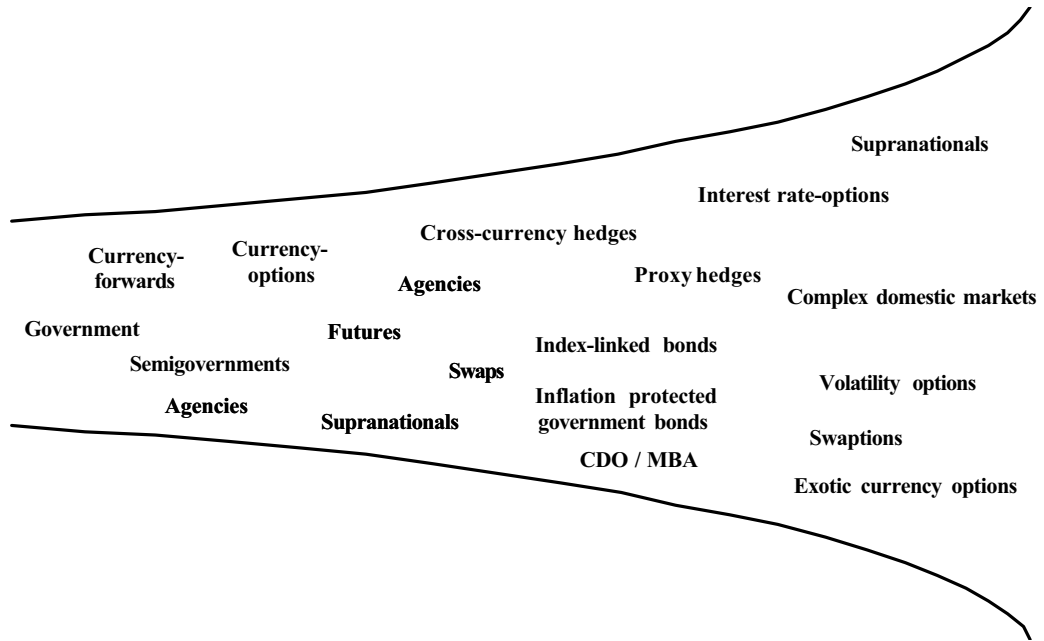


15.433 INVESTMENTS

Class 20: Active Portfolio Management

Spring 2003

Financial instruments are increasing in number and complexity



Key question for every investor

What is the goal for the total portfolio?

What is the time frame for achieving that goal?

What is the tolerance for loss/uncertainty within a shorter term (one-, three-, six-month) period?

Which kinds of risk are acceptable/unacceptable?

What are you willing to pay for active risk management? (e.g. currency hedges)

How do you monitor/evaluate your risk management?

The risk-versus-return compass

Increasing compensated risks can increase returns

Two major types of compensated risk:

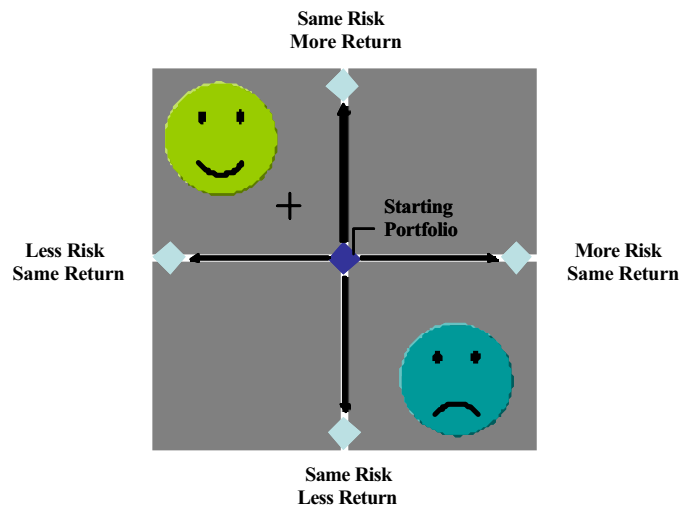
- Credit
- Market

Are these areas of "skill" ?

Optimize the risk exposure

Insufficient evidence of "skill" ?

Ignore, hedge or transfer the risk?



Higher Moments of Asset

Asset \longrightarrow Return \longrightarrow Risk

$\frac{\partial(\text{asset})}{\partial\Delta} = \text{return}$ change in value of asset

$\frac{\partial(\text{return})}{\partial\Delta} = \text{risk}$ speed of change

$\frac{\partial(\text{risk})}{\partial\Delta} = \text{higher moments of risk}$ profile of speed

Active vs. Passive management

Active management means allocation of resources based on an active strategy. Usually active management is performed against a benchmark, requiring intended over-/ underweights of positions.

Passive management means following an index, benchmark or another portfolio using quantitative techniques, such as principal component analysis to replicate an index.

The discussion of active vs passive management is linked to the efficient market discussion: Can information add value (performance).

