

Investment management (parts 2-3)

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COURSE OUTLINE

1. PORTFOLIO MANAGEMENT PROCESS & PERFORMANCE EVALUATION*
2. PASSIVE EQUITY INVESTING
3. ACTIVE EQUITY INVESTMENT STRATEGIES, INVESTMENT STYLES & FACTOR INVESTING*

* supported by practical assignments

PART

2

PASSIVE EQUITY INVESTING

Index definition and uses

Indices are designed to provide concise summary of the price movements of their constituents

Indices are mainly used to:

- provide a record of historical price movements, which facilitates determination of trends
- serve as benchmarks in performance measurement
- act as a basis for index tracking funds, exchange traded funds (ETFs) and index derivatives
- support portfolio management research and asset allocation decisions

Index weighting schemes

There are three index weighting schemes:

(1) Market value (capitalisation) weighting

- largest stock has the greatest influence on the index value
- example: CAC 40, FTSE 100, S&P 500, NASDAQ 100*

(2) Price weighting

- stock with highest price has the greatest influence on the index value
- example: Dow Jones Industrial Average index; Nikkei 225

(3) Equal weighting (arithmetic or geometric)

- all stocks are assigned an equal weight (unweighted indices)
- example: Russell 100 Equal Weight Index; S&P 500 Equal Weight Index; Value Line (uses geometric averages)
- difficult to replicate equal weights, so rarely used as a benchmark in index tracking

Methods of index averaging

Arithmetic vs geometric

- All indices are calculated as arithmetic averages, except unweighted indices (e.g., FT 30 and Value Line)
- As a price of a stock increases, the weights adjust automatically for the consistency with the share amount
- Although weights change, the share amounts do not and, consequently, no rebalancing is necessary
- Accordingly, arithmetic indices can be tracked exactly by owning all stocks in the index in the proportions suggested by their weights in the index

Sample exam question 5

Period	Stock X [800 shares in issue]	Stock Y [100 shares in issue]	Stock Z [100 shares in issue]	Price weighted arithmetic index	Unweighted geometric index	Value weighted arithmetic index
t_0	100p	100p	100p	100	100	100
t_1	90p	105p	120p	105	104.3	94.5
t_2	100p	0p	100p	?	?	?

Calculate the value for these indices at time t_2 . Refer to the next slide for some hints.

Example – calculations for t_1

1. Price weighted arithmetic index:

$$\frac{\sum P_{t_n}}{\sum P_{t_0}} \times \text{index base value} = \left[\frac{(90 + 105 + 120)}{(100 + 100 + 100)} \right] \times 100 = 105$$

2. Unweighted geometric index:

$$\sqrt[n]{\frac{\prod P_{t_n}}{\prod P_{t_0}}} \times \text{index base value} = \sqrt[3]{\frac{(90 \times 105 \times 120)}{(100 \times 100 \times 100)}} \times 100 = 104.3$$

Example – calculations for t_1

3. Value weighted arithmetic index:

$$\frac{\sum P_{t_n} q_{t_n}}{\sum P_{t_0} q_{t_0}} \times \text{index base value} =$$
$$= \left[\frac{(90 \times 800 + 105 \times 100 + 120 \times 100)}{(100 \times 800 + 100 \times 100 + 100 \times 100)} \right] \times 100 = 94.5$$

Equal weighted (arithmetic)

- Cumulative values of the arithmetic average of the percentage changes in price for all stocks in index.
- Equivalent to investing the same \$ amount in each stock, then rebalancing each period.
- An equal weighted (unweighted) index is biased towards the returns of smaller companies relative to a value weighted index because small companies are quite numerous.
- Constant portfolio rebalancing is needed to track such an equal weighted index.

Index averaging methods: comparison

1. Price weighted arithmetic indices (e.g., DJ)
 - ignore the number of shares in issue and favour highly priced shares
 - not representative of the real world portfolio – limited use as performance measurement benchmarks
2. Unweighted geometric indices
 - always understate the price rises and overstate the price falls of constituents relative to that of price weighted indices
 - collapse when the price of an index constituent is zero

Index averaging methods: comparison

3. Value weighted arithmetic indices

- more complex calculations and significant data requirements
- replicate the precise effect that changing share values would have on a portfolio comprising the same underlying index constituents weighted in accordance with their relative market capitalisations
- have a broad coverage of the market being represented
- Accordingly, they are the most suitable indices to assess market trends, act as performance benchmarks and provide a basis for index tracking

Free floatation

- The applicability of the market value index as a performance measurement benchmark can be compromised if the index constituents make significantly less than 100% of their issued shares available to the market but are, nonetheless, accorded a full market value index weighting
- Restricted supply of such stocks prevents a portfolio manager from holding a full weighting of the stock within their portfolio
- Price of the stock will be distorted given the need of index tracking funds to hold the stock in accordance with their index weighting
- Hence, free floatation rules were introduced to get around this problem

Dealing with the free float

CAC 40 (as of December 2020)

- Includes only top 40 Euronext companies ranked by free float market capitalisation and share turnover (no illiquid)
- Free float factors are rounded up to the next multiple of 5%.
- Factors are reviewed annually (based on the information available on the last day of August & new factors come into effect on the 3rd Friday of September).
- A weighting limit of 15% is applied to CAC 40 constituents. If the weight of a given stock exceeds this limit, it is scaled down by so-called "capping factor"

Dealing with the free float

FTSE (as of December 2020)

• Less than or equal to 5%	Ineligible
• Greater than 5% but less or equal to 15%	Actual ^(rounded)
• Greater than 15% but less or equal to 20%	20%
• Greater than 20% but less or equal to 30%	30%
• Greater than 30% but less or equal to 40%	40%
• Greater than 40% but less or equal to 50%	50%
• Greater than 50% but less or equal to 75%	75%
• Greater than 75%	100%

Main equity indices

in France

CAC 40	Top 40 Euronext stocks by free float adjusted market capitalization and turnover
CAC Large 60	Includes CAC 40 and CAC Next 20
CAC Mid 60	60 largest companies after CAC 40 & CAC Next 20
SBF 120	120 most actively traded stocks listed in Paris (combines CAC Large 60 and CAC Mid 60)
CAC Small	All eligible companies after SBF 120 index companies
CAC Mid & Small	All companies in CAC Mid 60 & CAC Small
CAC All-tradable	All eligible companies listed in Paris

Main equity indices

Examples of other major indices:

FTSE 100

100 largest companies in the UK

S&P 500

500 most widely held NYSE stocks; 70-80% of NYSE market capitalisation

Nikkei 225

Price weighted index of 225 Japanese companies representative of the market

Nikkei 300

Capitalisation-weighted index of Japanese top 300 companies

FTSE All World

3100 stocks, 47 countries, 90%-95% of investable market capitalisation

MSCI All Country
(ACWI IMI)

almost 9000 stocks across 50 developed and emerging markets (99% of global equity set)

Fundamental weighted indices

- Share prices are volatile in the short-term and consequently mislead...potentially causing misdirected capital
- To remedy this, the index components may be chosen based on fundamental criteria rather than market capitalisation
- Companies' ranks and weights are selected by firm financial data such as sales, cash flow, book value, dividend yield and net profit

How do they work?

- Stocks are reviewed using fundamental factors and not the stock price/market capitalisation
- The constituents are then weighted in the index according to the factors themselves and not their market cap

Fundamental weighted example

- FTSE Global Wealth Allocation (FTSE GWA) Index series
- FTSE GWA constructs portfolios without referring to share prices – stocks should be weighted according to their proven ability to create wealth
 - Wealth is measured by three fundamentals – net income, cash flow & book value
- Each company weight in the index is directly proportional to these three fundamentals
- The review process holds for every company in the index, but weights it according to wealth

Definition of indexing

- Index fund: portfolio of securities that replicates the returns of a selected index (aka “tracker” or “passive” funds)
- Process of investing in such a portfolio – indexing/indexation
- Index funds exist across asset classes but are predominant in equities: indexing helps achieving optimal diversification
- This strategy is supported by theoretical and empirical findings:
 - responds to the concept of the efficient market hypothesis and CAPM
 - maximises control over investment outcomes and minimises cost of investment compared to active strategies (no need for research analysts, little trading needed)
 - no outperformance* but assurance of no underperformance

Development of index funds

- In 1970 Wells Fargo Bank introduced the Stagecoach Fund
 - tracks NYSE Composite index; discontinued due to lack of interest
 - research published thereafter helped in understanding how difficult it is to outperform the market through active strategies
- In 1973, Wells Fargo introduced the fund to track more widely followed S&P 500 Index
- J. Bogle introduced one of the most popular index tracking funds Vanguard 500 Index Fund in 1976 (also tracks S&P 500)
- Increased popularity in 1990s and nowadays 20-30% of the US funds are managed passively
- Three largest pension fund managers in the UK (£800bn) are index-tracking specialists

Classic index fund

One example of a classic index fund is Vanguard 500 Index Investor (VFINX), data as of December 31, 2020:

- Inception 8/1976
- TNA \$636.9bn
- no purchase or redemption fees, min investment \$3000 (closed)
- 0.17% expense ratio (of which management fee 0.14%), 1.8% turnover
- 99.86% in 502 stocks, 0.14% in cash
- 2020 tracking error relative to S&P500: -0.15%
- 2018-20 alpha = - 0.14%, beta = 1.00, R-squared = 1.00, Sharpe = 0.71

Minimising the costs with indexing

Costs are minimised in three important ways:

- **Transaction costs:** reduction in brokerage commission by minimising necessity to transact
 - almost a “buy and hold” strategy with a very low turnover
 - need to transact only to contribute or withdraw funds, reinvest income or accommodate the changes in the benchmark index
- **Market impact** is minimised when transaction cost do occur
 - investment in securities in proportion to their actual weights on the market
 - largest investment in securities with greatest liquidity
- **Management fees:** no asset selection or market timing research involved, so management fees are low

Fist step in creating an index fund

Step 1: Selecting a benchmark

- Fund performance may be measured against the 'market' portfolio or a subset of sectors' portfolios (> 3000 to choose from)
 - pure index fund, by definition, would tend to perfectly replicate the underlying market portfolio
- Selection of appropriate benchmark is primary driven by the desired level of diversification and cost effectiveness
 - CAC 40 (large mature companies) is feasible to buy and hold with no need for particular adjustments
 - less diversified, but more cost effective
 - CAC All share (younger, smaller cap firms) is less liquid, includes more expensive stocks, more frequent revision needed
 - more diversified, but less cost effective

Customised benchmark

- Choosing the right benchmark is crucial
- With an increasing trend in global oriented investment strategies, benchmark error is magnified if an inappropriate international index is chosen as a benchmark
- Customised benchmarks are available – used in performance measurement of specific, custom-made portfolios
- These may include benchmarks based on fundamentals (e.g., P/E, dividend yield, etc) or simply (weighted) combinations of different indices

Approaches to replicating an index

Step 2: How perfect should the replication be?

