Marking to Market Corporate Debt

Lorenzo Bretscher, Peter Feldhutter, Andrew Kane, and Lukas Schmid

discussion by Toni Whited

2020 CAFFE Seminar

Outline

This is a paper about measurement

- It offers a marvelous job of measuring the market value of debt.
- Great data!
- The measure tracks the book value of debt
  - more closely for firms outside of financial distress.
  - less closely for firms inside financial distress.

The paper contains three main results

- Make a better measure of Tobin's q and find little evidence of investment–cash flow sensitivity.
- Their measure improves the prediction of default.
- They find a leverage premium but no value premium after they control for market leverage.

The organization of the paper is fractured

- They start with a simple real-options model with defaultable debt.
- There is a careful explanation of the data and the measurement.
- The investment–cash flow results with no reference to the model.
- The default results with reference to the model.
- The asset pricing results without reference to the model.

There is a lot of good stuff in this paper

I want to make some suggestions for reorganizing it in a single unifying framework.

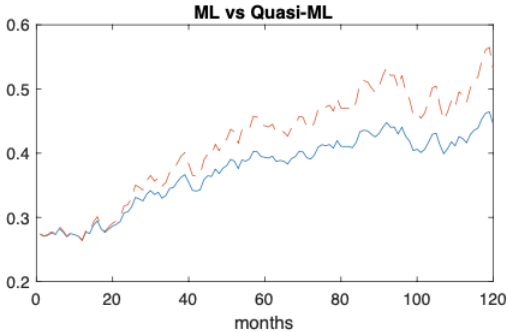
- Explain why the current model is *too* stylized
- Outline a model that might be able to nest all of the interesting facts.

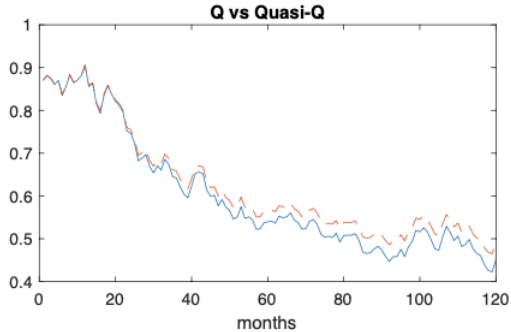
Outline

The real options framework is too simple to capture all of the issues in the paper

- A stochastic, decreasing returns technology
- Idiosyncratic technology shock is a Brownian motion
- The firm has a one-shot option to invest in capital
- The firm can restructure its debt only at that time
- Nice pde's to solve.

Market leverage and quasi-market leverage diverge*





*But they look highly correlated.

What can this framework address?

- Investment cash flow sensitivity?
  - No real financial frictions
  - No ongoing investment to covary with anything.

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- Default predictions?
  - Yabbut . . .
- Asset pricing results?
  - No pricing kernel

Outline

A partial equilibrium model of a representative firm

- Discrete time, infinite horizon
- Maximizes the expected present value of distributions
- Stochastic, decreasing returns technology that uses capital.
- Capital investment
- Many financing options with frictions

Standard production technology

c_f	Pay fixed operating costs up front
zxk^α	Stochastic profit function of capital
$\ln z' = \rho \ln z + \varepsilon'_z$	Idiosyncratic shock, AR(1) in logs
$\varepsilon_z \sim N(0, \sigma_z^2)$	Normal innovation
x	Aggregate shock: x_h and x_l
$I = k' - (1-\delta)k$	Investment

The firm has two different sources of financing

- profits: $zxk^{\alpha} - c_f$
- one-period risky debt (b): repaid when the debt matures
  - negative b indicates cash
  - default occurs when firm value falls below zero
  - price of the debt (p): determined by shocks, and the firm's current-period decisions
- No equity issuance

Reduced-form pricing kernel

- Expected returns vary with x. The conditional expected return is

$$\beta m(x, x').$$

- Time-varying expected return is a function of current and future x.

$$\ln m(x, x') = m_0 + m_1(x' - x).$$

- Investors value assets that pay off in bad states of the world, so $m_1 < 0$.

The firm maximizes its discounted expected value

- The value function is given by

$$V(z, x, k, b) = \max\{0, V^c(z, x, k, b)\}$$

- If firm value drops below zero, the firm defaults.

- The Bellman equation is:

$$V^c(z, x, k, b) = \max_{I, b'} \left\{ d + \beta \mathbb{E} m(x, x') V^c(z', x', k', b') \right\}$$

subject to

$$d = zxk^\alpha - c_f + pb' - b - I,$$

$$d \geq 0$$

Debt Pricing

- The firm borrows from a competitive and risk neutral lender
- In the event of default, the lender gets to keep a fraction χ of the depreciated capital stock.
- The lender provides a state-contingent contract that compensates for the loss in case of default
- p is the price of debt

$$pb' = \beta \mathbb{E} m(x, x') \left\{ \underbrace{\mathbf{1}_{V'>0} b'}_{\text{solvency}} + \underbrace{\mathbf{1}_{V' \leq 0} [\chi(1-\delta)k']}_{\text{default}} \right\}$$

Outline

Result 1

- How does this relate to investment cash flow sensitivity?
- Consider the usual investment regression:

$$\begin{aligned} \text{investment} &= (\text{true q})\beta + (\text{cash flow})\alpha + u \\ \text{observed q} &= \text{true q} + \varepsilon \end{aligned}$$

- The cash flow coefficient is decreasing in the R^2 of the measurement equation, aka measurement quality.

How does this relate to the sketched model?

- Estimate measurement quality
  (Erickson and Whited 2000; Erickson, Jiang, and Whited 2014):
  1. In the actual data with the usual q
  2. In the actual data with the improved q
  3. In simulated data with q constructed with book debt, b.
  4. In simulated data with q constructed with market debt, pb.

- See whether the discrepancy between market and book debt in the model can explain any observed changes in measurement quality.

- Give an **economic** interpretation to a source of measurement error.

Result 2

- In the model, the price of debt falls as the firm nears default
- So of course market leverage will be a better predictor of default
- The default prediction results should be more of a reality check than a prediction

Result 3

- Can the model with market debt replicate your bond spread results?
- Can the model with market debt replicate your equity sorting results?
- Does using market debt in the model-simulated data matter?

Outline

A paper with enormous potential

- Great measurement
- Interesting empirical results
- Needs a better unifying framework to make sense of all of the seemingly disparate results.

Erickson, T., C. Jiang, and T. M. Whited. 2014. Minimum Distance Estimation of the Errors-in-Variables Model Using Linear Cumulant Equations. *Journal of Econometrics* 183:211–221.

Erickson, T., and T. M. Whited. 2000. Measurement Error and the Relationship Between Investment and q. *Journal of Political Economy* 108:1027–1057.