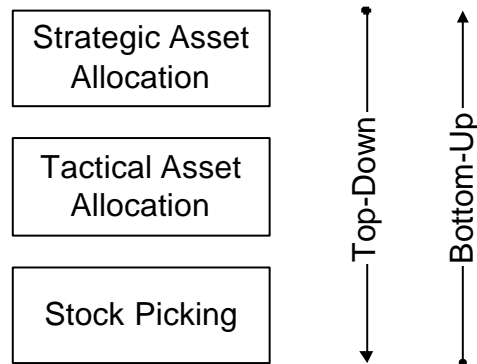


Figure 3: Bottom-up vs. top down approach

From Where does Superior Performance Come?

From Where does Superior Performance Come? Superior performance arises from active investment decisions which differentiate the portfolio from a "passive" benchmark These decisions include:

- **Market Timing:** Altering market risk exposure through time to make advantage of market fluctuations;
- **Sectoral emphasis:** Weighting the portfolio towards (or away from) company attributes, such as size, leverage, book/price, and yield, and towards (or away from) industries;
- **Stock selection:** Making bets in the portfolio based on information idiosyncratic to individual securities;
- **Trading:** large funds can earn incremental reward by accommodating hurried buyers and sellers.

Some Definitions

Active management: The pursuit of transactions with the objective of profiting from competitive information - that is, information that would lose its value if it were in the hands of all market participants Active management is characterized by a process of continued research to generate superior judgment, which is then reflected in the portfolio by transactions that are held in order to profit from the judgment and that are liquidated when the profit has been earned.

Alpha: The "risk adjusted expected return" or the return in excess of what would be expected from a diversified portfolio with the same systematic risk When applied to stocks, alpha is essentially synonymous with misvaluation: a stock with a positive alpha is viewed as undervalued relative to other stocks with the same systematic risk, and a stock with a negative alpha is viewed as overvalued relative to other stocks with the same systematic risk When applied to portfolios, alpha is a description of extraordinary reward obtainable through the portfolio strategy. Here it is synonymous with good active management: a better active manager will have a more positive alpha at a given level of risk.

Alpha, historical: The difference between the historical performance and what would have been earned with a diversified market portfolio at the same level of systematic risk over that period. Under the simplest procedures, historical alpha is estimated as the constant term in a time series regression of the asset or portfolio return upon the market return.

Alpha, judgmental: The final output of a research process, embodying in a single quantitative measure the degree of under or overvaluation of the stocks. Judgmental alpha is a product of investment research and unique to the individual or organization that produces it; it is derived from a "forecast" of extraordinary return, but it has been adjusted to be the expected value of subsequent extraordinary return. For example, among those stocks that are assigned judgmental alphas of 2 percent, the average performance (when compared to other stocks of the same systematic risk with alphas of zero) should be 2 percent per annum. Thus, average experienced performance for any category of judgmental alpha should equal the alpha itself. A judgmental alpha is a prediction, not retrospective experience.

Alpha, required: The risk adjusted expected return required to cause the portfolio holding to be optimal, in view of the risk/reward tradeoff. The required alpha is found by solving for the contribution of the holding to portfolio risk and by applying a risk/reward tradeoff to find the corresponding alpha. It can be viewed as a translation of portfolio risk exposure into the judgment which warrants that exposure.

CAPM

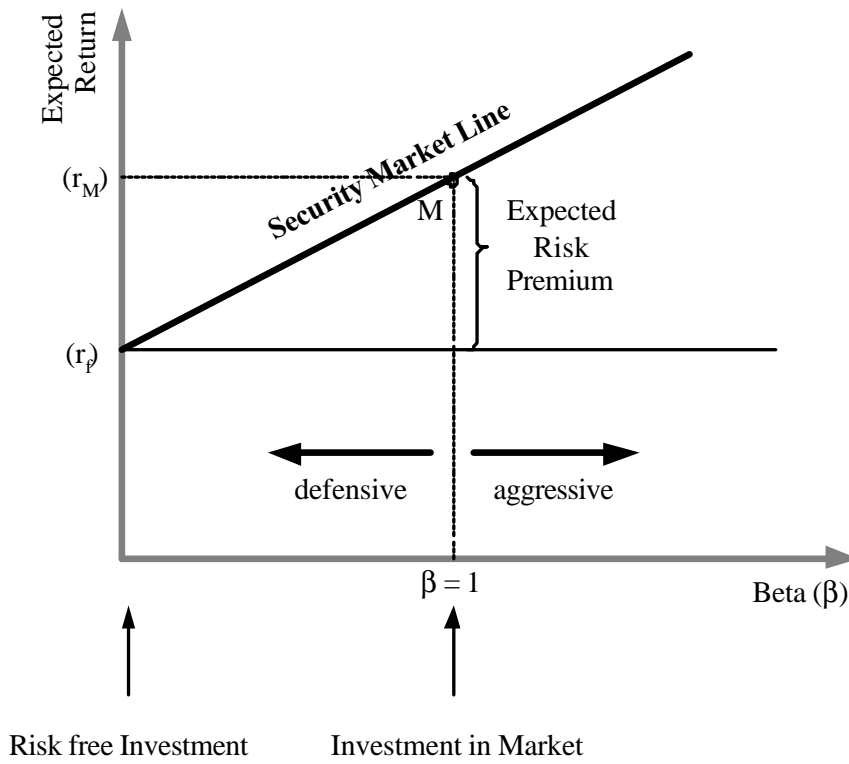


Figure: CAPM and market-aggressivity

$$\beta_i = \frac{E(r_i) - r_f}{E(r_M) - r_f} \quad (1)$$

$$\beta_i = \frac{cov(r_i, r_M)}{\sigma_M^2} \quad (2)$$

APT

APT says:

- Expected excess return for any asset is a weighted combination of the asset's exposure to factors.

