A Macroeconomic Model of Equities and Real, Nominal and Defaultable Debt

by Eric T. Swanson, University of California, Irvine.

Discussion:

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Overview

- Main result: A simple structural macroeconomic model can be consistent with various asset-pricing facts, in particular with the size and variability of risk premia on:
  - Equities
    Equity premium puzzle: Large excess returns of equities.
  - Real and nominal (credit-risk-free) bonds
    Bond premium puzzle: The nominal yield curve is positive on average.
  - Corporate bonds
    Credit spread puzzle: Credit spreads are higher than average credit losses.
- The model relies on Epstein-Zin utility, embeds a single supply shock (versus 3 shocks in Rudebusch and Swanson, 2012).
- Solved by means of the perturbation AIM algorithm of Swanson, Anderson, and Levin (2006), using a 5^{th}-order approximation.

The paper within the (risk premia) literature

General Equilibrium Models

Jermann (1998)
Tallarini (2000)
Boldrin, Christiano, and Fisher (2001)
Hordahl, Tristani and Vestin (2008)
Rudebusch and Swanson (2012)

Equilibrium Models

Campbell and Cochrane (1999)
Bansal and Yaron (2004)
Piazzesi and Schneider (2006)
Dai, Le and Singleton (2010)

(Affine) Term-Structure Models

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Duffee (2002)
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- This paper belongs to the literature aiming at reconciling macroeconomic equilibrium models (o.w. DSGEs) and asset pricing models (o.w. Affine Term Structure Models).
- The SDF is internally consistent with the rest of the model.

Key element: Epstein Zin preferences

- Rudebusch and Swanson (2012): Epstein and Zin (1989) preferences make a good job at accounting for risk premia in (credit-risk-free) bonds.
- Perturbation method at fifth order: the larger the curvature of the SDF (α), the more important solving the model up to high orders is.

Epstein Zin (1989) preferences

Under normality assumptions (Piazzesi and Schneider, 2006):

$$
\begin{aligned}
m_{t,t+1} \quad = \quad & \ln\beta - \Delta c_{t+1} - (\alpha - 1)\sum_{i=0}^{\infty}\beta^i (E_{t+1} - E_t)\Delta c_{t+1+i} \\
& + \frac{1}{2}(\alpha - 1)^2 \mathrm{Var}_t\left(\sum_{i=0}^{\infty}\beta^i E_{t+1}\Delta c_{t+1+i}\right)
\end{aligned}
$$

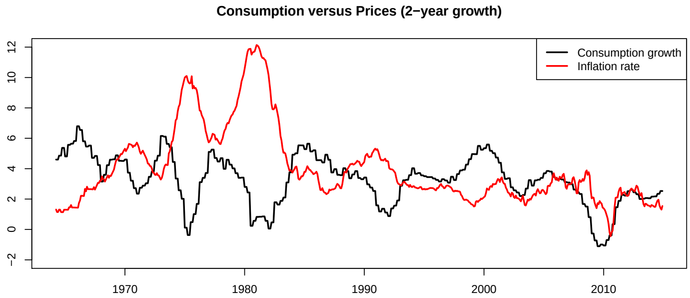
- Aversion to bad news regarding expected future consumption path
- Aversion to volatility in expected future consumption path
- The IES and coefficient of RRA are independently parameterized

Comment 1 - The shocks affecting the economy

- The paper focuses on supply shocks (three shocks in Rudebusch and Swanson, 2012).
- In such an (RBC-like) economy, negative covariance between inflation and consumption $\Rightarrow$ key to account for the positive slope of the yield curve.
- Very tempting to know how the results are affected when demand-type shocks are introduced.
- Evidence that the relative importance of supply/demand shocks have changed over time (e.g. Campbell, Sunderam and Viceira, 2013).

