Financial Economy

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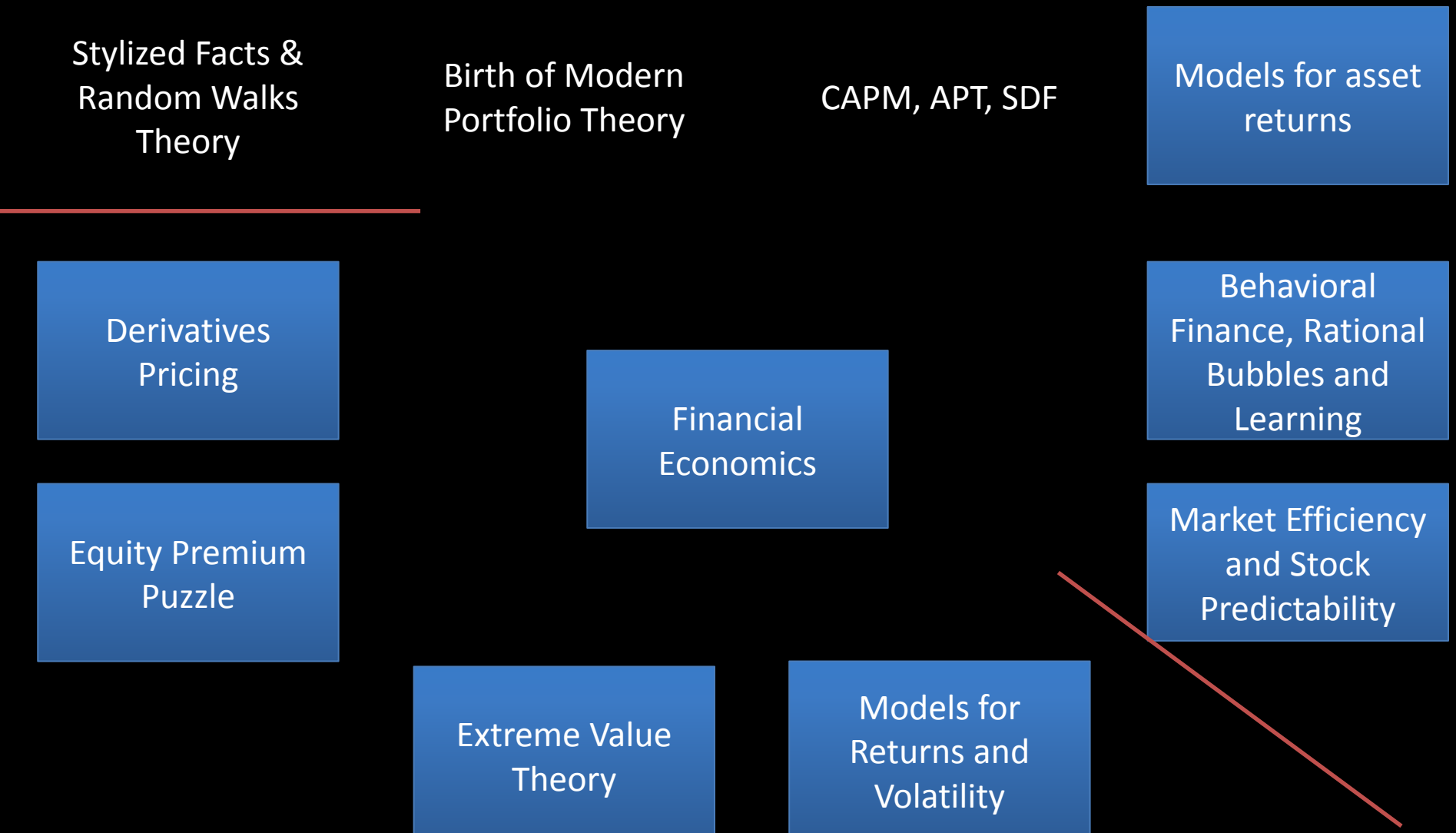
Course Logic



Buzzwords and concepts

- Asset class
- Super class
- Business cycle
- Investment style
- Active/Passive
- Long/Short
- Value strategy
- Growth strategy
- Style box
- Indexation
- Stratified sampling
- Full replication
- Index optimization
- Types of indices
- Index weighting schemes
- Equity premium puzzle
- Equity premium approach
- Gordon Growth
- Grinold-Kroner
- Beta, adjusted beta
- Zinger-Terhaar
- Pastor-Stambaugh model

The Plan

- What is asset class
- Should we add new asset class to existing asset mix?
- Business Cycle and Asset Classes Returns
- Equities: Modeling Returns and Strategies
- Debts: Strategies
- Labs:
  - Asset returns exploratory analysis (at home, 60 min)
  - Factor models for asset classes and assets returns

Asset classes: examples

- Cash and money market instruments
- Equities
- Debts
- Alternatives
  - Real Estate
  - Commodities
  - Gold
  - Hedge Funds
  - Private Equity

Super Asset Classes

- capital assets: claim on the future cash flows of an enterprise
  - provide a source of ongoing value: quoted/private equity/debts
  - may be valued based on the net present value of their expected returns
  - alternatives: hedge funds, private equity funds, credit derivatives, and corporate governance funds
- assets that are used as inputs to creating economic value
  - can be consumed as part of the production cycle and converted into another asset.
  - physical commodities: grains, metals, energy products, and livestock
  - cannot be valued using a net present value analysis
  - important diversification potential
- assets that are a store of value
  - art, wine, antiquities, books - assets that store value
  - no DCF, no transformation
  - Its value can be realized only through its sale and transfer of possession
  - no rational way to gauge whether the price of art will increase or decrease

Bonds and Equities

- Bonds and equities are dominating as investment assets
- Equities account for biggest part of world tradable securities portfolio
- That’s why we’ll focus on primarily on equities, and only then on debts
- We won’t cover alternatives: lack of time

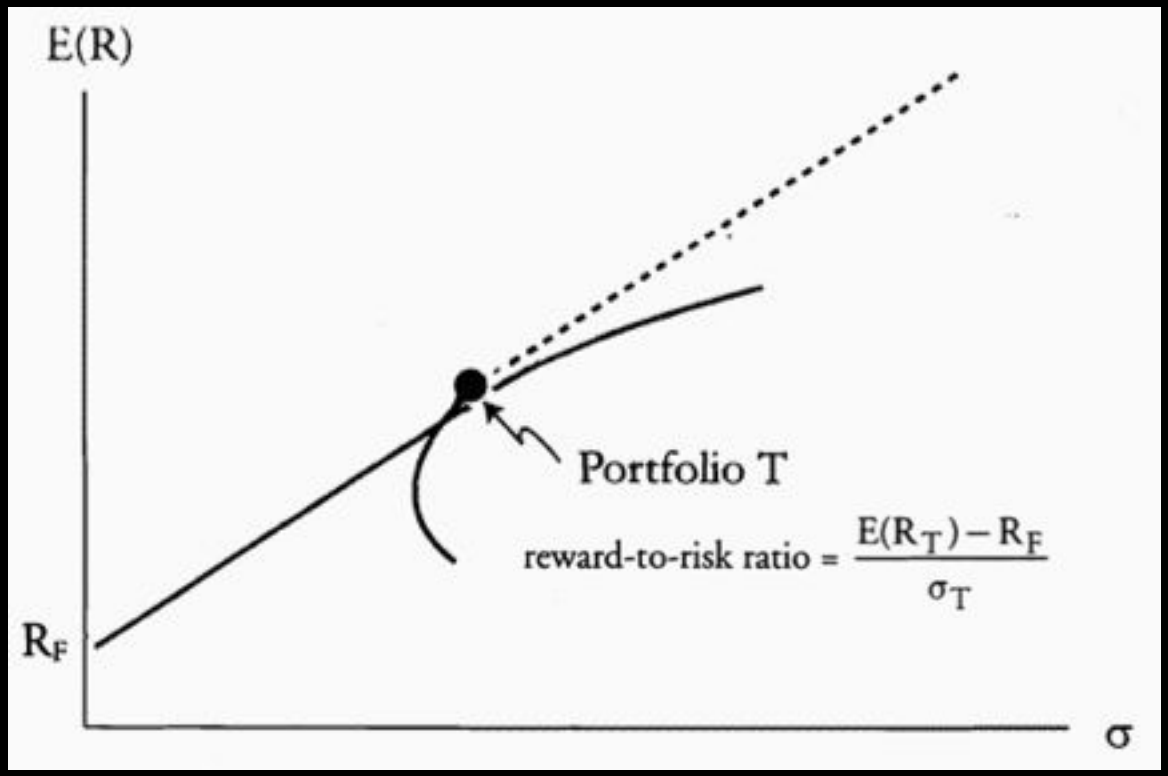
Part II.1

INCLUSION OF NEW ASSET CLASS

$$\frac{E(R_{new}) - R_F}{\sigma_{new}} > \left(\frac{E(R_p) - R_F}{\sigma_p}\right) \mathrm{Corr}(R_{new}, R_p)$$