- “Census” approach [full replication]
 - perfect replication; buying every stock in the index
 - stocks have same weights as in the index
- Sampling approach
 - select a subset of index optimised to track the benchmark as closely as possible
 - needed when: certain securities in the index are illiquid, or when investor is restricted by policy from owning them
 - 3 approaches: optimisation, stratified sampling and capitalisation replication
- Synthetic indexation: using derivative products on the index
 - possibility to create a synthetic index fund as an alternative to holding underlying equities that make up the index

Sampling approach: optimisation

- Use mathematical algorithms to identify a suitable sample
- The solution obtained through optimisation is the efficient frontier
- Investor's utility defines where the optimal portfolio lies
- Equalise the beta of the replicating portfolio with the beta of the benchmark
- Key issue:
 - optimisation relies on the historical estimates of expected returns, variances, and covariances; it also assumes normal distribution of returns
 - mathematics that underlies optimisation is difficult to apply to heterogeneous groups of stocks
- Not the most widely used approach for tracking a benchmark

Sampling approach: capitalisation

- Capitalisation method involves constructing a basket with fewer stocks than in the index
- Purchasing a number of top capitalisation stocks in actual weights and equally weighting the residual stock weighting in the basket
- Example: if 100 top market cap stocks selected for the basket represent 80% of the total capitalisation of the index (e.g., CAC 40 and CAC All share), then invest 80% of available funds in these stocks as per their weightings in the index; the remaining 20% is evenly proportioned among the remaining stocks

Sampling approach: stratification

- Universe of stocks is stratified using certain criteria (e.g., industry)
- Stock selection within each stratum:
 - matching the weight of the stratum in the basket portfolio as it naturally exists in the index (e.g., IT is 10% of the benchmark => invest 10% of funds in a few selected IT stocks)
 - stocks within each stratum are selected using either capitalisation ranking, valuation methods or optimisation
- Problems: no mathematical backing
- Strength: not concerned with historical data
- Appropriate for high turnover indices, since historical estimates are less relevant
- Widely used approach for benchmark replication

Initiating a fund (step 3)

- Program trading or package trading
 - refers to the purchase or sale of a diversified portfolio of stocks
- The cost of executing such a transaction should be smaller than for individual stocks as the risk of portfolio is smaller than the risk of individual stocks - informationless trade
- Investors transfer execution risk to the broker (complete package trading)
 - broker provides investor with an insurance protection option, the cost of which is negotiated with a broker
 - price protection – “best efforts” basis

Tracking Error Management (step 4)

- Index tracking objectives:
 - minimise the cost while retaining the replicating portfolio's ability to track the benchmark index
- Holding fewer stocks than in the index generates tracking error
- Tracking error represents the risk that the replicating portfolio will perform differently to the benchmark
- In statistical terms, there are two commonly used definitions of ex-post tracking error
 - tracking error as residual risk
 - tracking error as performance volatility

TE as residual risk

- Market model suggest:

$$R_{it} = \alpha_i + \beta_B R_{Bt} + \varepsilon_{it}$$

where R_i is return on the replicating portfolio i , R_B is return on the benchmark portfolio, and ε_i is the residual

- TE is then defined as:

$$\begin{aligned} TE &= \text{st.dev}(\varepsilon_{it}) \\ &= \text{st.dev}(R_{it}) \times \sqrt{1 - \text{Corr}(R_{it}, R_{Bt})^2} \end{aligned}$$

- TE is model dependant in this definition (model risk)
- Residuals and variance of residuals can easily be obtained in excel or more sophisticated statistical packages

TE as performance volatility

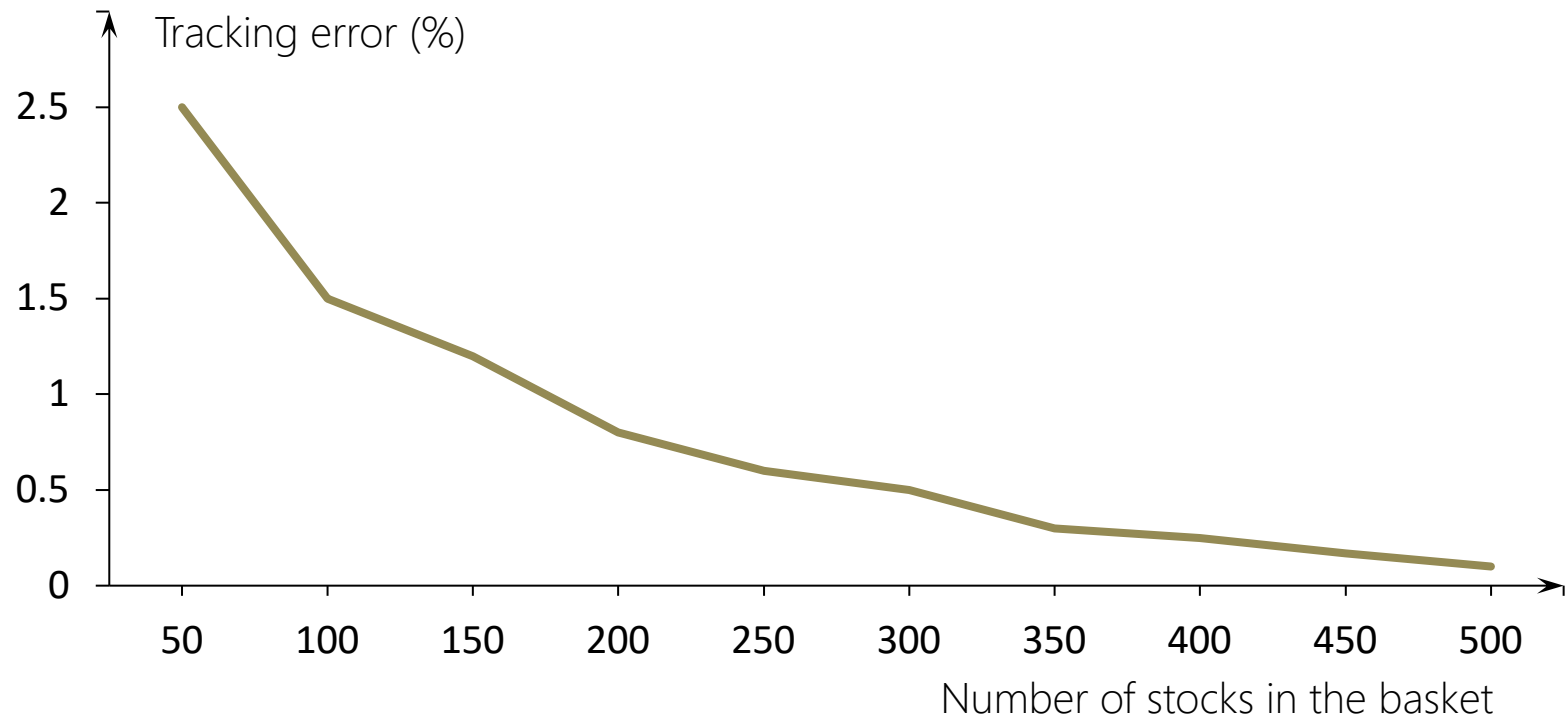
- TE is defined as the standard deviation of the difference in expected returns between the replicating portfolio and the benchmark portfolio:

$$TE = \text{st.dev}(R_{it} - R_{Bt})$$

- The size of the TE depends on benchmark volatility which cannot be controlled by investment manager
- For all portfolio betas not equal to 1, the volatility of performance is larger than residual risk, so the TE will be different

TE and size of replicating portfolio

Hypothetical replication of a benchmark consisting of 500 equities will result in the following tracking errors for different sizes of the basket portfolio:



Reasons for TEs in perfect baskets

Example shows that even when the benchmark is perfectly replicated, TE is still present. The reasons are:

- Odd-lot purchases of stocks vs round lots
 - index funds are comprised of round lots: the number of shares of each stock in the basket is rounded off to the nearest hundred from the exact number of shares indicated by basket building model. This might affect the ability of smaller baskets to track the index
- Changing composition of the benchmark index (changing weights of stocks & changing index composition)
 - hold all stocks as in the index and weights will self-adjust
 - if fewer stocks held, rebalancing is needed

Tracking error interpretation

TE statistics has some desirable properties:

- fund with a TE of 2% pa is expected to have 2/3 of its annual returns falling within -2% to +2% of the benchmark returns and 95% of its returns within -4% to 4% of the benchmark (recall the normal distribution)

Is 2% TE small or large?

- this depends on the volatility of the underlying benchmark, the type of the benchmark and the method used to construct the basket/replicating portfolio

Empirical evidence on TEs

Larsen and Resnick (1998)

- Data: US; 1981-1997 period; 200 high capitalisation (HC) and 200 low capitalisation (LC) stocks used to create value weighted and equally weighted indices
- Main conclusions:
 - indexed portfolios from HC indices have less tracking error and lower standard deviation of tracking error than indexed portfolios of LC indices
 - value weighted portfolio can be indexed more accurately than equally weighted portfolio
 - the more stocks in a tracking basket portfolio, the smaller the tracking error

Empirical evidence on TEs

Tracking error (TE)/Standard deviation of TE for all indexed portfolios

No of stocks	EQUALLY WEIGHTED		VALUE WEIGHTED	
	Stratified	Non-stratified	Stratified	Non-stratified
HIGH CAPITALISATION PORTFOLIOS				
10	1.60/1.29	1.89/1.38	1.50/1.19	1.53/1.13
20	1.40/1.11	1.47/1.08	1.37/1.01	1.22/0.95
40	1.14/0.79	1.27/0.91	1.02/0.74	1.06/0.80
80	0.78/0.64	0.82/0.65	0.75/0.57	0.71/0.56
LOW CAPITALISATION PORTFOLIOS				
10	2.50/2.07	2.59/1.85	2.43/1.90	2.42/1.75
20	1.84/1.38	1.75/1.36	1.79/1.19	1.68/1.27
40	1.51/1.24	1.44/1.04	1.42/1.10	1.43/0.99
80	1.08/0.84	1.08/0.81	1.04/0.89	1.08/0.81

Difficulties in trading the basket

- Difficult situation arises when stocks are deleted from or added to the benchmark index
- Benchmark is calculated as though the changes were made at closing prices
- However, changes are not publically announced until the market has already closed
- Accordingly, the index fund manager must trade the following day at prevailing prices which may (and most likely will) be less advantageous than the previous day's closing price – [market impact](#)

Market impact

- The price at which a basket of stocks can be bought or sold will differ substantially from the cash index price which is based on the prices at which each of the individual stocks comprising the index last traded
- To sell a basket of stocks, the seller would receive the current bid prices of the individual stocks and vice versa
- Market impact is the difference between the cash index and the cost of buying/selling a basket of stocks
 - major component of transaction costs of index funds
- Level of market impact varies over time and depends upon:
 - liquidity – better liquidity implies smaller bid/ask spread and smaller market impact
 - size of the basket – market impact increases with the size of the basket

Return enhancement strategies

There are two strategies by which the indexer can enhance the returns on the portfolio without compromising the goal of tracking the benchmark index:

- Manager can lend securities in basket portfolio to brokerage firms who need them for short-selling
- Indexer can engage in index futures arbitrage: manager can sell the basket portfolio and replace it with a position in the futures (when they are undervalued), investing the cash proceeds in money market instruments until the futures are settled – use of synthetic indexation

Synthetic indexation

- By purchasing futures contracts and Treasury bills it is possible to create a synthetic index fund that will have the same returns profile as if one was holding the stocks that make up the index (roll over the futures every 3m)
- Constraint: benchmark with available liquid futures contracts has to be chosen
- Advantages of holding long stock position rather than synthetic fund are mainly related to special corporate events such as dividend payments and special dividends
- However, the major drawbacks of holding the replicating portfolio of stocks are high initial transaction costs, market impact, custodial costs and tracking error

Synthetic fund: pros and cons

Advantages:

- low transaction costs, no tracking error, no problems due to dividend reinvestment

Disadvantages:

- **price risk** related to the fact that: (a) futures may be overpriced when purchased, or (b) futures position may have to be rolled over to the next contract (spread overpriced)
- **variation margin risk** that arises from the fact that futures are marked-to-market daily
 - futures position will outperform the index in the upmarket and vice versa
 - underhedging techniques could be used to minimise the risk of underperformance due to variation margin

Empirical evidence on synthetics

Hill and Naviwala (1999)

- Data: futures on the US S&P 500; 1992-1998 period
- Demonstrate that quarterly return tracking error is smaller than the monthly one
- Over the period of 5 years, an S&P 500 synthetic strategy has delivered returns within 0.01% of the underlying benchmark

Period	Synthetic index returns	S&P 500 returns	Difference
1992-1998	19.45%	19.51%	-0.06%
Last 5 yrs	23.12	23.13	-0.01
Last 3 yrs	31.08	31.22	-0.14

- The range of relative returns on the annual basis has been from -0.58% to +19% before transaction costs. The worst case scenario of underperformance would be between -50 to -75 bp

Link between passive & active mgmt

Purely passive “plain vanilla” index fund vs. purely active styles (market timing and stock picking)

- pure passive funds assume beta of portfolio equal to one, i.e., tracking the stock market index
- pure active funds assume constant deviation from the market portfolio in search for positive alphas

Index fund management can be extended into active to a fairly modest degree being aimed at controlling risk in the following ways (see following slides):

- tilted index funds or core-satellite approach to indexation
- exploiting different sector exposures in indices
- asset allocation model applied to the question of rebalancing