Comment 1 - The shocks affecting the economy

Supply versus demand shocks



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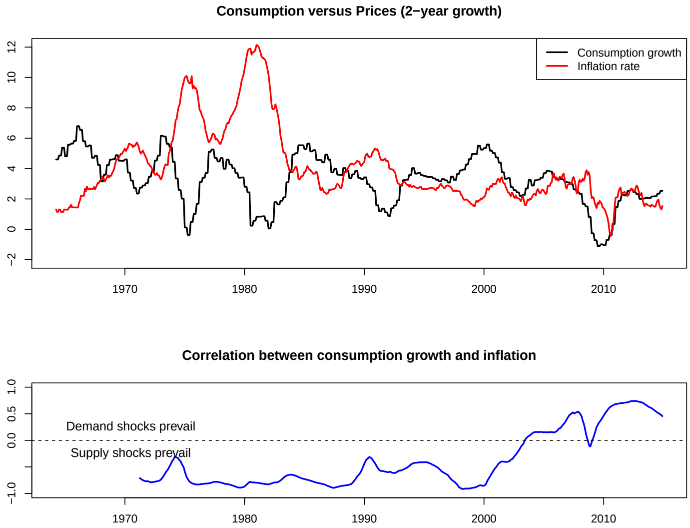
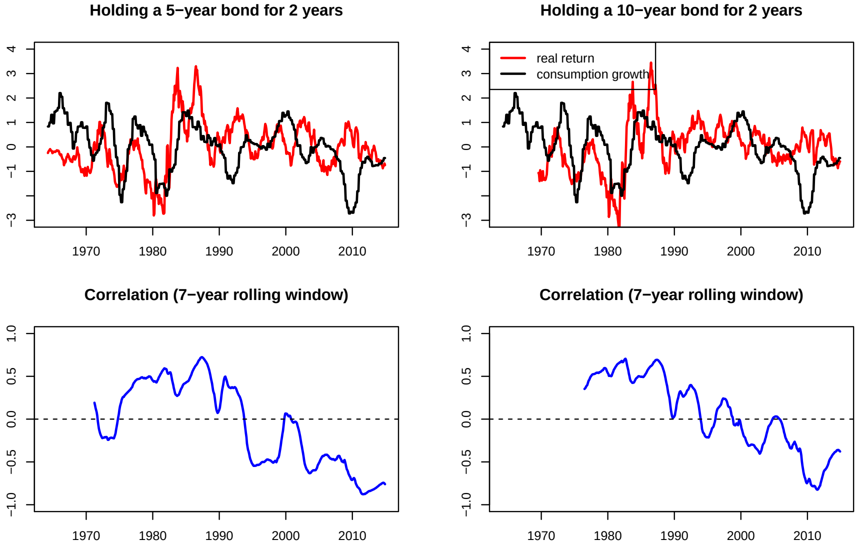


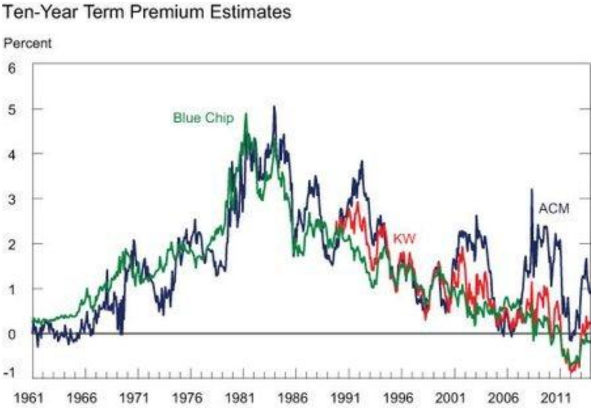
Comment 1 - The shocks affecting the economy

Over the last two decades nominal long term bonds were not bad hedging tools...



Comment 1 - The shocks affecting the economy

... consistently, term premia have decreased.



Sources: Authors' calculations; Federal Reserve Board; Blue Chip Financial Forecasts.
Notes: Blue chip estimates are based on data from the Blue Chip Financial Forecasts survey. ACM term premia are obtained from the model described in Adrian, Crump, and Moench (2013). KW estimates are derived from Kim and Wright (2005).

Source: Adrian, Crump, Mills and Moench (2014, *Liberty Street Economics*)

Comment 2 - Additional interesting outputs

- Model-based term premia (requires filtering methods).
- Model-implied (auto-)covariances.
- Campbell-Shiller (1987, 1991) regressions (Rudebusch and Swanson, 2008).