Expression for deciding whether to include new asset class in asset mix

If this equation holds, the investor can combine the new investment with his or her prior holdings to achieve a superior efficient frontier of risky assets (one in which the tangency portfolio has a higher Sharpe ratio)



Tangency portfolio

Notice that the tangency portfolio T is optimal in the sense that it has the highest possible reward-to-risk ratio, defined as $[E(R_T) - R_F]/\sigma_T$

Part II.2

ASSET CLASSES AND BUSINESS CYCLE

Business Cycle Stage	*Description*	*Attractive Investments*
Recovery	Economy begins to recover from recession.	• Cyclical stocks • Commodities • Other risky assets
Early upswing	Consumer confidence improves; economic growth rate increases.	• Stocks • Real estate
Late upswing	Peak growth rate; also known as "boom" period.	• Bonds • Interest-sensitive stocks
Economy slows	Declining growth; interest rates fall.	• Bonds • Interest-sensitive stocks
Recession	Low point of economic growth; government eases monetary policy to stimulate growth.	• Stocks (late in cycle) • Commodities (late in cycle)

Attractive Investment Opportunities in Various Business Cycle Stages

Key variables to watch cycle

- Confidence: business, consumer
- GDP
- Inflation
- Unemployment
- Output gap
- Treasuries spread
- Central bank policy

Part II.3

EQUITIES: INTRO

Asset Class	Multiple
Inflation	11 times
Treasury bills	18 times
Treasury bonds	71 times
Corporate bonds	100 times
Large-capitalization stocks	2,658 times
Small-capitalization stocks	13,706 times

Equities generate superior returns in the long run

Wealth multipliers for US Assets and Inflation, Dec'1925-Dec'2005

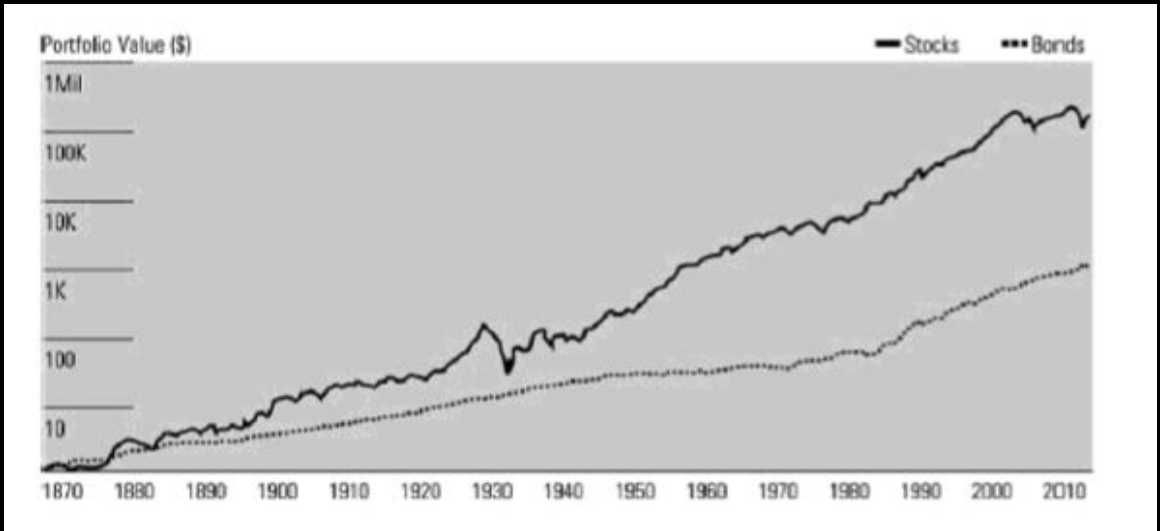
Source: Ibbotson Associates, Stocks, Bonds, Bills, and Inflation, 2006 Year Book

Asset Class	Multiple
Inflation	16 times
Treasury bills	4.8 thousand times
Treasury bonds	19.5 thousand times
Large-capitalization stocks	10.3 million times

Equities provide astonishing results in the very long run

Wealth multipliers for US Assets and Inflation, Dec'1802-Dec'2005

Source: Ibbotson Associates, Stocks, Bonds, Bills, and Inflation, 2006 Year Book, Jeremy Siegel, Stocks for the long run (New York 2002), Bloomberg



Exponential growth of $1 Invested in U.S. Stocks and Bonds on Dec. 31, 1870

Sources: Stocks: Cowles Foundation at Yale University, 1871 19'25; Morningstar (2011) 1926-2010. Stocks are all NYSE issues (1871-1925), S&P 90 (1926—February 1957), S&P 500 March 1957-Treasuly bonds, 1871-99; corporate bonds, 1900-25; Morningstar (2011) long-term Treasuly bonds, 1926-2010. For 1871-1925, yields reported in Homer (1977) were converted to total returns assuming a 20-year maturity.

Equity premium puzzle

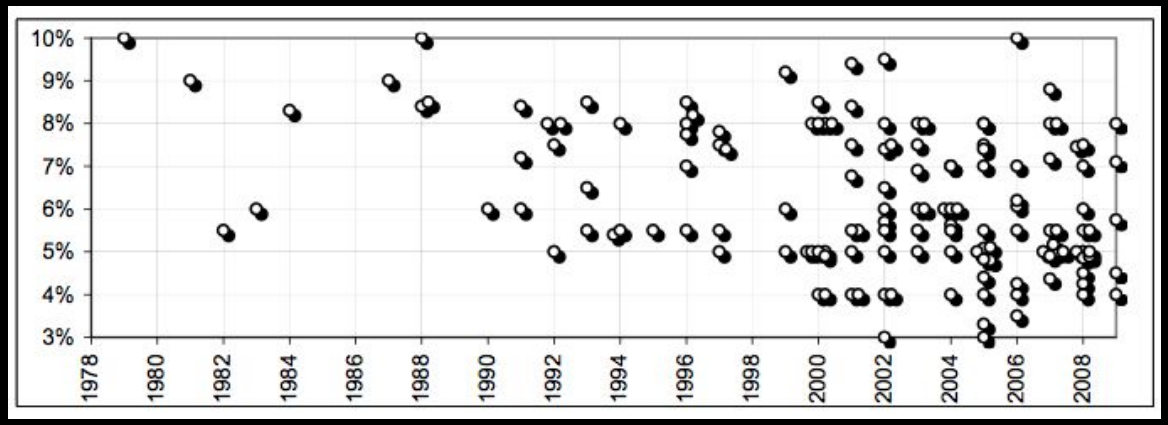
Lack of an explanation generally accepted by economists for the following situation:

- Much higher returns are achieved by stocks, but investments are still made in government bonds
- Term coined in Mehra, Prescott, 1985: in order to reconcile the much higher returns of stocks compared to government bonds in the United States, individuals must have implausibly high risk aversion according to standard economics models
- ERP implied by stock market valuations and forecasts of earnings in relation to current market value has been estimated at 3.8%
- In US = 7% per annum over last century; no premium in 1979-2009

Data set	% real return on a market index (mean)	% real return on a relatively riskless security (mean)	% equity premium (mean)
1802–1998 (Siegel)	7.0	2.9	4.1
1871–1999 (Shiller)	6.99	1.74	5.75
1889–2000 (Mehra–Prescott)	8.06	1.14	6.92
1926–2000 (Ibbotson)	8.8	0.4	8.4

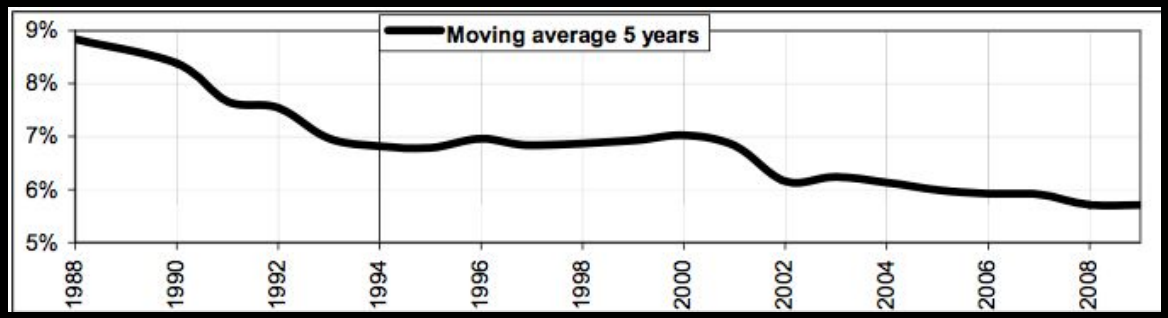
US Equity premium using different data sets

Source: Equity premium in retrospect, Mehra, Prescott, 2003



Evolution of the Required Equity Premium (REP) used or recommended in 150 finance and valuation textbooks

