

Bringing Return & Risk Together in Multi-Layer Attribution

Date: November 2012
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Agenda

- Return & risk attribution – The big picture
- Decision-oriented return attribution
- Decision-oriented risk attribution
- How to bring return and risk attribution together
- Comments and questions
- Contact details and disclaimer

Return & risk attribution – The big picture

Performance decomposition – An overview

Performance decomposition

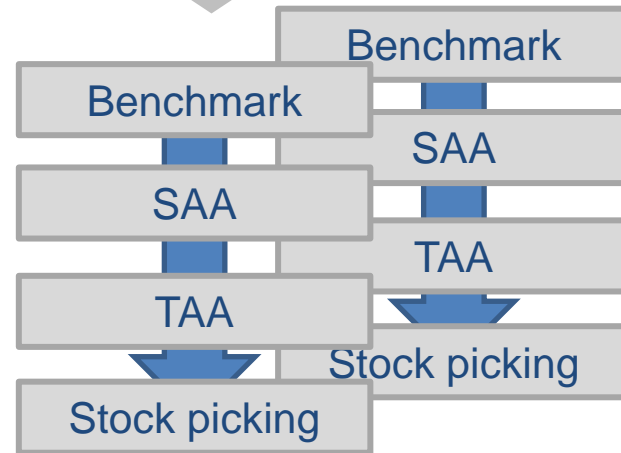
Performance contribution

Performance attribution

Contributions to return and risk (absolute or relative)

| | | |
|------------------|---------------|------|
| Equities | Bonds | Etc. |
| USA | Europe | Etc. |
| Financials | Telecom | Etc. |
| AAA | AA | Etc. |
| USD | JPY | Etc. |
| Asset allocation | Stock picking | Etc. |

Investment process



Common practice return attribution

(1/2)

| | Portfolio | | | Benchmark | | | Management Effects | | | Total |
|-------------------|--------------|----------------|-------------------|--------------|----------------|-------------------|---------------------|------------------|--------------|--------------|
| | Return | Weight | Contri- bution | Return | Weight | Contri- bution | Asset allocation | Stock picking | Interaction | |
| Cash | 0.10% | 2.00% | 0.00% | 0.10% | 15.00% | 0.02% | -0.01% | 0.00% | 0.00% | -0.01% |
| Domestic Bonds | -1.00% | 14.00% | -0.14% | 1.00% | 25.00% | 0.25% | -0.11% | -0.50% | 0.22% | -0.39% |
| Foreign Bonds | -2.65% | 15.00% | -0.40% | 2.00% | 15.00% | 0.30% | 0.00% | -0.70% | 0.00% | -0.70% |
| Domestic Equities | 14.00% | 25.00% | 3.50% | 12.20% | 12.00% | 1.46% | 1.59% | 0.22% | 0.23% | 2.04% |
| Foreign Equities | 16.00% | 25.00% | 4.00% | 14.00% | 14.00% | 1.96% | 1.54% | 0.28% | 0.22% | 2.04% |
| Mortgages | 1.00% | 3.00% | 0.03% | 1.00% | 3.00% | 0.03% | 0.00% | 0.00% | 0.00% | 0.00% |
| Real Estate | -1.00% | 10.00% | -0.10% | -1.00% | 10.00% | -0.10% | 0.00% | 0.00% | 0.00% | 0.00% |
| Commodities | 2.00% | 4.00% | 0.08% | 2.00% | 4.00% | 0.08% | 0.00% | 0.00% | 0.00% | 0.00% |
| Private Equity | 1.00% | 1.00% | 0.01% | 1.00% | 1.00% | 0.01% | 0.00% | 0.00% | 0.00% | 0.00% |
| Hedge Funds | 3.00% | 1.00% | 0.03% | 3.00% | 1.00% | 0.03% | 0.00% | 0.00% | 0.00% | 0.00% |
| Total | 7.01% | 100.00% | 7.01% | 4.04% | 100.00% | 4.04% | 3.00% | -0.70% | 0.67% | 2.98% |

=> Performance attribution requires the analytics to reflect the investment management process.

Common practice return attribution

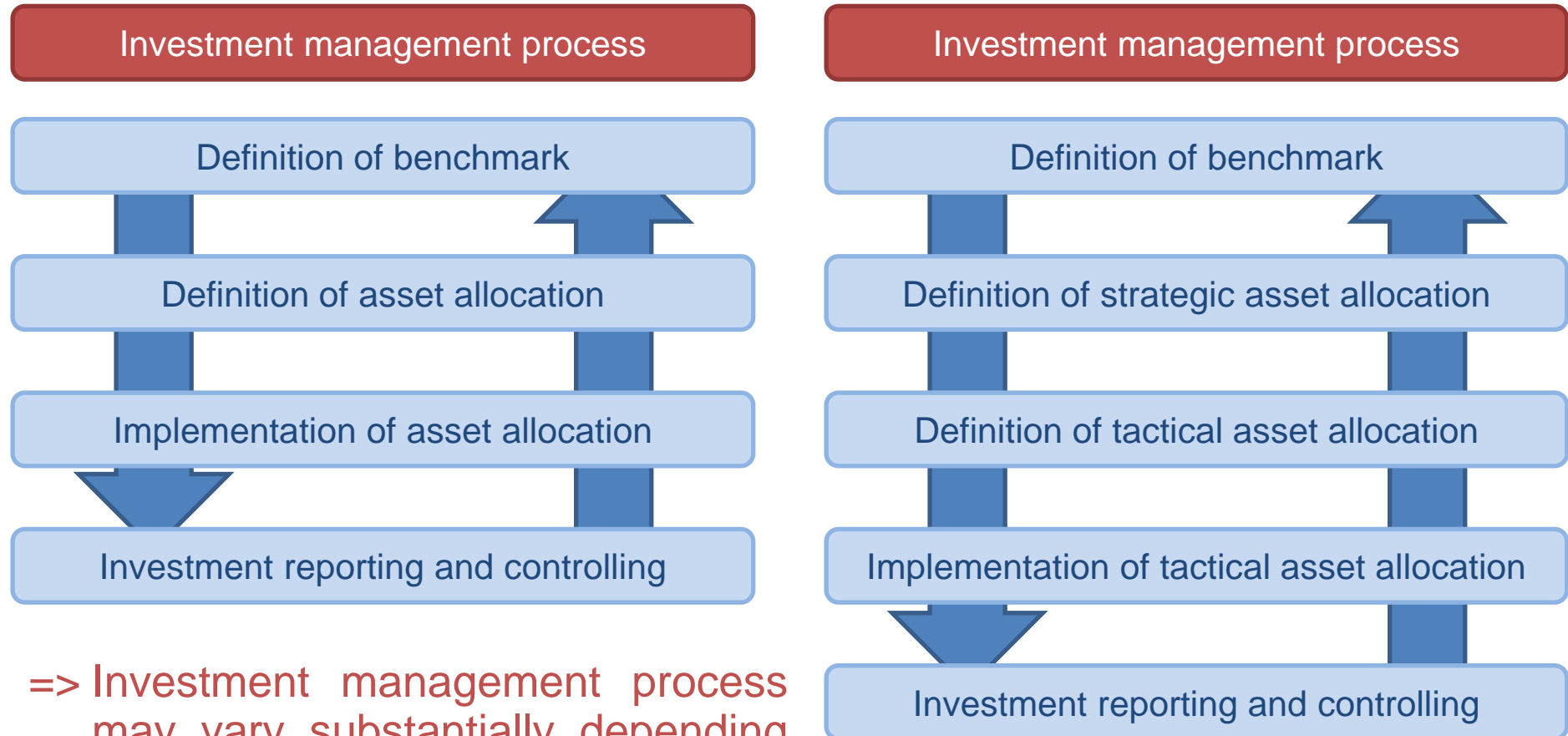
(2/2)

