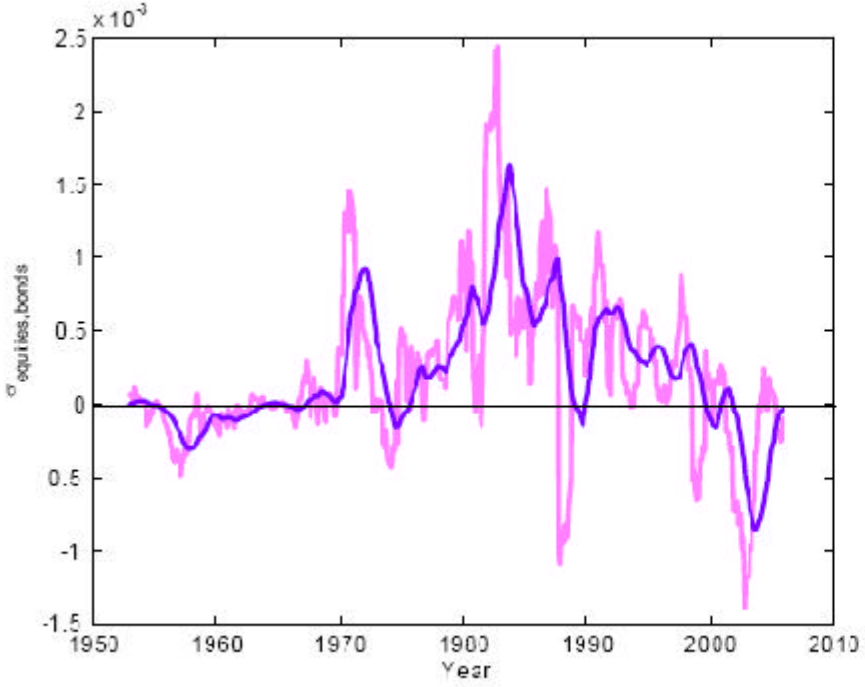
- We consider five factors that move in different ways:
  - Real interest rate x_t (transient)
  - Risk aversion z_t (persistent)
  - Long-run expected inflation $?_t$ (permanent)
  - Temporary expected inflation $?_t$ (transient)
  - Covariance of inflation with recession $?_t$ (persistent, can change sign)

- The five factors are not directly observed, so we back out their implied values from data we do observe
  - Nonlinear Kalman filtering

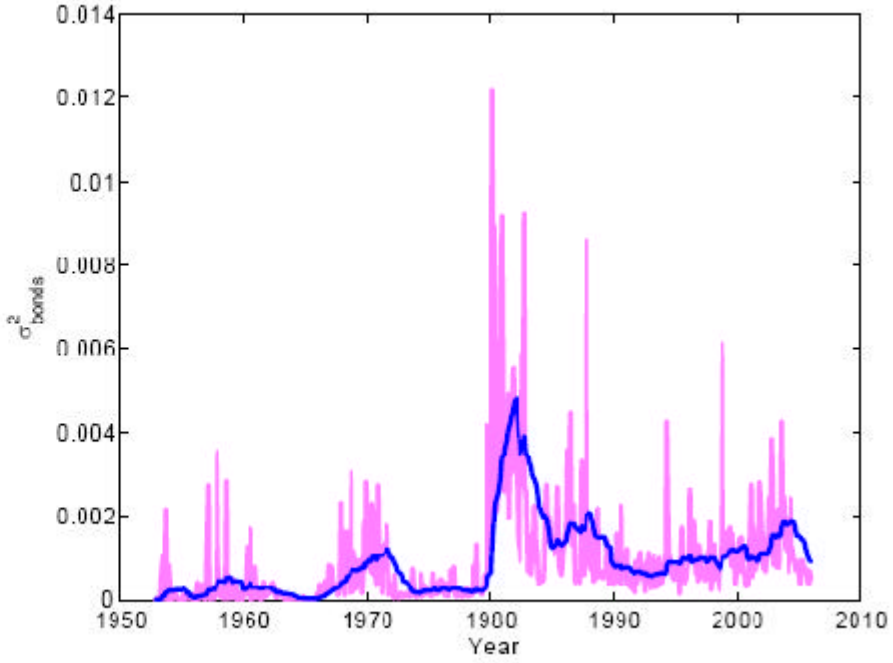
Observed variables

- Nominal yield curve at maturities 3 months, 1 year, 3 years, 10 years
- Inflation-indexed bond yield
- Realized inflation
- Equity returns and dividend yield (proxy for risk aversion)
- Realized bond variance and bond-equity covariance in daily data
- Quarterly data, 1953-2005, with later start date for inflation-indexed yield