Source: Fernández, 2012

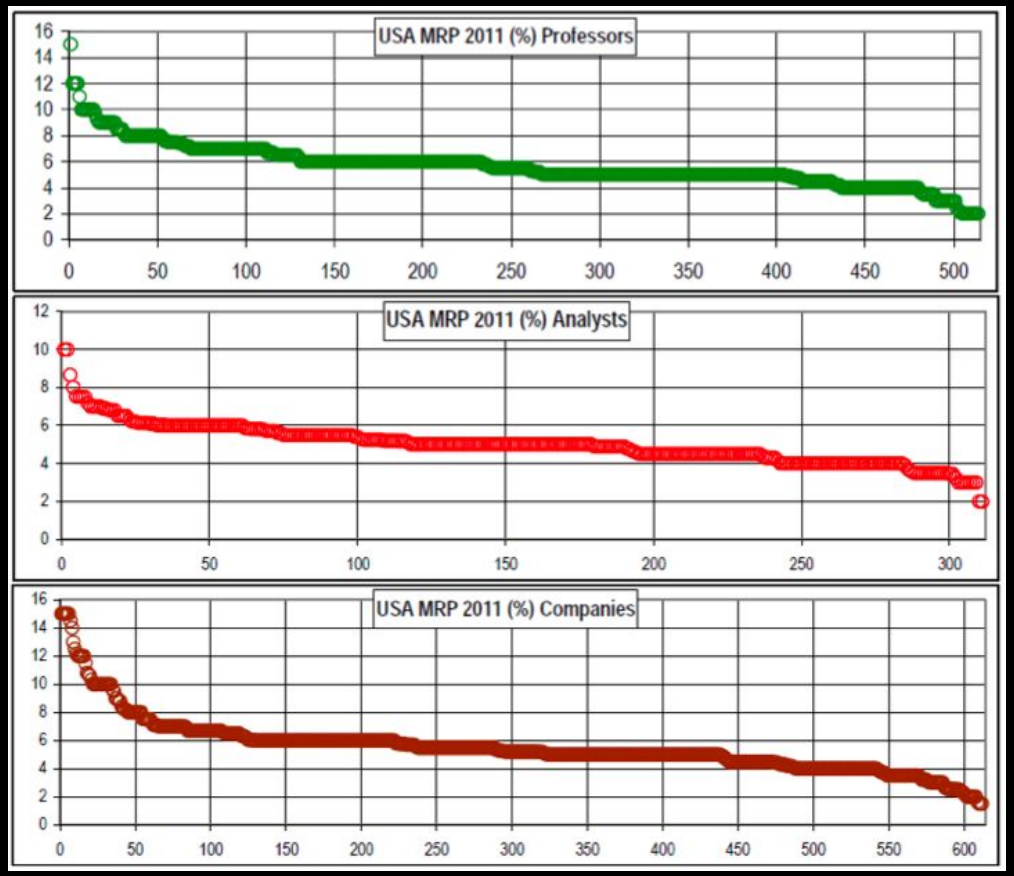


Moving average (last 5 years) of the REP used or recommended in 150 finance and valuation textbooks

Source: Fernández, 2012

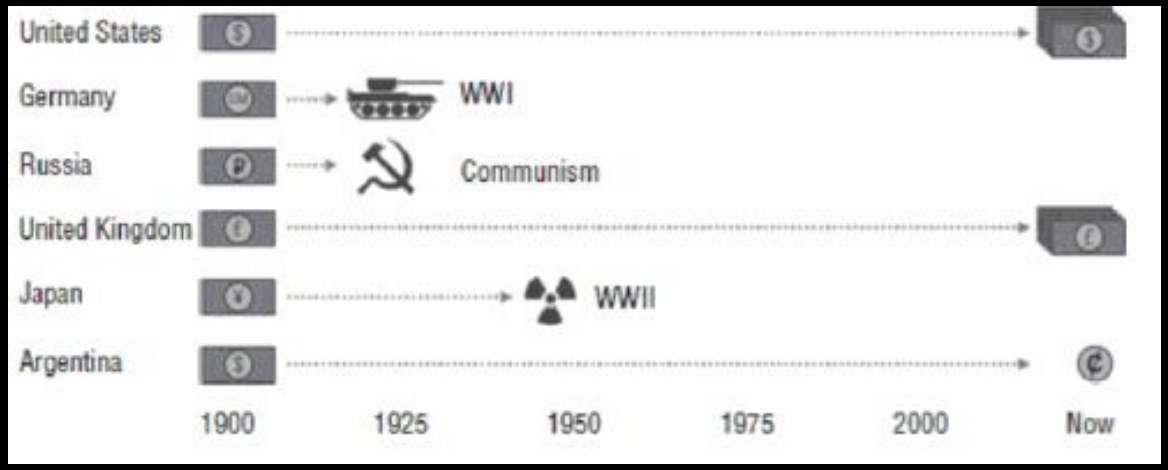
The term EP is used to designate 4 different concepts

- **Historical** equity premium (HEP): historical differential return of the stock market over treasuries.
- **Expected** equity premium (EEP): expected differential return of the stock market over treasuries.
- **Required** equity premium (REP): incremental return of a diversified portfolio (the market) over the risk-free rate required by an investor. It is used for calculating the required return to equity.
- **Implied** equity premium (IEP): the required equity premium that arises from assuming that the market price is correct.



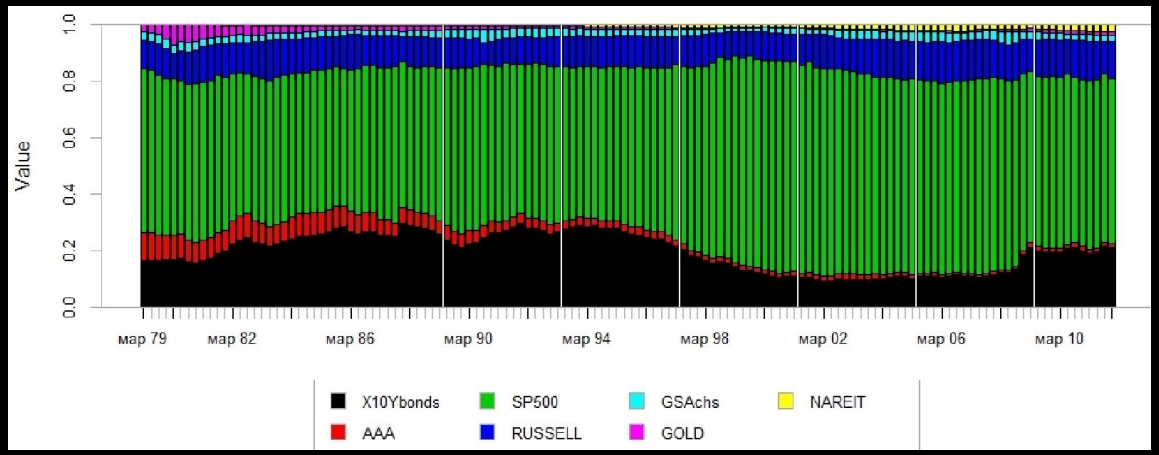
Market Risk Premium for the USA used in 2011

Source: Fernández, 2012



Are equities really profitable?

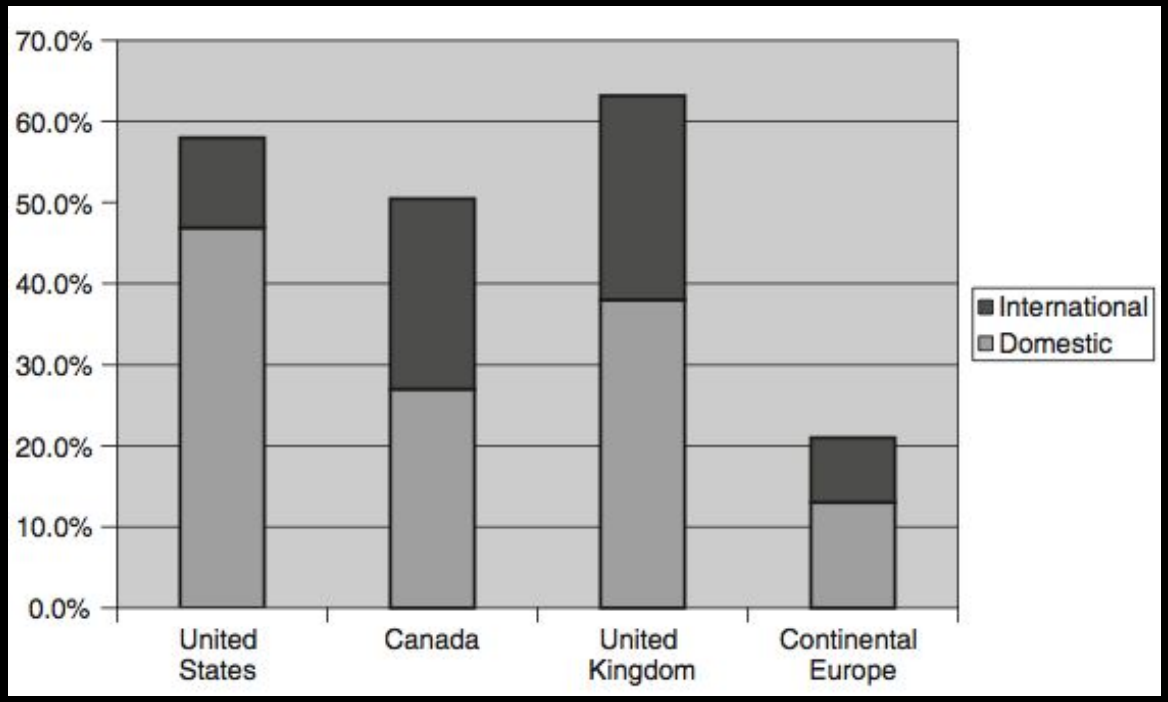
Survivorship bias: did you know in advance that UK and US would succeed?