Passive & active: core-satellite

- Build a low risk, low cost core to a portfolio using index funds, while pursuing higher returns with more aggressive, satellite active funds or individual stock proportions
- It is based on the belief that only some sectors of the market (e.g., large cap equities) are efficient and they should be indexed and a proportion should be invested in a less efficient market sector
- Exposure of a portfolio to factors that are expected to outperform: P/E ratio, growth, value, momentum, etc.
- Allows the investor to place active bets in the market while retaining the diversification of the index fund
- Tilted fund is unlikely to outperform the benchmark index dramatically (usually 1 to 2 percent)

Passive & active: sector exposures

By combining a long basket/replicating portfolio with one or more short futures positions, sector exposure can be realised at a low cost and additional returns could be generated

Example:

Small Cap exposure can be achieved when holding a portfolio which tracks Russell 1000 Index (CAC All shares) and shorting the S&P 500 (CAC 40) futures contracts

Passive & active: asset allocation

- Additional cash is not added to the basket unless the expected return of the stock exceeds that of the short-term investment fund or money market instrument (MMI)
- Basically, investor holds an option to exchange one asset (MMI) for another (equity in the basket portfolio)
- The cost of having this choice is the price of the option
- Strategy may involve stock index and bonds futures for implementation of asset allocation decisions to reduce the costs of investing in actual equities and MMIs

Indexing in emerging markets

Example: Asia Pacific by [Liu \(2000\)](#)

- Passive management relies on the notion of market efficiency. BUT, are emerging markets efficient?
- Index funds have combined expense advantage and increased turnover advantage of up to 2.26% in the emerging markets
- Difficult task to persuade investors that index funds can accurately track emerging market indices and educating them about the benefits of indexation
- Hong Kong Tracker Fund is example of a reasonably well performing fund

PART

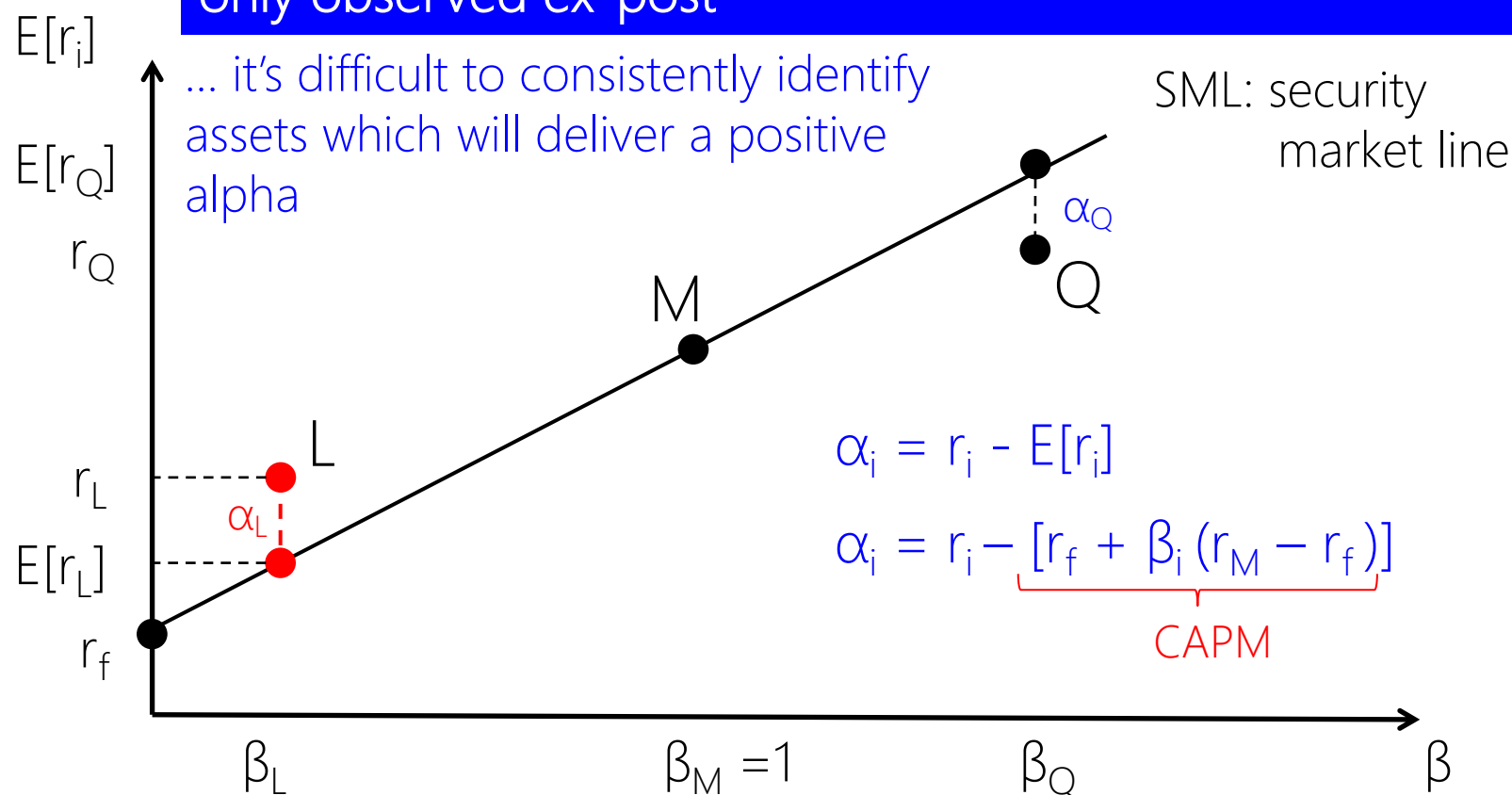
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ACTIVE EQUITY INVESTMENT STRATEGIES,
INVESTMENT STYLES & FACTOR
INVESTING*

Brief recap of CAPM and SML

Active managers chase underpriced securities - because they deliver positive **alphas**

However, alphas cannot be predicted ex-ante and are only observed ex-post



Alpha-based asset selection: S&P500

Consider the Fama-French model for the following the S&P500 stocks:

The question is what determines alphas.

	AMAZON	BEST BUY	FOREST LABS.	HARLEY-DAVIDSON	CMS ENERGY	GOODYEAR
Alpha	0.069	0.042	0.040	0.028	-0.022	-0.037
t-stats	<i>2.16</i>	<i>1.67</i>	<i>3.04</i>	<i>2.94</i>	<i>-1.69</i>	<i>-2.58</i>
MRK	2.056	2.040	0.498	1.347	1.566	1.843
t-stats	<i>2.90</i>	<i>3.63</i>	<i>1.70</i>	<i>6.35</i>	<i>5.52</i>	<i>5.79</i>
SMB	-0.876	0.288	-0.307	-0.122	-0.111	<i>0.767</i>
t-stats	<i>-1.20</i>	<i>0.50</i>	<i>-1.02</i>	<i>-0.56</i>	<i>-0.38</i>	<i>2.35</i>
HML	<i>-1.761</i>	-0.326	-0.258	0.025	<i>1.431</i>	<i>1.699</i>
t-stats	<i>-2.00</i>	<i>-0.47</i>	<i>-0.71</i>	<i>0.10</i>	<i>4.05</i>	<i>4.29</i>
R-sq	0.35	0.31	0.12	0.52	0.45	0.39

abs(t-stats)	> 1.65	> 1.96	> 2.33
Significance	Marginally significant	Significant	Very significant

Empirical findings suggest that companies' fundamentals drive alphas: SIZE; Book value – to – market value; dividend yield; growth rate.

Determinants of alphas

It has been noted that stocks and portfolios with positive alphas outperform the market. What determines positive alpha?

- empirical tests show that market-adjusted excess returns (alpha) often differ with respect to stocks' fundamental characteristics: e.g., dividend yield, size, P/E ratio, Market-to-Book ratio, sales growth, leverage, etc...

If there is a sufficient commonality in managers' investment philosophies, portfolio characteristics and subsequent returns, then such type of investing is labelled style investing

The existence of style is confirmed by the observation of consistent return patterns following from the style:

- performance of indices of stocks selected using style characteristics
- average returns of managers following a particular style

Classification of investment styles

Investment styles have emerged because of evidence that stocks with common characteristics show tendency to move together:

Value style

cheap stocks, low P/E, low market-to-book, high dividend yield stocks

Growth style

expensive stocks, consistent earnings growth & earnings momentum

Market oriented style

more diversified, market like portfolios ... value based or growth based

Small Cap style

investing in small cap companies has historically been popular with mutual funds and investment trusts

last 10 years – evidence that small companies underperform large in the US, but not in France, UK, or Global portfolio (on the value-weighted basis)

Small cap style

Invest in small capitalisation stocks, which can be defined as the smallest decile (bottom 10%) of stocks in terms of market cap

- some institutional investors may alter this definition by treating bottom 25% or 30% as small caps

Historically, small stocks outperformed, on average, large stocks but the volatility of small stocks is also larger

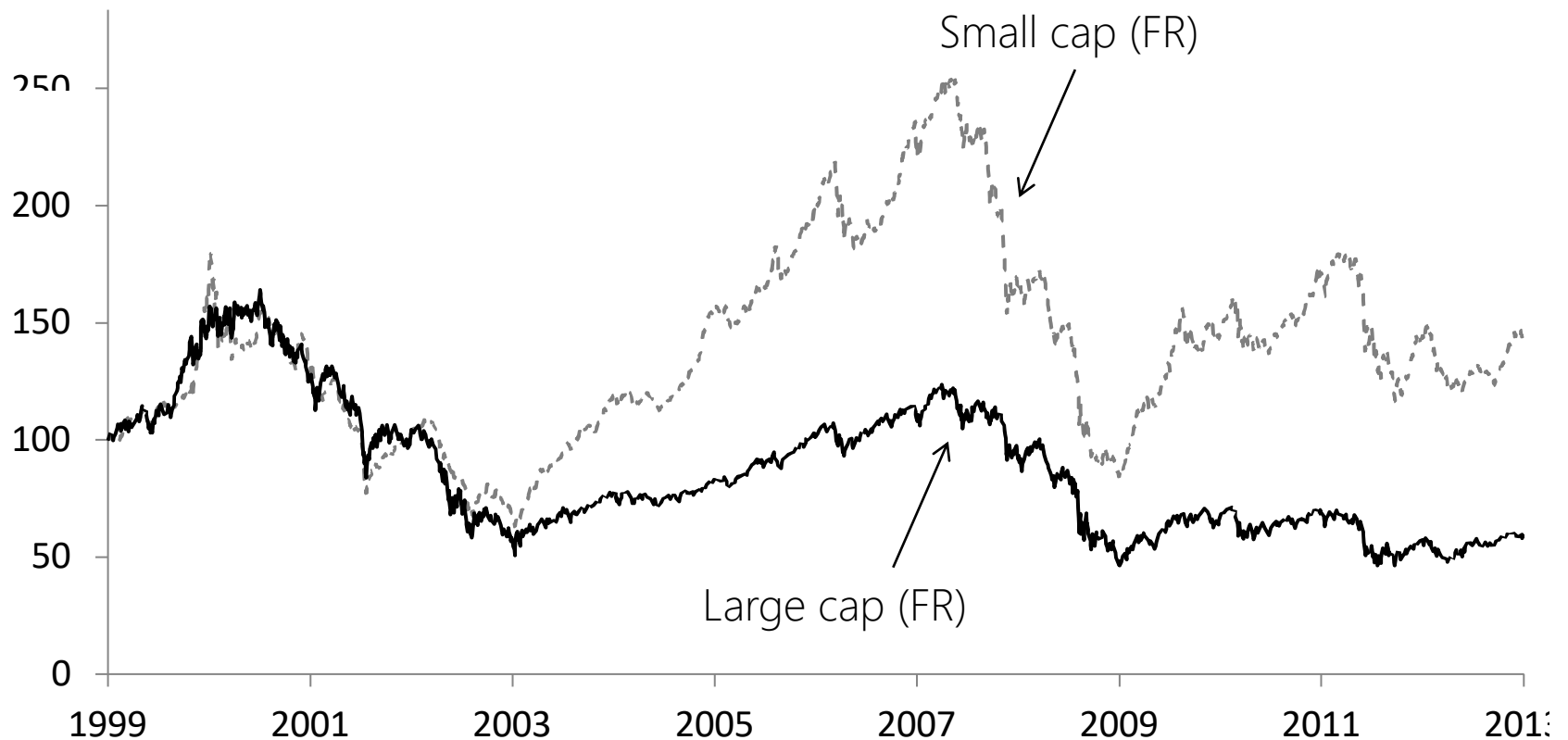
- there is evidence to suggest cyclical of this pattern: small outperform large for a number of years and *vice versa*