Campbell-Shiller (1987, 1991) regressions

- The literature on evaluating the ability of dynamic term structure models to resolve the expectations puzzle has notably focused on the Campbell-Shiller (1987, 1991) regressions:

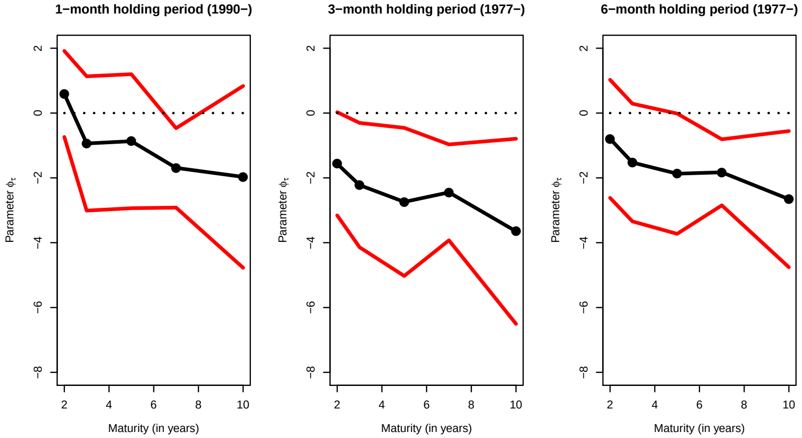
$$R_{t+1,h-1} - R_{t,h} \quad = \quad \alpha_h + \phi_h \frac{R_{t,h} - i_t}{h-1} + \xi_{t+1}$$

- Under the expectation hypothesis, we should have $\phi_h = 1$:

Estimated $\phi_h \neq 1 \Rightarrow$ Existence of time-varying risk premia.

Comment 2 - Additional interesting outputs

Campbell-Shiller regressions



Note: 95% confidence intervals in red. End of regression period: September 2014.

Comment 3 - Credit risk premia

The term structure of credit-risk premia

- Credit spread = difference between yields-to-maturity of (a) corporate bonds and (b) credit-risk-free yields of same maturity (or duration).
- Credit risk premium = difference between observed credit spread and expected credit loss.
- If credit losses are independent from the sdf, credit risk premium $\equiv 0$.
- By allowing for some correlations between the default intensities (+ recovery rates) and the business cycle, the model generates sizable 10-year credit-risk premium, which solves the credit spread puzzle...

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  ... for long maturities.
- The framework cannot generate substantial short-term credit-risk premia.

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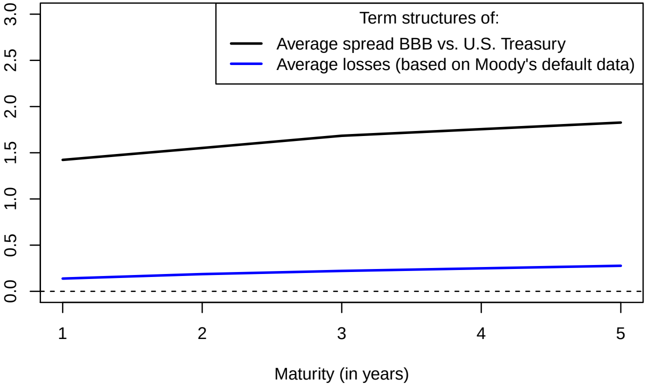

Note: The black curve is based on Bloomberg generic data (BBB-rated corporates, period 2002-2014). The blue curve is based on Moody's default data (cumulative default rates of BBB-rated bonds for different horizons, period 1985-2009); a recovery rate of 40% is employed in the expected losses calculation. y axis is in pp.

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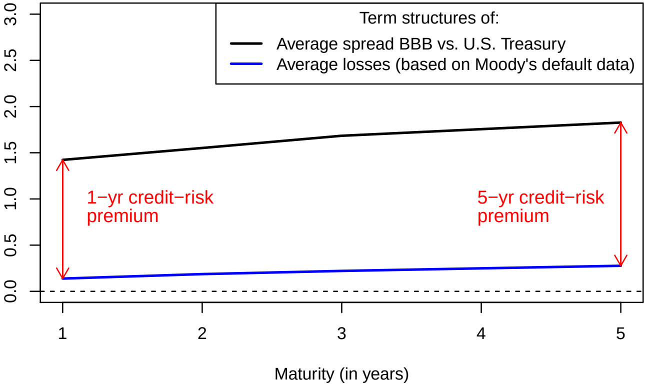