Share of equities in market capitalization of investment universe consisting 7 major asset classes

Source: Mikaelyan (2012)

Even in spite of many controversies, equities were – and are – one of 2 major investment asset classes in the world



Equity Allocations for Institutional Investors

Source: Greenwich Associates, 2003.

For many investors hierarchy of questions when managing portfolio looks as follows

- how many of the portfolio to invest in equities
- how to distribute equities part of the portfolio

Equities as instrument in PM

- inflation hedge — an asset is IH if its returns are able to reserve purchaising power during periods of inflation
  - earnings tend to positively correlate with inflation
- companies high historical LT real rates of return
- diversification benefits
- one of the most widespread and capitalized assets in the world

Approaches to Equity Inv.

- **passive management**: after costs the return on the average actively managed dollar should be less than on passive managed
  - Indexing
  - dropped/added from/to index, SPO, buyback
- **active management** (historically — the principal way) — market offer opportunities to beat the benchmark
- **semiactive management/enhanced indexing** — markets offer opportunities to achieve a positive information ratio with limited risk relative to benchmark

Definitions

- **active return** — portfolio's return in excess of the benchmark portfolio
- **active risk** — risk relative to the portfolio benchmark
- **tracking risk** — measure of active risk, annualized StdDev of active returns
- **information rate** — efficiency with which portfolio is managed; MeanActiveR/TrackingRisk

Returns

- succesfull active manager will have expected active return of 2+%, but tracking error is likely to be 4+%; IR is 0,5 or lower;
- opposite side of spectrum is index fund: 0% active return, IR 0%.
- enhanced indexing: IR 0,5 to 2,0

Example

The table below shows the active return of an equity portfolio. Calculate the portfolio's tracking risk for the six-period time frame.

Period	Portfolio Return	Benchmark Return	Active Return
1	14.10%	13.70%	0.400%
2	8.20	8.00	0.200
3	7.80	8.00	−0.200
4	3.20	3.50	−0.300
5	2.60	2.40	0.200
6	3.30	3.00	0.300

Solution

Period	Portfolio Return	Benchmark Return	Active Return	(AR − Avg. AR)^2
1	14.10%	13.70%	0.400%	0.00090%
2	8.20	8.00	0.200	0.00010
3	7.80	8.00	−0.200	0.00090
4	3.20	3.50	−0.300	0.00160
5	2.60	2.40	0.200	0.00010
6	3.30	3.00	0.300	0.00040
Average active return per period =				0.100%
Sum of the squared deviations =				0.00400%
Tracking risk (std. dev.) =				0.28284%

Passive Equity Investing

- simple indexing
  - types of indices: price weighted, value weighted, equal weighted
  - major indices
  - problem of correct benchmark
- passive investing vehicles
  - indexed portfolios
  - ETF
  - equity index futures
  - equity total return swap

What makes a good index?

- It must provide some useful information about the market that is not already available from existing indices.
- It must use logical stock selection criteria and an intuitive weighting scheme such that the index level has some significance.
- If the goal of the index is to promote trading in related products it must be replicable.

Why make an index?

- considerable research needed, what's the benefit?
- some sell-side institutions develop indices as a part of their research product, and are compensated through commission revenue from clients in related derivatives
- Investment companies that wish to offer funds tracking the index or broker-dealers that want to use the index as the basis for derivative products must pay a licensing fee to the index provider for permission to reference the name of the index in their products

Weighting shemes

- Price-weighted
- Volume-weighted
- Cap-weighted / modified cap (MICEX)
- Free-float weighted
- Equal (dollar) – weighted / modified
- Other (ex. - share of earnings coming from China)

Types of indices

- Broad market
  - Total market
  - Cap range
- Sector indices
- Geographic
- Markets: advanced/emerging/frontier
- Exchange
- Concept based
  - Style: value/growth/core
  - Economic sensitivity: cyclical/defensive
  - Fundamental factors: Div. yield/PE ratio/etc.
  - Thematic: “green”/Shariah/etc.

Implementing an indexing strategy

- Indexed separate or pooled accounts
  - Low cost
- index mutual funds
  - widely accessible alternative with a considerable range of cost structures
- exchange-traded funds
  - structural advantages compared with mutual funds
  - permit short positions
- equity index futures
  - relatively low-cost vehicles for obtaining equity market exposure that require a rollover to maintain longer term
- equity total return swaps
  - relatively low-cost way to obtain long-term exposure to an equity market that may offer tax advantages

3 methods of indexation

- full replication
  - Every index security is held with approximately the same weight as in benchmark index
- stratified sampling
  - samples from the index from the index securities organised into representative cells
- optimization
  - Choosing a portfolio that minimizes expected tracking risk to index based on multifactor model of index risk exposures

Active Equity Investing

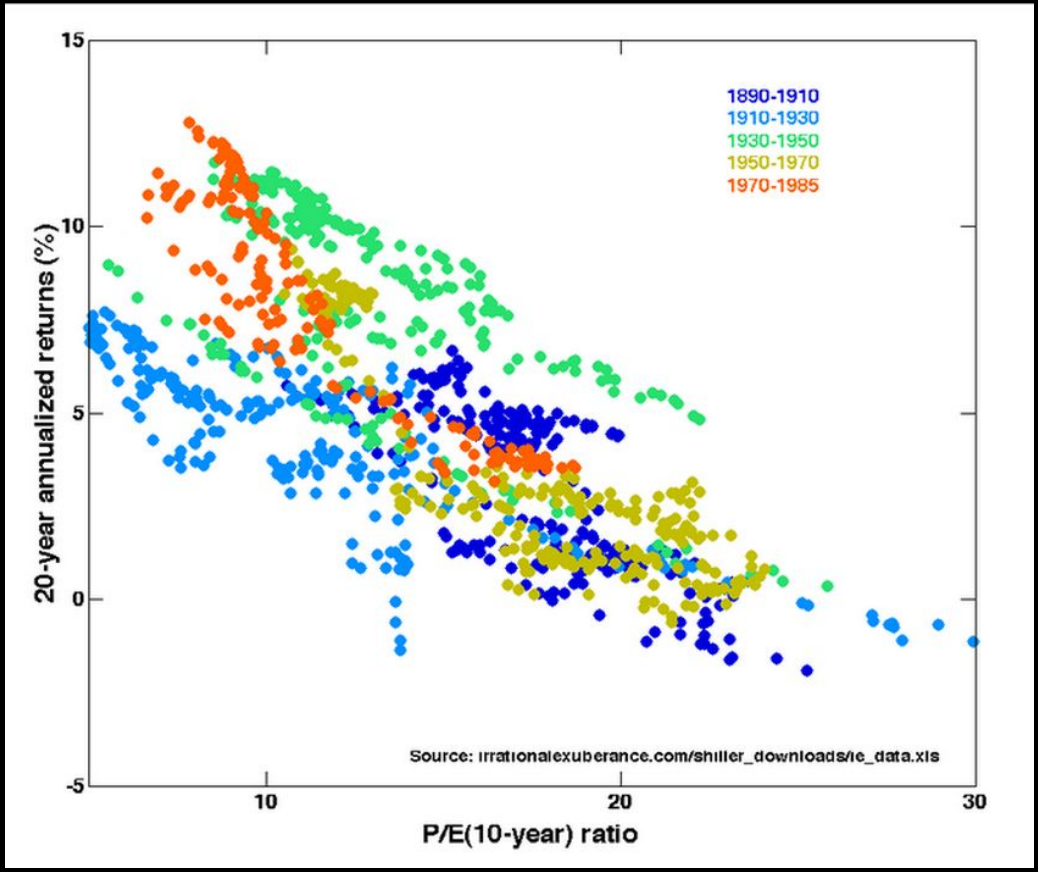
- equity styles
  - Value vs. Growth vs. Market oriented
  - Style index

Main types of active strategies

- Value,
  - value investors are more concerned about buying a stock that is deemed relatively cheap in terms of the purchase price of earnings or assets than about the company's future growth prospects.
    - low price-to-earnings ratio (P/E),
    - contrarian, and
    - high yield.
- Growth,
  - growth investors are more concerned with earnings growth.
    - consistent growth and
    - earnings momentum
- Market-oriented
- Socially responsible investing
- Long/short investing
- Sell disciplines/trading