Assumptions:

- Three step decision making process consisting of:
 - Benchmark selection,
 - Asset allocation and
 - Stock picking.
- Investment decisions can be implemented, means:
 - Investment restrictions are not considered.
 - Level of freedom for implementing the investment decisions is not considered.
- Transaction costs, fees and taxes are covered by the stock picking effect.
- Benchmark do not consider transaction costs, fees or taxes.

=> Are these assumptions appropriate for all investment management processes?

Are all steps of the decision making process reflected? (1/2)



=> Investment management process may vary substantially depending on the specific investor or investment organization.

Are all steps of the decision making process reflected? (2/2)

- Common practice to decompose the absolute or excess return and risk of an investment portfolio assume a “simple” investment management process.
- Often more complex investment management processes are observed.
- Applying a “simple” decomposition of the absolute or excess return and risk of an investment portfolio to more complex investment management processes may bear the **risk of misinterpretations** and with this of the **risk of wrong feedback** to the participants of the investment management process.
- Therefore **often a decision-oriented or a target-oriented** investment performance monitoring **is not possible**.

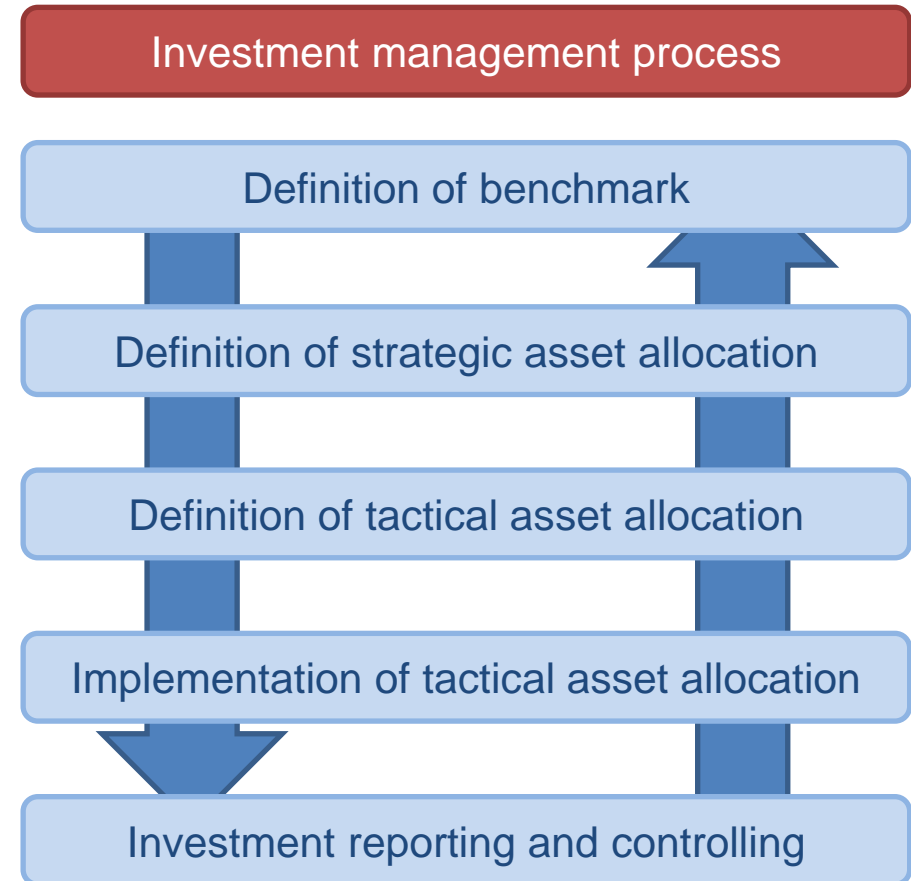
=> Performance attribution needs to be adjusted. A solution for reflecting all steps of the investment management process is the **decision-oriented decomposition of the absolute or excess return and risk**.