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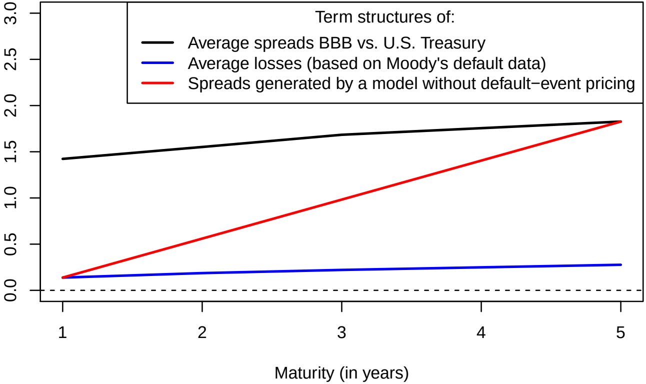
Limitations of models that do not price default events



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Comment 3 - Credit risk premia

Limitations of models that do not price default events

- (As in many credit-risk models,) the defaults are not state variables: default processes correlate with the economy but do not "Granger-cause" it.
- Here, *default-event risk* can be diversified away (Jarrow, Lando and Yu, 2005, Driessen, 2005).
- Denoting by X_t the vector of state variables, the fact that the defaults do not cause the sdf implies that (Monfort and Renne, 2013):

$$Pr^{\mathbb{Q}}(\mathbb{I}^d_{i,t+1} = 1 | \mathbb{I}^d_{i,t} = 0, X_{t+1}) = Pr^{\mathbb{P}}(\mathbb{I}^d_{i,t+1} = 1 | \mathbb{I}^d_{i,t} = 0, X_{t+1}), \qquad (1)$$

where $\mathbb{P}$ and $\mathbb{Q}$ denote the physical and equivalent martingale measures.

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$\Rightarrow$ Credit risk premia depend on the difference between conditional $\mathbb{Q}$ and $\mathbb{P}$ default probabilities.

$\Rightarrow$ Because of Eq. (1), model-implied premia are small for short horizons.

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This models that price default events

- In order to have substantial credit-risk premia for short maturities, one needs:

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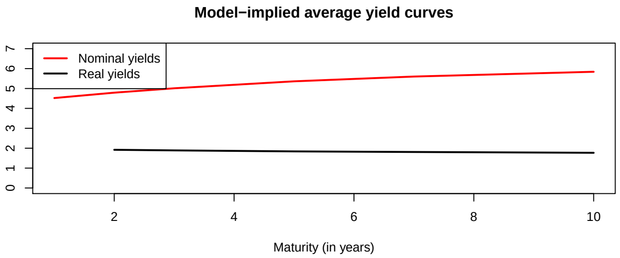
  i.e., the defaults have to Granger-cause the sdf (Gouriéroux, Monfort and Renne, 2014).

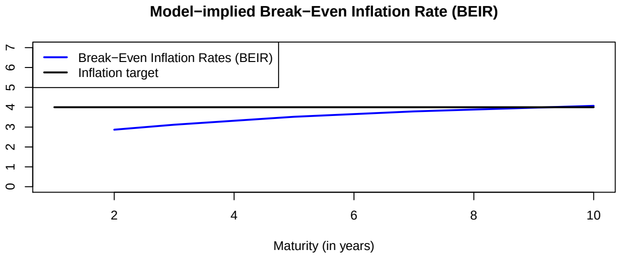
- It would be the case if the number of firms in the economy was not infinite and if their defaults had specific repercussions on the production/consumption process.

Additional questions...

- Could the model be used to investigate zero-lower bounds issues? (by performing the perturbation-method Taylor expansion around a ZLB state).
- Would it be possible to estimate the model using time series data?
- What about inflation-risk premia?

Model-implied inflation risk premia





Conclusion

- Very nice paper.
- More discussion about the effects of demand-type shocks would be welcome.
- Additional term-premia statistics could be computed to enrich the analysis (Campbell-Shiller regression, term-premia persistency).
- The financial accelerator extension (discussed in the last section) is appealing.
- Shows that the same General Equilibrium Model (with Epstein-Zin preferences) can simultaneously replicate moments of different risk premia.
- 3 puzzles solved ...

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Thank you!