Bond Second Moments

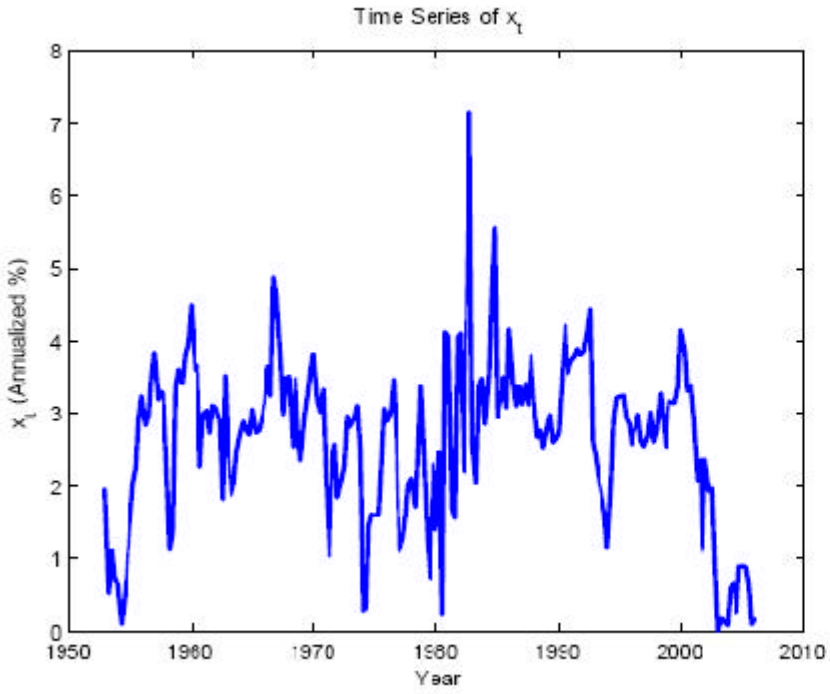


Bond-Equity Covariance

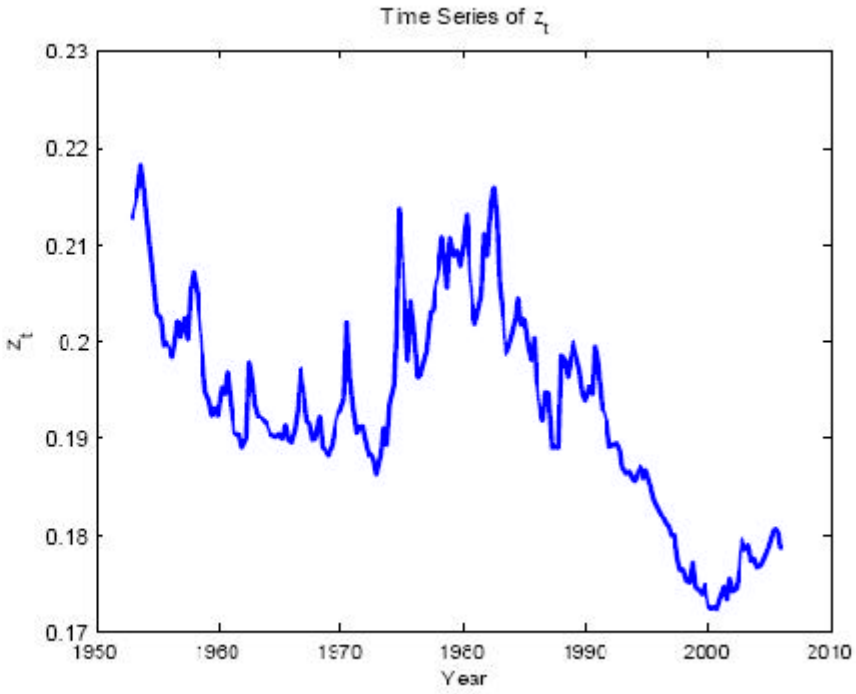


Bond Variance

Real State Variables

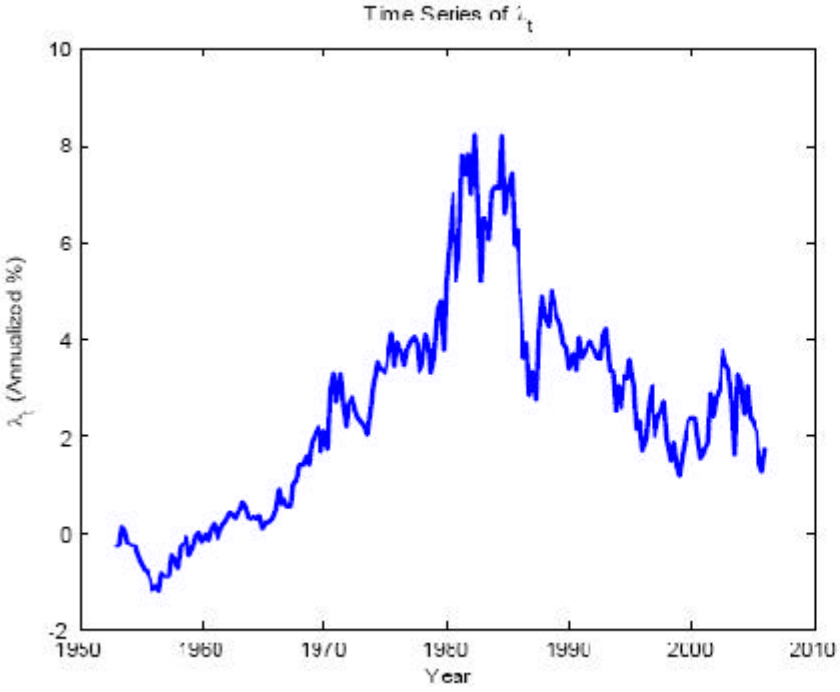


Real Interest Rate

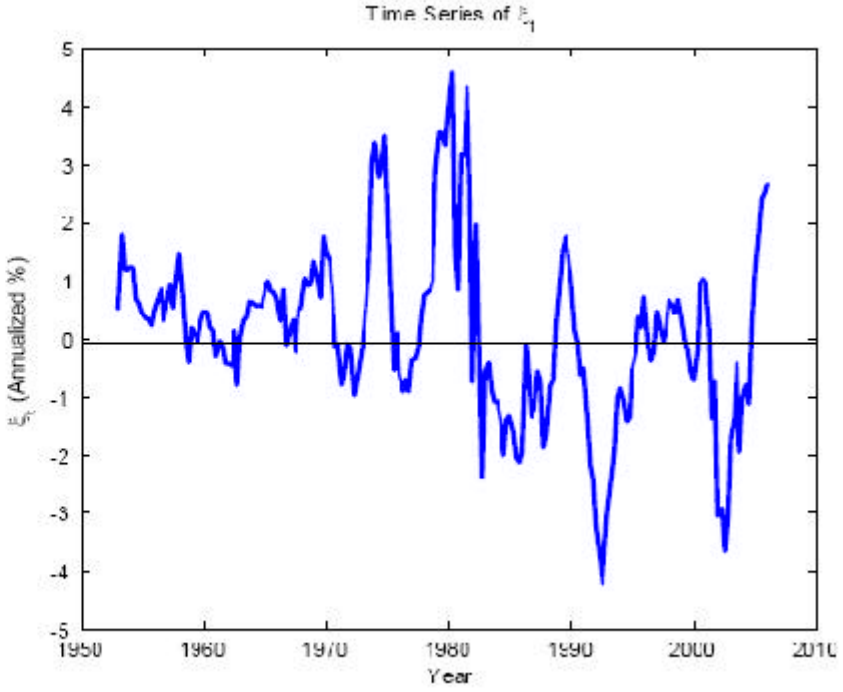


