Week 3: Outline

- Problem set (finance is an "iceberg")
- Potential project topics
- Review of readings for quiz
- Credit factor
- Private Equity

Week 3: Homework Solutions

- In Excel

Week 3: Readings on Quiz

- Week 1
  - Ang, Chaps 1-3, 4.1
- Week 2
  - Bodie Et. Al. Chaps 9-10 (CAPM and APT)
  - Ang, Chap 6: Factor theory (compliment to APT)
  - Illmanen Chaps 2-3 (Equity Risk Premium/Term Prem) <u>OR</u> Ang Chap 8-9. Note: on Ang Chap. 8, his assertion that stocks are a poor inflation hedge has not stood the test of time (he confounds real interest rate risk with inflation); you can skip section 8.4 (or read it and judge for yourself)
- Week 3
  - Illmanen Chaps 4 and 5 (you can skip 5.2): PE, Real Estate, Hedge Funds
  - Illmanen AQR (2019): a compliment to PE fundamental approach to risk premium estimation
  - Cambridge Associates, "An Introduction to LBOs": institutional / historical context on PE

Week 3: Group Projects

Team selection

- Teams can be from 1 to 3 people
- The larger the team, the greater the expectation
- Each team needs to select a correspondent
- Monday (4/14): Team correspondents should email Yuying AND myself with your topics by next. Email should include your initial thoughts on how you plan to pursue your topic (research task list). Copy other team members on the email please.
- Wed – Fri (4/16-4/18): Zoom calls to discuss research plan w/ Prof Conklin
- Wednesday (4/30): First drafts due. You will get comments back by CoB 5/2
- Tuesday (5/6): Final drafts due.

Week 3: Group Projects

Suggested topics

1. <u>Factor Theory</u>. Implement the Ross APT framework to estimate asset pricing return premia for risk factors for a specific equity sector or market (e.g., the last section of problem 3 in Problem Set 1).

2. <u>Equity Risk Premium</u>. Derive a time series estimate of the ERPB for US small-cap equities (S&P 600), US mid-cap stocks (S&P 400), a market sector (Energy stocks, Financials, Industrials…) or the Nasdaq

3. <u>Public Credit Risk Premium</u>. Work out the computation for "distance to default" for the Merton Model, and implement it for 10 US companies across the credit quality spectrum. Compare your results to the answers in Bloomberg's analytics (function DRSK), and compare this metric to S&P or Moody's bond ratings/historical default rates (function DDIS).

4. <u>Expected returns, Private Equity</u>. Derive estimates of expected returns for US Private Equity by sector (e.g., Buyout, Growth, Sector, Infrastructure) using either historical econometric measures or fundamental-based approach

5. <u>Expected returns, Private Real Estate</u>. Derive estimates of expected returns for US REITs, by sector, using a 'beta building blocks'

Week 3: Group Projects

Suggested topics

6. <u>Private Credit Risk Premium</u>. Do research on major private credit asset classes (e.g., Leveraged Loans, Direct Lending, Middle Market Lending, Leveraged Loans, Mezzanine Debt, Distressed / Special Sits, Asset-Based Lending, Real Estate Debt (CMLs), Infrastructure Debt, Private IG Debt, Specialty Finance, CLO Tranches)

7. <u>Comparative SAA.</u> Set up an optimization specification for either an Endowment/SWF, Pension or Insurance company. Then input historical returns / risk matrices, and LTCMAs from at least two other sources (e.g., JPM, BlackRock, Black Stone, etc.). Examine how the allocations change under the different assumptions and create an analysis that might be of interest to a CIO (Chief Investment Officer)

8. <u>Factor-based SAA</u>. Using methods described class, in course papers, or other methods you determine are best suited, use both historical returns and forward looking 'building blocks', to compute asset class expected returns as a function of their 'investible betas'. Compare the optimal allocations that correspond with your inputs to the optimal allocations derived in class. You may select one or multiple types of institutions (e.g., Endowments, Pension Funds, etc.) for your optimization