Explanations for this phenomenon: small cap stocks are usually low priced, neglected, low liquidity, have higher betas, and susceptible to seasonality

- no clear evidence to support the validity of these explanations; behavioural explanation works well

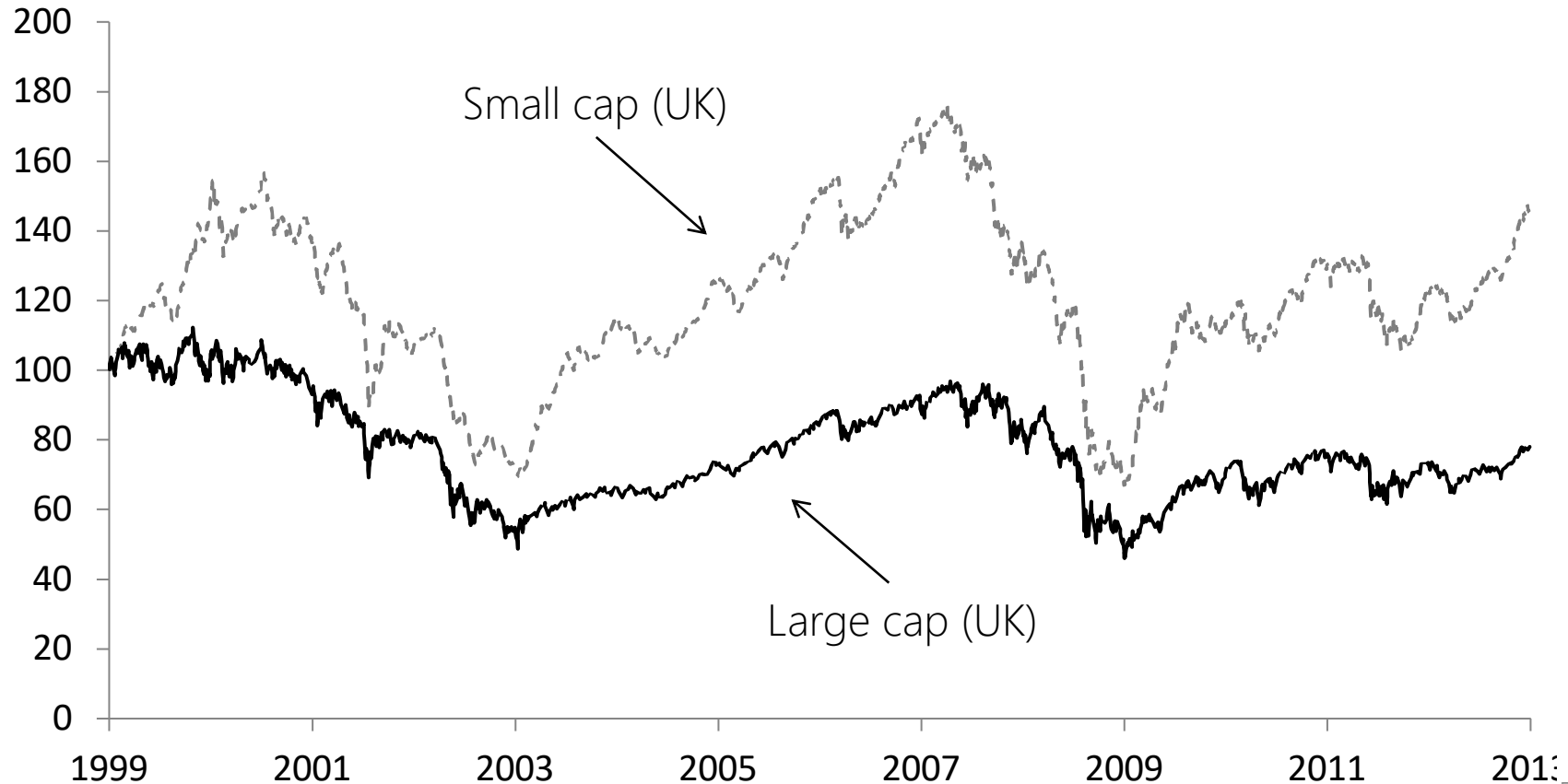
Small & Large: historical performance

Small & Large caps' performance in FRANCE, 1999-2014



Small & Large: historical performance

Small & Large caps' performance in the [UK](#), 1999-2014



Small vs. Large: January performance

Whole January

	CAC SMALL	CAC 40	FTSE SMALL	FTSE 100
1/31/2003	-4.06%	-4.11%	-5.00%	-9.46%
1/30/2004	8.40%	2.26%	5.84%	-1.93%
1/31/2005	11.72%	1.50%	4.33%	0.79%
1/31/2006	3.77%	3.58%	4.68%	1.39%
1/31/2007	5.63%	-0.17%	0.55%	-1.71%
1/31/2008	-18.86%	-12.26%	-8.57%	-8.37%
1/30/2009	2.75%	-7.58%	-3.95%	-6.42%
1/29/2010	5.40%	-5.00%	1.09%	-4.14%
1/31/2011	3.56%	2.68%	0.91%	-0.63%
1/31/2012	8.09%	2.37%	6.27%	1.96%
31/1/2013	6.51%	2.51%	6.23%	6.43%
Average	2.99%	-1.29%	1.12%	-2.01%
Compound	2.66%	-1.42%	1.01%	-2.11%

Average without 2008	5.18%	-0.20%	2.09%	-1.37%
without 2007-2009	5.42%	0.72%	3.04%	-0.70%
Long-short	4.28%		3.13%	

Small vs. Large: January performance

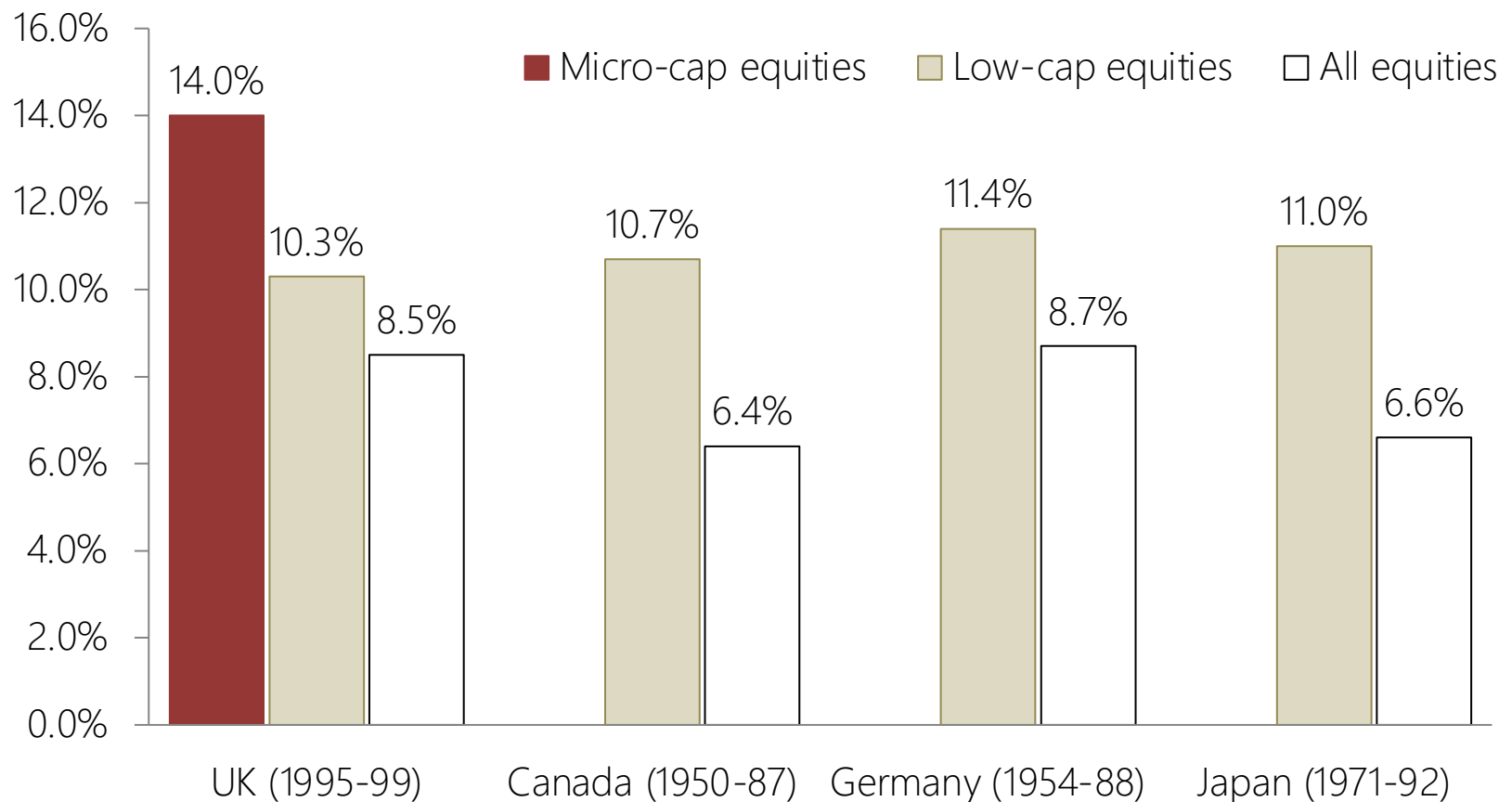
First 5 days of January

	CAC SMALL	CAC 40	FTSE SMALL	FTSE 100
1/7/2003	2.33%	3.17%	1.36%	0.43%
1/7/2004	2.51%	0.16%	1.53%	-0.09%
1/7/2005	1.37%	0.58%	0.84%	0.83%
1/6/2006	1.63%	2.36%	2.07%	2.01%
1/5/2007	2.04%	-0.44%	0.78%	-0.01%
1/7/2008	-5.63%	-2.87%	-2.26%	-1.88%
1/7/2009	7.88%	3.98%	4.71%	1.65%
1/7/2010	4.41%	2.25%	2.19%	2.10%
1/7/2011	1.59%	-0.90%	0.45%	1.43%
1/6/2012	0.02%	-2.64%	0.35%	1.39%
1/7/2013	3.41%	1.75%	3.06%	2.83%
Average	1.96%	0.67%	1.37%	0.97%
Compound	1.91%	0.65%	1.36%	0.96%

Average without 2008	2.64%	0.95%	1.59%	1.08%
without 2007-2009	2.16%	0.84%	1.48%	1.37%

Size anomaly: international evidence

Mean returns. Source: Dimson and Marsh (2001)



Value style (low P/E and high DY)

Value investors are interested in the price component of P/E ratio. They buy at low Price relative to company Earnings, expecting that the price will rise during the investment horizon resulting in profits

- approach based on low market valuation of stocks at the time of distress for a company – contrarian approach

Value investors are short-term investors, with high income (dividend yield) expectations

Historically, value stocks have outperformed growth stocks (not in the US)

Some explanations for such market anomaly:

- higher risk associated with low P/E ratio stocks → greater returns
- explained by another anomaly: e.g., most value stocks are small size
- examples: utilities, banking sector, cyclical stocks

Growth style (high P/E and low DY)

Growth style is more pragmatic and less clear defined than value

Growth investors are interested in the earnings component of P/E

- Consistent growth strategy: investing in stocks that have consistent earnings growth rate, and are usually reasonably priced
- Earnings momentum strategy: investing in companies that have recently experienced large increase in earnings growth – aggressive approach to growth investing
- Investors are expecting the company will increase earnings in the future, which will be reflected in higher price and returns

Growth investors are long-term investors, expecting no or low income (dividend yield) and high growth of the company