Risk Aversion

Inflation Components

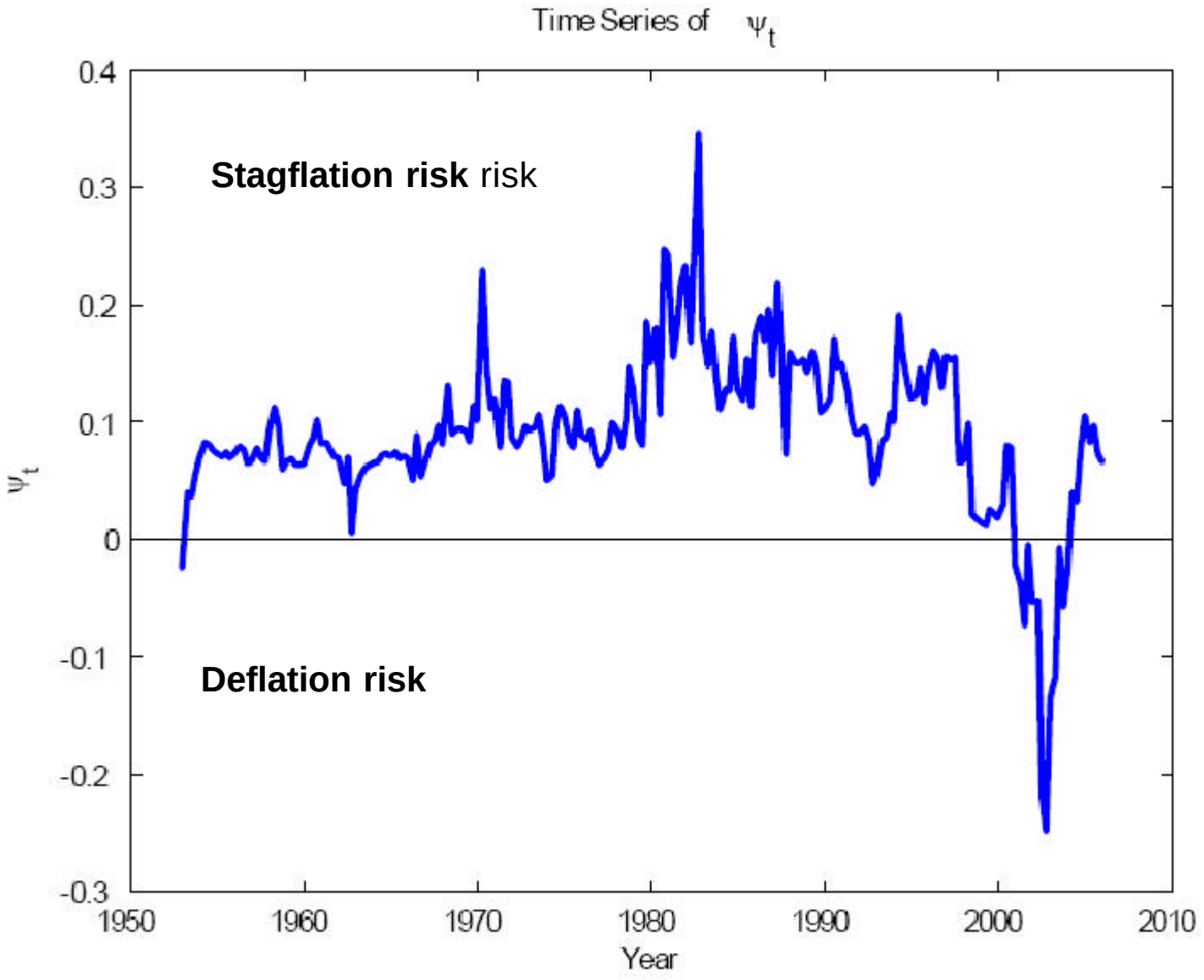


Permanent Expected Inflation



Temporary Expected Inflation

Inflation-Recession Covariance



Implications for the Yield Curve

- We plot the yield curve at the sample mean of all the state variables
- Then we vary each state variable to its sample minimum and maximum, while holding the other state variables at their sample mean

Permanent expected inflation is a “level” factor, while transitory expected inflation is a “slope” factor:

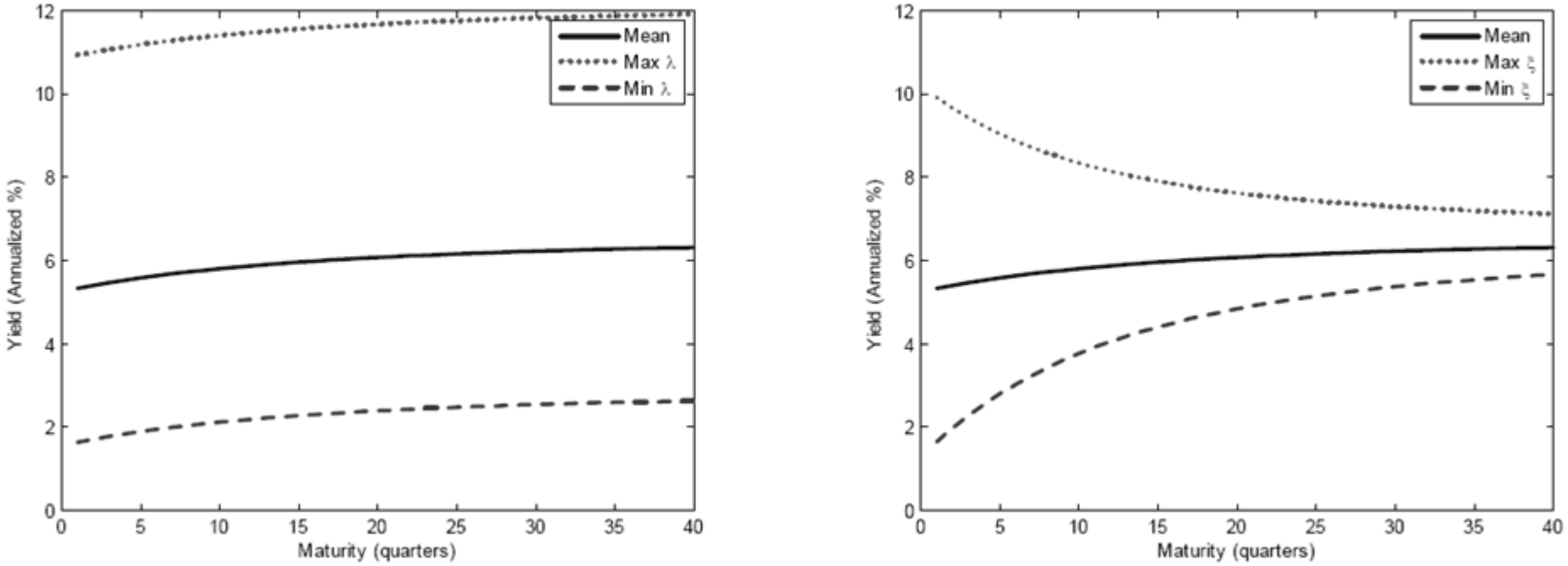


Figure 10

Response of nominal yield curve to permanent (left) and transitory (right) expected inflation

The nominal-real covariance is mainly a “curvature” factor:

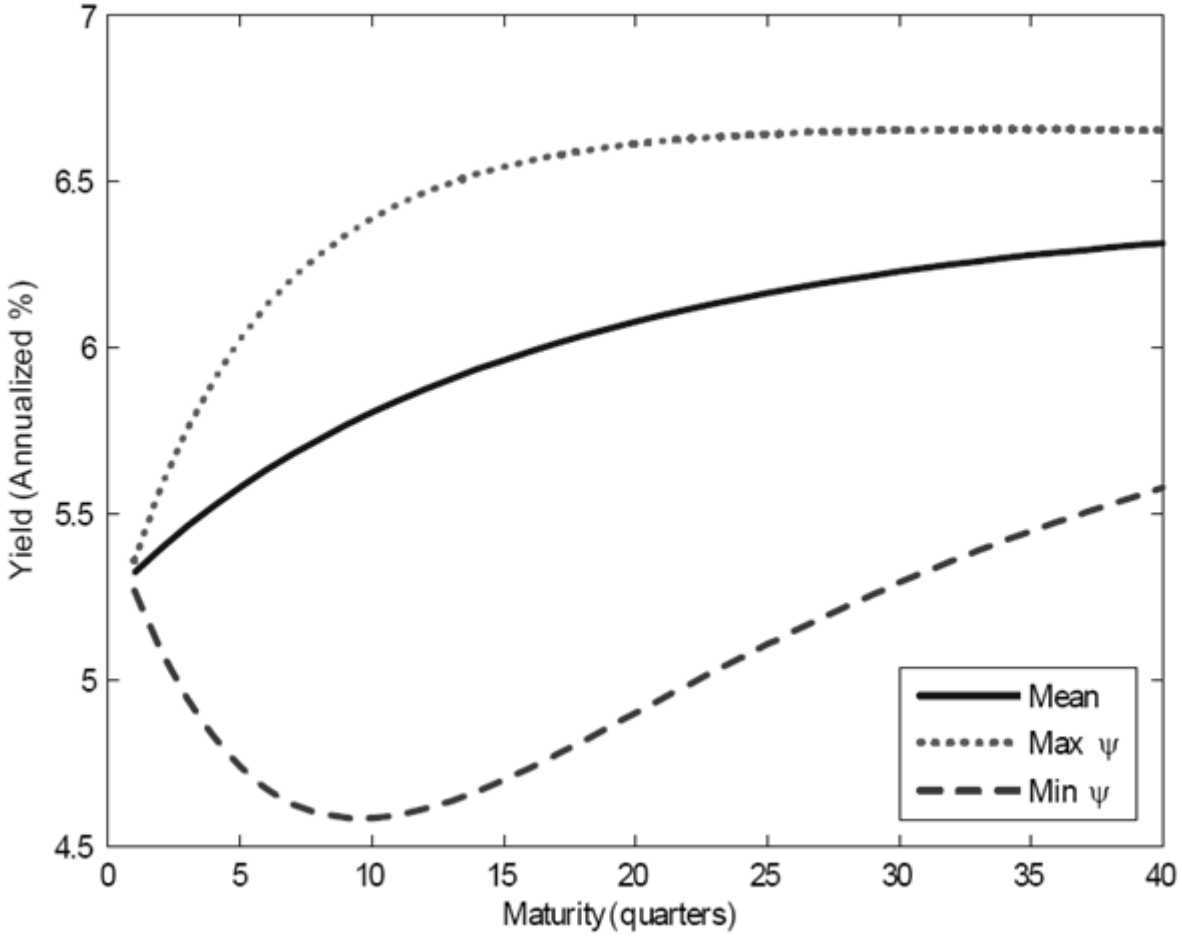


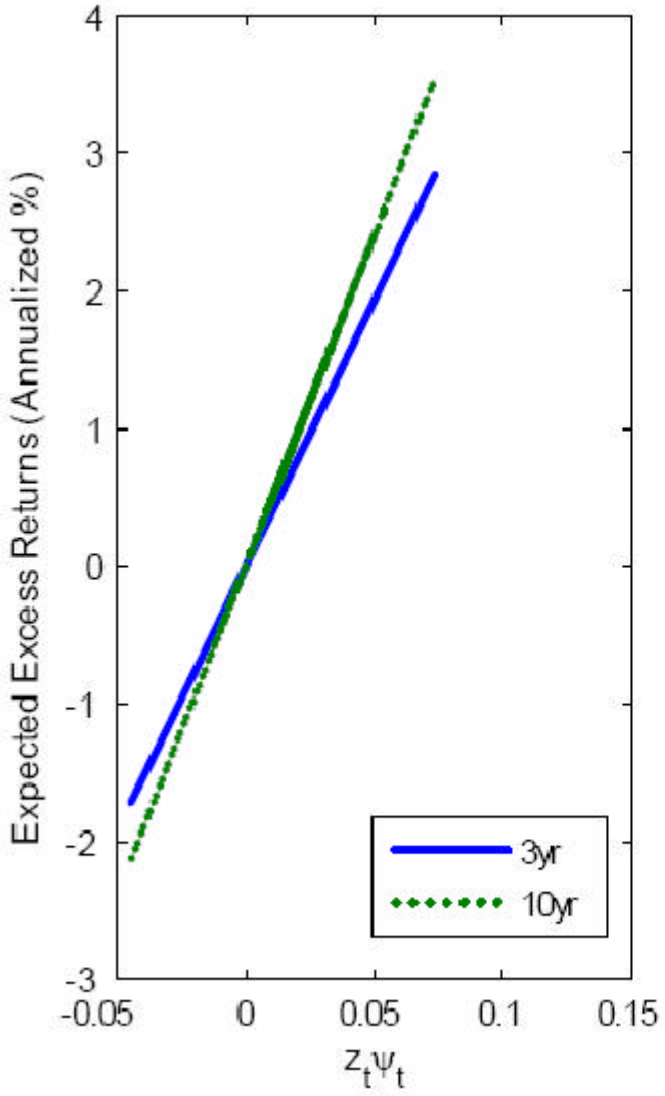
Figure 11