9. Topic of your choice (please clear with Prof Conklin for feasibility before 4/14).

Week 3: Expected Returns, Expected Risk

Merton (1974) corporate credit model:

$$V_t = S_t + B_t, 0 \leq t \leq T$$

- No dividends, no new issuance
- Uncertainty realized at time T.
- Two states of the world:
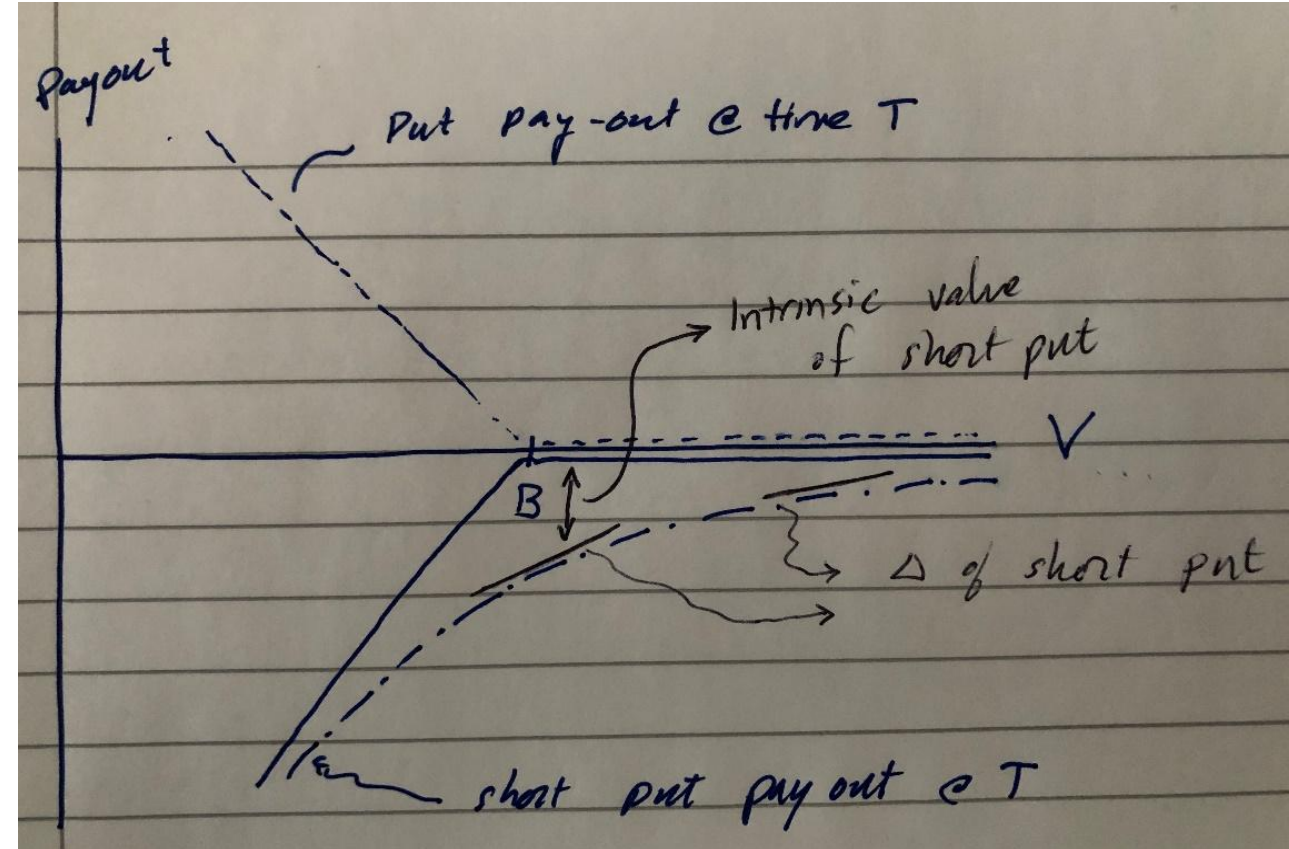
$$V_T \geq B \text{ or } V_T < B$$