Value investing

- buying a stock that is deemed relatively cheap in terms of the purchase price of earnings or assets than about the company's future growth prospects
- substyles: low P/E, contrarian, high yield
- misinterpretation the stock's cheapness



P/E ratios as a predictor of twenty-year returns

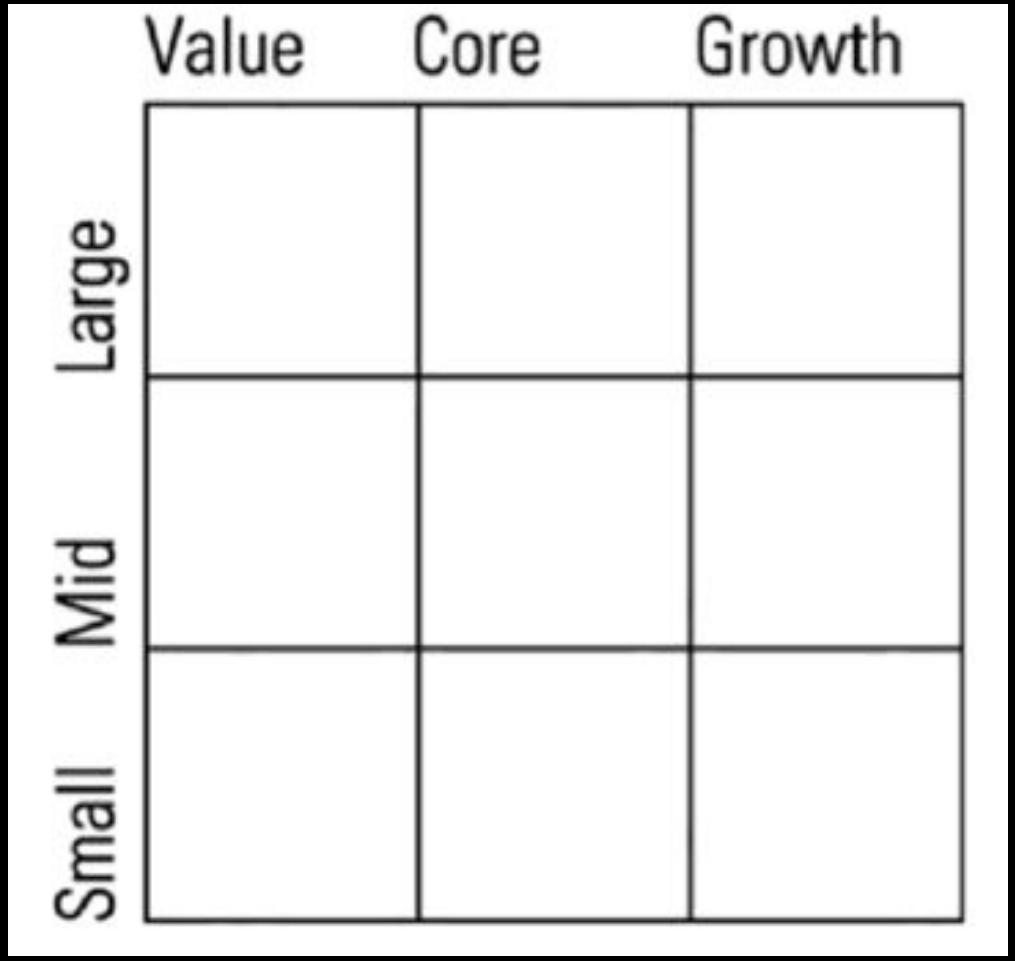
Source: Robert Shiller, Irrational Exhuberance

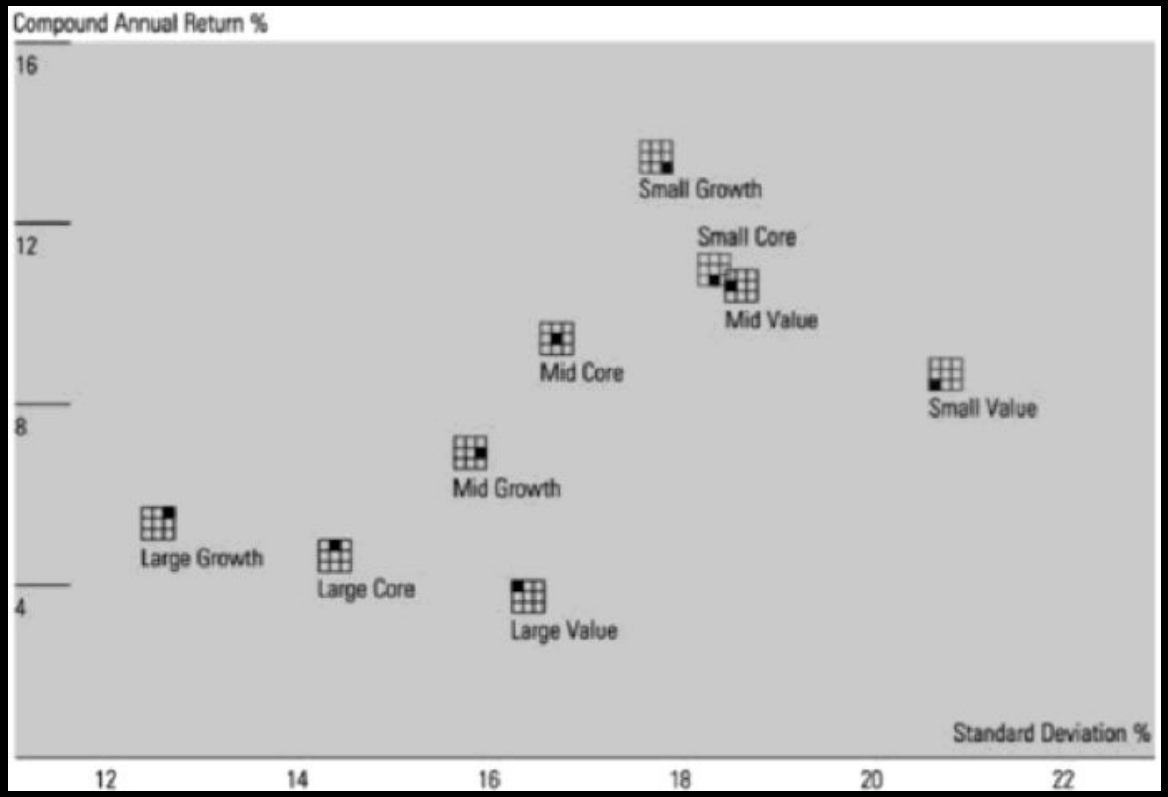
The horizontal axis shows inflation adjusted price divided by the prior ten-year mean of inflation-adjusted earnings. The vertical axis shows the geometric average real annual return on investing in the S&P Composite Stock Price Index, reinvesting dividends, and selling twenty years later.

Growth investing

- value investors are focusing on price; growth investors are focusing on earnings growth rate
- substyles: consistent growth, earnings momentum
- major risk: fwdEPS fails to materialize

Morningstar Equity Style Box





Risk/return of Morningstar style indices 2003-2010

Source: Morningstar

What's the sense in Large Core and Value?

Flaws of indexation

- Several researchers criticize fundamental indexation on both theoretical and empirical grounds
- Collared weighting (Arya, Kaplan 2008) – hybrid weighting technique: most of the portfolio is weighted by market value; only stocks with outlying valuation ratios (high and low) subject to fundamental weighting

Risks of value/growth

- The main risk for a value investor is the potential for misinterpreting a stock's cheapness;
  - it may be cheap for a very good economic reason that the investor does not fully appreciate.
- The major risk for growth investors is that the forecasted earnings per share (EPS) growth fails to materialize as expected.
  - In that event, P/E multiples may contract at the same time as EPS, amplifying the investor's losses.

Long/short strategies

- long-only strategy can capture one overall alpha.
- in long–short strategy the value added can be equal to two alphas, one from the long position and one from the short position.
- A market-neutral strategy is constructed to have an overall zero beta.
- Long–short strategies may benefit from pricing inefficiencies on the short side (a greater supply of overvalued than undervalued securities).

