Macroeconomic Implications of Changes in the Term Premium

Glenn D. Rudebusch\textsuperscript{1}  Brian P. Sack\textsuperscript{2}  Eric T. Swanson\textsuperscript{1}

\textsuperscript{1}Economic Research
Federal Reserve Bank of San Francisco

\textsuperscript{2}Macroeconomic Advisers

AEA Meetings, Chicago
January 6, 2007
Web Site

For additional information:
- a copy of these slides
- a copy of the paper
- related papers
- computer code
- etc.

visit http://www.ericswanson.pro
Long-Term Interest Rates Very Low in 2004-5

Long-term interest rates have trended lower in recent months even as the Federal Reserve has raised the level of the target federal funds rate by 150 basis points. For the moment, the broadly unanticipated behavior of world bond markets remains a conundrum.

Alan Greenspan, February 2005
Long-term interest rates have trended lower in recent months even as the Federal Reserve has raised the level of the target federal funds rate by 150 basis points... For the moment, the broadly unanticipated behavior of world bond markets remains a conundrum.

Alan Greenspan, February 2005
Long-term interest rates have trended lower in recent months even as the Federal Reserve has raised the level of the target federal funds rate by 150 basis points. . . For the moment, the broadly unanticipated behavior of world bond markets remains a conundrum.

Alan Greenspan, February 2005
Long-Term Interest Rates Very Low in 2004-5

Yield on 10-Year US Treasury Securities and Federal Funds Rate

10-year Treasury yield (right scale)
Long-Term Interest Rates Very Low in 2004-5

Yield on 10-Year US Treasury Securities and Federal Funds Rate

- Federal funds rate (left scale)
- 10-year Treasury yield (right scale)
Term Premium Also Unusually Low in 2004-5

A significant portion of the sharp decline in the ten-year forward one-year rate over the past year appears to have resulted from a fall in term premiums.

Alan Greenspan, July 2005
A significant portion of the sharp decline in the ten-year forward one-year rate over the past year appears to have resulted from a fall in term premiums.

Alan Greenspan, July 2005
A significant portion of the sharp decline in the ten-year forward one-year rate over the past year appears to have resulted from a fall in term premiums.

Alan Greenspan, July 2005
Term Premium Also Unusually Low in 2004-5

Kim-Wright Term Premium on 10-Year Zero-Coupon Bond

Percent

0.0 0.5 1.0 1.5 2.0 2.5 3.0

92 93 94 95 96 97 98 99 00 01 02 03 04 05 06
## Two Questions

- What are the macroeconomic implications of a change in the term premium?
- How should monetary policy respond to a change in the term premium?
Two Questions

What are the macroeconomic implications of a change in the term premium?
Two Questions

What are the macroeconomic implications of a change in the term premium?

How should monetary policy respond to a change in the term premium?
The Practitioner View

To the extent that the decline in forward rates can be traced to a decline in the term premium, the effect is financially stimulative and argues for greater monetary policy restraint, all else being equal. Specifically, if spending depends on long-term interest rates, special factors that lower the spread between short-term and long-term rates will stimulate aggregate demand. Thus, when the term premium declines, a higher short-term rate is required to obtain the long-term rate and the overall mix of financial conditions consistent with maximum sustainable employment and stable prices.

Ben Bernanke, March 2006
The Practitioner View

To the extent that the decline in forward rates can be traced to a decline in the term premium, . . . the effect is financially stimulative and argues for greater monetary policy restraint, all else being equal. Specifically, if spending depends on long-term interest rates, special factors that lower the spread between short-term and long-term rates will stimulate aggregate demand. Thus, when the term premium declines, a higher short-term rate is required to obtain the long-term rate and the overall mix of financial conditions consistent with maximum sustainable employment and stable prices.

