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:


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
CAPM beta of bonds (2002.06-2008.09)

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

Inflation \((- R_{bond})\)

Good times

Bad times

Unemployment \((- \text{Output})\)
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

Inflation (- $R_{\text{bond}}$) vs. Unemployment (- Output)

- **Bad times**
- **Good times**
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).

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 $\pi_t$ (permanent)
  – Temporary expected inflation $\pi_t$ (transient)
  – Covariance of inflation with recession $\pi_t$ (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

Stagflation risk

Deflation risk
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 \( \hat{\epsilon} \) quantity of risk
  - Risk aversion \( \hat{\epsilon} \) inflation-recession covariance
  - \( z \) \( \hat{\epsilon} \) ?
- Both matter, but the inflation-recession covariance \( \hat{\epsilon} \) is more important because our estimate of \( z \) does not move much over time
Implications for Term Premia

![Graphs showing expected excess returns and term premia over time.](image)
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?