State 1: $B_T = B, S_T = V_T - B$

State 2: $B_T = V_T < B, S_T = 0$

Implying:

$S_T = \max(V_T - B, 0), = a \text{ European call on } V_T \text{ struck at } B$

$B_T = \min(V_T, B) = a \text{ risk free bond minus a put on } V_T \text{ struck at } B$

Week 3: Expected Returns, Expected Risk

Merton (1974) corporate credit model:

So the return on corporate credit can be interpreted as

$$r_{cred,t} = r_{gov,t} + \delta \cdot r_{equity,t} + r_{theta,t}$$

Interpretations:

- IG is further from the strike B than HY, hence has a lower implied put option delta, less return from drift

- Corporate credit, once neutralized of its equity beta, has a positive drift with highly negative skew (-theta)

- How do we map this into a world of risk premia?

$$r_{cred,t} = r_{gov,t} + \delta \cdot r_{equity,t} + r_{theta,t} = r_{gov,t} + spread$$

$$spread = creditRiskPrem + E[default\&recoveryLoss]$$

$$corpCredRiskPrem = \delta \cdot r_{equity,t} + r_{theta,t} - E[defaultLoss]$$

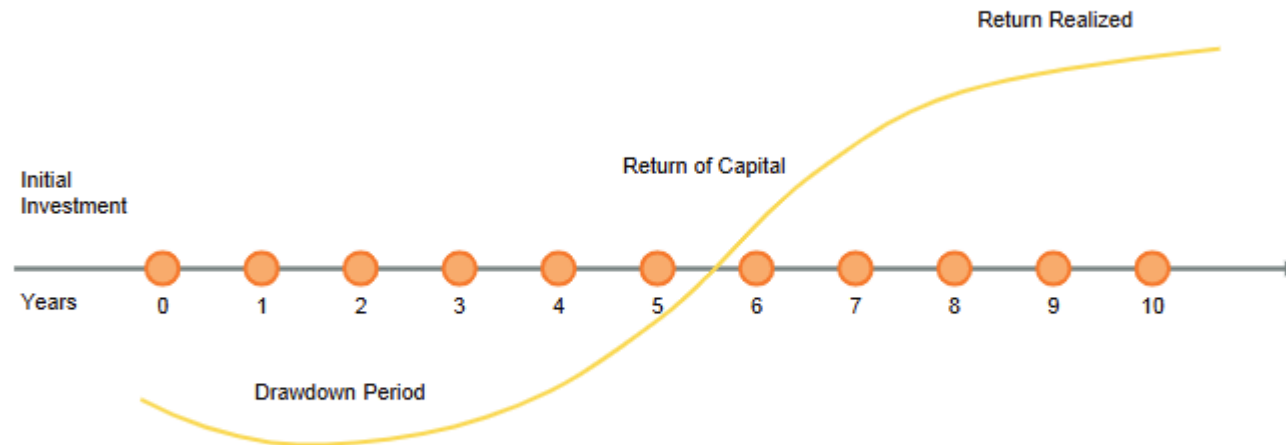# Week 3: Adding Private Assets to Public Assets

What is Private Equity?

- See Cambridge Associates article

- Companies are companies. Private Equity is not listed on an exchange while "public equity" or listed corporations, are.

- Technically, a family-owned restaurant, dry cleaner or grocery store is PE.

- Some of the largest PE firms in the world are Vitol (commodities trading), Trafigura Group (commodities trading), Schwarz (retail), Koch Industries (conglomerate) and Cargill (food and agricultural commodities). Any of these firms could easily issue shares and become public. Why don't they?

- Companies classified as Buyout PE generally have two origins: privately held companies (e.g., owned by a family) that are bought out by a private equity firm; or, public firms that are taken private

Week 3: Adding Private Assets to Public Assets

What is Private Equity?