Decision-oriented return attribution

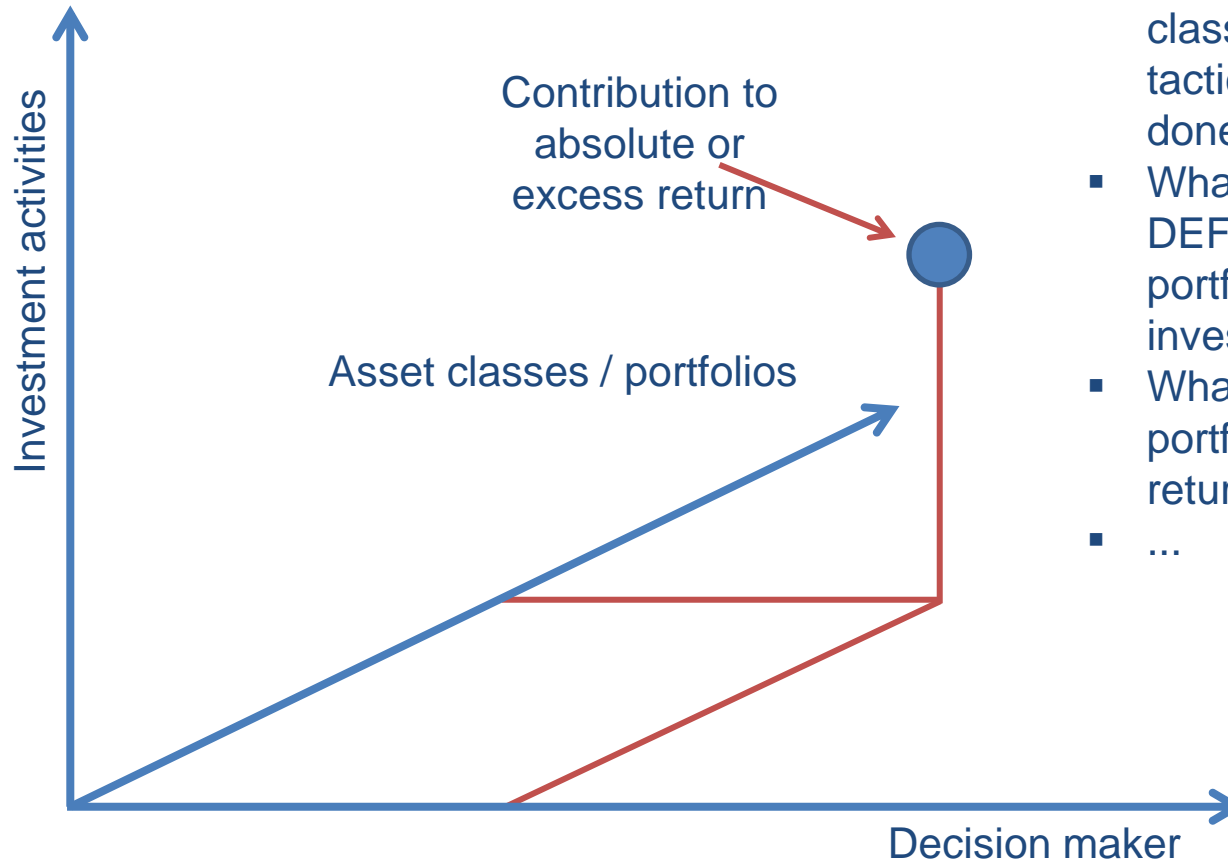
Definition – Decision-oriented return attribution

Decision-oriented return attribution is the decomposition of the absolute or excess return of an investment portfolio according to specific investment decisions done by specific decision makers.

The decomposition approach is difficult to standardize and therefore **normally tailor-made** as the relevant investment management processes differ – sometimes substantially.



Aspects addressed and clarified



- What is the contribution of the asset class ABC to excess return due to tactical asset allocation decisions done by the investment committee.
- What is the contribution of portfolio DEF to absolute return due to portfolio positioning done by the investment committee.
- What is the contribution of the portfolio manager GHI to excess return due to stock picking decisions.
- ...

Generic decomposition approach



Decision-oriented decomposition of the absolute (excess) return allows to quantify the return contribution or the value added of the individual decision makers and is based on the following steps:

- **Step 1:** Identify the circumstances, the investment management setup, and derive relevant assumptions for calculation.
- **Step 2:** Mirror the specific investment decisions into (absolute) asset allocations.
- **Step 3:** Calculate the corresponding returns.
- **Step 4:** Assign the returns as well as the return differences to the investment decisions and to the relevant decision makers.

Example – Step 1 (Investment process)

(1/2)

Analyze the circumstances or characteristics relevant for the investment portfolio:

- Decision makers:
 - Board of directors.
 - Investment committee.
 - Portfolio managers.
- Monthly revolving investment management process.
- Investment portfolio invests in four asset classes:
 - Domestic bonds.
 - Foreign bonds.
 - Domestic equities.
 - Foreign equities.

Example – Step 1 (Investment process)

(2/2)

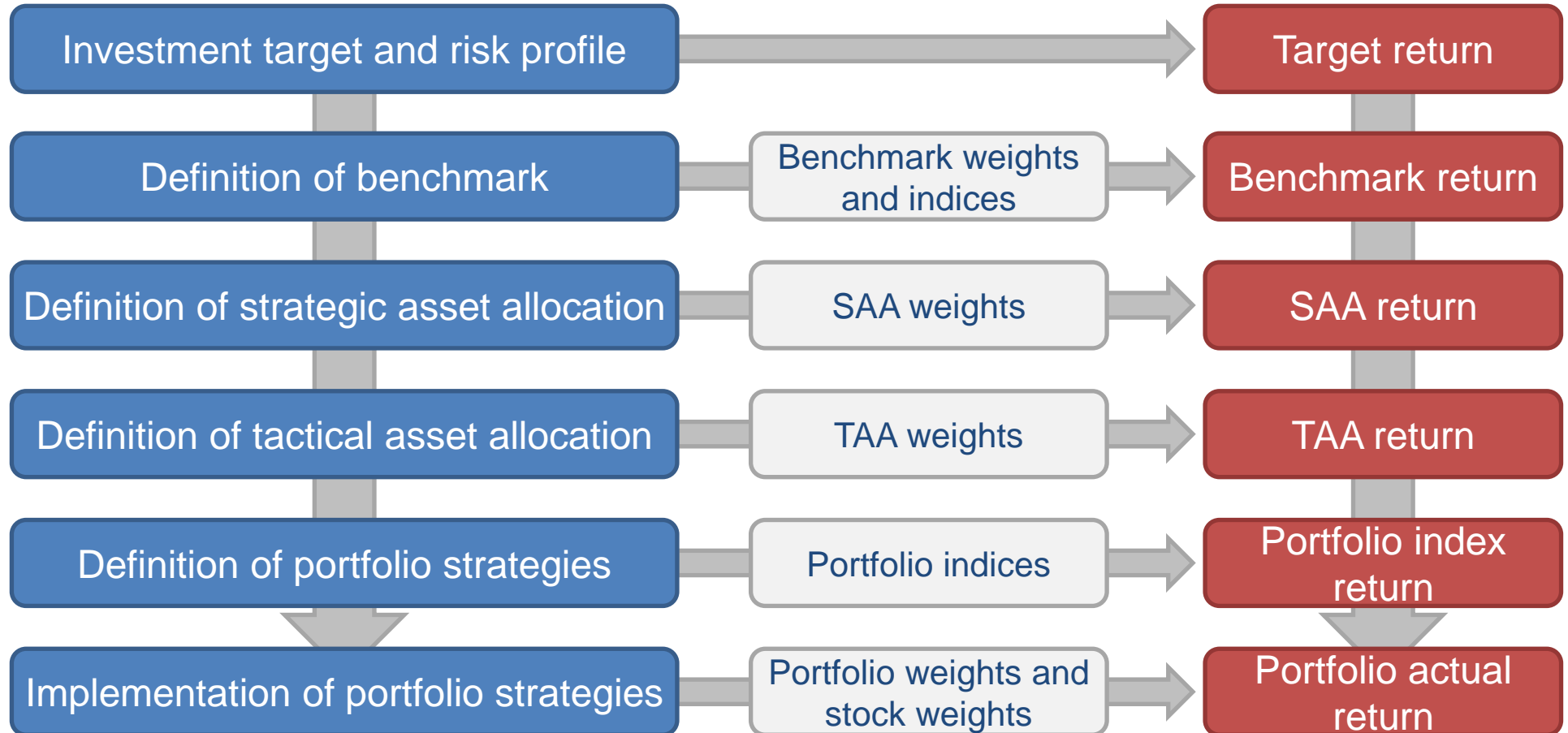
- Investments are managed through eight sub-portfolios – two for each asset class.
- No specific investment restrictions to be considered.
- 5 step investment management process:
 - Definition of benchmark.
 - Definition of strategic asset allocation.
 - Definition of tactical asset allocation.
 - Definition of portfolio strategies.
 - Implementation of portfolio strategies.
- ...