Ben Bernanke, March 2006
The Practitioner View

To the extent that the decline in forward rates can be traced to a decline in the term premium, the effect is financially stimulative and argues for greater monetary policy restraint, all else being equal. Specifically, if spending depends on long-term interest rates, special factors that lower the spread between short-term and long-term rates will stimulate aggregate demand. Thus, when the term premium declines, a higher short-term rate is required to obtain the long-term rate and the overall mix of financial conditions consistent with maximum sustainable employment and stable prices.

Ben Bernanke, March 2006
Foundations of Practitioner/Chairman View Unclear

New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_t + (1 - 1) \gamma (i_t - E_t \pi_t + 1) + \epsilon_t \]

Solving forward:

\[ y_t = -(1 - 1) \gamma E_t \sum_{j=0}^{\infty} \beta_j (i_t + j - \pi_t + 1 + j) + \epsilon_t \]

Note: no role for the term premium in this model

Instead, practitioners' model may be more informal:

IS-LM intuition

Partial equilibrium analysis
Foundations of Practitioner/Chairman View Unclear

New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma}(i_t - E_t \pi_{t+1}) + \varepsilon_t \]
New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma}(i_t - E_t \pi_{t+1}) + \varepsilon_t \]

Solving forward:

\[ y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \varepsilon_t \]
Foundations of Practitioner/Chairman View Unclear

New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma} (i_t - E_t \pi_{t+1}) + \varepsilon_t \]

Solving forward:

\[ y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \varepsilon_t \]
New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma} (i_t - E_t \pi_{t+1}) + \varepsilon_t \]

Solving forward:

\[ y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \varepsilon_t \]

Note: no role for the term premium in this model
Foundations of Practitioner/Chairman View Unclear

New Keynesian IS curve (linearized):

$$y_t = \beta E_t y_{t+1} - \frac{1}{\gamma} (i_t - E_t \pi_{t+1}) + \epsilon_t$$

Solving forward:

$$y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \epsilon_t$$

Note: no role for the term premium in this model
Instead, practitioners’ model may be more informal:
Foundations of Practitioner/Chairman View Unclear

New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma} (i_t - E_t \pi_{t+1}) + \varepsilon_t \]

Solving forward:

\[ y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \varepsilon_t \]

Note: no role for the term premium in this model

Instead, practitioners’ model may be more informal:
- IS-LM intuition
New Keynesian IS curve (linearized):

\[ y_t = \beta E_t y_{t+1} - \frac{1}{\gamma} (i_t - E_t \pi_{t+1}) + \varepsilon_t \]

Solving forward:

\[ y_t = -\frac{1}{\gamma} E_t \sum_{j=0}^{\infty} \beta^j (i_{t+j} - \pi_{t+1+j}) + \varepsilon_t \]

Note: no role for the term premium in this model

Instead, practitioners’ model may be more informal:
- IS-LM intuition
- Partial equilibrium analysis
Foundations of Practitioner/Chairman View Unclear

In general equilibrium, implications of change in term premium are not clear:
In general equilibrium, implications of change in term premium are not clear:

- Why did the term premium change?
Foundations of Practitioner/Chairman View Unclear

In general equilibrium, implications of change in term premium are not clear:

- Why did the term premium change?
- Different structural shocks might have different implications for the economy
Foundations of Practitioner/Chairman View Unclear

In general equilibrium, implications of change in term premium are not clear:

- Why did the term premium change?
- Different structural shocks might have different implications for the economy
- Term premium might be partly a “wedge”
In general equilibrium, implications of change in term premium are not clear:

- Why did the term premium change?
- Different structural shocks might have different implications for the economy
- Term premium might be partly a “wedge”
- Term premium might be related to potential output rather than output gap
Structural Analysis

- Review Asset Pricing
- Define Benchmark New Keynesian Model
- Graph Impulse Responses
Asset Pricing

Asset pricing:

\[ p_t = d_t + E_t \left[ m_{t+1} + p_{t+1} \right] \]