Examples: technology, IT, pharmaceutical sectors

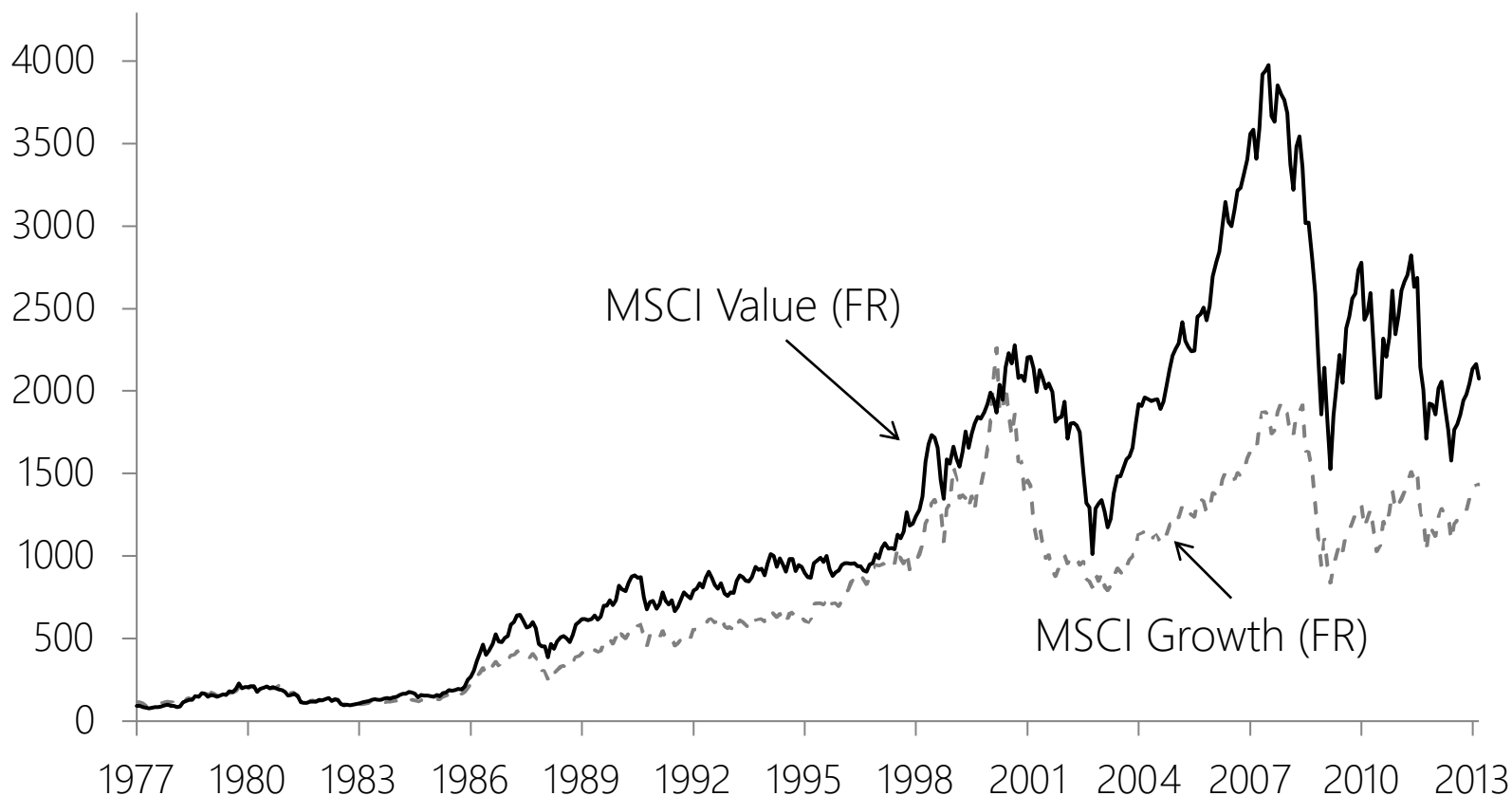
Value vs Growth styles

Appear to be mutually exclusive because investors have different risk profile and different strategy – but there is an overlap:

- A few growth managers would claim they buy expensive stocks and many value managers will include in their portfolio a cheap stock with good growth prospects
- Only in their extreme forms these styles are at the opposite end of investment spectrum
- Large number of stocks on the market exhibit both value and growth characteristics over time