Part II.4

EQUITIES: RETURN MODELS

Models of equity return

- Historical Estimates
- premium approach,
- DCF,
- Gordon growth,
- Grinold-Kroner,
- Singer-Terhaar,
- Pastor-Stambaugh
- Barra model

Historical estimates: geometric mean

- focus of MVO (Markowiyz, 1952): tradeoff between StdDev and expected return
- many investors are unfamiliar with the concept of expected return as used by Markowitz and confuse it with geometric mean
- in Markowitz's investment model, the expected return is the relevant measure of investors reward
- for long-term investors, however, what matters is the long-term rate of portfolio growth, or the geometric mean
- that concepts are not related: difference between expected return and geometric mean increases with return volatility
- for bonds geometric mean is a good approximation of return volatility, for emerging equity - not

Geometric mean and StdDev

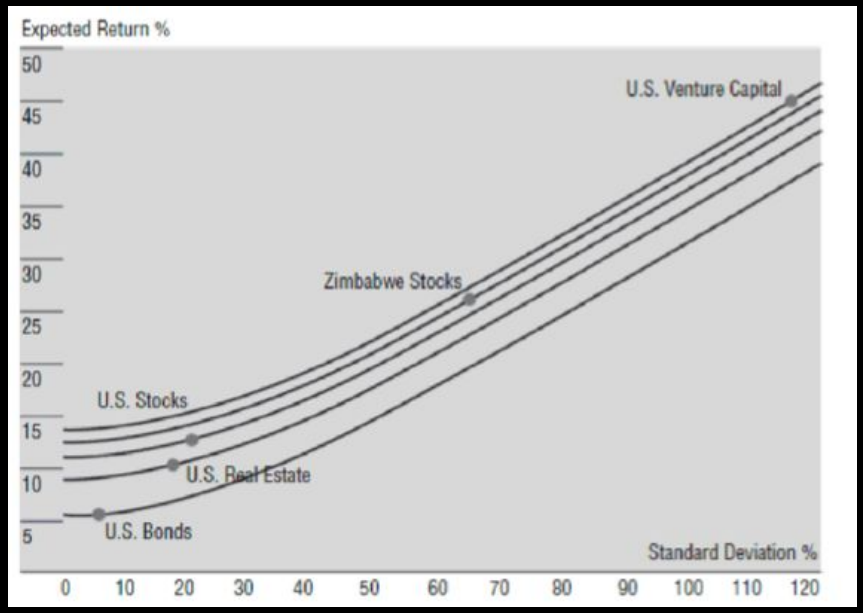
$$GM = \frac{(1 + ER)^2}{\sqrt{(1 + ER)^2 + SD^2}} - 1$$

Example

CMA for 5 asset classes

Article	Asset Class	Geometric Mean %	Expected Return %	Standard Deviation %
Kaplan (1995) Chapter 12	U.S. Stocks	10.59	12.36	20.16
Kaplan (1995) Chapter 12	U.S. Bonds	5.15	5.30	5.57
Kaplan (1995) Chapter 12	U.S. Real Estate	8.54	9.88	17.33
Clare and Kaplan (1999) Chapter 9	Zimbabwe Stocks	12.21	26.00	64.35
Chen, Baierl, and Kaplan (2002) Chapter 15	U.S Venture Capital	13.38	45.00	115.60

Isogeometric mean curves



DCF

- You all know it very well, don’t you?

Historical Premium Approach

$$E(R_e) = \text{YTM on a long-term government bond} + \text{Equity risk premium}$$

Supply-side premium

$$\text{equity risk premium} = [1+\hat{i}]\times[1+\widehat{rEg}]\times[1+\widehat{PEg}]-1+\hat{Y}-\widehat{RF}$$

where:

$\hat{i}$ = expected inflation $\hat{i}$ = (YTM of 20-year T-bonds) – (YTM of 20-year TIPS)

$\widehat{rEg}$ = expected real growth in GDP = labor productivity growth rate + labor supply growth rate

$\widehat{PEg}$ = expected changes in the P/E ratio

$\hat{Y}$ = the expected yield on the index

$\widehat{RF}$ = the expected risk-free rate

Gordon Model

$$E(R_e) = \frac{D_0(1+g)}{P_0} + g = \frac{D_1}{P_0} + g$$

D_0 = the most recent annual dividend per share
g = the long-term growth rate in dividends, assumed equal to the long-term earnings growth rate
P_0 = the current share price

Growth rate

- Expected Real GDP + expected inflation
- Sometimes: + excess corporate growth (some sectors)

Grinold-Kroner Model

- In the United States and other major markets, share repurchases have become an important means for companies to distribute cash to shareholders.

$$E(R_e) \approx \frac{D}{P} - \Delta S + i + g + \Delta PE$$

$E(R_e)$ = the expected rate of return on equity
D/P = the expected dividend yield
ΔS = the expected percent change in number of shares outstanding
i = the expected inflation rate
g = the expected real total earnings growth rate (not identical to the EPS growth rate in general, with changes in shares outstanding)
ΔPE = the per period percent change in the P/E multiple

Example

Cynthia Casey employs the Grinold–Kroner model in forecasting long-term developed market equity returns. Casey makes the following forecasts:

- A 2.25 percent dividend yield on Canadian equities, based on the S&P/TSE Composite Index.
- A repurchase yield of 1 percent for Canadian equities.
- A long-term inflation rate of 2 percent per year.
- Long-term corporate real earnings growth at 4 percent per year, based on a 1 percentage point premium for corporate growth over her expected Canadian GDP growth rate of 3.0 percent.
- An expansion rate for P/E multiples of 0.25 percent per year.

Based only on the information given, determine the expected rate of return on Canadian equities consistent with Casey's assumptions.

Solution: Using Casey's assumptions and Equation 4-6, the expected rate of return on Canadian equities should be 9.5 percent, calculated as:

$$E(R_e) \approx 2.25\% - (-1.0\%) + 2.0\% + 4.0\% + 0.25\% = 9.5\%$$

Case

An Australian investor currently holds an A$240 million equity portfolio. He is considering rebalancing the portfolio based on an assessment of the risk and return prospects facing the Australian economy. Information pertaining to the Australian investment markets and the economy has been collected in the following table:

10-Year Historical	Current	Capital Market Expectations
10-yr avg govt bond yield: 6.6%	10-yr govt bond yield: 5.6%	
Avg annual equity return: 7.3%	Year-over-year equity return: 2.6%	
Avg annual inflation rate: 2.6%	Year-over-year inflation rate: 3.3%	Expected annual inflation: 3.5%
Equity market P/E (beginning of period): 15.0	Current equity market P/E: 14.5	Expected equity market P/E: 14.0
Avg annual income return: 2.0%		Expected annual income return: 1.5%
Avg annual real earnings growth: 6.0%		Expected annual real earnings growth: 5.0%

- Historical equity risk premium is (use bond yield-equity premium approach)
  A. 0,44% B: 0,7% C. 11,3% D.13,9%
- Expected return using Grinold-Kroner model (assume no change in shares outstanding):
  A.5,80% B.6,42% C. 6,55% D. 6,75%
- Using answer from previous question, expected equity risk premium is
  A.0,95% B.0,96% C. 1,15% D.0,2%

Answer

A. The historical equity risk premium is 0.7 percent, calculated as follows:

Historical Equity Returns	–	Historical 10-Year Government Bond Yield	=	Historical Equity Risk Premium
7.3%	–	6.6%	=	0.7%

B. The Grinold–Kroner model states that the expected return on equity is the sum of the expected income return (1.5%), the expected nominal earnings growth return (8.5% = 3.5% from inflation + 5.0% from real earnings growth), and the expected repricing return (−3.45%). The expected change in market valuation of −3.45% is calculated as the percentage change in the price-to-earnings ratio (P/E) level from the current 14.5x to the expected level of 14.0x: (14–14.5)/14.5 = −3.45%.

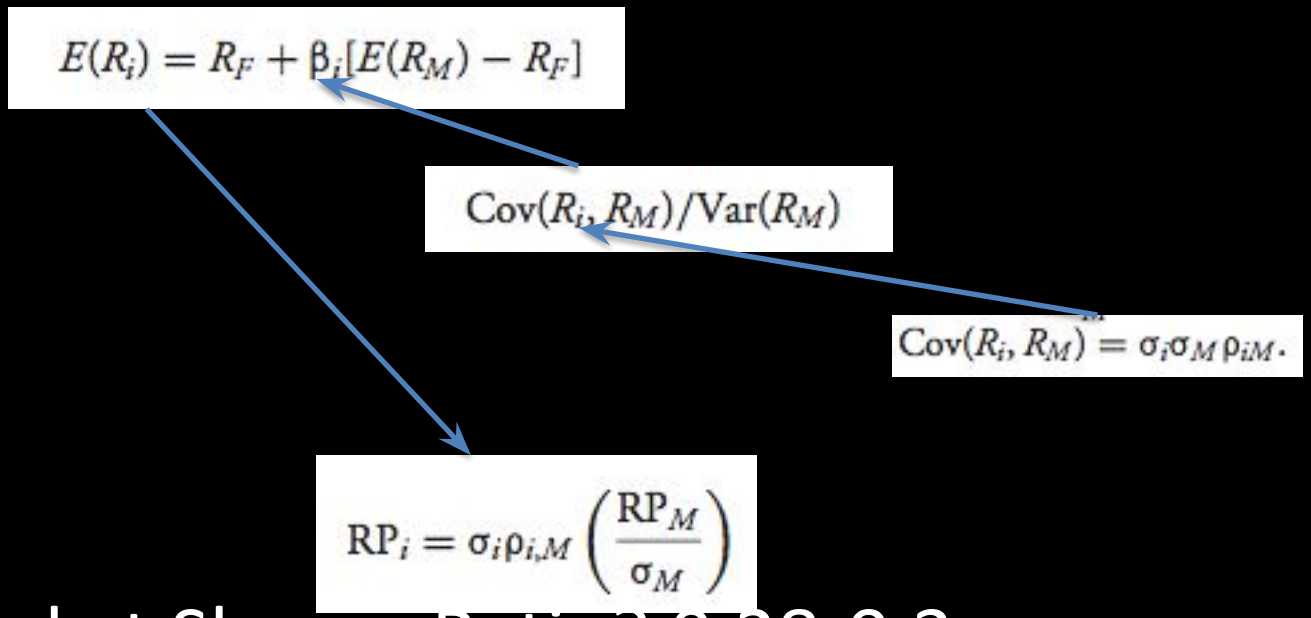
Thus, the expected return is 1.5% + 8.5% − 3.45% = 6.55%, or approximately 6.6%.

