

# The Long and Short of Cash Flow Shocks and Debt Financing

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## Do firms subject to more transitory shocks have less leverage?

- ▶ Yes!
- ▶ HP filter data on firm operating income  $\longrightarrow$  temp and perm components
- ▶ Do a Monte Carlo to show that this procedure works
- ▶ Regress leverage on the ratio of temporary shock variance to permanent shock variance
- ▶ Regress debt issuance on the ratio of permanent to total income variance

# I want to talk about four things

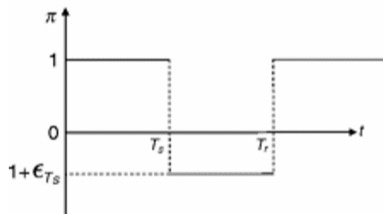
- ▶ Theoretical background
- ▶ A puzzling fact
- ▶ Is the HP filter a good idea?
- ▶ Suggestions

## Gorbenko and Strebulaev (2010) is all about taxes and default

- ▶ Firms subject to more transitory profit shocks have lower leverage.
- ▶ “Leland” style model:
  - ▶ EBIT generating machine
  - ▶ tax on EBIT
  - ▶ debt serves to shield these taxes
  - ▶ debt proceeds are distributed to shareholders

## Two kinds of shocks

- ▶ Standard geometric Brownian motion—nonstationary
- ▶ An additive temporary shock that can be either positive or negative.



- ▶ Because negative cash flows get no tax benefit, leverage is lower.

# Dynamic investment–finance models are about conserving debt capacity

- ▶ EBIT comes from a decreasing returns technology that uses capital
- ▶ Subject to stationary TFP shocks that can be more or less **persistent**

$$\ln z_t = \rho \ln z_{t-1} + \varepsilon_t$$

- ▶ Firms invest in capital
- ▶ Firms respond more strongly to more persistent TFP shocks.

## Debt financing

- ▶ An almost constant returns way to transfer resources through time
- ▶ Has a standard tax advantage: firm is impatient relative to the return on debt
- ▶ The firm wants an infinite amount of debt.
- ▶ Debt is limited by distress costs or a collateral constraint
- ▶ Firms endogenously limit debt **further** because equity is costly or unavailable

## Why does persistence matter for debt?

- ▶ Persistent shocks are associated with big investment outlays
- ▶ The more likely a bigger outlay, . . .  
the more likely the firm needs to tap external finance
- ▶ Firms conserve debt capacity to be able to respond to shocks
- ▶ More persistence leads to lower leverage



## I find the investment model intuition more compelling

- ▶ Gorbenko and Strebulaev (2010) shocks are not just temporary but **negative**
- ▶ Survey evidence that managers like to be conservative in order to keep their powder dry

## A simple back-of-the-envelope calculation

- ▶ What if the firm faces the following **income** process:

$$y_t = z_t + u_t$$

$$z_t = z_{t-1} + \varepsilon_t$$

where  $u_t$  and  $\varepsilon_t$  are i.i.d.

- ▶ If I estimate

$$y_t = \rho y_{t-1} + e_t,$$

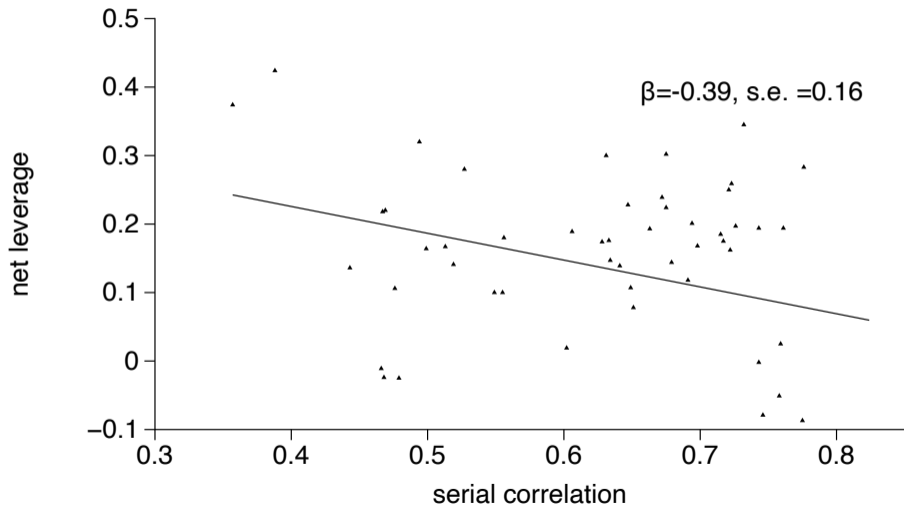
the larger  $\sigma_u/\sigma_\varepsilon$ , the lower my estimate of  $\rho$ .