APT does not say:

- What the factors are or what the weights are.

So what?

- CAPM forecasts can be used for performance measurement, i.e. beat the index;
- APT forecasts are difficult to use for performance - remember they are arbitrary;
- A good APT forecast can help you to outperform the index;
- APT is an active management tool based on a multifactor model.

Factor Models

$$R^2 = 1 - \frac{\text{var}(\varepsilon_i)}{\text{var}(r_i)} \quad (3)$$

$$r_i = [b_{i,1}F_1 + b_{i,2}F_2 + \dots + b_{i,n}F_n] \quad (4)$$

A factor model tries to explain the variation of return, which is a transformation of the original level: asset behavior.

Some techniques help to understand what moves the assets and thus determine return and risk. The principal component analysis is frequently used, but . . . *first hand interpretation is maybe not intuitive.*

*"Shall I go long principal component 2 and short principal component 4
?"*

Le Penseur, Rodin 1880

The Treynor-Black Model

Mix Security Analysis with Portfolio Theory

Suppose that you find several securities appear to be mispriced relative to the pricing model of your choice, say the CAPM.

According to the CAPM, the expected return of any security with β_k is:

$$\mu_k^{CAPM} = r_f + \beta_k \cdot (E(r_M) - r_f) \quad (5)$$

Let A be subset with "mis-priced" securities. For any security $k \in A$, you find that

$$r_k = \alpha_k + \mu_k^{CAPM} + \varepsilon_k \quad (6)$$

where α_k is the perceived abnormal return.

You would like to exploit the "mis-pricing" in the subset A. For this, you form a portfolio A, consisting of the "mis-priced" securities. At the same time, you believe that the rest of the universe is fairly priced.

The rest of the portfolio allocation problem then becomes a standard one:

- The objective is that of a mean-variance investor.
- The choice of assets:
 1. The market portfolio with μ_M and σ_M
 2. The portfolio of "mis-priced" securities A,
 3. with μ_A and σ_A

4. The riskfree asset.

- The solution: same as the one we considered in Class 5.

The Black-Litterman Model

Mix Beliefs with Portfolio Theory

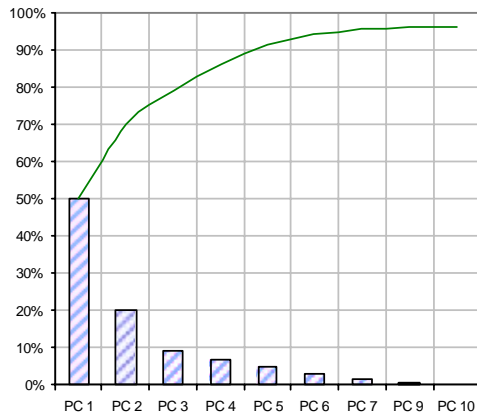
The Black-Litterman asset allocation model, developed when both authors were working for Goldman Sachs, is a significant modification of the traditional mean-variance approach. In the mean-variance approach of Markowitz, the user inputs a complete set of expected returns and the variance-covariance matrix, and the portfolio optimizer generates the optimal portfolio weights. Due to the complex mapping between expected returns and portfolio weights, users of the standard portfolio optimizers often find that their specification of expected returns produces output portfolio weights which may not make sense. These unreasonable results stem from two well recognized problems:

1. Expected returns are very difficult to estimate. Investors typically have knowledgeable views about absolute or relative returns in only a few markets. A standard optimization model, however, requires them to provide expected returns for all assets.
2. The optimal portfolio weights of standard asset allocation models are extremely sensitive to the return assumptions used.

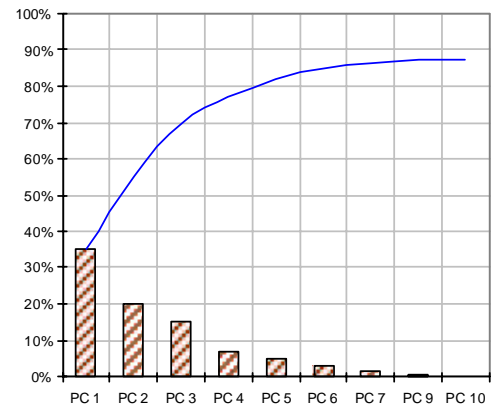
These two problem compound each other; the standard model has no way to distinguish strongly held views from auxiliary assumptions, and the optimal portfolio it generates, given its sensitivity to the expected returns, often appears to bear little or no relation to the views the investor wishes to express.

In practice, therefore, despite the obvious attractions of a quantitative approach, few global investment managers regularly allow quantitative models to play a major role in their asset allocation decision. In the Black-Litterman model, the user inputs any number of views or statements about the expected returns of arbitrary portfolios, and the model combines the views with equilibrium, producing both the set of expected returns of assets as well as the optimal portfolio weights. Since publication of 1990, the Black-Litterman asset allocation model has gained wide application in many financial institutions.

How relevant are factors in relation to different styles?