C. Using the results from Part B, the expected equity risk premium is 1.0 percent.

Expected Equity Return	–	Current 10-Year Government Bond Yield	=	Expected Equity Risk Premium
6.6%	–	5.6%	=	1.0%

Singer-Terhaar's ICAPM

- "ICAPM minus imperfections"



- Market Sharpe Ratio? 0.28-0.3

Case

- Suppose that an investor predicts that the standard deviation of Canadian bonds will be 7.0 percent per year and that their correlation with the GIM is 0.54.
- Then, with our estimate of the market Sharpe ratio (0.28), we would estimate the risk premium as

$$7\% \times 0.54 \times 0.28 = 1.06\%$$

- For Canadian equities, with a standard deviation of 17% and a 0.70 correlation with the GIM, we would estimate the equity risk premium as

$$17\% \times 0.70 \times 0.28 = 3.33\%$$

ICAPM drawbacks

- the ICAPM assumes perfect markets (markets without any frictional costs, where all assets trade in liquid markets)
- we need to add an estimated illiquidity premium to an ICAPM expected return estimate as appropriate
- illustrated risk premium estimates for Canadian bonds and equities are those that would hold if Canadian bond and equity markets were perfectly integrated with other world asset markets.
- Market segmentation/integration
- The more a market is segmented, the more it is dominated by local investors.
- When markets are segmented, two assets in different markets with identical risk characteristics may have different expected return
- If an asset in a segmented market appears undervalued to a nondomestic investor not considering barriers to capital mobility, after such barriers are considered, the investor may not actually be able to exploit the opportunity.

Adjustments to ICAPM

- Most markets lie between the extremes of perfect market integration and complete market segmentation.
- We need first to develop an estimate of the risk premium for the case of complete market segmentation.
- With such an estimate in hand, the estimate of the risk premium for the common case of partial segmentation is just a weighted average of the risk premium assuming perfect market integration and the risk premium assuming complete segmentation, where the weights reflect the analyst's view of the degree of integration of the given asset market.
- We already have premiums for complete integration case, 1,06% and 3,33%

Segmented ICAPM

- Because the individual market and the reference market portfolio are identical, $\rho_{i,M}$ in equals 1.

$$RP_i = \sigma_i \rho_{i,M} \left(\frac{RP_M}{\sigma_M} \right) \rightarrow RP_i = \sigma_i \left(\frac{RP_M}{\sigma_M} \right)$$

- In this case we assume Sharpe ratios of local market portfolio and GMP to be equal

$$17\% \times 0.28 = 4.76\% \qquad 7\% \times 0.28 = 1.96\%$$

Segmented + Integrated

- Taking the degree of integration as 0.8 for both Canadian equities and bonds, our final risk premium estimates would be as follows:

  - $RP_{CdnFI} = (0.8 \times 1.06\%) + (0.2 \times 1.96\%) = 1.24\%$
  - $RP_{Cdnequities} = (0.8 \times 3.33\%) + (0.2 \times 4.76\%) = 3.62\%$

- Thus, assuming a risk-free rate of 4 percent, we would estimate the expected returns on Canadian bonds and equities as the sum of the risk-free rate and the relevant risk premium, as follows:

  - Canadian bonds: $E(R_{CdnFI}) = 4\% + 1.24\% = 5.24\%$
  - Canadian equities: $E(R_{Cdnequities}) = 4\% + 3.62\% = 7.62\%$

Singer–Terhaar approach

- Estimate the perfectly integrated and the completely segmented risk premiums for the asset class using the ICAPM.
- Add the applicable illiquidity premium, if any, to the estimates from the prior step.
- Estimate the degree to which the asset market is perfectly integrated.
- Take a weighted average of the perfectly integrated and the completely segmented risk premiums using the estimate of market integration from the prior step.

Singer–Terhaar Approach: Case

- Zimmerman Capital Management (ZCM) is developing a strategic asset allocation for a small U.S. foundation that has approved investment in the following five asset classes: U.S. equities, U.S. fixed income, non-U.S. equities, non-U.S. fixed income, and U.S. real estate. The foundation limits nondomestic assets to no more than 12 percent of invested assets.
- The final set of expectations needed consists of the expected returns, standard deviations, and all distinct pairwise covariances of U.S. equities, U.S. fixed income, non-U.S. equities, non-U.S. fixed income, and U.S. real estate.
- The investment time horizon is 10 years.
- A risk premium approach will be taken to developing expected return estimates following the methodology of Singer and Terhaar. Historical estimates of standard deviations will be used, and ICAPM betas will be used to develop estimates of covariances.

Case II

- Exhibit below supplies the standard deviation estimates and gives relevant inputs for other quantities needed. In addition, ZCM has gathered the following facts and estimates:
  - The Sharpe ratio of the GIM is estimated to be 0.28.
  - The standard deviation of the GIM is estimated to be 7%.
  - The risk-free rate of interest is 3%.
- Equities and bonds are assumed to be 80% integrated, and U.S. real estate is assumed to be 70% integrated.

Asset Class	Standard Deviation	Correlation with GIM	Premium to Equate Sharpe Ratio at Illiquidity Horizon
U.S. equities	15.7%	0.85	0 %
U.S. fixed income	3.8	0.75	0
Non-U.S. equities	15.6	0.80	0
Non-U.S. fixed income	9.1	0.70	0
U.S. real estate	11.5	0.50	0.30

Case III

- Based on the information given, address the following problems:
- CalculatetheexpectedreturnsonU.S.equities,U.S.fixedincome,non-U.S.equi- ties, non-U.S. fixed income, and U.S. real estate. Make any needed adjustments for illiquidity.
- Show the calculation of the covariance between U.S. equities and U.S. fixed income.
- Critique the following statement: ‘‘The ZCM risk premium estimates are low, given that the foundation has a very strong home-country bias, reflected in its limitation of nondomestic assets to no more than 12 percent of the portfolio.’’

Solution - Integrated Case

$$RP_{U.S.equities} = 15.7\% \times 0.85 \times 0.28 = 3.74\%$$

$$RP_{U.S.FI} = 3.8\% \times 0.75 \times 0.28 = 0.80\%$$

$$RP_{non-U.S.equities} = 15.6\% \times 0.80 \times 0.28 = 3.49\%$$

$$RP_{non-U.S.FI} = 9.1\% \times 0.70 \times 0.28 = 1.78\%$$

$$RP_{U.S.RE} = (11.5\% \times 0.50 \times 0.28) + 0.30\% = 1.61\% + 0.30\% = 1.91\%$$

Solution – Segmented Case

$$RP_{\text{U.S.equities}} = 15.7\% \times 0.28 = 4.4\%$$

$$RP_{\text{U.S.FI}} = 3.8\% \times 0.28 = 1.06\%$$

$$RP_{\text{non-U.S.equities}} = 15.6\% \times 0.28 = 4.37\%$$

$$RP_{\text{non-U.S.FI}} = 9.1\% \times 0.28 = 2.55\%$$

$$RP_{\text{U.S.RE}} = (11.5\% \times 0.28) + 0.30\% = 3.22\% + 0.30\% = 3.52\%$$

Solution to 1

$$RP_{\text{U.S.equities}} = (0.8 \times 3.74\%) + (0.2 \times 4.4\%) = 3.87\%$$

$$RP_{\text{U.S.FI}} = (0.8 \times 0.80\%) + (0.2 \times 1.06\%) = 0.85\%$$

$$RP_{\text{non-U.S.equities}} = (0.8 \times 3.49\%) + (0.2 \times 4.37\%) = 3.67\%$$

$$RP_{\text{non-U.S.FI}} = (0.8 \times 1.78\%) + (0.2 \times 2.55\%) = 1.93\%$$

$$RP_{\text{U.S.RE}} = (0.7 \times 1.91\%) + (0.3 \times 3.52\%) = 2.39\%$$

$$E(R_{\text{U.S.equities}}) = 3\% + 3.87\% = 6.87\%$$

$$E(R_{\text{U.S.FI}}) = 3\% + 0.85\% = 3.85\%$$

$$E(R_{\text{non-U.S.equities}}) = 3\% + 3.67\% = 6.67\%$$

$$E(R_{\text{non-U.S.FI}}) = 3\% + 1.93\% = 4.93\%$$

$$E(R_{\text{U.S.RE}}) = 3\% + 2.39\% = 5.39\%$$

Solution to 2

- Based on Equation 4-3b with one factor, the covariance between any two assets in a one-beta model (such as the ICAPM) is equal to the product of each asset's beta with respect to the market times the variance of the market. The needed betas can be calculated as:

$$\beta_{U.S.equities} = (15.7\% \times 0.85)/7\% = 1.91$$

$$\beta_{U.S.FI} = (3.8\% \times 0.75)/7\% = 0.41$$

- and the covariance between U.S. equities and U.S. fixed income returns as:

$$\begin{aligned} \text{Cov}(\text{U.S.equities, U.S.FI}) &= 1.91 \times 0.41 \times (7\%)^2 \\ &= 38.37 (\text{in units of percent squared}) \end{aligned}$$

Pastor-Stambaugh

- the **Pastor-Stambaugh model** adds a liquidity factor to the Fama-French model.
- the baseline value for the liquidity factor beta is zero.
- Less liquid assets should have a positive beta, while more liquid assets should have a negative beta.