Zero-coupon bond pricing:

\[ p(n)_t = E_t \left[ m_{t+1} + p(n-1)_t + \frac{i(n)_t}{n} \right] \]

Notation: let \( i_t \equiv i(1)_t \)
Asset Pricing

Asset pricing:

\[ p_t = d_t + E_t[m_{t+1}p_{t+1}] \]
Asset Pricing

Asset pricing:

\[ p_t = d_t + E_t[m_{t+1}p_{t+1}] \]

Zero-coupon bond pricing:

\[ p_t^{(n)} = E_t[m_{t+1}p_{t+1}^{(n-1)}] \]
Asset Pricing

Asset pricing:

\[ p_t = d_t + E_t[m_{t+1}p_{t+1}] \]

Zero-coupon bond pricing:

\[ p_t^{(n)} = E_t[m_{t+1}p_{t+1}^{(n-1)}] \]

\[ i_t^{(n)} = -\frac{1}{n} \log p_t^{(n)} \]
Asset Pricing

Asset pricing:

\[ p_t = d_t + E_t[m_{t+1}p_{t+1}] \]

Zero-coupon bond pricing:

\[ p_{t}^{(n)} = E_t[m_{t+1}p_{t+1}^{(n-1)}] \]

\[ i_{t}^{(n)} = -\frac{1}{n} \log p_{t}^{(n)} \]

Notation: let \( i_t \equiv i_t^{(1)} \)
Benchmark New Keynesian Model (Very Standard)

Representative household with preferences:
\[
\max_{E_t} \sum_{t=0}^{\infty} \beta^t \left( (c_t - bC_{t-1})^{1-\gamma} - \chi_0 l_t + \chi_t \right)
\]

Stochastic discount factor:
\[
m_{t+1} = \beta (C_{t+1} - bC_t) - \gamma (C_t - bC_{t-1}) - \gamma P_t P_{t+1}
\]

Parameters:
\[
\beta = 0.99, \quad b = 0.66, \quad \gamma = 2, \quad \chi = 1.5
\]
Benchmark New Keynesian Model (Very Standard)

Representative household with preferences:

\[
\max \mathbb{E}_t \sum_{t=0}^\infty \beta^t \left( \frac{(c_t - bC_{t-1})^{1-\gamma}}{1 - \gamma} - \chi_0 \frac{l_t^{1+\chi}}{1 + \chi} \right)
\]
Benchmark New Keynesian Model (Very Standard)

Representative household with preferences:

\[
\max E_t \sum_{t=0}^{\infty} \beta^t \left( \frac{(c_t - bC_{t-1})^{1-\gamma}}{1 - \gamma} - \chi_0 \frac{l_t^{1+\chi}}{1 + \chi} \right)
\]

Stochastic discount factor:

\[
m_{t+1} = \frac{\beta(C_{t+1} - bC_t)^{-\gamma}}{(C_t - bC_{t-1})^{-\gamma}} \frac{P_t}{P_{t+1}}
\]
Benchmark New Keynesian Model (Very Standard)

Representative household with preferences:

\[
\max E_t \sum_{t=0}^{\infty} \beta^t \left( \frac{(c_t - bC_{t-1})^{1-\gamma}}{1 - \gamma} - \chi_0 \frac{I_t^{1+\chi}}{1 + \chi} \right)
\]

Stochastic discount factor:

\[
m_{t+1} = \frac{\beta(C_{t+1} - bC_t)^{-\gamma}}{(C_t - bC_{t-1})^{-\gamma}} \frac{P_t}{P_{t+1}}
\]

Parameters: \( \beta = .99, \ b = .66, \ \gamma = 2, \ \chi = 1.5 \)
Benchmark New Keynesian Model (Very Standard)