Factors for "Value" portfolio



Factors for "Growth" portfolio

Depending on the nature of the investments, the influencing factors are different. Thus, the principal components, reflecting the "explanatory power" of existing, but "unknown" factors are different in structure and dimension. What makes a "good" factor?

- Interpretable: It is based on fundamental and market-related characteristics commonly used in security analysis
- Incisive: It divides the market into well defined slices
- Interesting: It contributes significantly to risk, or it has persistent or cyclical positive or negative exceptional return

Why Factors?

- Change in behavior (company restructuring, new business strategy etc),

- reflected in sensitivities to factors; Screening of universe for "adequate" investments, depending on investment objective;
- Handling of information-overflow

Some examples of Style-definitions:

- Large Cap Value: Stocks in Standard & Poor's 500 index with high book-to-price ratios
- Large Cap Growth: Stocks in Standard & Poor's 500 index with low book-to-price ratios
- Small Cap Stocks: Stocks in the bottom 20
- Each styles reacts different and thus fits different clients in different ways

Factor Definitions:

Size: Captures differences in stock returns due to differences in the market capitalization of companies. This index continues to be a significant determinant of performance as well as risk.

Success: Identifies recently successful stocks using price behavior in the market as measured by relative strength. The relative strength of a stock is significant in explaining its volatility.

Value: Captures the extent to which a stock is priced inexpensively in the market. The descriptors are as follows:

- Forecast Earnings to Price;
- Actual Earnings to Price;
- Actual Earnings to Price;
- Yield.

Variability in Markets (VIM): Predicts a stock's volatility, net of the market, based on its historical behavior. Unlike beta, this index measures the stock's overall volatility.

Growth: Uses historical growth and profitability measures to predict future earnings growth. The descriptors are as follows:

- Dividend payout ratio over five years. Computed using the last five years of data on dividends and earnings;
- Variability in capital structure;

- Growth rate in total assets;
- Earnings growth rate over last five years;
- Analyst-predicted earnings growth;
- Recent earnings change Measure of recent earnings growth.

Return Decomposition

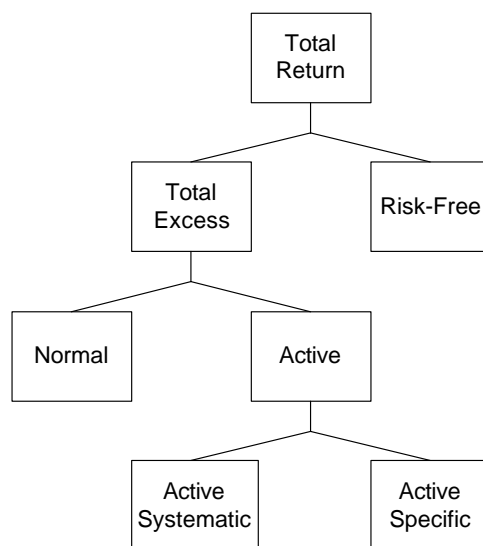


Figure: Return decomposition

Risk Decomposition

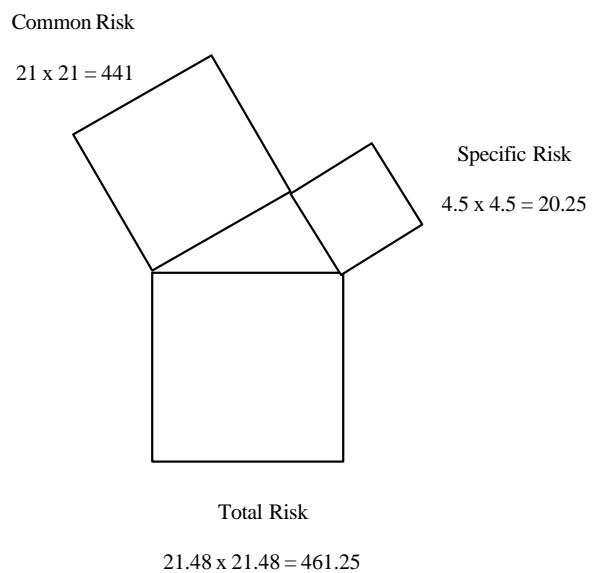


Figure: Risk decomposition,

Return and Risk, A Two Factor Linear Model

Return:

$$r_p = a_p + b_{p,1}F_1 + b_{p,2}F_2 + \varepsilon_p$$

$$r_{BM} = a_{BM} + b_{BM,1}F_1 + b_{BM,2}F_2 + \varepsilon_{BM} \quad (7)$$

Excess Return:

$$\begin{aligned} r_p - r_{BM} &= a_p + (b_{p,1} - b_{BM,1})F_1 + (b_{p,2} - b_{BM,2})F_2 \\ &+ (a_p + \varepsilon_p - a_{BM} - \varepsilon_{BM}) \end{aligned} \quad (8)$$

Variance of Excess Return :

$$\begin{aligned} var(r_p - r_{BM}) &= (b_{p,1} - b_{BM,1})^2 var(F_1) + (b_{p,2} - b_{BM,2})^2 var(F_2) \\ &+ 2 \cdot (b_{p,1} - b_{BM,1})(b_{p,2} - b_{BM,2}) \cdot cov(F_1, F_2) \\ &+ var(\varepsilon_p) + var(\varepsilon_{BM}) - 2 \cdot cov(\varepsilon_p, \varepsilon_{BM}) \end{aligned} \quad (9)$$