- PE Funds pool capital commitments and pursue a variety of different strategies

- Recall: $EquityRiskPremium = \dfrac{payouts}{P} + g - r$

  Value   Growth

- Schematic of PE strategies

Private Equity 2.0 (2005–today)

Co-Investments

Buy-and-Build
Operational PE
Mezzanine
Capital Solutions
Distressed
Uncorrelated

Buy-and-Build
Sector Funds
Growth Buyouts
Growth Equity
Venture Capital

Value Oriented
(May include leverage as strategy)

Plain Vanilla
(Leverage)

Growth Oriented
(Low to no leverage)

Source: Cambridge Associates LLC.

Week 3: Adding Private Assets to Public Assets

What is Private Equity? Fund mechanics

- GP runs the Fund, LPs provide capital
- The "J-Curve"

Figure 5. Illustrative Cash Flow for a Private Investment Fund

Return Realized

Return of Capital

Initial
Investment

Years 0 1 2 3 4 5 6 7 8 9 10

Drawdown Period

Source: Cambridge Associates LLC.
Note: Illustrative cash flow is calculated from the Cambridge Associates LLC Private Investments Exposure Model, based on a
starting total pool value of $800mm and 2% pool growth rate.

Week 3: Adding Private Assets to Public Assets

Private Assets' Returns are "Smooth" Relative to Listed Assets

- PE holdings are valued by Fund management, not traded on exchanges where we can use market prices to get an unbiased valuation

- PE Fund general partners (GPs) themselves determine methodology for valuation

- Incentive for overstating valuations: capital raises for subsequent funds (1-5yr horizon)

- Incentive for honesty: eventually, all funds' IRRs and MOICs (Multiple on Invested Capital) are determined by cash flows + IPO valuation; bias will eventually be detected

- Incentive for smoothing: understate valuations in favorable environments, delay gains; delay write-downs in unfavorable environments; margin for discretion in valuations

- Smoothing results not just in lower vol, but lower correlations as well

- Appraisals, infrequent transactions also contribute to smoother apparent returns

Week 3: Adding Private Assets to Public Assets

## Private Equity Asset Valuation Methods

1. Comparables: find a public company that is similar in industry, business model, size (Sales? Earnings? EBIDTA? EV?) and use its multiple. Many practitioners do this and then apply a discount (e.g., 20%) depending on how far they estimate they are from exit (acquisition by a larger firm, IPO)

2. DCF. Again, this requires many assumptions: which definition of cash flow, what growth rates do we assume, how much cash is projected to be re-invested, how will costs grow, what IRRs do we assume? Peer firms are often used to justify these assumptions

3. Precedent Transactions: other acquisitions, IPOs of similar private firms (similar to the Comparables approach but based on transactions, not listed firms)

4. Asset-Based Valuation: Relies on traditional balance sheet accounting methods: company value = value of assets – value of liabilities. Valuations involve assumptions.

5. Book-Value: Basically relies on traditional accounting methods and assumes a Price-to-Book ratio that is estimated by establishing a peer group of public companies

Week 3: Adding Private Assets to Public Assets

Private Assets' Returns are "Smooth" Relative to Listed Assets

- Broadly, market caps in the CA PE index are comparable to the Russell 2000 (small cap) constituents

- Buyout PE firms have higher debt

- Ceteris paribus (Modigliani-Miller), you'd expect PE firms to be riskier

- But on an index return basis they have half the vol

- Intrinsically, shouldn't similar asset classes have similar Sharpe ratios?

Index	average return	vol	IR
US Public Equity -- Buyout -- Cambridge Associates	11.3%	10.1%	1.12
Russell 2000	9.1%	21.6%	0.42