Continuum of differentiated firms:
- face Dixit-Stiglitz demand with elasticity \( \frac{1+\theta}{\theta} \), markup \( \theta \)
- set prices in Calvo contracts with avg. duration 4 quarters
- identical production functions \( y_t = A_t \overline{k}^{1-\alpha} l_t^{\alpha} \)
- have firm-specific capital stocks
- face aggregate technology \( A_t = \rho_A A_{t-1} + \varepsilon_t^A \)

Parameters \( \theta = .2, \rho_A = .9, \sigma_A^2 = .01^2 \)
Benchmark New Keynesian Model (Very Standard)

Government:
- imposes lump-sum taxes $G_t$ on households
- destroys the resources it collects
- $G_t = \rho_G G_{t-1} + \varepsilon_t^G$

Parameters $\rho_G = .9$, $\sigma^2_G = .004^2$

Monetary Authority:

$$i_t = \rho_i i_{t-1} + (1 - \rho_i) \left[ i^* + g_y (y_t - y_{t-1}) + g_\pi \pi_t \right] + \varepsilon_t^i$$

Parameters $\rho_i = .7$, $g_y = 0.5$, $g_\pi = 2$, $\sigma^2_i = .004^2$
The Term Premium in the Benchmark Model

In DSGE framework, convenient to work with a default-free *consol*, a perpetuity that pays $1 (nominal) every period.
The Term Premium in the Benchmark Model

In DSGE framework, convenient to work with a default-free consol, a perpetuity that pays $1 (nominal) every period

Price of the consol:

\[ p_t(\infty) = 1 + E_t m_{t+1} p_{t+1}(\infty) \]
The Term Premium in the Benchmark Model

In DSGE framework, convenient to work with a default-free *consol*, a perpetuity that pays $1 (nominal) every period

Price of the consol:

\[ p_t^{(\infty)} = 1 + E_t m_{t+1} p_{t+1}^{(\infty)} \]

Risk-neutral consol price:

\[ p_t^{(\infty)rn} = 1 + e^{-i_t} E_t p_{t+1}^{(\infty)rn} \]
In DSGE framework, convenient to work with a default-free *consol*, a perpetuity that pays $1$ (nominal) every period

Price of the consol:

$$p_t^{(\infty)} = 1 + E_t m_{t+1} p_{t+1}^{(\infty)}$$

Risk-neutral consol price:

$$p_t^{(\infty)rn} = 1 + e^{-i_t} E_t p_{t+1}^{(\infty)rn}$$

Term premium:

$$\log \left( \frac{p_t^{(\infty)}}{p_t^{(\infty)} - 1} \right) - \log \left( \frac{p_t^{(\infty)rn}}{p_t^{(\infty)rn} - 1} \right)$$
Solving the Model

The benchmark model above has a relatively large number of state variables: $C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon_t^A, \varepsilon_t^G, \varepsilon_t^i$.
The benchmark model above has a relatively large number of state variables: $C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon^A_t, \varepsilon^G_t, \varepsilon^i_t$

Value function iteration strategies are intractable
Solving the Model

The benchmark model above has a relatively large number of state variables: $C_{t-1}$, $A_{t-1}$, $G_{t-1}$, $i_{t-1}$, $\Delta_{t-1}$, $\varepsilon^A_t$, $\varepsilon^G_t$, $\varepsilon^i_t$

Value function iteration strategies are intractable

We solve the model by approximation around the nonstochastic steady state (perturbation methods)
Solving the Model

The benchmark model above has a relatively large number of state variables: $C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon^A_t, \varepsilon^G_t, \varepsilon^i_t$

Value function iteration strategies are intractable

We solve the model by approximation around the nonstochastic steady state (perturbation methods)

- In a first-order approximation, term premium is zero
Solving the Model

The benchmark model above has a relatively large number of state variables: $C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon^A_t, \varepsilon^G_t, \varepsilon^i_t$

Value function iteration strategies are intractable

We solve the model by approximation around the nonstochastic steady state (perturbation methods)

- In a first-order approximation, term premium is zero
- In a second-order approximation, term premium is a constant (sum of variances)
Solving the Model