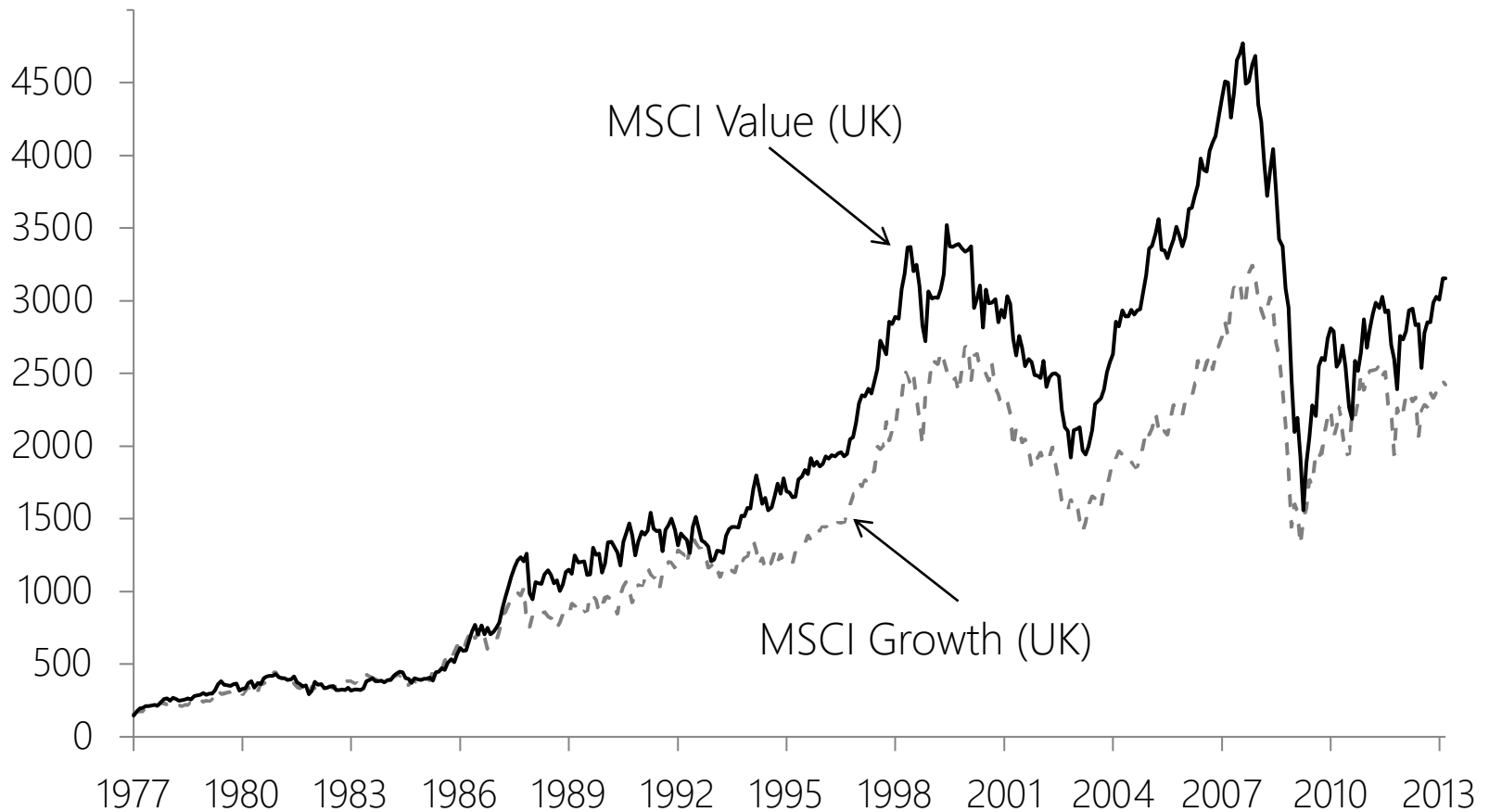
Value & Growth: historical performance

Value & Growth performance in [FRANCE](#), 1977-2013



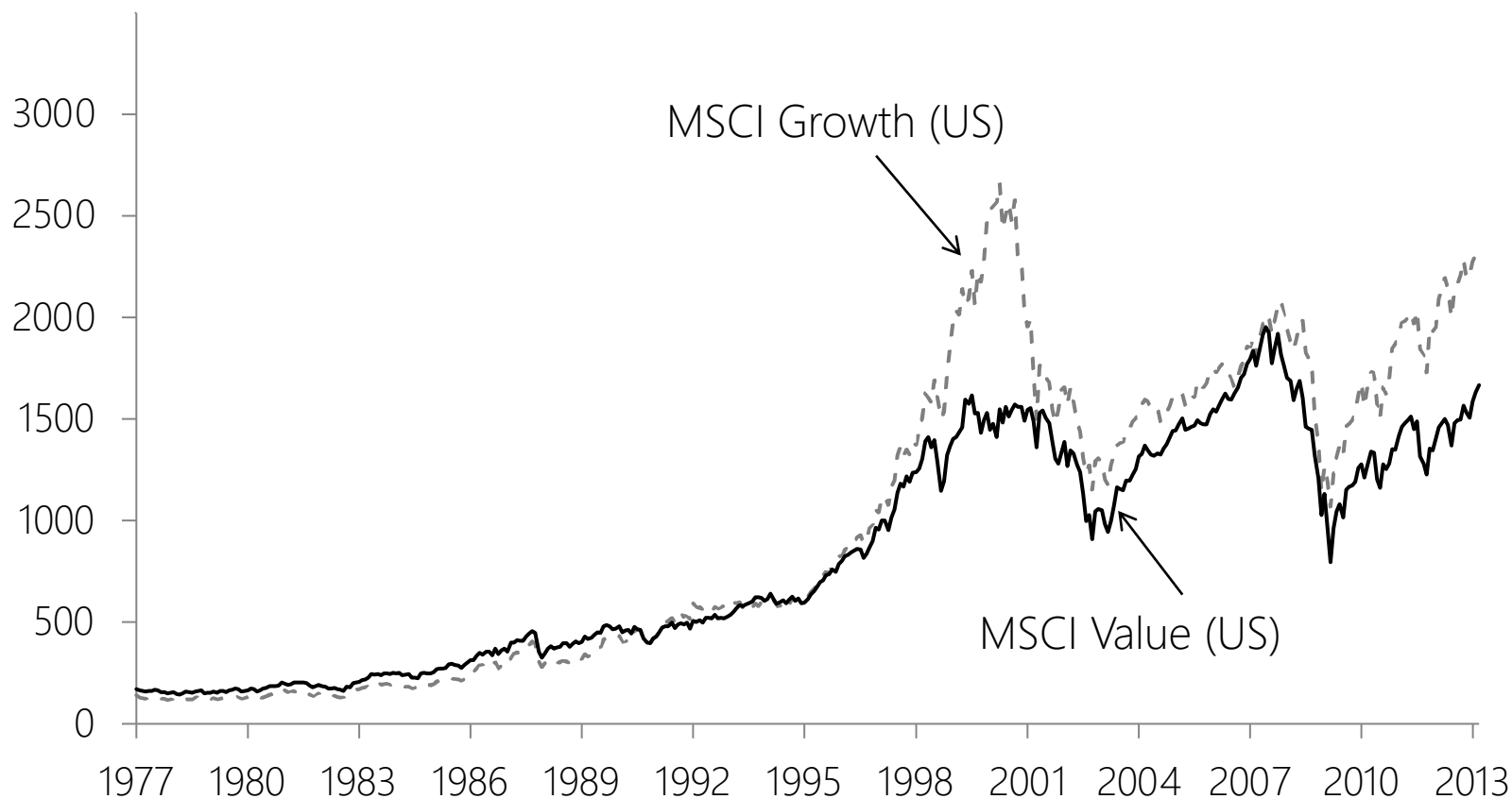
Value & Growth: historical performance

Value & Growth performance in the UK, 1977-2013



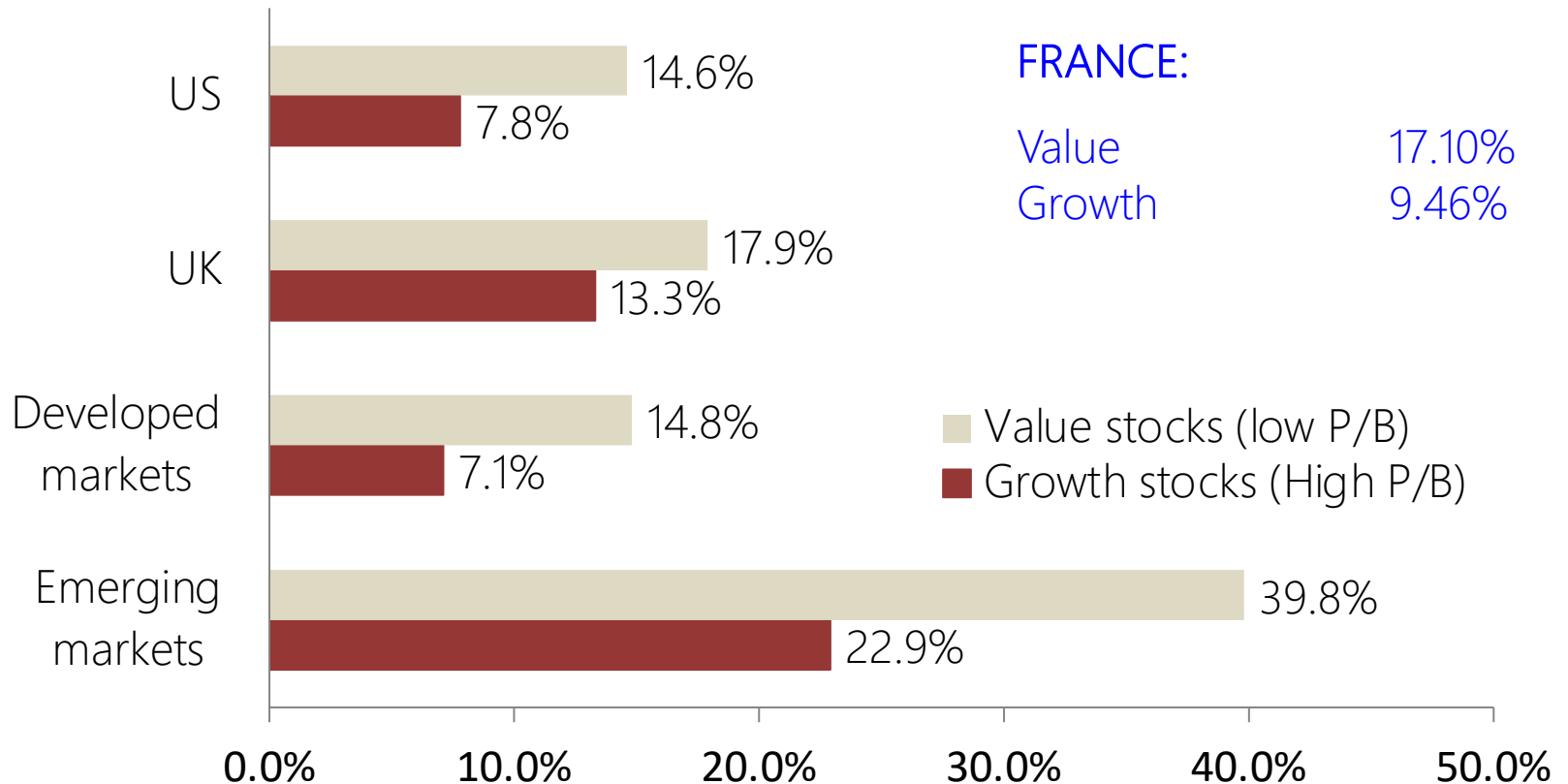
Value & Growth: historical performance

Value & Growth performance in the [US](#), 1977-2013



Value anomaly: international evidence

Average excess return. Source: Fama and French (1998)



Value premium explanation

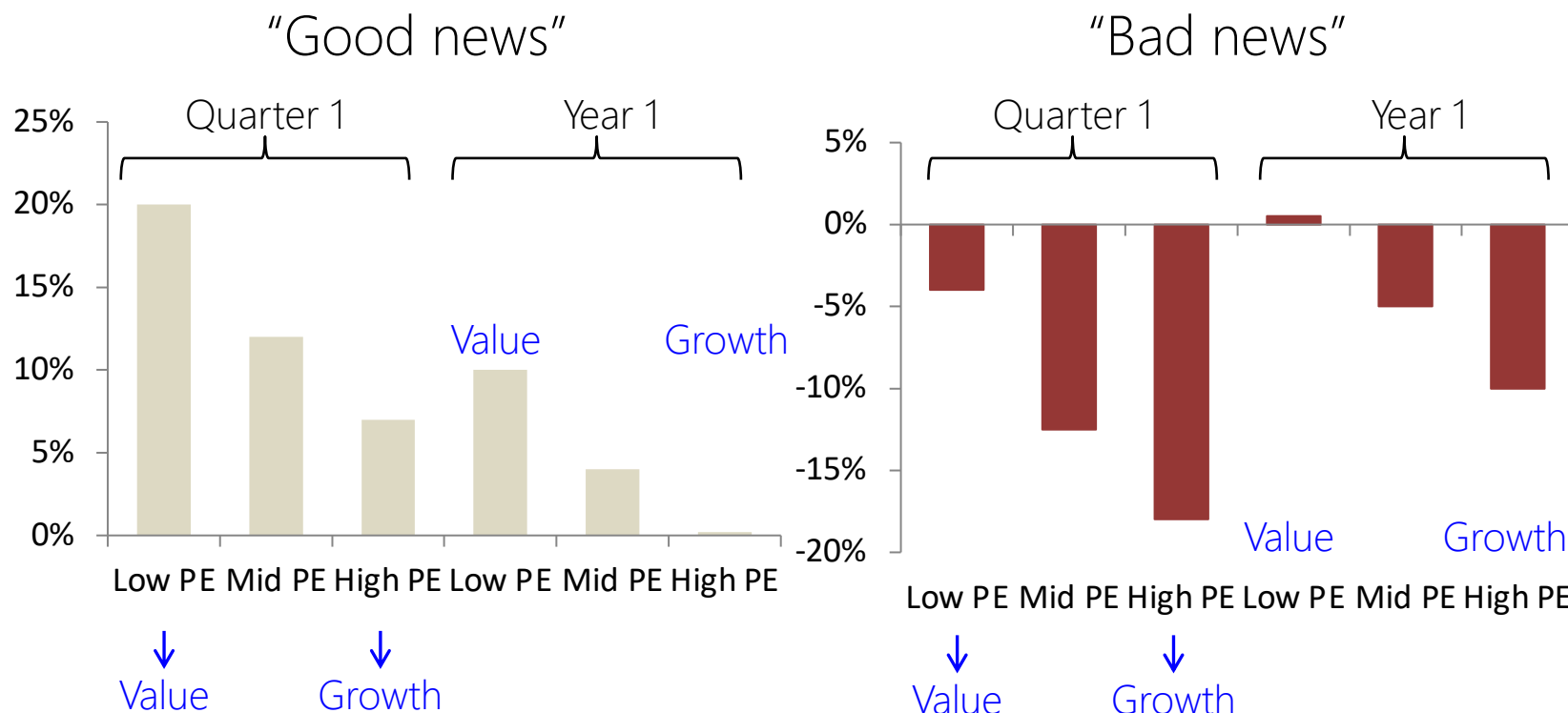
- Risk explanation for value premium
 - value companies are typically more leveraged: high D/E ratios
 - ...have higher operating leverage (high fixed/variable costs)
 - ...are unable to promptly cut fixed costs and expenses due to higher irreversible capital
 - ...have higher volatility of dividends
-

Value tend to underperform during recession → higher risk premium

- Behavioural explanation
 - investors often misprice/overvalue growth companies
 - investors underestimate the speed at which abnormal earnings revert to the mean
 - investors overreact to news about growth companies

Biased reaction to earnings news

Annualised market adjusted holding period returns, 1973-1993



- It pays to hold stocks that have experienced recent large positive earnings surprises; market takes 3 quarters to reflect the “good news”
- Long/short investment strategy is possible in such case

Style favoured by investors (2009/16)

- Morningstar's December 2009 & 2016 mutual fund asset flow report suggests that US open-end MF investors favour growth funds to value funds in all asset classes:

Total AUM (\$B)	Growth	Value	Value %
Large Cap	750	509	40%
Mid Cap	163	91	36%
Small Cap	95	57	38%
Total	1,008	657	39%

All data as of December , 2009

Total AUM (\$B)	Growth	Value	Value %
Large Cap	1,327	1,000	43%
Mid Cap	260	221	46%
Small Cap	186	122	40%
Total	1,773	1,343	43%

All data as of April , 2016

Returns by style (last 10 years)

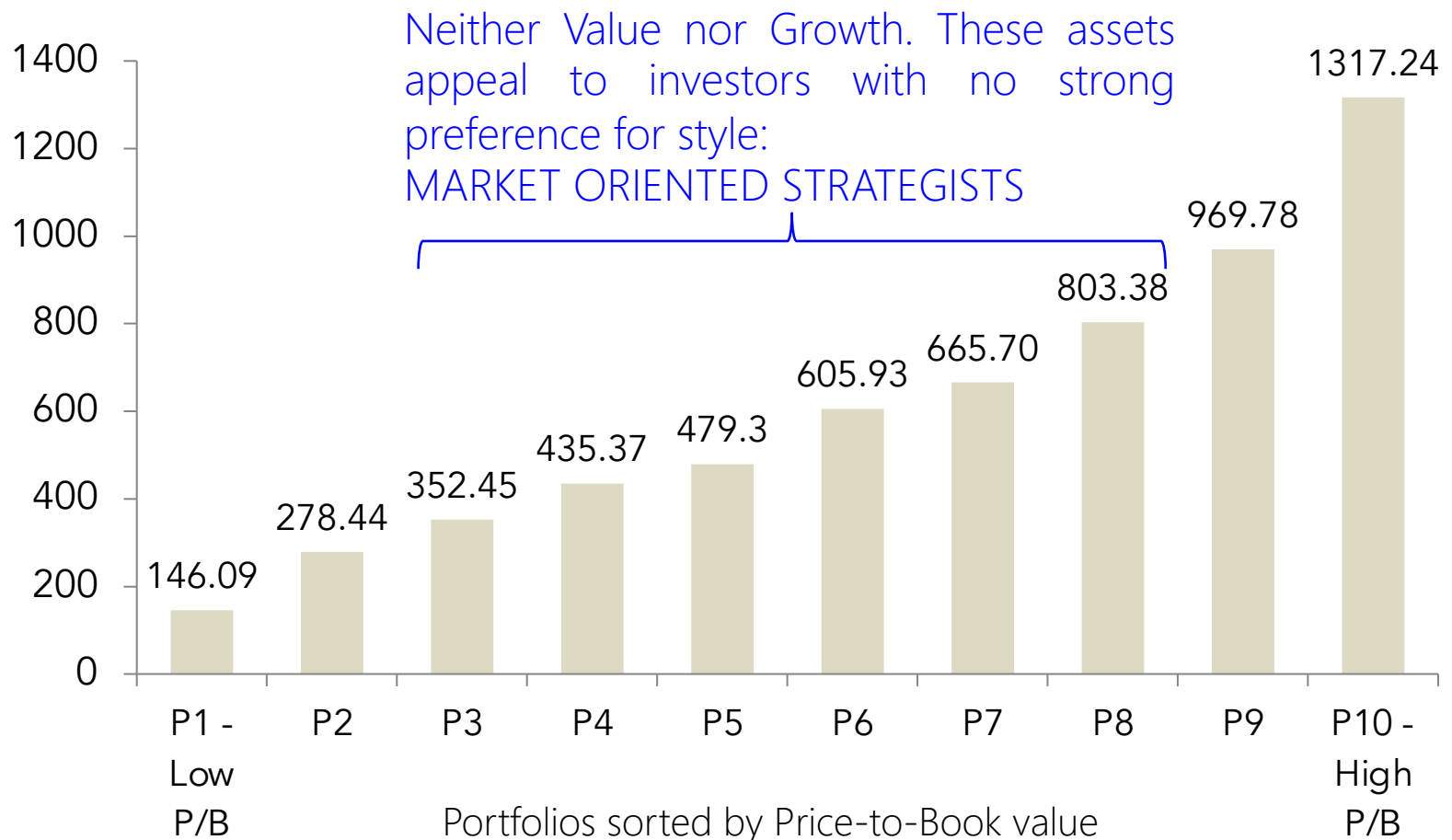
Total annual return by Morningstar's mutual fund category and year:

Total AUM (\$B)	Large Cap		Mid Cap		Small Cap	
	Value	Growth	Value	Growth	Value	Growth
2011	-0.75%	-2.46%	-3.96%	-3.95%	-4.45%	-3.55%
2012	12.82%	14.69%	13.98%	12.10%	12.16%	10.62%
2013	31.21%	33.92%	35.14%	34.93%	36.22%	40.91%
2014	22.74%	24.09%	22.51%	13.67%	9.05%	4.97%
2015	-2.02%	10.88%	-3.63%	5.11%	-3.91%	7.01%
2016	12.39%	2.64%	16.01%	5.70%	21.70%	10.29%
2017	17.59%	28.87%	14.04%	24.56%	9.46%	21.67%
...						
2020	2.68%	34.84%	2.84%	37.32%	3.84%	36.91%
2018-2020	5.46%	20.22%	3.81%	19.25%	2.13%	18.01%
2016-2020	9.30%	18.04%	8.37%	17.43%	7.88%	17.31%

All data are from Morningstar's mutual fund asset flow reports.

