"Uncertainty trends"
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March 20, 2021, MFA

Objective

▸ Examine and explain the **long-run**, **low-frequency** predictive relationship between uncertainty and equity price

⇒ Uncertainty-of-interest: Total Factor Productivity (TFP)

⇒ A general equilibrium model: endogenous long-run growth risks, nominal price rigidities, Epstein-Zin preferences

Motivation: The uncertainty-asset prices literature

- ▸ Large and growing literature! Researchers have explored:
  - ⇒ {types} market volatility, consumption volatility, macro uncertainty, monetary policy uncertainty, vol of vol, Knightian uncertainty;
    {proxies} realized volatility, conditional uncertainty, forward-looking option/news-driven uncertainty;
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- ▸ Thus, a fuller picture should be explored: short-run v. long-run predictability, asset returns v. economic growth predictability. This Paper focuses on the long-run effects and examines economic and financial effects via a GE framework.

What does this paper do? (1) Empirical part

- ▸ Enter both DP and TFP uncertainty into predictive regressions of excess returns at annual frequency
- ▸ Find that TFP being: **(1) orthogonal to DP, (2) a strong alternative long-run predictor**

	1y	2y	3y	4y	5y	7y	10y
Dependent Variable: Excess Returns, $R_{t+1,t+h}$							
A. Dividend-Price							
β_{DP}	0.10	0.21	0.27	0.38	0.57	0.96	1.80
	(1.67)	(1.91)	(1.72)	(1.82)	(2.27)	(2.82)	(4.16)
$R^2(\%)$	5.89	10.90	12.60	15.27	20.64	29.84	39.97
B. TFP Uncertainty							
β_{TFP}	0.08	0.19	0.33	0.48	0.64	0.97	1.63
	(2.02)	(2.36)	(2.72)	(2.93)	(3.17)	(3.34)	(4.42)
$R^2(\%)$	4.35	9.91	19.94	26.71	27.69	31.49	32.18
C. Dividend-Price & TFP Uncertainty							
β_{DP}	0.10	0.21	0.27	0.38	0.57	0.96	1.80
	(2.17)	(1.85)	(1.65)	(1.74)	(2.18)	(2.69)	(4.10)
β_{TFP}	0.08	0.19	0.33	0.48	0.64	0.97	1.63
	(1.90)	(2.26)	(2.60)	(2.79)	(3.03)	(3.17)	(4.37)
$R^2(\%)$	10.24	20.81	32.54	41.97	48.33	61.33	72.16

What does this paper do? (2) Campbell-Shiller Insight

▸ Use a Campbell-Shiller framework and discussions in Cochrane (2008) to provide a conceptual framework of understanding potentially why TFP predicts

$$d_t - p_t = \sum_{j=1}^{k} \rho^{j-1} \left(\left(r_{t+j} - r_{t+j}^f \right) - (\Delta d_{t+j} - \pi_{t+j}) + \left(r_{t+j}^f - \pi_{t+j} \right) \right) + \rho^k \left(d_{t+k} - p_{t+k} \right), \quad (10)$$

$$= r_t^k - \Delta d_t^{\text{real},k} + r_t^{f,\text{real},k} + (d/p_t)^k, \quad (11)$$

$$\beta_{r,x}^{\infty} = \beta_{\Delta d^{\text{real}},x}^{\infty} - \beta_{rf,\text{real},x}^{\infty},$$

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▸ "TFP volatility is associated with a persistent decline in future inflation rates" → the channel that jointly explains the the TFP uncertainty being orthogonal to DP but has long-run asset return predictability

▸ **The third part of the paper** is to use a GE model to reconcile the relationship among TFP volatility, expected inflation rate, and equity risk premium.

What does this paper do? (3) GE

- The three central features of the model are price rigidities, an endogenous growth channel and Epstein-Zin preferences:

  ⇒ TFP Unc, $\sigma_{a,t}$ ↑, HH savings ↑, HH consumption ↓ (precautionary savings)

  ⇒ TFP Unc, $\sigma_{a,t}$ ↑, HH labor supply ↑, wage ↓ & mark-up ↑, R&D investment ↓ (precautionary labor supply)

  ⇒ Together, with consumption and investment ↓, output ↓, employment ↓, prices ↓.

- Simulation+standard asset moment matching+predictability moment matching

Comment #1: Like this paper!