The benchmark model above has a relatively large number of state variables: \( C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon^A_t, \varepsilon^G_t, \varepsilon^i_t \)

Value function iteration strategies are intractable

We solve the model by approximation around the nonstochastic steady state (perturbation methods)

- In a first-order approximation, term premium is zero
- In a second-order approximation, term premium is a constant (sum of variances)
- So we compute a third-order approximation of the solution around nonstochastic steady state
Solving the Model

The benchmark model above has a relatively large number of state variables: $C_{t-1}, A_{t-1}, G_{t-1}, i_{t-1}, \Delta_{t-1}, \varepsilon_t^A, \varepsilon_t^G, \varepsilon_t^i$

Value function iteration strategies are intractable

We solve the model by approximation around the nonstochastic steady state (perturbation methods)

- In a first-order approximation, term premium is zero
- In a second-order approximation, term premium is a constant (sum of variances)
- So we compute a third-order approximation of the solution around nonstochastic steady state
**Figure 1**
Impulse Responses to One Percentage Point Federal Funds Rate Shock

**Basis points**

**Term Premium**

**Output**

**Percent**


**Figure 2**

**Impulse Responses to One Percent Technology Shock**

- **Top Graph:** Term Premium in Basis points over Quarters.
  - The graph shows an increasing trend in the term premium from 0.00 to about 0.20 over 20 quarters.

- **Bottom Graph:** Output in Percent over Quarters.
  - The graph shows an initial increase followed by a decrease, with output peaking at around 0.15 after 5 quarters and then gradually declining.
Impulse Responses

**Figure 3**
Impulse Responses to One Percent Government Purchases Shock

- **Term Premium**
  - Basis points
  - Percent
  - Output
  - Quarters

The graphs illustrate the impulse responses to a one percent government purchases shock. The top graph shows the term premium in basis points, while the bottom graph depicts the output in percent, both as a function of quarters.
Reduced-Form Analysis

3

Reduced-Form Analysis

- The Yield Curve Slope and Forecasting GDP
- Importance of Term Premium for Forecasting GDP
A large literature uses slope of yield curve to forecast GDP:

\[
(y_{t+4} - y_t) = \beta_0 + \beta_1(y_t - y_{t-4}) + \beta_2(i_t^{(n)} - i_t) + \varepsilon_t
\]
The Yield Curve Slope and Forecasting GDP

A large literature uses slope of yield curve to forecast GDP:

\[(y_{t+4} - y_t) = \beta_0 + \beta_1(y_t - y_{t-4}) + \beta_2(i_t^{(n)} - i_t) + \varepsilon_t\]

Note: This is a reduced-form forecasting equation, no structure
The Yield Curve Slope and Forecasting GDP

A large literature uses slope of yield curve to forecast GDP:

\[(y_{t+4} - y_t) = \beta_0 + \beta_1(y_t - y_{t-4}) + \beta_2(i_t^{(n)} - i_t) + \varepsilon_t\]

Note: This is a reduced-form forecasting equation, no structure

Motivation: \(i_t^{(n)}\) proxies for \(i^*\), so \(i_t^{(n)} - i_t\) proxies for stance of monetary policy
The Yield Curve Slope and Forecasting GDP

A large literature uses slope of yield curve to forecast GDP:

\[(y_{t+4} - y_t) = \beta_0 + \beta_1(y_t - y_{t-4}) + \beta_2(i_t^{(n)} - i_t) + \epsilon_t\]

Note: This is a reduced-form forecasting equation, no structure

Motivation: \(i_t^{(n)}\) proxies for \(i^*\), so \(i_t^{(n)} - i_t\) proxies for stance of monetary policy