Example – Step 2 (Mirror investment decisions)

| Weights | Benchmark | Strategic asset allocation | Tactical asset allocation | Portfolio strategies allocation | Actual portfolio allocation |
|-------------------|-----------|----------------------------|---------------------------|---------------------------------|-----------------------------|
| Domestic bonds | 10.00% | 10.00% | 10.00% | 10.00% | 12.00% |
| Foreign bonds | 20.00% | 10.00% | 25.00% | 25.00% | 23.00% |
| Domestic equities | 30.00% | 35.00% | 55.00% | 55.00% | 55.00% |
| Foreign equities | 40.00% | 45.00% | 10.00% | 10.00% | 10.00% |
| Total assets | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

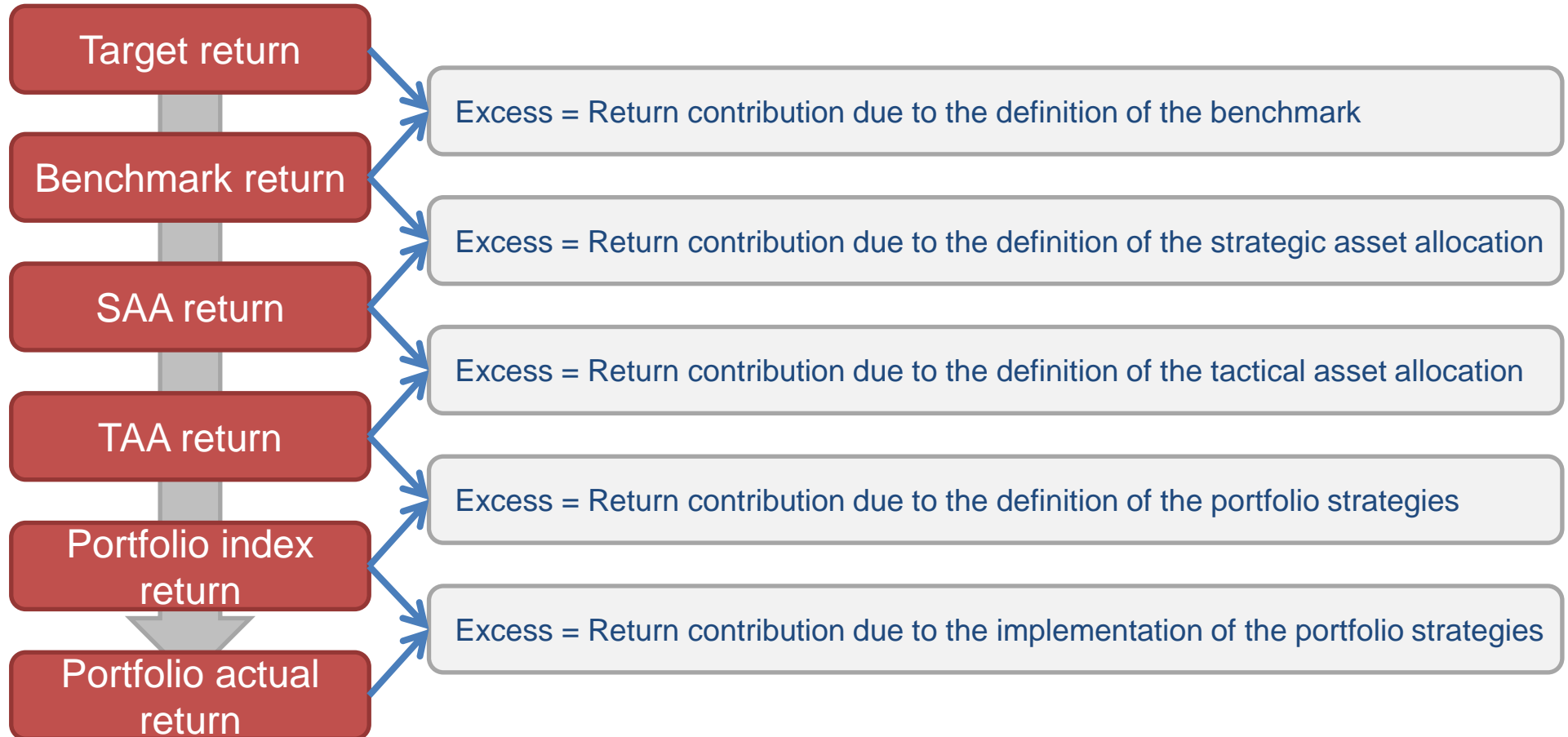
Example – Step 3 (Calculation of returns)

(1/3)