Example

An analyst estimates that stock j has a CAPM beta equal to 1.3. Stock j is a small-cap, growth stock that has traded at a low book to market in recent years. Using the Fama-French model, an analyst estimates the following betas for stock j:

$\beta_{mkt,j} = 1.2$

$\beta_{SMB,j} = 0.4$

$\beta_{HML,j} = -0.2$

Calculate the required return on equity using the CAPM and the Fama-French models:

Answer:

CAPM estimate: required return = 3.4% + (1.3 × 4.8%) = 9.64%

Fama-French model estimate: required return = 3.4% + (1.2 × 4.8%) + (0.4 × 2.4%) + (−0.2 × 1.6%) = 9.8%

Example contd.

Example: Applying the Pastor-Stambaugh model

Assume a liquidity premium of 4%, the same factor risk premiums as before, and the following sensitivities for stock k:

$\beta_{mkt,k} = 0.9$

$\beta_{SMB,k} = -0.2$

$\beta_{HML,k} = 0.2$

$\beta_{liquidity,k} = -0.1$

Calculate the cost of capital using the Pastor-Stambaugh model.

Answer:

cost of capital = $3.4\% + (0.9 \times 4.8\%) + (-0.2 \times 2.4\%) + (0.2 \times 1.6\%) + (-0.1 \times 4\%) = 7.16\%$

Adjusted betas

- when making forecasts of the equity risk premium, some analysts recommend adjusting the beta for **beta drift**.
- Beta drift refers to the observed tendency of an estimated beta to revert to a value of 1.0 over time.
- to compensate, an often-used formula to adjust the estimate of beta is:
- adjusted beta = (2/3 × regression beta) + (1/3 × 1.0)

Example

Example: Calculating adjusted beta

Assume an analyst estimates a beta equal to 0.8 using regression and historical data and adjusts the beta as described previously. Calculate the adjusted beta and use it to estimate a forward-looking required return.

Answer:

$$0.867 = (2/3 \times 0.8) + (1/3 \times 1.0)$$

Note that this adjusted beta is closer to one than the regression beta.

If the risk-free rate is 4% and the equity risk premium is 3.9%, then the required return would be:

$$7.38\% = 4\% + (3.9\% \times 0.867)$$

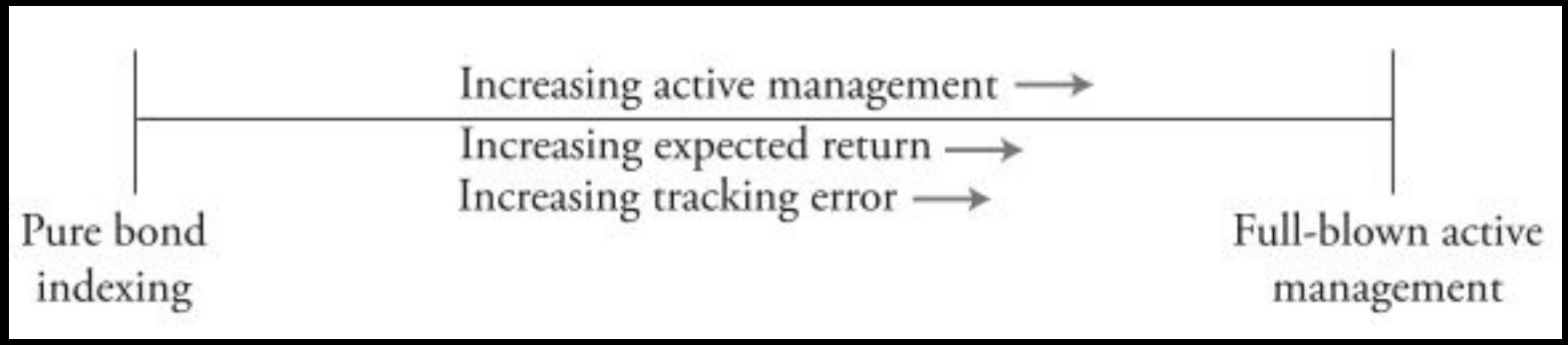
Note that the required return is higher than the 7.12% derived using the unadjusted beta. Naturally, there are other methods for adjusting beta to compensate for beta drift. Statistical services selling financial information often report both unadjusted and adjusted beta values.

Part II.5

DEBTS: INTRO AND STRATEGIES

Debts PM Strategies

- pure bond indexing,
- enhanced indexing
  - by matching primary risk factors,
  - by small risk factor mismatches,
- active management by larger risk factor mismatches,
- full-blown active management



Pure bond indexing

- objectives
  - Matching benchmark return
- Technique
  - matching the portfolio's characteristics to the benchmark's risk profile.
- Advantages
  - indexed portfolios have no research costs as to compare with actively managed portfolios
  - broadly based bond index portfolios provide excellent diversification
- disadvantages
  - liquidity issues might make it more difficult to implement
  - Implementation costs may be higher

Enhanced indexing

- **Objective**: enhancing return
- **Techniques:**
  - matching primary risk factors (sampling),
    - primary risk factors to match are the portfolio's duration, key rate duration and cash flow distribution, sector and quality percentage, sector duration contribution, quality spread duration contribution, sector/coupon/maturity weights, and issuer exposure
  - minor risk factor mismatches
    - maintaining the exposure to large risk factors (duration),
    - slightly tilting the portfolio towards other, smaller risk factors by
      - pursuing relative value strategies (undervalued sectors) or
      - identifying other return-enhancing opportunities.
    - small tilts are only intended to compensate for administrative costs.
- advantages
- disadvantages

Other techniques

As even perfectly indexed portfolio will still underperform the benchmark by the amount of transactions costs a manager can further enhance return by

- lowering managerial and transactions costs,
- issue selection,
- yield curve positioning,
- sector and quality positioning,
- call exposure positioning

Active Management by Larger Risk Factor Mismatches

- Objective: earning sufficient return to cover administrative as well as increased transactions costs without increasing the portfolio's risk exposure beyond an acceptable level.
- Techiques:
  - Difference – in degree of mismatches;
  - quality and value strategies (e.g., overweight quality sectors expected to outperform, identify undervalued securities).
  - altering the duration of the portfolio somewhat
- Pros
- Contras

Full-Blown Active

- Objectives: outperform at all costs
- Techniques: tilting, relative value, and duration strategies
- advantages
- disadvantages

Strategy	*Advantages*	*Disadvantages*
Pure bond indexing (PBI)	• Tracks the index (zero or very low tracking error) • Same risk factor exposures as the index • Low advisory and administrative fees	• Costly and difficult to implement • Lower expected return than the index
Enhanced indexing by matching primary risk factors (sampling)	• Less costly to implement • Increased expected return • Maintains exposure to the index's primary risk factors	• Increased management fees • Reduced ability to track the index (i.e., increased tracking error) • Lower expected return than the index
Enhanced indexing by small risk factor mismatches	• Same duration as index • Increased expected return • Reduced manager restrictions	• Increased risk • Increased tracking error • Increased management fees
Active management by larger risk factor mismatches	• Increased expected return • Reduced manager restrictions • Ability to tune the portfolio duration	• Increased risk • Increased tracking error • Increased management fees
Full-blown active management	• Increased expected return • Few if any manager restrictions • No limits on duration	• Increased risk • Increased tracking error • Increased management fees

Summary of bonds portfolio managing strategies

Source: Maginn et al.

Aligning Risk Exposures

- portfolio and benchmark risk profiles can be measured along several dimensions
  - duration,
  - key rate duration,
  - duration contributions,
  - spread durations,
  - sector weights,
  - distribution of cash flows,
  - diversification.

Sampling

- Sampling can be utilized to guarantee that the portfolio and benchmark are comparable
  - Stratified sampling/cell-matching – subsetting benchmark based on some list of risk factors
  - Exposure Replication (APT) – estimating risk multifactor model:
    - to use a multifactor model we must
    - determine the risk profile of the benchmark, which requires
    - measuring the index's exposure to factors including duration, key rate duration, cash flow distribution, sector and quality weights, and duration contribution, etc.