Tracking Error:

$$TE = \sqrt{var_p - r_{BM}} = \sqrt{\begin{aligned} &(b_{p,1} - b_{BM,1})^2 var(F_1) + (b_{p,2} - b_{BM,2})^2 var(F_2) \\ &+ 2 \cdot (b_{p,1} - b_{BM,1})(b_{p,2} - b_{BM,2}) \cdot cov(F_1, F_2) \\ &+ var(\varepsilon_p) + var(\varepsilon_{BM}) - 2 \cdot cov(\varepsilon_p, \varepsilon_{BM}) \end{aligned}} \quad (10)$$

Tracking Error

The tracking error is defined as: "the standard deviation of active return".

$$\begin{aligned}\sigma_A &= \text{std}[r_{AP}] = \sigma[r_P] - \sigma[r_{BM}] \\ &= \sigma_{AP} = \sigma_P - \sigma_{BM}\end{aligned}\tag{11}$$

The tracking error measures the deviation from the benchmark, as the r_p is the sum of the weighted returns of all positions in the portfolio and r_{BM} is the sum of the weighted returns of all positions in the benchmarks. Portfolio and benchmark do not always contain the same positions!

Tracking error is called as well active risk.

Information Ratio

Information Ratio: A measure of a portfolio manager's ability to deliver, relating the relative return to the benchmark and the relative risk to the benchmark:

- Expected Active Return (alpha)
- Active Risk

$$IR = \frac{\textit{expected active return}}{\textit{active risk}} = \frac{\alpha}{TE} \quad (12)$$

Implied alpha: Alpha backed-out through reverse engineering; how much has my expected return to be to justify all other parameters ceteris paribus

Forecasts

Some examples:

- MCAR: How much does active risk increase if I increase the holding x by 1 % and reduce cash by 1 %
- MCTCFR: How much does common factor risk increase if I increase the holding x by 1 % and reduce cash by 1 %
- MCASR: How much does specific active risk increase if I increase the holding x by 1 % and reduce cash by 1 %

Performance Attribution

The identification of individual return components can be performed quite easily, subject to the history of the restructuring of the portfolio.

The straight forward approach is based on the definition of a passive benchmark portfolio, which reflects the long-term investment strategy. In the context of the investment strategy (or the strategic asset allocation) the investment management decides which asset categories (equities, fixed income, currencies, etc.) are over-/underweighted relative to the benchmark (strategy). The weights of specific asset categories - as determined in the investment strategy - are called normal weights.

For each asset category of the portfolio exists a corresponding asset category of the benchmark (index), relative to which the performance is calculated. The return of these indices are called normal returns. It is obvious, that the the normal return is a return of a passive investment in the corresponding asset category of the benchmark.

For equities, fixed income and for currencies exist different indices, reflecting different needs.

The normal weight of the asset category i ($w_{s,i}$) multiplied with the normal return ($r_{s,i}$) is the return of this intended asset category. Summed up over all returns from the different asset categories, the portfolio has the following strategy/-benchmark return:

$$r_{strategy} = \sum_{i=1}^N w_{s,i} \cdot r_{s,i}$$

Against this benchmark-portfolio we want to know the realized return of the actively managed portfolio. We have a positive excess-return, if the effectively realized portfolio return ($r_{portfolio}$) exceeds the strategy return ($r_{strategy}$):

$$r_{excess\ return} = r_{strategy} - r_{portfolio}$$

The current portfolio return ($r_{portfolio}$) is calculated from the effective breakdown of the portfolio in the different asset categories ($w_{p,i}$) as well as the effectively realized returns ($r_{s,i}$) of the individual asset categories:

$$r_{portfolio} = \sum_{i=1}^N w_{p,i} \cdot r_{p,i}$$

The difference between the strategy return and the realized portfolio return results from the fact, that the portfolio manager restructures the portfolio through market timing strategies based on the on the assumption of predicting the direction of the performance. Overperformance by timing the market can be achieved by adjusting the overall market exposure of the portfolio. Various techniques exist to time the market:

- tactical over- and underweights of categories and thus deviates from the normal weights through changes in the asset class mix (especially stock and cash positions), also called rotation (sector rotation, asset class rotation)
- timing within an asset class: changing the security mix by shifting the proportions of conservative (low beta) and dynamic (high beta) securities.

- derivatives instruments: especially index futures and the use of options.

Security selection is the identification of over/-under priced securities. So a superior valuation process is needed to compare the true value for a security with the current market value.