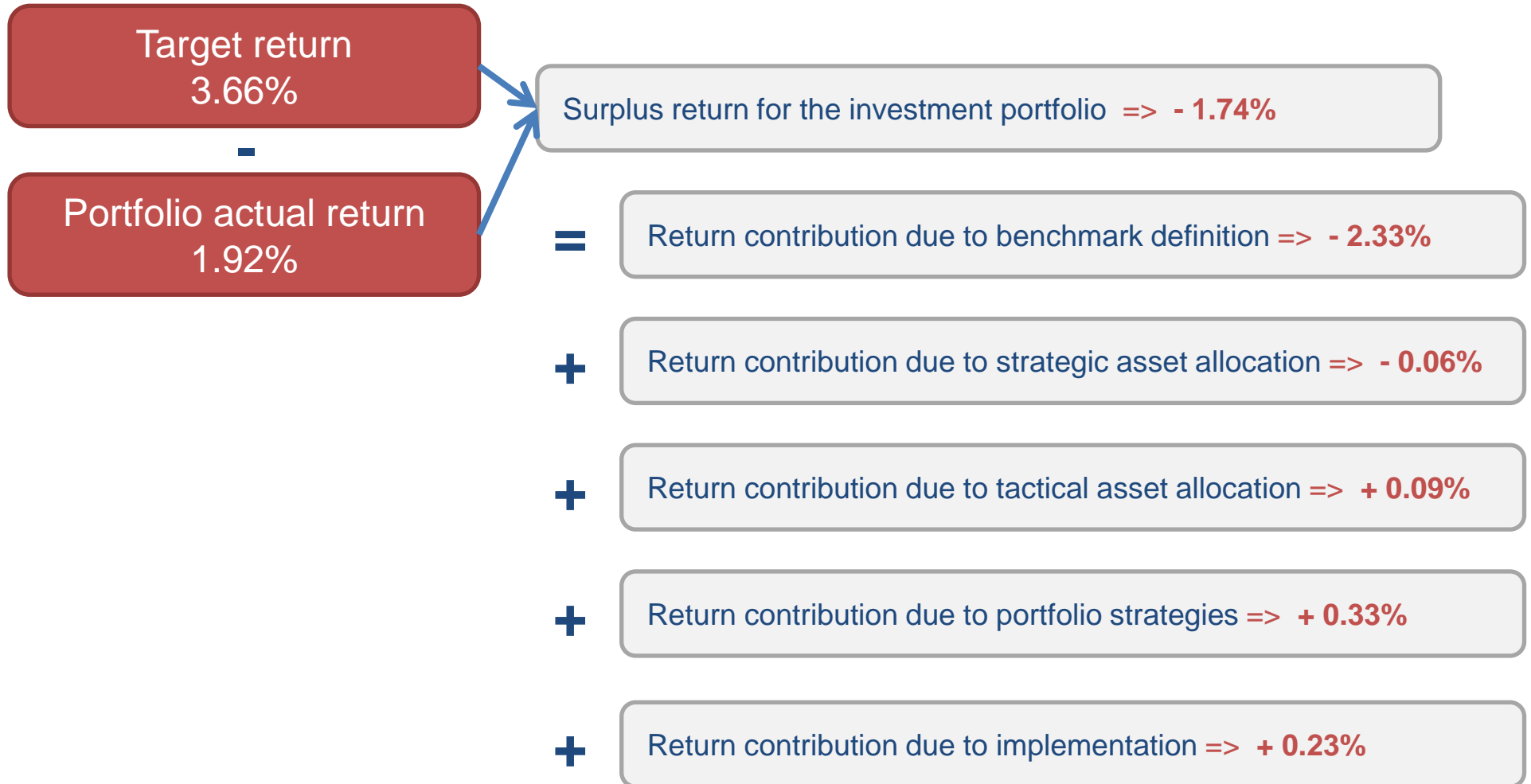
Example – Step 3 (Calculation of returns)

(2/3)



Example – Step 3 (Calculation of returns)

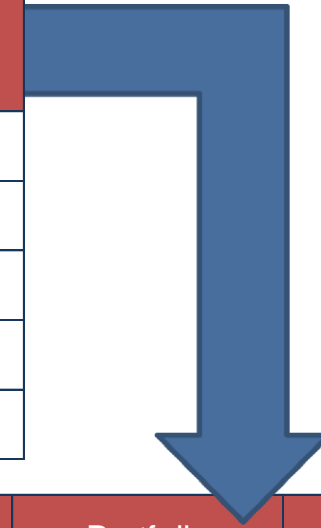
(3/3)



Example – Step 4 (Assigning of (excess) returns)

(1/2)

| | Asset allocation effect | Stock picking effect | Interaction effect | Total management effects |
|-------------------|-------------------------|----------------------|--------------------|--------------------------|
| Domestic bonds | -0.20% | 0.61% | 0.00% | 0.41% |
| Foreign bonds | -0.30% | -0.58% | 0.05% | -0.83% |
| Domestic equities | -0.43% | 0.61% | 0.00% | 0.18% |
| Foreign equities | -1.35% | -0.15% | 0.00% | -1.50% |
| Total assets | -2.28% | 0.49% | 0.05% | -1.74% |



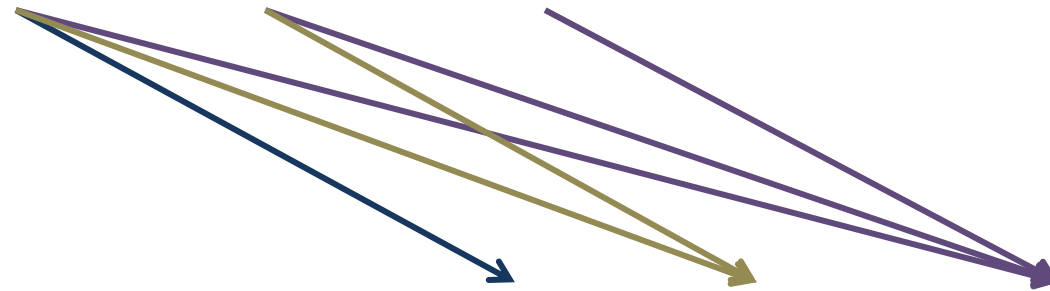
| | Board of directors | Investment committee | Portfolio manager | Total management effects |
|-------------------|--------------------|----------------------|-------------------|--------------------------|
| Domestic bonds | -0.25% | 0.48% | 0.17% | 0.41% |
| Foreign bonds | -0.37% | -0.06% | -0.40% | -0.83% |
| Domestic equities | -0.74% | 0.30% | 0.61% | 0.17% |
| Foreign equities | -0.98% | -0.36% | -0.15% | -1.49% |
| Total assets | -2.33% | 0.36% | 0.23% | -1.74% |

Remark: Delta between total effects are due to compounding.

Example – Step 4 (Assigning of (excess) returns)

(2/2)

