Long-Term Investments

Asset-Class Based Capital Budgeting

Taiwan Securities and Financial Markets Conference

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December 2014

Financial Markets Conference

- ► Not Big but Long Data

- ► Our paper is 2/3 CF and 1/3 AP.

- ► My presentation is the reverse.

but it's generic enough to be of interest to everyone.

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AP Part

Long-Term Risky vs. Safe Investments

- Long-term $\neq$ illiquid.

- Long-term = long-distant payoffs.

Common Risk Premium Defn in AP

"Long-Horizon Stock Payoffs"

compared to

"Short-Horizon Risk-Free Bills"

(not my interest)

confounds maturity premia with risk premia.

Long-Term Risk Premium Definition

"Long-Horizon Stock Payoffs"

compared to

"**Long**-Horizon Risk-Free Bills"

(my interest)

think, holding maturity "more" constant.

AP Part

What is the expected rate of return demanded of stocks over bonds?

- The benchmark are not short bills but long bonds.

- No rebalancing. Buy-and-hold. $\Rightarrow$ Geometric mean.

Why?

- Because I am (also) interested in CF.

- Because this is what investors (can) demand for safe projects with equal far-off payout.

- Because our models add a risk-premium to *equivalent* risk-free rate.

- Because the NPV/IRR natural benchmark (required cost of capital) for constructing a factory with long-term expected payoffs is long-term safe payoffs.

Differences

- Use a longer-term risk-free bond rate.
    - Talk about differences and consistency.

- Break out time- from default-premium.
    - Even default-free assets have a time-premium.
    - Today: 3% Bond-Bill Yield Difference
    - Not exactly comparable: Want rolled-over short-term assets, not instant standing.

- It is critical to use geometric means.
    - we don't want $(+101\%, -100\%) \Rightarrow -100\%$ to count as better than $(+0\%, -0\%)$.

(Free) Historical Data

http://ivo-welch.info/professional/goyal-welch/

- Annual Data
- Right now, about 1857-2013. Planned: 1820s-now,
- Convenient csv file
- Will need more curating...not final.

Long Data

- 1802- : Inflation

- 1832- : Short Default-Safe Rates

- 1802- : Long Default-Safe Rates

- 1871- : Long AAA-like Rates

- 1802- : (Long) Stock Returns

and not everything turns out like Ibbotson 1926-

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Differences and Internal Consistency

Bonds vs. Bills.

Close-To-Tautotologies

- ► T-bills and T-bonds are both default-free fixed-income securities.

- ► On average over the very very long run:
  - ► Default-free fixed-income securities will return what they promise.
  - ► If T-bonds have an average yield spread of 2% over T-bills, then they will earn 2% more.

Bonds over Bills

	Yld	Ret
2000-2013	3.6	4.8
1970-2013	3.0	4.0
1926-2013	2.5	2.5
1870-2013	1.9	2.2

- ▶ Interest rates declined from 2000-13.
- ▶ Today, the T-bond yield spread is not unusually small (3%).

Internal Consistency

- ► Historical data should not allow you to believe short-term equity premium is 5% and long-term equity premium is 4%.

- ► Historical data should not allow you to believe short-term equity premium is 5% and long-term equity premium is 0%.

- ► If you believe short-term equity premium is 5%, then you should believe long-term equity premium is 2-3%.

- ► If you believe short-term equity premium is 3%, then you should believe long-term equity premium is 0-1%.

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Quiz

- Our first wp draft ended in 2012.
- What was the 2013 rate of return on stocks?

32%

- What was the 2013 rate of return on stocks over bonds?

$$32\% - (-7\%) \approx 40\%$$

- This has influence even over decades!

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Agree to Disagree?

- ▸ Ref A: by ignoring 2013, you cheated.

- ▸ Ref A: equity premium from 1926 was 6.5%.

- ▸ Ref B: short eqprem from 1970 was 4-5%.

- ▸ Ref B: long eqprem from 1970 was 2%.

- ▸ How can anyone reconcile referees?

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Agree to Disagree?

- ► You/they need to pick own period.

- ► I need to show what influence a choice has.