Overall, the return of a portfolio can be decomposed in four return components, which summed up again result in ($r_{portfolio}$):

- $r_{strategy} = \sum_{i=1}^N w_{s,i} \cdot r_{s,i}$

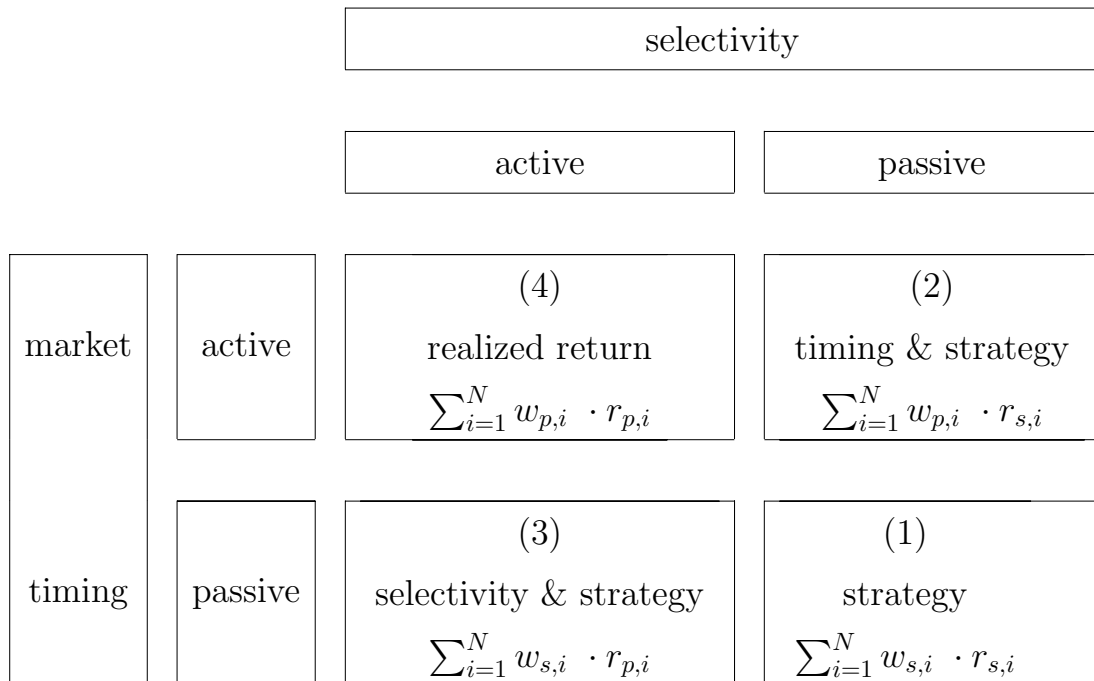
- $r_{timing} = \sum_{i=1}^N r_{s,i} \cdot (w_{p,i} - w_{s,i})$

- $r_{selectivity} = \sum_{i=1}^N w_{s,i} \cdot (r_{p,i} - r_{s,i})$

- $r_{cumulative\ effect} = \sum_{i=1}^N (w_{p,i} - w_{s,i}) \cdot (r_{p,i} - r_{s,i})$

Figure 1 highlights the decomposition of the portfolio return in the individual components and their relationship to a active respectively passive portfolio management. Quadrant (1) is put together from passive selectivity and passive timing. It represents the long-term investment strategy and serves as the benchmark return for the observation period in examination. If the portfolio management performs a passive market timing, we receive the return in quadrant (2). It represents the return from timing and strategy. We understand timing as the deviation in the weight of the individual asset category from the normal weight. Within the individual asset categories we invest in a passive index portfolio. Through subtraction of the strategy return from quadrant (1) we receive the net result from timing.

Quadrant 3 reflects the returns from selectivity and strategy. Selectivity is the active choice of individual securities within an asset strategy. The normal weights are kept equal. The return from selectivity is received through subtraction of the strategy return in quadrant (1) from quadrant (3). In quadrant (4) we finally find the realized return of the portfolio over the observation period in examination, calculated as the product of the current weights of the individual asset categories with the current returns within the asset categories. Not obvious from the figure is the fourth component, the cumulative effect (also called interaction effect), which is based on cross product of return- and weight differences. The residual term can be derived from the interaction between timing and selectivity. It is based on the fact that the portfolio manager puts more weight on the asset categories with a higher return than in the benchmark index (selectivity).



$$\text{Timing} = (2) - (1)$$

$$\text{Selectivity} = (3) - (1)$$

$$\text{Residual} = (4) - (3) - (2) + (1)$$

Figure 1: Performance components in an active portfolio

Example without Currency Components

All returns are calculated in the domestic currency. All foreign exposures are perfectly hedged back into the domestic portfolio currency. The upper part of the table contains the normal weights and normal returns required to calculate the passive strategy of the individual asset categories.

In the second part of the table are the effective weights and the current returns of the individual asset categories in the specific quarters.

The current weights and returns are adjusted from quarter to quarter to reflect the restructuring of the tactical asset allocation and the stock picking and result in the active over/-underweights.

In the lower part of the table are the individual performance components resulting in the individual quarters. They are calculated using the equations in the previous equations.