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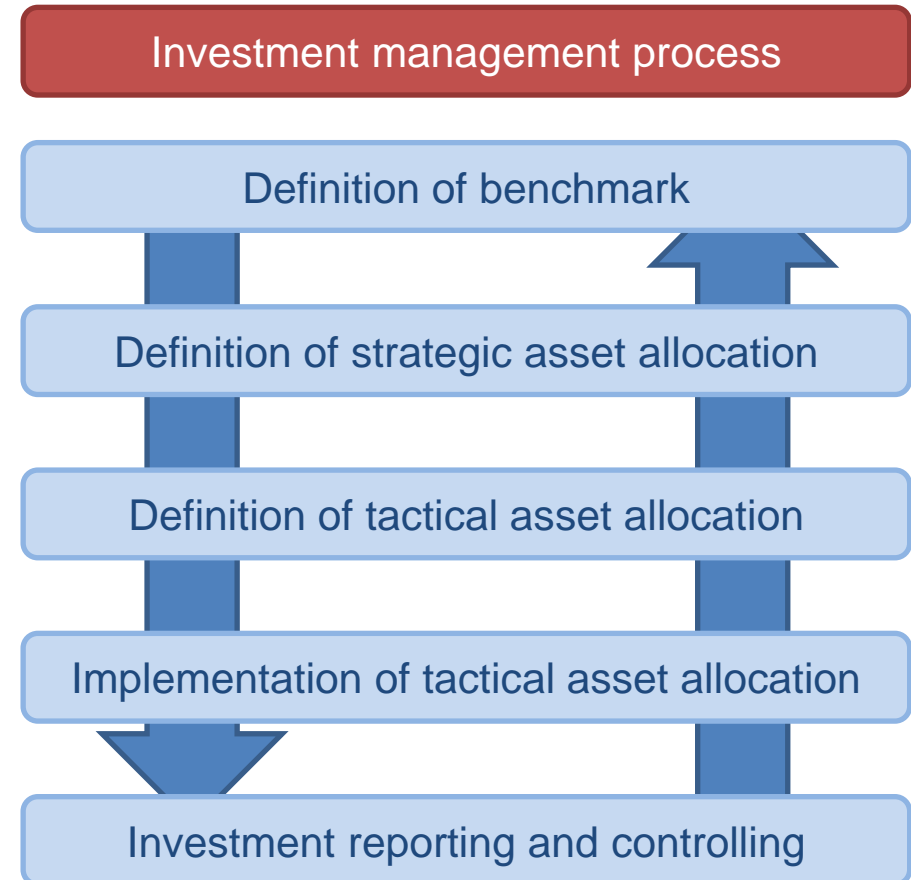
| | Board of directors | Investment committee | Portfolio manager | Total management effects |
|----------------|--|---|---|--------------------------|
| Domestic bonds | -0.25% | 0.48% | 0.17% | 0.41% |
| | Definition of benchmark versus target return | SAA and TAA weights and choice of portfolio index | Effective portfolio weights and stock picking | ! |

Decision-oriented risk attribution

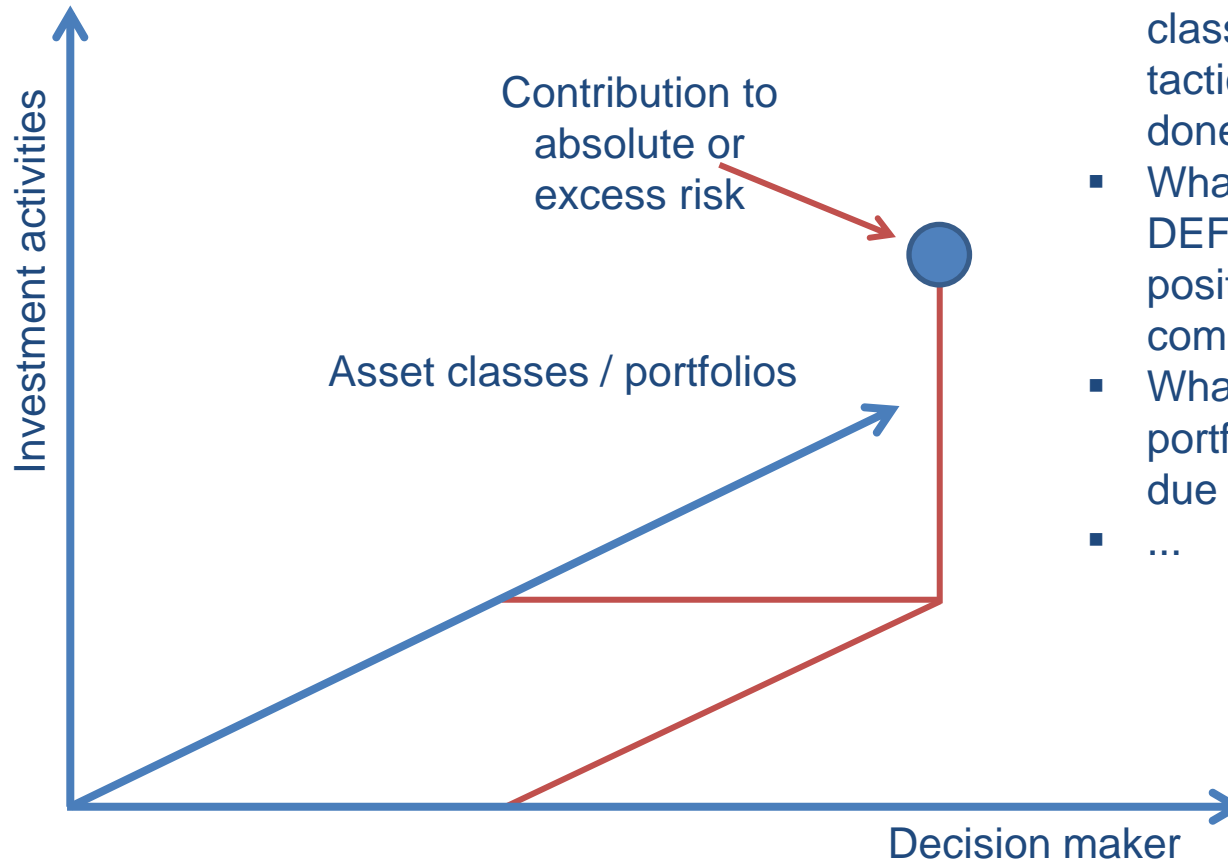
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Generic decomposition approach

(1/2)



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- **Step 1:** Identify the circumstances, the investment management setup, and derive relevant assumptions for calculation.
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- **Step 3:** Calculate the corresponding risk figures.
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Example – Step 1 (Investment process)

(1/2)

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Example – Step 1 (Investment process)

(2/2)