- ▶ So  $\rho$  can measure the importance of persistent shocks.

## I estimated serial correlation by two-digit industry

- ▶ Compustat from 1970 to 2018.
- ▶ Han and Phillips (2010) AR(1) panel estimator to absorb heterogeneity
- ▶ Plotted the estimates against net leverage.

## Leverage is negatively related to persistence



## The difference might be the sample size

- ▶ My sample size:  $> 150,000$ .
- ▶ Their sample size:  $\sim 60,000$ .
- ▶ Both samples drop firms with fewer than 10 consecutive observations.

# The difference is probably the HP filter

Hamilton, J. D. 2018. [Why You Should Never Use the Hodrick-Prescott Filter](#).  
*Review of Economics and Statistics* 100:831–843

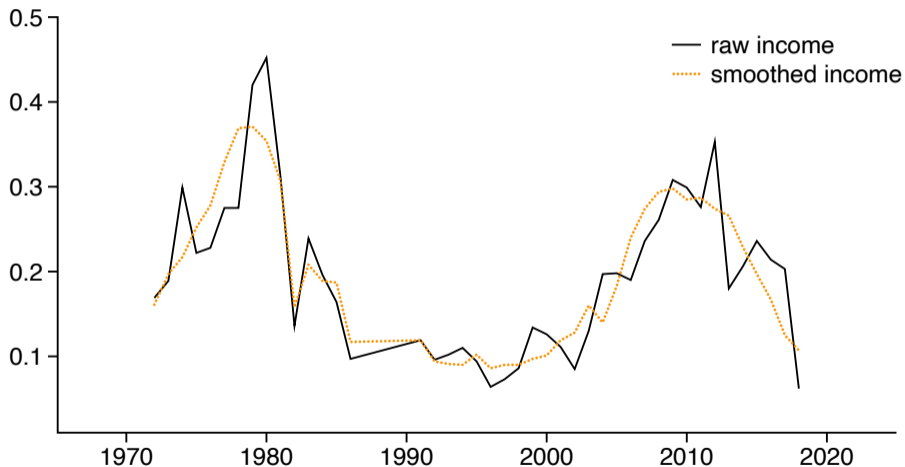
# I learned that there are many things wrong with the HP filter

$$\min_{\{g_t\}_{t=-1}^T} \left\{ \sum_{t=1}^T (y_t - g_t)^2 + \lambda \sum_{t=1}^T [(g_t - g_{t-1}) - (g_{t-1} - g_{t-2})]^2 \right\}$$

$$\min_{\{g_t\}_{t=-1}^T} \{(\text{actual series}) + \lambda(I(2) \text{ smoothed series})\}$$

- ▶ Bad behavior at the ends of the sample.
- ▶ Difficult to choose the smoothing parameter  $\lambda$
- ▶ Should be related to the relative variances of the permanent and idiosyncratic process components.
- ▶ Is it OK to use the same  $\lambda$  for all firms in a heterogeneous panel?

## It works fine for the operating income of this firm





## It seems to work less well for the operating income of this firm



## If you want to HP filter, make the Monte Carlos more convincing

- ▶ And replicable
- ▶ Report RMSE, bias, MAD, all in terms of normalized-to-one coefficients
- ▶ Calibrate to Compustat data—not to somebody else's model.

## Other ways to estimate permanent and transitory components

- ▶ Han and Phillips (2010) measures persistence
- ▶ Saporta-Eksten and Terry (2018) use the MCMC methods in Nakata and Tonetti (2015), which are designed for labor income processes

## Reframe the paper theoretically

- ▶ Temporary shocks can affect investment and financing for many reasons:

Terry (2015)

Myopia

Terry, Whited, and Zakolyukina (2019)

Beating earnings thresholds

Barrero (2020)

Expectation formation

Bordalo, Gennaioli, Shleifer, and Terry (2020)

- ▶ Find data variation to back up the Gorbenko and Strebulaev (2010) story versus one of these stories.

Operating income is not a shock

# A paper with enormous potential

- ▶ Interesting topic!
- ▶ Find a better way to measure permanent versus transitory components.

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- Hamilton, J. D. 2018. Why You Should Never Use the Hodrick-Prescott Filter. *Review of Economics and Statistics* 100:831–843.
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- Nakata, T., and C. Tonetti. 2015. Small Sample Properties of Bayesian Estimators of Labor Income Processes. *Journal of Applied Economics* 18:121–148.
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- Terry, S. J., T. M. Whited, and A. A. Zakolyukina. 2019. Information versus Investment. Manuscript, University of Michigan.