Value premium & size premium

Market value (\$ millions)



Value

Growth

Growth at reasonable price (GARP)

- There are investors who want to have a cheap stock with a good growth potential
- GARP investors typically relate P/E ratios to growth rates:

$$\text{GARP} = \frac{\text{P/E}}{\text{Earnings growth rate}}$$

- Imagine 4 stocks with P/E ratios of 10, 20, 30, 40 and growth rates of 8%, 20%, 20%, and 30% respectively
- The GARP ratios would be 1.25, 1, 1.15 and 1.33. The stock with P/E of 20 would be the cheapest although it is neither the lowest P/E or highest growth stock. Is it growth or value then?
- GARP is neither pure value nor pure growth tool – it lies somewhere in between

Sample exam question 5

You are given the following information about eight stocks:

Stock:	P/E ratio:	Earnings growth rate:
1	12	9%
2	5	3%
3	6	4%
4	13	14%
5	14	10%
6	18	15%
7	11	12%
8	22	17%
Average	12.625	10.5%

Explain the characteristics of value, growth and growth-at-reasonable price stocks and select two stocks from the above table for each of these three groups.

Investment styles recap

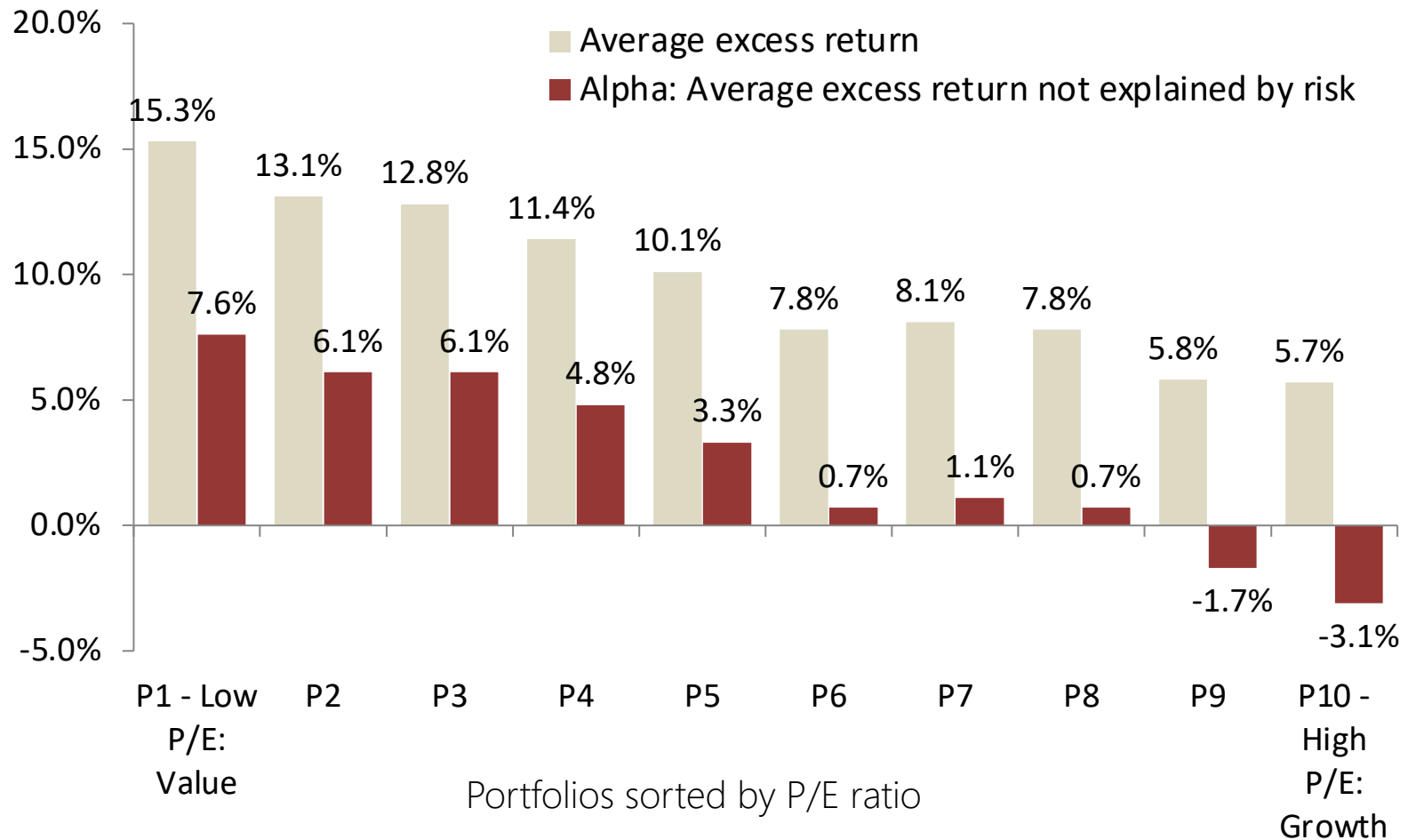
- We have considered 5 popular investment styles
 - Small capitalisation and Large Capitalisation
 - Market oriented style (e.g. GARP investors)
 - Value and Growth
- Historically, value and small stocks outperformed, on average, growth and large stocks
 - evident cyclicalities of the pattern
 - multiple exceptions to the rule
- How does one select value vs. growth & small vs large stocks?

Selecting value and growth stocks

- Select a universe of stocks (e.g., CAC40) and calculate (or collect from a data source) P/E (or DY) for each company
- Sort stocks according to P/E (or DY) in ascending order
- Pick stocks from the top of the list until you have 50% of all companies – these are the value (growth) stocks, and the rest are growth (value) stocks
 - problem with this method: stocks which are neither pure value nor pure growth are included
 - need to create minimum three (or even more) portfolios
- Alternative stock characteristics used to define style: P/B ratios, earnings growth estimates, etc.

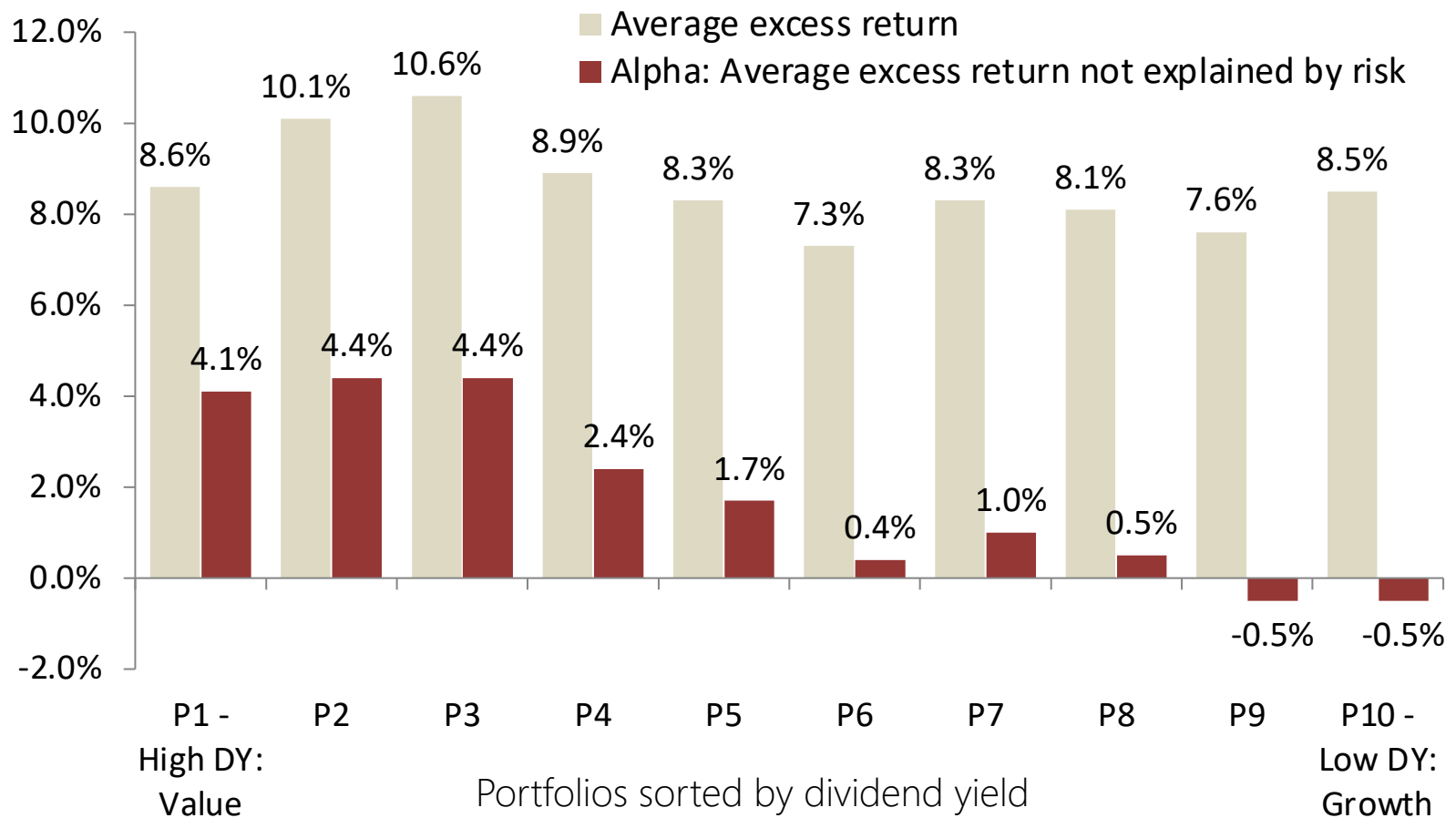
Size anomaly: P/E as value proxy

Stock alpha is lower for stocks with a higher P/E ratio



Size anomaly: DY as value proxy

Stock alpha is decreasing with dividend yield



Defining style & style mathematics

SIM theory suggests: the return on a stock/portfolio is dependent on the market return which is observed through the beta coefficient:

$$r_{i,t} = \alpha_i + \beta_M r_{M,t} + \varepsilon_{i,t}$$

Style mathematics suggest: take 60 consecutive observations of monthly returns for a given stock/portfolio and regress them against monthly market index and style index returns for the same period to generate "style betas":

$$r_{S,t} = \alpha_S + \beta_{S,M} r_{M,t} + \beta_{S,Value} r_{Value,t} + \beta_{S,Growth} r_{Growth,t} + \beta_{S,Small} r_{Small,t} + \beta_{S,Large} r_{Large,t} + \varepsilon_{S,t}$$