Estimates in literature consistently find \(\beta_2 > 0\), highly significant
If $i_t^{(n)}$ proxies for $i^*$, then:
If $i_t^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_t^{(n)}$ should be better measure of $i^*$
If $i_{t}^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_{t}^{(n)}$ should be better measure of $i^*$
- term premium itself might have predictive power for GDP
The Term Premium and Forecasting GDP

If $i_t^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_t^{(n)}$ should be better measure of $i^*$
- term premium itself might have predictive power for GDP

Separate yield curve slope $i_t^{(n)} - i_t$ into:
The Term Premium and Forecasting GDP

If $i_t^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_t^{(n)}$ should be better measure of $i^*$
- term premium itself might have predictive power for GDP

Separate yield curve slope $i_t^{(n)} - i_t$ into:

$$\left( \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} - i_t \right) + \left( i_t^{(n)} - \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} \right)$$

- expectations component
- term premium
The Term Premium and Forecasting GDP

If $i_t^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_t^{(n)}$ should be better measure of $i^*$
- term premium itself might have predictive power for GDP

Separate yield curve slope $i_t^{(n)} - i_t$ into:

$$
\left( \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} - i_t \right) + \left( i_t^{(n)} - \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} \right)
$$

$$
\underbrace{\left( \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} - i_t \right)}_{\text{exsp}_t} + \underbrace{\left( i_t^{(n)} - \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} \right)}_{\text{tp}_t}
$$
The Term Premium and Forecasting GDP

If $i_t^{(n)}$ proxies for $i^*$, then:

- expectations component of $i_t^{(n)}$ should be better measure of $i^*$
- term premium itself might have predictive power for GDP

Separate yield curve slope $i_t^{(n)} - i_t$ into:

$$
\begin{align*}
\text{exsp}_t &= \left( \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} - i_t \right) \\
\text{tp}_t &= \left( i_t^{(n)} - \frac{1}{n} \sum_{j=0}^{n-1} E_t i_{t+j} \right)
\end{align*}
$$

Generalize basic GDP forecasting equation to:

$$(y_{t+4} - y_t) = \beta_0 + \beta_1 (y_t - y_{t-4}) + \beta_2 \text{exsp}_t + \beta_3 \text{tp}_t + \varepsilon_t$$
### GDP Forecasting Results

#### Table 2

**Prediction Equations for GDP Growth**

Dependent variable: $y_{t+4} - y_t$

<table>
<thead>
<tr>
<th></th>
<th>1962–2005 Sample (3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$y_t - y_{t-4}$</td>
<td>0.32 (3.04)</td>
<td>0.38 (4.22)</td>
</tr>
<tr>
<td>$exsp_t$</td>
<td>1.03 (5.64)</td>
<td></td>
</tr>
<tr>
<td>$exsp_{t-4}$</td>
<td>-0.79 (-3.49)</td>
<td></td>
</tr>
<tr>
<td>$tp_t$</td>
<td>-0.61 (-1.34)</td>
<td></td>
</tr>
<tr>
<td>$tp_{t-4}$</td>
<td>0.54 (1.24)</td>
<td></td>
</tr>
<tr>
<td>$exsp_t - exsp_{t-4}$</td>
<td></td>
<td>0.96 (5.62)</td>
</tr>
<tr>
<td>$tp_t - tp_{t-4}$</td>
<td></td>
<td>-0.77 (-1.95)</td>
</tr>
</tbody>
</table>
GDP Forecasting Results

Table 2
Prediction Equations for GDP Growth
dependent variable: $y_{t+4} - y_t$

<table>
<thead>
<tr>
<th></th>
<th>1962–2005 Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(3)</td>
</tr>
<tr>
<td></td>
<td>(4)</td>
</tr>
<tr>
<td>$y_t - y_{t-4}$</td>
<td>0.32 (3.04)</td>
</tr>
<tr>
<td>$exsp_t$</td>
<td>1.03 (5.64)</td>
</tr>
<tr>
<td>$exsp_{t-4}$</td>
<td>-0.79 (-3.49)</td>
</tr>
<tr>
<td>$tp_t$</td>
<td>-0.61 (-1.34)</td>
</tr>
<tr>
<td>$tp_{t-4}$</td>
<td>0.54 (1.24)</td>
</tr>
<tr>
<td>$exsp_t - exsp_{t-4}$</td>
<td></td>
</tr>
<tr>
<td>$tp_t - tp_{t-4}$</td>
<td>0.96 (5.62)</td>
</tr>
<tr>
<td></td>
<td>-0.77 (-1.95)</td>
</tr>
</tbody>
</table>