- ► I need a different kind of figure:
  - ► Not a log-plot of wealth
  - ► But a backward-looking inference plot.
  - ► Standing in 2013, looking back X years, ...
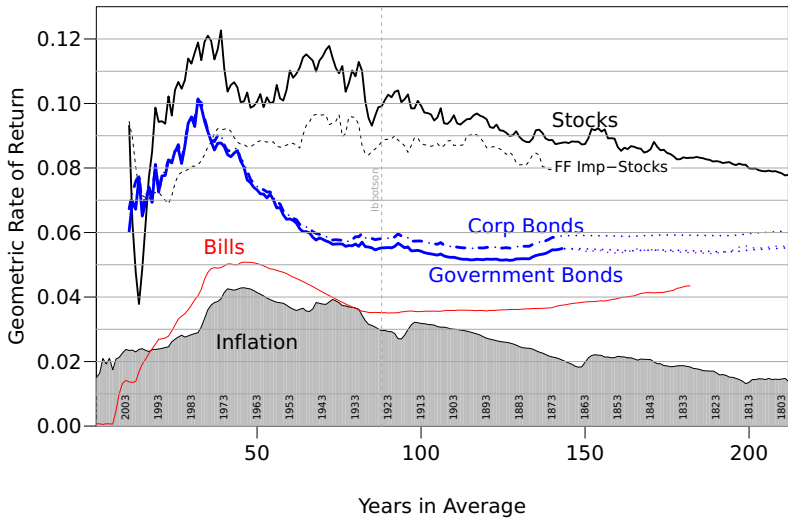
Numeric

Long-Horizon Equity Premium Spread
(Now=**12/2013**):

2000-now $\approx$ 0%	1950–now $\approx$ 5%
1990–now $\approx$ 1.5%	1926–now $\approx$ 4%
1980–now $\approx$ 2%	1872–now $\approx$ 3%
1970–now $\approx$ 2%	1803–now $\approx$ 2%

Note: corporate AAA bonds are not much different from T-Bonds.

Choices

- The world has been changing. Weight more recent returns more?

  2%

- Use all the data you can get?

  2%

- But why the Ibbotson 1926- sample?

Historical Equity Premium Inference

- ▶ Principal Data Change:
  - ▶ Not lower stock returns nowadays,
  - ▶ but higher long-term bond yields nowadays.

- ▶ Oft-quoted 6-8% are arithmetic returns from 1926 to 1970 vis-a-vis Treasury bills?!

- ▶ If based on historical performance, the exp. equity premium relative to LT bonds should be 2-3% or less.
  - ▶ This estimate is consistent with equity premium 5% above short-term bills.

Me: $< 1-2\%$ above long T-bond. $3-4\%$ above T-bill. High?

Non-Historical Inference

It used to be that the implied cost of capital (ICCs) was lower than the historical cost of capital.

Non-Historical Inference

No longer. Li, Ng, and Swaminathan, JFE2013 extended: Implied Cost of Capital, Based on Analyst Estimates, Oct 2014:

- ▶ Relative to Bonds: **6.5%**
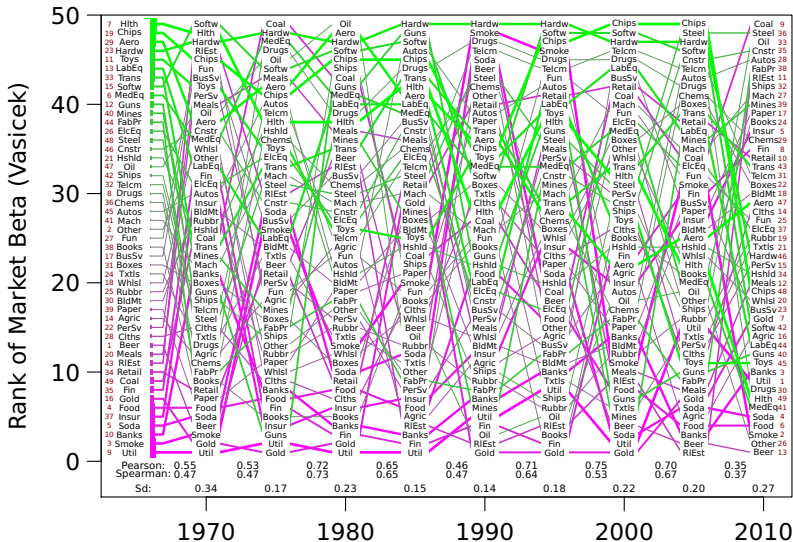
- ▶ Relative to Bills: 9.7%

I cannot reconcile them. Choose:

- ▶ $\approx 3\%$ (historical)
- ▶ or $\approx 6\%$ (ICC).
- ▶ I choose $< 3\%$.
- ▶ If you choose 6%, you need to worry more about market-betas more than I.
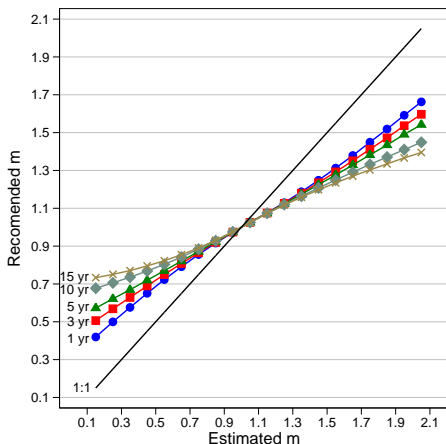
CF Rest of the Paper

- Betas drift (mean-revert) slowly but steadily.