Value & Growth index methodologies

Most index providers use similar methodologies with some minor differences:

S&P/ BARRA P/B; top half of market cap is growth, bottom half value; reconstructed semi-annually

Prudential **growth stocks:** sales growth > 10%; IBES est. 5-year growth > median; low dividend pay-out; low debt/capital

value stocks: earnings/price > median; dividends constant or rising

The validity of the value and growth benchmarks is crucial for the fund performance evaluation

Defining style & style mathematics

- Independent variables in the model on the previous slide are highly correlated which may lead to unstable coefficients
- Accordingly, a minor modification of the model is needed:

$$r_{S,t} = \alpha_S + \beta_{S,M} r_{M,t} + \beta_{S,\text{Value-Growth}} r_{\text{Value-Growth},t} + \beta_{S,\text{Small-Large}} r_{\text{Small-Large},t} + \varepsilon_{S,t}$$

- β_{V-G} is the sensitivity of a given stock/portfolio returns to the difference between the value and growth indices
 - if this beta is positive and significant, the stock is a value stock and vice versa (HML: High [book-to-market] Minus Low)
- β_{S-L} is the sensitivity of a given stock/portfolio returns to the difference between the large and small indices
 - if this beta is positive and significant, the stock is a small stock and vice versa (SMB: Small [market cap] Minus Big)

Sample exam question 6

An investor who is testing the presence of styles in a portfolio of stocks obtained the following result of the time-series regression (the values in brackets are t -statistics):

$$r_p = 0.015 + 0.51r_M + 1.1r_{HML} + 0.78r_{SMB} + \varepsilon_p$$

(0.51) (5.48) (3.56) (0.76)

Explain the model that the investor is using to test the presence of styles and interpret the values of style betas obtained. What are the main uses of these style betas?

Alpha-based asset selection: SP500

Consider the Fama-French model for the following the S&P500 stocks from Mini-case 1:

	AMAZON	BEST BUY	FOREST LABS.	HARLEY- DAVIDSON	CMS ENERGY	GOODYEAR
Alpha	0.069	0.042	0.040	0.028	-0.022	-0.037
t-stats	<i>2.16</i>	<i>1.67</i>	<i>3.04</i>	<i>2.94</i>	<i>-1.69</i>	<i>-2.58</i>
MRK	2.056	2.040	0.498	1.347	1.566	1.843
t-stats	<i>2.90</i>	<i>3.63</i>	<i>1.70</i>	<i>6.35</i>	<i>5.52</i>	<i>5.79</i>
SMB	-0.876	0.288	-0.307	-0.122	-0.111	<i>0.767</i>
t-stats	<i>-1.20</i>	<i>0.50</i>	<i>-1.02</i>	<i>-0.56</i>	<i>-0.38</i>	<i>2.35</i>
HML	<i>-1.761</i>	-0.326	-0.258	0.025	<i>1.431</i>	<i>1.699</i>
t-stats	<i>-2.00</i>	<i>-0.47</i>	<i>-0.71</i>	<i>0.10</i>	<i>4.05</i>	<i>4.29</i>
R-sq	0.35	0.31	0.12	0.52	0.45	0.39

abs(t-stats)	> 1.65	> 1.96	> 2.33
Significance	Marginally significant	Significant	Very significant

What can you say about these stocks in terms of Value and Size?

Use of style betas

Style betas help to determine whether a company is a pure value, growth, small or large company. This helps to avoid misclassification of securities.

Style betas show the evolution of a company/portfolio or sector over time

- some companies/sectors may have been growth and then they became value over years (e.g. Apple Inc.); the same for small and large stocks

Style betas enable finding stocks suitable for pairs trading

- style indices serve as a proxy for risk
- two stocks that have the same sensitivity to the styles should have the same returns

Deviation from a style – reality case

We have used statistical criteria to define a style. But only because a style does well/badly statistically will not imply that a manager will also perform well/badly

Stock picking bias: stocks within a particular style may exhibit diverse performance; a manager can over-/under-perform the style by picking different stocks

Example: low P/E ratio stock will be classified as cheap (by the model) and it will be a part of a value portfolio. In reality, a value manager may note that this stock has been receiving earnings downgrades, meaning that the future earnings forecast of the stock will go down and this stock has, in reality, a higher prospective P/E ratio. A good value manager will most likely avoid this stock while a poor one might buy it.

Deviation from a style – reality case

Cap bias: a low P/E criterion for buying stocks will probably produce a small-cap bias, which manager may prefer (or be obliged) to avoid. Avoiding small cap stocks will compromise dedication to investing in lowest P/E stocks

Sector bias: Further, low P/E stocks tend to be concentrated in a few sectors (these sectors may change over time). Accordingly, to get representation in other sectors, managers may be forced to buy a few stocks with high P/E ratios

Clearly, this alters the value approach and fund returns may be quite different from those suggested by academic studies which identify “value” stocks as simply bottom P/E stocks

Style rotation

In France and the UK, over the long time period, value stocks have outperformed the growth stocks

- in the second half of 1990s – technology boom – growth outperformed value (for instance in the US)
- therefore, style rotation is used by a number of managed funds, including hedge funds

Style rotation strategy

- invest 100% of funds in value stocks when they are expected to do better and switch all your funds to growth when growth stocks are expected to do better
- based on forecasts and successful market timing
- bare in mind the transaction costs (this can be a very expensive strategy)

Basics for style rotation

A difficulty is to identify the style that is expected to perform well in the longer term

- essentially the task becomes one of style selection rather than stock selection
- regression and other quantitative techniques may be of help

There are several ways to construct style-timing models, which are based on one of the following hypotheses:

Economic cycle hypothesis:

- a strong economy favours the investment of value style and vice versa

Stock valuation hypothesis

- style trend reflects the fundamental value of individual stock in each style pool

Mean reversion hypothesis

- assumption that the style trend reflects the mean reversion of the overvalued and the undervalued stocks

Economic indicators for style rotation

Forecast GDP growth

- based on the 1990s data, the relationship between the consensus real GDP growth forecast and the relative cumulative return on the S&P 500 Value index and S&P 500 Growth index is showing that the value style index did well when the economy was expected to do well and vice versa
- large stocks pick up expansion earlier than small ones

Interest rates and yield curve

- rising rates and upward slopping yield curve affect growth stocks in a negative way more than value stocks since the investors investing in growth stocks:
 1. receive almost all the income at the end of their investment horizon
 2. in general, they follow a more longer term investment approach than value investors

Fundamental indicators & style rotation

Earnings revision model:

- for example, if one uses average 1-year consensus earnings forecasts changes (that can be obtained on Thompson Financial database) for value and growth index, they can find that when Earnings revisions are higher for value stocks, they will perform better than growth stocks and vice versa

Rising risk premium of small stocks warns investors to shift their investment to larger ones

Mean reversion and style rotation

Residual risk spread model

- residual risk is simply calculated as the standard deviation of the alpha of the value and growth index
- when the residual risk spread is increasing it indicates that the portfolio is deviating more from the market portfolio and it is more likely that high alpha would be generated
- therefore, when there is positive residual risk spread between value and growth index, value stocks are expected to outperform

Forecast P/E ratio spread model

- value stocks traditionally have low P/Es whereas growth have high P/E ratios
- when this long term trend is disturbed, i.e., when there is narrowing forecast P/E ratio value-growth spread, value stocks will outperform growth

Further indicators & style rotation

Lagged Value-Growth or Small-Large spread

- past trends used as an indicator of a future trend

Seasonal indicators

- value, small cap stocks tend to outperform the rest of the market during the first five days in January generating returns of 40%

Technical analysis indicators

- charts and patterns in share prices as well as quantitatively based indicators such as moving averages

In general, the choice of indicators is subjective and more than one indicator is used to reach the style switching decision

Tactical asset allocation with style

Style rotation can prove to be expensive strategy having high transaction costs and turnover of assets

One should consider that style oriented portfolio does not have to have all the investment placed in one style only but rather employ TAA with style stocks/indices

TAA approach, called active style management, implies:

- tilting the equity portfolio with either growth stocks or value stocks in order to capture more superior return generated by in-favour style

Modest bid: 55% - 45% and Aggressive bid: 75% - 25%

How aggressive it is going to be depends on the risk tolerance of the plan sponsor and the confidence level of the investment manager

Advantages of the TAA with styles

Locks in excess return

- if allocation to winning style is not reduced from the, say 50%-50% proportion, that style will eventually underperform and return of the portfolio would revert to average
- can be implemented using judgemental rules, regression models or automatic rebalancing: when either style reaches 55% in the portfolio, it would be reduced back to meet 50/50 criterion

Provides diversification

- portfolio with similar proportion of value and growth stocks is automatically diversified by sector
- active stock-picker can concentrate his bets within each style and gain advantage (e.g., high-tech stocks)

Advantages of the TAA with styles

Complements other portfolio management techniques

- its function is as in tactical asset allocation
- it can be a separate style or it can give flexibility to existing growth and value managers

Saves time and fees

- there is one manager instead of two
- price discounts can be offered as portfolio size increases
- fewer managers to correspond to saves time

Disadvantages of the TAA with styles

If there are so many advantages, why isn't active style management more widely used?

Very difficult to market:

- investors used to be misinformed and not educated about this
- this picture is changing nowadays

Complicates the task of research and portfolio management especially when combined with active stock selection

- growth are risk takers and value are more risk averse

In some instance both the style rotation and the TAA with styles is pointless

- there can be periods when both value and growth stocks underperform the market

Introduction to sector rotation

Callahan (2000)

If the leading style in the market is large cap, it is simply because it is time when sectors concentrated in that style are leading the way

Style management heavily tilted towards certain industries

Industries are not constant through time on their style grid: as industries are in favour they move up and to the right as they become larger and higher in price to book ratio

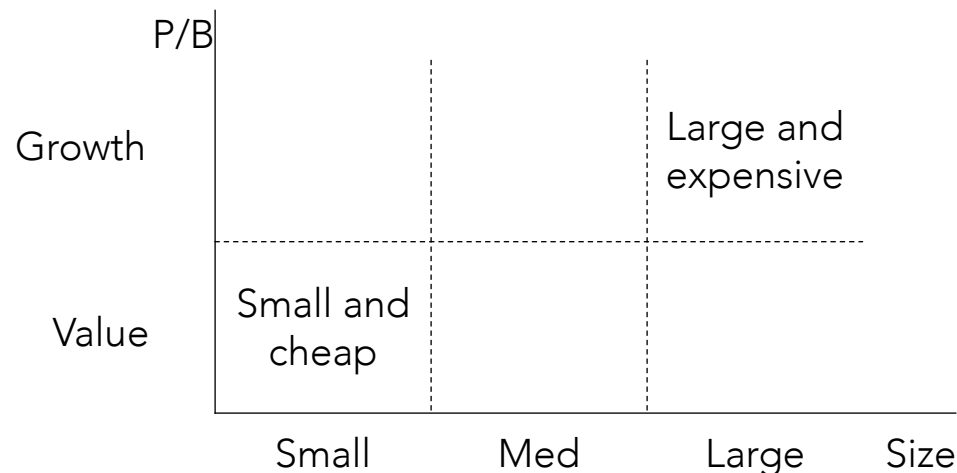
Analysed 115 industries over the 1991 to 1998 period

- S&P 1500 Composite index
- ranking size: 1-38 small sector; 39-76 medium sector; 77-115 large sector
- ranking P/B ratio: 1-57 value sectors; 58-115 growth sectors

Example of sector rotation, Callahan

Some findings of the study:

- basic materials industries have moved down and to the left in the grid
- managers in the midcap value, growth and small cap style boxes are dealing with different industries in 1998 compared to 1991
- financial services industry moved up and to the right



More on sector rotation

As demonstrated by [Callahan \(2000\)](#), industries do not remain in the same style box through time

Hence, a manager dedicated to a given style may, unwittingly, engage in sector/industry rotation

This makes manager's performance difficult to predict as investors may not have analytical skills to analyse sector tilts

Capturing shifts in industries appears more important than style diversification

Core manager with a sector rotation abilities would provide a valuable foundation for a successful strategy