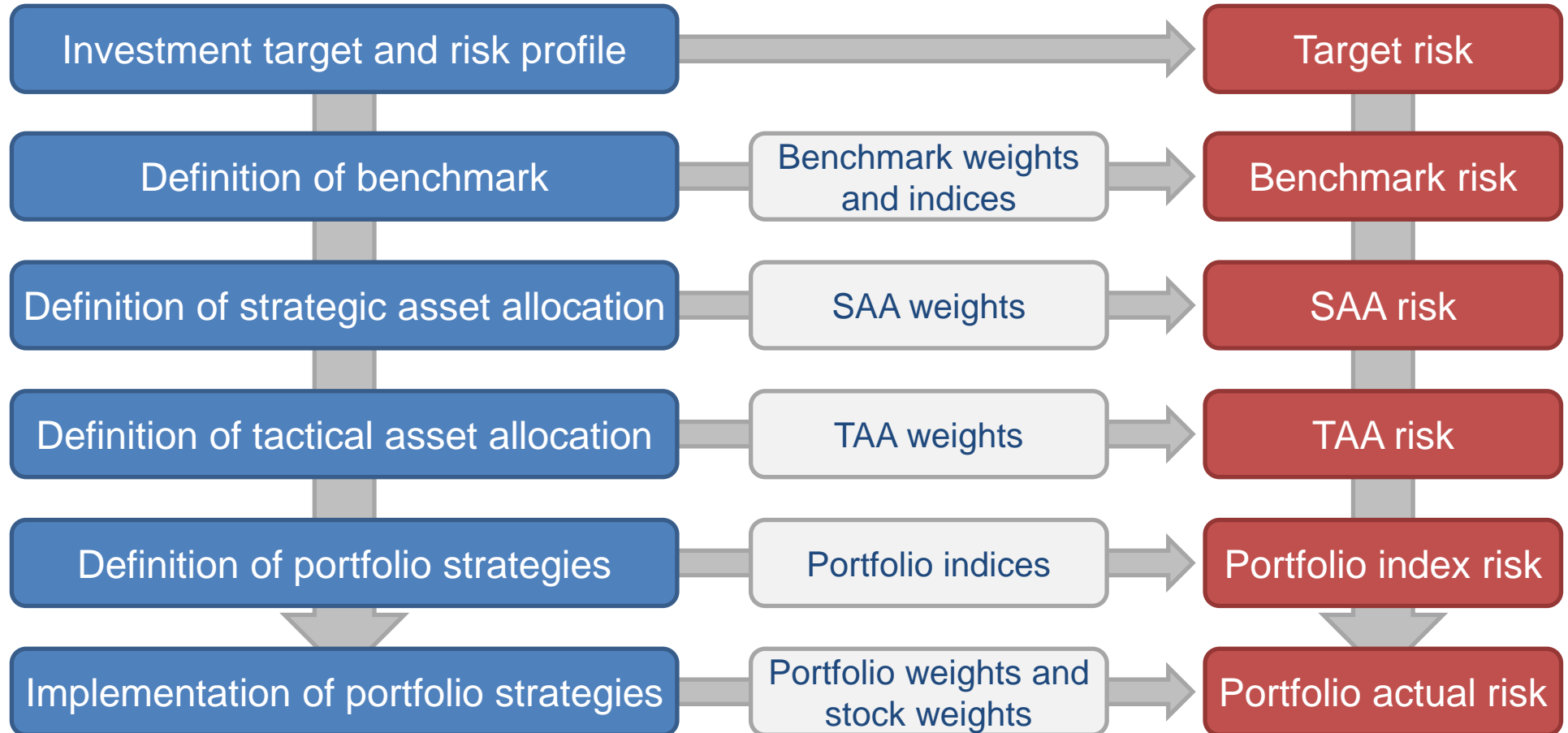
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- No specific investment restrictions to be considered.
- 5 step investment management process:
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 - Definition of portfolio strategies.
 - Implementation of portfolio strategies.

Example – Step 2 (Mirror investment decisions)

| Weights | Benchmark | Strategic asset allocation | Tactical asset allocation | Portfolio strategies allocation | Actual portfolio allocation |
|-------------------|-----------|----------------------------|---------------------------|---------------------------------|-----------------------------|
| Domestic bonds | 10.00% | 10.00% | 10.00% | 10.00% | 12.00% |
| Foreign bonds | 20.00% | 10.00% | 25.00% | 25.00% | 23.00% |
| Domestic equities | 30.00% | 35.00% | 55.00% | 55.00% | 55.00% |
| Foreign equities | 40.00% | 45.00% | 10.00% | 10.00% | 10.00% |
| Total assets | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

Example – Step 3 (Calculation of risk figures)

(1/3)



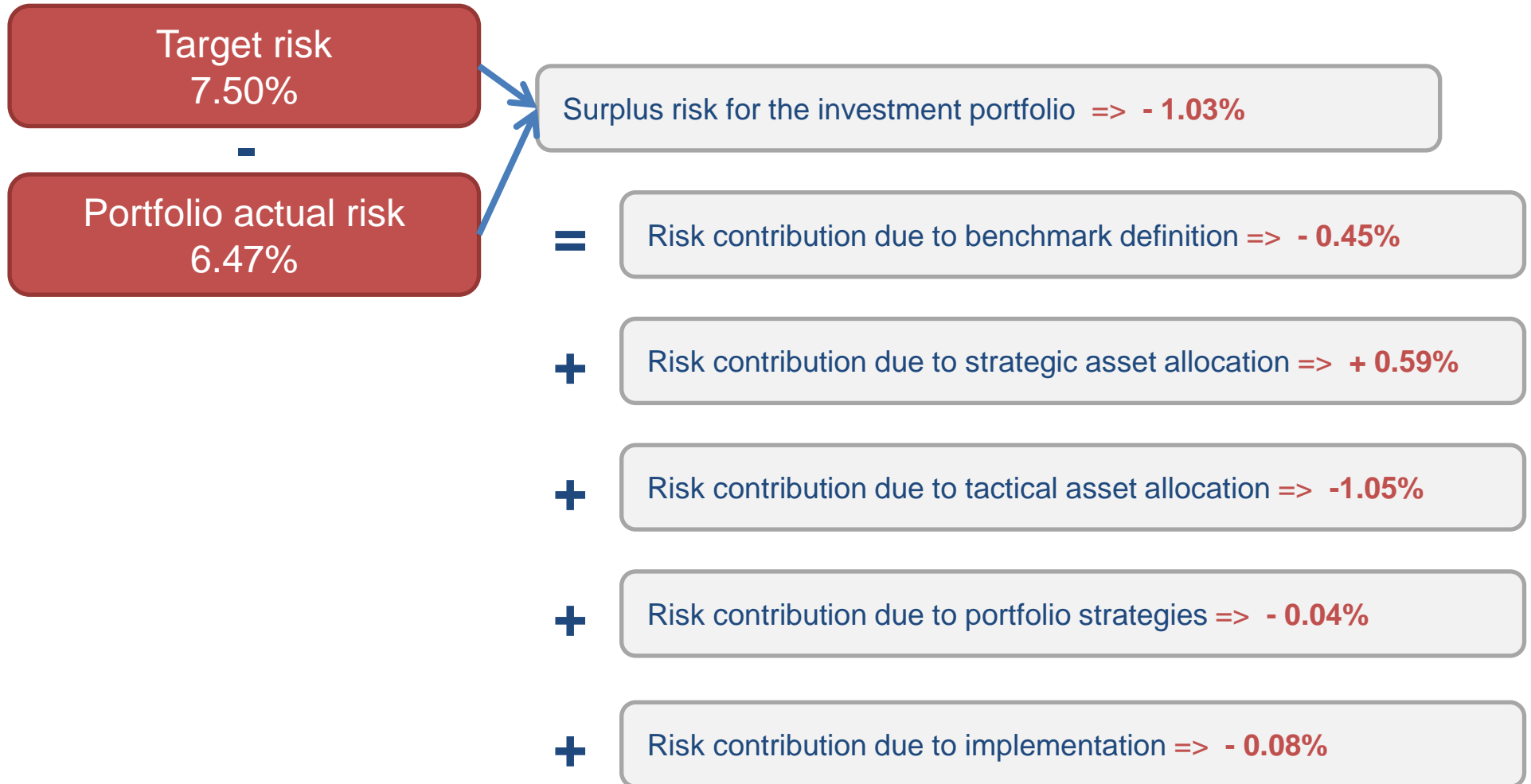
Example – Step 3 (Calculation of risk figures)