1. Research question is important and relevant, and I agree that it is usually harder to reconcile long-run predictors with just the risk compensation intuition

2. The paper uses a Campbell-Shiller insight to motivate why we need to invite a GE model to explain the empirical fact

3. Evidence and discussions are thorough

Summary of my suggestions:

#2 DP trend and TFP uncertainty trend

#3 TFP and market uncertainty trends

#4 Model performance

#5 A few minor comments

Comment #2: DP trend and TFP uncertainty trend

▸ Conventional wisdom is, DP and Unc trends should comove to some degree:
  For instance, heightened uncertainty about real economic growth (and unusually high risk aversion), both of which rationally raise equity yields

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For instance, heightened uncertainty about real economic growth (and unusually high risk aversion), both of which rationally raise equity yields

▸ In your model, trends are purely driven by the persistence of the second moment, and because shocks driving the dividend and TFP vol are orthogonal ($\epsilon_{a,t} \rightarrow$ dividend; $\epsilon_{\sigma_a,t} \rightarrow$ TFP vol), rendering **orthogonal "trends" between DP and TFP uncertainty**

$$a_t = (1 - \rho_a)\bar{a} + \rho_a a_{t-1} + \sigma_{a,t}\epsilon_{a,t} \tag{1}$$

$$\sigma_{a,t} = (1 - \rho_{\sigma_a})\bar{\sigma}_a + \boxed{\rho_{\sigma_a}}\ \sigma_{a,t-1} + \sigma_{\sigma_a}\epsilon_{\sigma_a,t} \tag{2}$$

▸ Suggestion: More economic discussions on why DP and TFP uncertainty appear statistically uncorrelated would be very useful (they actually don't appear always statistically uncorrelated from the data)

  ⇒ Should they be uncorrelated? Or it is a particular result based on a particular sample period?

  ⇒ How to reconcile conventional wisdom/theoretical implications from your core empirical finding?

Comment #3: TFP and market uncertainty trends

- ▸ The paper uses total market uncertainty as a robustness check to the predictability results of TFP uncertainty, which is implicitly making the point:
  - ⇒ *It is the TFP uncertainty-correlated component in the total market uncertainty that drives its long-run predictability*

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  ⇒ *It is the TFP uncertainty-correlated component in the total market uncertainty that drives its long-run predictability*

▸ Suggestion: Consider mentioning this point a bit earlier, as it helps providing a context of this corre predictor the paper is studying:
  - What is special about TFP uncertainty trend that's worth investigating,
  - How does it relate it to market/financial uncertainty that other papers study,
  - Is it expected that TFP uncertainty is a long-run predictor?

▸ Suggestion: Consider discussing whether there identifies a structural break in production data around certain period (e.g. 1970) that is driving the predictability results? (Consider different samples evidence?)
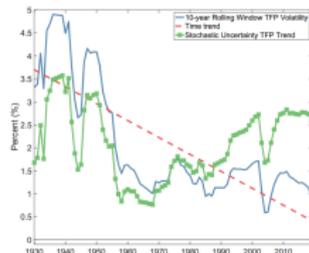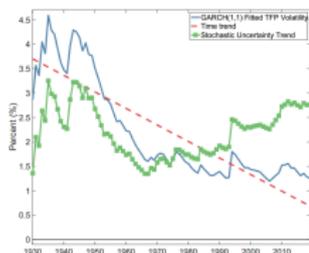
Comment #4: Model performance

▸ Model-implied predictive coefficients of TFP volatility on various LHS are generally larger and more significant than the data counterparts (e.g., Table 10 on asset prices, 11 on inflation, real rate and real dividend growth, 12 on consumption and output growth), suggesting:

⇒ TFP volatility generated by the model, $\sigma_{a,t}$, is still too stable relative to data

⇒ And/or, TFP volatility is too correlated with outcome variables

▸ Suggestions: Simulate the TFP process using more realistic sample statistics, given this paper is interested in matching second moment relationship (i.e., predictive coefficient)? In some sense, you already have it from the GARCH(1,1) estimate (with a little twist)
[An "unfair" comment that I can see being brought out: it is expected that a persistent state variable in a model simulation generate predictability] Perhaps emphasize the correct signs of predictive coefficients?

Comment #5: A few minor comments

- Some of my concerns above can be potentially addressed by adding more "dynamic moments" matching, or simply first, second and cross moments of the simulated TFP uncertainty and some asset prices — adding to Table 9

- I like Table 13, 16 (comparison of TFP uncertainties to market uncertainty and EPU), Suggestion: as mentioned in Comment 3, I would consider bringing this part a bit earlier to the first part of the paper to help readers relate to the literature and understand the importance of TFP uncertainty

- Style comment :) 10 sections, 17 tables, 10 figures.
  Suggestion: Section 3/4/5 can be combined; some tables (and table notes) are getting repetitive, consider putting them in one table at a glance.

Conclusion

- ▸ I highly recommend this paper! It is very well written and quite insightful.

- ▸ To potentially make it better: More discussions on the relationship between DP and uncertainty trends, the relationship between TFP and other uncertainty trends, and dynamic matching in the model

Thank You!
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