From the results in Table 1 it is obvious that the return from active management varies substantially from quarter to quarter and reflects no constant pattern. The timing-return varies between -0.15% in the 4th quarter x1 and max 0.28% in the 1st quarter x1. Selectivity has even more variation: min is -0.18% in and 1.48% in the 1st quarter. The residual terms have a surprising big impact, with 0.18% of the portfolio return in 1st quarter and 2n quarter and reducing the portfolio return with -0.39%!

		x0/3	x0/4	x1/1	x1/2	x1/3	x1/4	x2/1	entire period
normal weights	FI \$	57.50	57.50	57.50	57.50	57.50	57.50	57.50	
	FI Euro	12.50	12.50	12.50	12.50	12.50	12.50	12.50	
	Eq \$	22.50	22.50	22.50	22.50	22.50	22.50	22.50	
	Eq Euro	7.50	7.50	7.50	7.50	7.50	7.50	7.50	
normal returns	FI \$	-0.75	1.26	4.53	2.09	0.46	0.91	3.26	
	FI Euro	-19.37	2.50	14.52	3.31	-0.99	-3.16	7.07	
	Eq \$	-28.62	1.39	16.02	0.85	-1.12	-2.18	7.79	
	Eq Euro	-1.94	4.37	6.71	4.48	2.15	2.18	5.71	
current weights	FI \$	57.50	53.70	55.70	52.30	54.50	53.80	52.40	
	FI Euro	12.50	16.50	15.80	16.10	15.90	15.70	16.50	
	Eq \$	22.50	22.10	22.30	23.60	23.50	23.10	23.20	
	Eq Euro	7.50	7.70	6.20	8.00	6.10	7.40	7.90	
current returns	FI \$	-0.32	0.81	4.22	2.12	1.15	0.78	2.32	
	FI Euro	-2.06	4.15	7.05	4.68	1.74	2.33	5.93	
	Eq \$	-26.19	1.99	16.69	0.97	0.16	-3.89	10.09	
	Eq Euro	-21.61	2.37	17.75	4.89	-2.97	-3.24	7.08	
strategy		-9.44	1.68	8.53	2.14	0.05	-0.20	4.94	7.70
timing		0.00	0.06	0.28	0.04	-0.09	-0.15	0.19	0.33
selectivity		1.48	-0.07	-0.13	0.25	0.64	-0.18	-0.06	1.93
interaction		0.00	0.08	-0.39	0.05	0.16	0.18	0.02	0.10
realized		-7.96	1.74	8.29	2.48	0.76	-0.35	5.09	10.06
return from active manag		1.48	0.06	-0.24	0.34	0.71	-0.15	0.16	2.36

Table 1: Example for performance components without currency exposure

The active management contributed in 5 out of 7 quarters positively to the overall return. Over the time period of 7 quarters the active management added 2.36%, with contribution from timing of 0.33%, selectivity contributed 1.93% and the residual term 0.10%. Looking at the realized return of the portfolio (10.06%), the contribution from active management with 2.36% is substantial!

Even more important is the contribution from the strategy, which added 7.70% to the portfolio return, and thus is the most important component. This example shows quite nicely, that the most important contribution to the return is from the strategic asset allocation. The substantial part of the achieved investment performance is based on the strategy and not from the active management through the portfolio manager.

	Brinson/Hood/Beebower (1986)		Brinson/Singer/Beebower (1991)	
	return components (%)	variance components (%)	return components (%)	variance components (%)
strategy	10.11	93.6	13.49	91.5
timing	-0.66	1.7	-0.26	1.8
selectivity	-0.36	4.2	0.26	4.6
residual	-0.07	0.5	-0.07	2.1
total	9.01	100	13.41	100
comments	91 pension funds, USA 1974-1983, n=43		82 pension funds, USA 1977-1987, n=45	

Table 2: Performance components for US pension funds

Table 2 the study has been carried out over a time period of 10 years. In the first analysis the pension funds realized a return of 9.01%. This is 1.10% below the strategy return of 10.11. The active management destroyed value worth 1.10% (0.66% timing, 0.36%). For the second analysis the results look not better. The selectivity added in average 0.26% to the annual return, however the active return does not look better, active management lowered the returns by 8 basis points in average. A comparison between the dimension of strategy return and the "added value" of active management shows in both studies that the active component is only a small fraction of the total return.

Performance Attribution with a currency component

We know from previous classes and from own experience that diversification can improve the performance of the portfolio. Diversification can be generated through investments in e.g. different asset categories or individual sectors, industries etc. Especially the diversification across the border lines is important, adding additional low correlations to the portfolio. Looking at the performance attribution of international diversified portfolios, we want to know the impacts of strategy, timing and selectivity and as well the contribution from fx-components from the portfolio allocation. Exposure to foreign currencies can be generated through direct investments in fx (buy, sell), or through investments in foreign securities, without completely hedging the fx exposures. The portfolio return is increases through the fx-return by carrying the fx-exposures during the observation period.

We define with $f_{p,j}$ the strategic component in currency j and $f_{p,j}$ the effectively held exposure to currency j. The return of an internationally diversified portfolio including fx-exposures can be calculated as following:

$$r_{portfolio} = \sum_{i=1}^N w_{p,i} \cdot r_{p,i} + \sum_{i=1}^N f_{p,i} \cdot r_{fx,j}$$

$w_{p,i}$ is again the current portfolio weight for asset category i. The current return of an actively managed portfolio yields $r_{p,i}$ is no longer exclusively in the domestic currency (1 to 1), but in the local currency of the particular investment. Thus, the first sum of previous equation includes the weighted return of the investments in different securities,

measured in the local currency of the corresponding market. For investments in American securities it reflects e.g. the local equity return in US\$. With the second term in the previous equation we add an additional return components coming from the fx-return for the exposure held in the particular currency. The currency return $r_{fx,j}$ is weighted with the corresponding fx-component in the portfolio. In the example, where e.g. 20% of the equity portfolio are invested in Euro-denominated securities (without hedging the portfolio against the Euro-exposure), we have to add to the local US-equity return a 20%-investment (exposure) in Euro-currency. For a portfolio, which is exclusively invested in the domestic portfolio currency, the second terms is dropped.