we strongly reject hypothesis that coefficients on $exsp_t$, $tp_t$ are equal
There is no structural, causal relationship running from the term premium to the economy. This correlation is different for different structural shocks. In this respect, the Practitioner View of declines in the term premium is simplistic and incorrect.

Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting. The strong rejection of the hypothesis that coefficients on \( \exp(t) \) and \( \text{tp} \) were equal in the forecasting regression supports this view.

Declines in the term premium have typically been followed by economic expansion. This is true in both the post-1960 and post-1985 periods. In this reduced-form sense, the Practitioner View of declines in the term premium may have some merit.
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect

2. Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect

2. Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting
   - strongly rejected hypothesis that coefficients on $\text{exsp}_t$, $\text{tp}_t$ were equal in forecasting regression
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect

2. Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting
   - strongly rejected hypothesis that coefficients on $exsp_t$, $tp_t$ were equal in forecasting regression

3. Declines in the term premium have typically been followed by economic expansion
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect

2. Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting
   - strongly rejected hypothesis that coefficients on $\text{exp}t$, $\text{tp}_t$ were equal in forecasting regression

3. Declines in the term premium have typically been followed by economic expansion
   - true in both the post-1960 and post-1985 periods
Conclusions

1. There is no structural, causal relationship running from the term premium to the economy
   - correlation is different for different structural shocks
   - in this respect, the Practitioner View of declines in the term premium is simplistic, incorrect

2. Reduced-form evidence strongly suggests that policymakers should take term premium into account when forecasting
   - strongly rejected hypothesis that coefficients on $exsp_t$, $tp_t$ were equal in forecasting regression

3. Declines in the term premium have typically been followed by economic expansion
   - true in both the post-1960 and post-1985 periods
   - in this reduced-form sense, the Practitioner View of declines in the term premium may have some merit
For additional information:
- a copy of these slides
- a copy of the paper
- related papers
- computer code
- etc.

visit http://www.ericswanson.pro
Figure 4
Five Measures of the 10-Year Term Premium

Bernanke-Reinhart-Sack
Cochrane-Piazzesi
Kim-Wright
Rudebusch-Wu
VAR
Figure 5
Kim-Wright Decomposition of the 10-Year Zero-Coupon Yield

- 10-year zero-coupon yield
- Risk-neutral 10-year zero-coupon yield
- 10-year term premium
Figure 6
Kim-Wright Term Premium and the CBO Output Gap
Figure 1
Term Premium for Ten-Year Treasury Security
Implied by Cochrane-Piazzesi Results
Figure 1
Term Premium for Ten-Year Treasury Security
Implied by Cochrane-Piazzesi Results

Figure 2
Comparison of Term Premium and One-Year Expected Excess Returns
for Ten-Year Treasury Security
Table 1
Correlations between Five Measures of the Term Premium

<table>
<thead>
<tr>
<th></th>
<th>BRS</th>
<th>RW</th>
<th>KW</th>
<th>CP</th>
<th>VAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRS</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RW</td>
<td>0.76</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KW</td>
<td>0.98</td>
<td>0.81</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CP</td>
<td>0.92</td>
<td>0.87</td>
<td>0.96</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>VAR</td>
<td>0.96</td>
<td>0.68</td>
<td>0.94</td>
<td>0.88</td>
<td>1.00</td>
</tr>
</tbody>
</table>