PE vs. Russell 2000
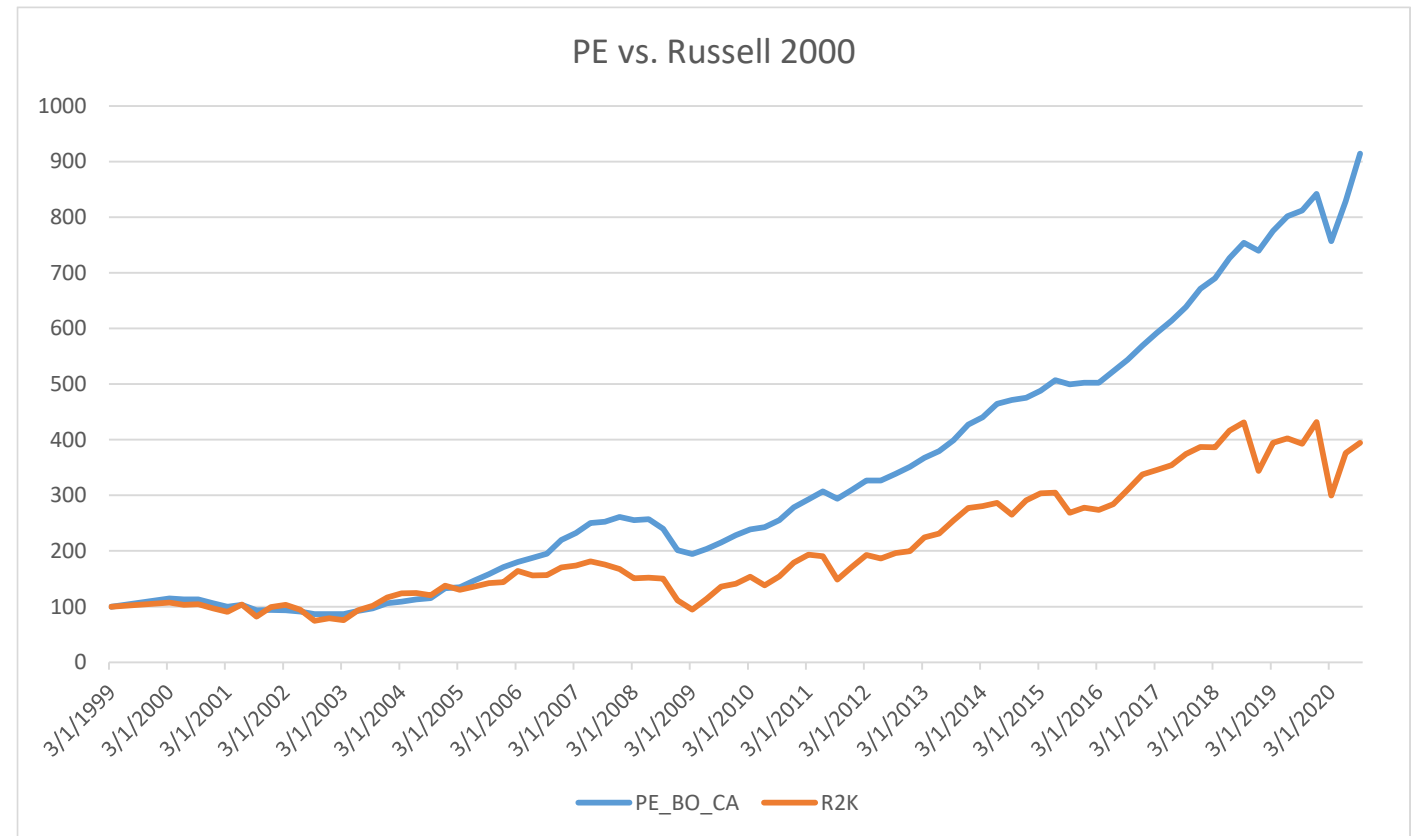
Week 3: Adding Private Assets to Public Assets

Some fundamental rationales for PE superior risk-adjusted returns

1. Listed assets suffer from excess volatility; private marks remove some of the "insanity"

2. Concentrated equity risk (simple capital structure + leverage) and smoother marks account for it

3. Agency costs: Jenson Meckling

4. Illiquidty premium

General consensus:

- Excess returns of PE are rationally priced and likely sustainable (reasons 2-4 above)

- Evaluating PE as being assets with less intrinsic risk than public corps is difficult to justify

- Smoother marks are an attractive accounting convenience for asset holders (just as holding bonds Hold-to-maturity (HTM) and holding at cost in an accounting convenience for commercial banks)