The strategy return is calculated analogous to the portfolio return using the passive strategy weights and normal returns in the local currency:

$$r_{strategy} = \sum_{i=1}^N w_{s,i} \cdot r_{s,i} + \sum_{i=1}^N f_{s,i} \cdot r_{fx,j}$$

Again, here as well we add a fx-component. The different fx-returns are weighted according their corresponding strategic fx-weights $f_{s,j}$.

The decision, to vary the proportions of individual currency exposures in the portfolio is considered part of the tactical asset allocation. Through conscious deviations from strategic currency weights the active portfolio manager can add (loose) an additional return component to the domestic portfolio return.

Independent from the previous statement is the decision to invest in local markets and asset categories to benefit from the local performance.

Accordingly, the timing-component of an international diversified portfolio is split into two parts: one in a market-component, which reflects the investment decisions regarding the specific market and asset categories, and a second part which reflects the currency component from the allocation decision in different currency exposures:

$$r_{markets} = \sum_{i=1}^N r_{s,i} \cdot (w_{p,i} - w_{s,i})$$

$$r_{currency} = \sum_{j=1}^N r_{fx,j} \cdot (f_{p,j} - f_{s,j})$$

The market component is calculated through multiplication of the passive normal returns $r_{s,j}$, measured in the specific local currency of the investment position, with deviation of the portfolio weights from normal weights. The return, coming from the deviation from the strategic currency allocation, is reflected in the fx-component.

The return component from selectivity is defined as:

$$r_{selectivity} = \sum_{i=1}^N w_{s,i} \cdot (r_{p,i} - r_{s,i})$$

The portfolio return, $r_{p,i}$, and as well the normal return, $r_{s,i}$, are measured in the local portfolio currency. The performance component from selectivity decisions is thus not be affected from the currency of specific investments, but is calculated exclusively through the choice of specific securities within a market or an asset category.

Legend:

$w_{s,i}$ strategy weight (normal weight) for asset class i

$r_{s,i}$ strategy return (normal return) for asset class i

$w_{p,i}$ portfolio weight (effective weight) for asset class i

$r_{p,i}$ portfolio return (effective return) for asset class i

Similar terms:

- Timing: Allocation
- Cumulative effect: Interaction effect

Performance Measure

Capital Market oriented View

Sharpe's measure:

$$Sharpe = \frac{r_p - r_f}{\sigma_p} \quad (13)$$

Divides average portfolio excess return over the sample period by the standard deviation of returns over that period. It measures the reward to (total) volatility trade-off?

Treynor's measure:

$$Treynor's = \frac{r_p - r_f}{\beta_p} \quad (14)$$

Gives excess return per unit of risk over the sample period by the standard deviation of returns over that period. It uses systemic risk instead of total risk.

Jensen's measure:

$$Jensen's \alpha = r_p - [r_f + \beta_p (r_M - r_f)] \quad (15)$$

It is the average return on the portfolio over and above that predicted by the CAPM, given the portfolio's beta and the average market return. Jensen's measure is the portfolio's alpha value.

Appraisal ratio:

$$\textit{Appriasal Ratio} = \frac{\alpha_p}{\sigma_{\varepsilon_p}} \quad (16)$$

It divides the alpha of the portfolio by the nonsystematic risk of the portfolio. It measures abnormal return per unit of risk that in principle could be diversified away by holding a market index portfolio.

Summary

The (simple) performance attribution allows to figure out where the portfolio manager added value and where he destroyed value.

It is key to learn from past errors and not to repeat them. Performance attribution is an essential element in investment to ensure that exposures are rewarded with the appropriate risk premium.

The capital market oriented performance attribution is another approach to analyze the performance. It allows to calculate the risk premiums for the factors / styles to which the portfolio is exposed.

Focus:

BKM Chapter 26

- p. 874-883, 890-897 (learn general definitions and assumptions)

type of potential questions: Concept check questions, p. 899 ff. question 2,3,4,5

BKM Chapter 27

- p. 917-933 (objectives of active portfolios, market timing, security selection, portfolio construction, multifactor models and portfolio management, quality of forecasts)

type of potential questions: Concept check questions, p. 899 ff. question 2,3,4,5

- Thomas (2000), p. 26 f. information ratio Strongin, Petsch and Sharenow (2000), p. 18 dealing with stock-specific benchmark, p. 23 f. portfolio manager patterns
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Preparation for Next Class

Please read:

- Kritzman (1994a),
- Kritzman (1994b),
- Ross (1999), and
- Perrold (1999).

Video (Optional):

”Trillion Dollar Bet”, (a PBS Documentary). I have just one copy of the video tape. It is to be distributed by Joon Chae (jchae@mit.edu) on a first come first serve basis. If there is excess demand, some alternative means of distribution will be worked out. Please contact Joon directly.