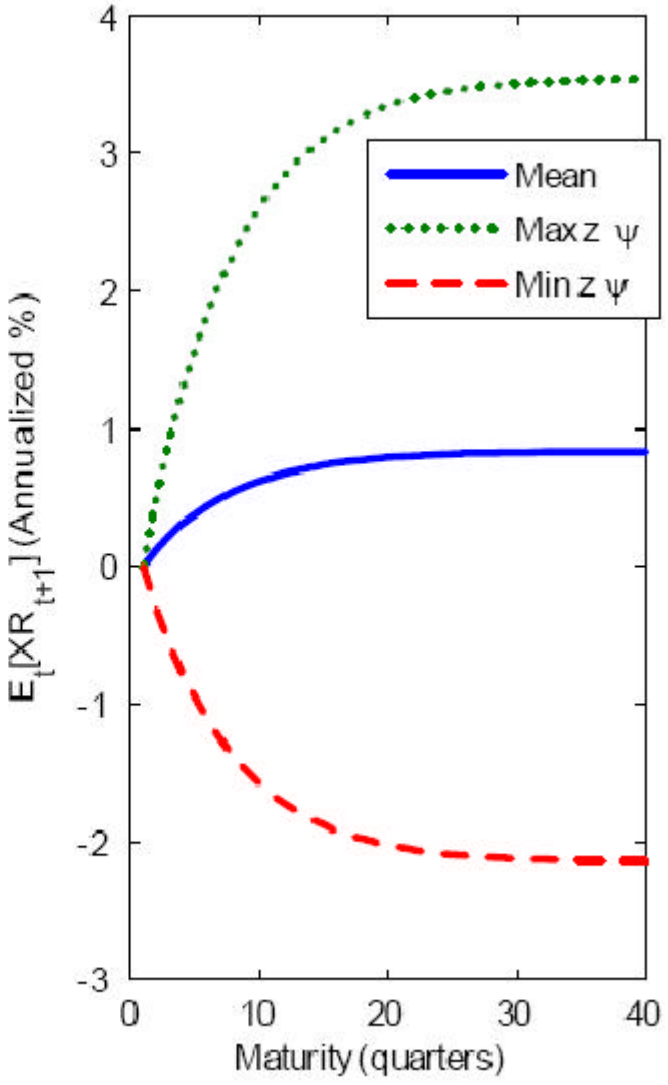
Response of nominal yield curve to nominal-real covariance