- Equity betas! Asset betas are more stable, because debt is more stable.
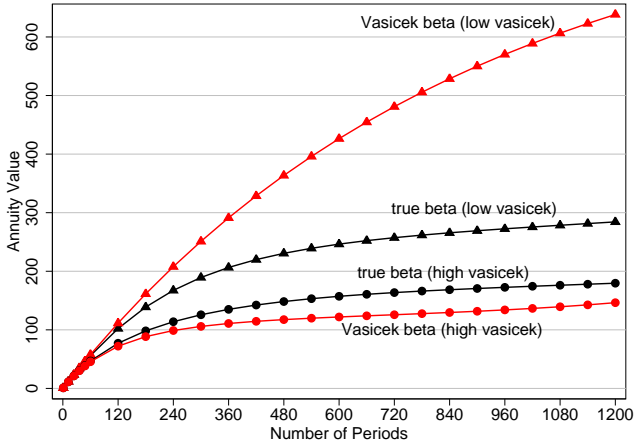
Ranks of 49 Industries

Appropriate Shrinkage

▶ Betas require **second** shrinkage for time-horizon.
  ▶ Roughly, over 10-15y: $\beta \approx \lambda \times \hat{\beta}^{\text{VCK}} + (1 - \lambda) \times 1$ and $\lambda \approx (1 + 35)/(m + 35)$.

Appropriate Shrinkage

- For 20-30 year (factory vs safe) PV of cash flow, do not use eqp=4% diff:

$$1\% + 4\% \times 2 \qquad 1\% + 4\% \times 0 \qquad \Delta = 9\%$$

but eqp=1%:

$$4\% + 1\% \times 1.3 \qquad 4\% + 1\% \times 0.7 \qquad \Delta = 1\%$$

- Comparing two common projects, ignoring standard factor-exp risk is measurement error.

PS: Models have failed empirically

- ► The beta-shrinkage argument is right even if the models are right.

- ► CAPM and FFM Models have no empirical evidence to suggest usefulness.

- ► Models even fail to predict 1-month ahead. They are not better predicting 10 years ahead.

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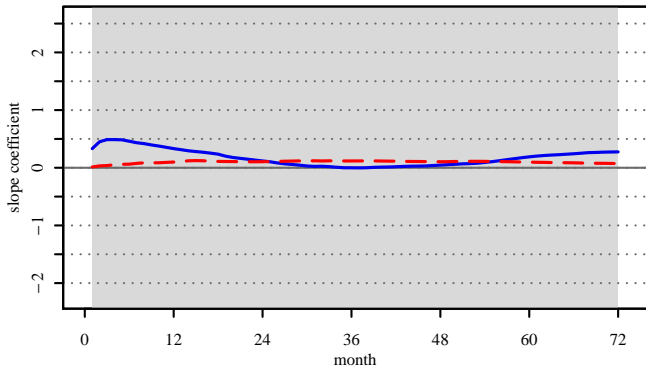
Specific CC Prescription

- ► We know the beta-predicted premia (or value-exposure premia) over long horizon
  - ► couldn't have mattered (with proper shrinkage).
  - ► didn't matter empirically (models fail)
- ► So what does matter? What should we prescribe?
- ► No better model – and we will teach CAPM/FFM forever.

Better Model

- We know that payoff timing matters, so differential maturity payoffs have different CCs.

- We know that taxes matters, so differential debt-financed payoffs have different CC.
  - (Our paper discusses leverage evidence.)

- Use Asset-class Based CC

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  - ► (Our paper discusses leverage evidence.)
- ► **Use Asset-class Based CC**

ABC

- Make your life easy: assign $\beta = 1$ to all equity expected rates of return and use CAPM ;-).

- Use equivalent-horizon risk-free rate.

- Predict your leverage. Don't forget about tax-shelter and prob-distress of debt.

akin to imperfect-market CC prescription.

Textbooks

- If you want to teach this, which textbook ?

    - A: None Yet.

  - Which One First?

    - OK, my own—but not yet. Will continue to cover CAPM.

    - Always **Free** — I am not serving myself here.

    - Outside U.S.: order one copy. You have my permission for your copy shop to make free copies.

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