Implications for Term Premia

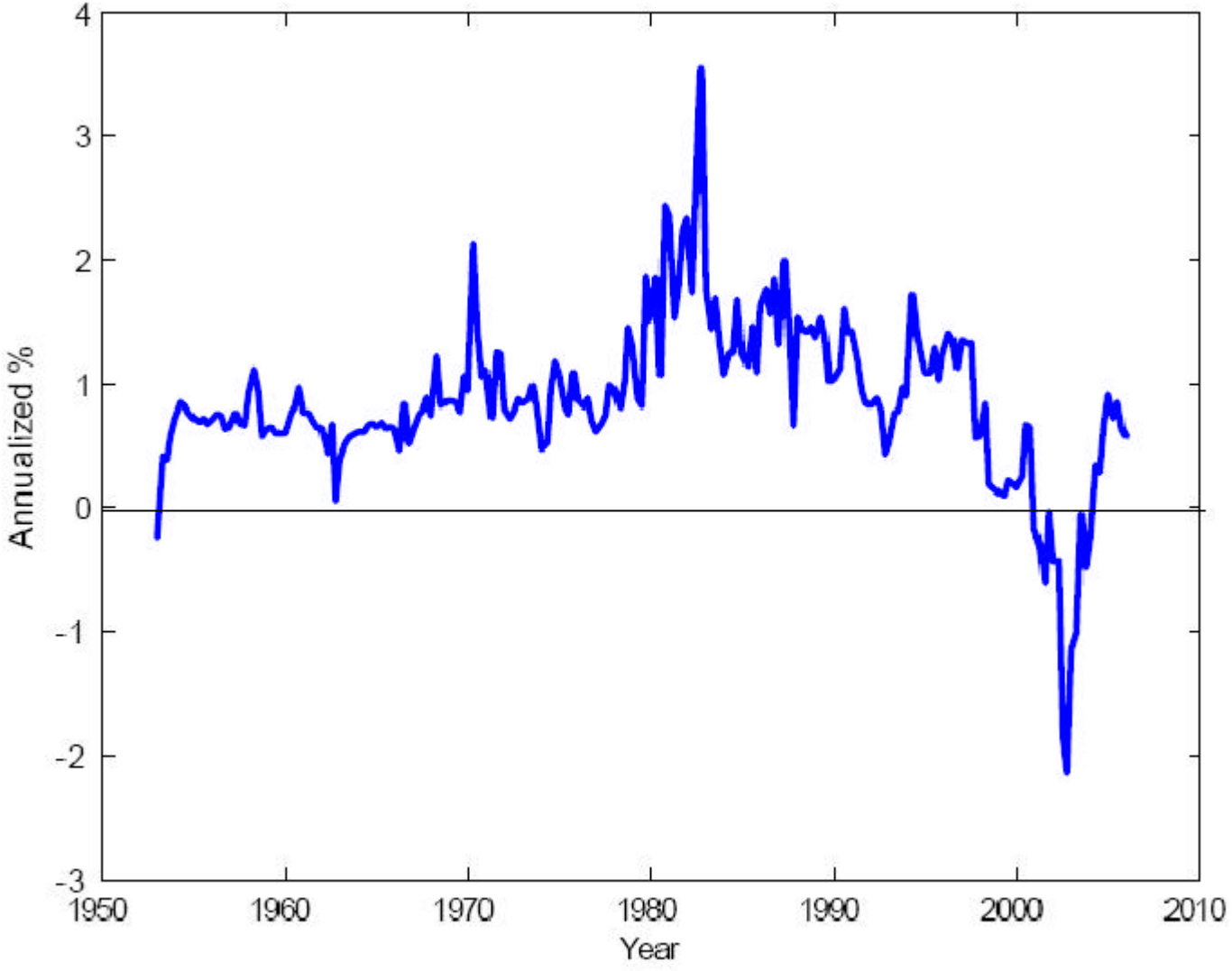
- Expected excess bond returns (term premia) are determined by
  - Price of risk î quantity of risk
  - Risk aversion î inflation-recession covariance
  - z î ?
- Both matter, but the inflation-recession covariance ? is more important because our estimate of z does not move much over time

Implications for Term Premia





History of Term Premia



The Term Structure Today

- Investors still trust nominal Treasuries as hedges
  - Little curvature in the Treasury yield curve
  - Stable and declining long Treasury yields
- This trust has been well founded recently
  - Treasuries have covaried negatively with stocks over the past year
  - Panic of 2008 makes inflation procyclical (deflation as the bad outcome)
- But what about the future?
  - Energy supply risks remain
  - New risk of destabilized inflation expectations from expensive financial bailouts

The US Dollar as a Hedge

- Similarly, the US dollar has been a good hedge during the last year
- Consistent with earlier patterns documented in Campbell, Serfaty-de Medeiros, and Viceira
- The perceived hedge value of the dollar may contribute to low US interest rates
  - The “exorbitant privilege”
- But the fundamental underpinnings of this hedge value may be weakening

Conclusion

- Asset allocation analysis typically assumes stable risks of asset classes
- For nominal bonds, this is a mistake
- The risks of nominal bonds depend on whether deflation or stagflation is the greater threat
- Bonds can be used to hedge against deflation, but the hedge fails in stagflation
- What will be the risks in the future?