(2/3)



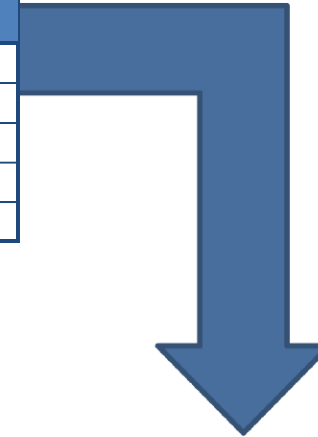
Example – Step 3 (Calculation of risk figures)

(3/3)



Example – Step 4 (Assigning of (excess) risk figures) (1/2)

| Management effects to excess risk | Asset allocation effect | Stock picking effect | Interaction effect | Total effects |
|-----------------------------------|-------------------------|----------------------|--------------------|---------------|
| Domestic Bonds | 0.00% | 0.01% | 0.00% | 0.00% |
| Foreign Bonds | -0.10% | -0.07% | 0.01% | -0.09% |
| Domestic Equities | -0.76% | -0.02% | 0.07% | -0.82% |
| Foreign Equities | -0.13% | -0.28% | 0.24% | -0.13% |
| Total assets | -0.99% | -0.36% | 0.32% | -1.03% |

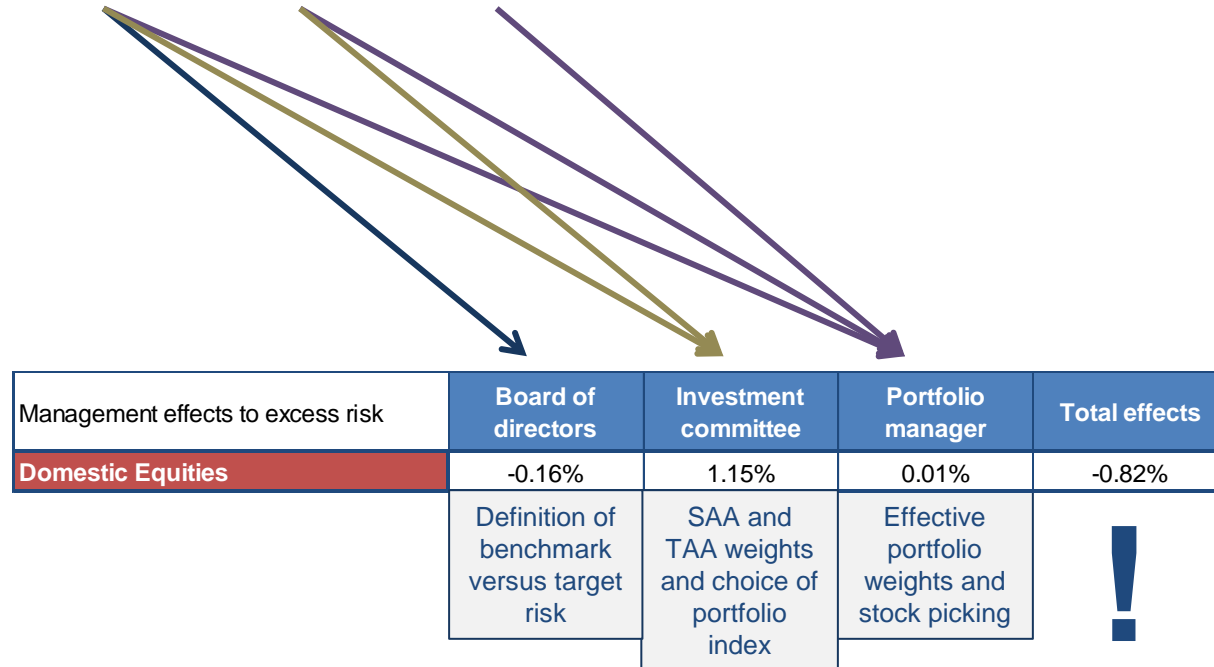


| Management effects to excess risk | Board of directors | Investment committee | Portfolio manager | Total effects |
|-----------------------------------|--------------------|----------------------|-------------------|---------------|
| Domestic Bonds | 0.00% | 0.01% | 0.00% | 0.00% |
| Foreign Bonds | -0.04% | -0.02% | -0.07% | -0.09% |
| Domestic Equities | -0.16% | 1.15% | 0.01% | -0.82% |
| Foreign Equities | -0.25% | -1.64% | -0.02% | -0.13% |
| Total assets | -0.45% | -0.50% | -0.08% | -1.03% |

Example – Step 4 (Assigning of (excess) returns)

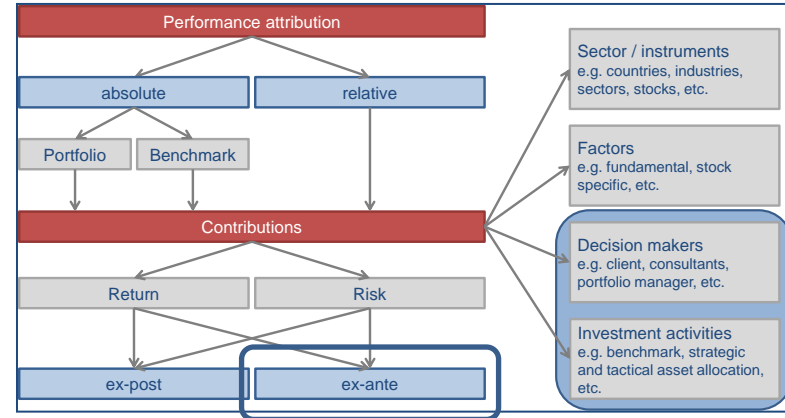
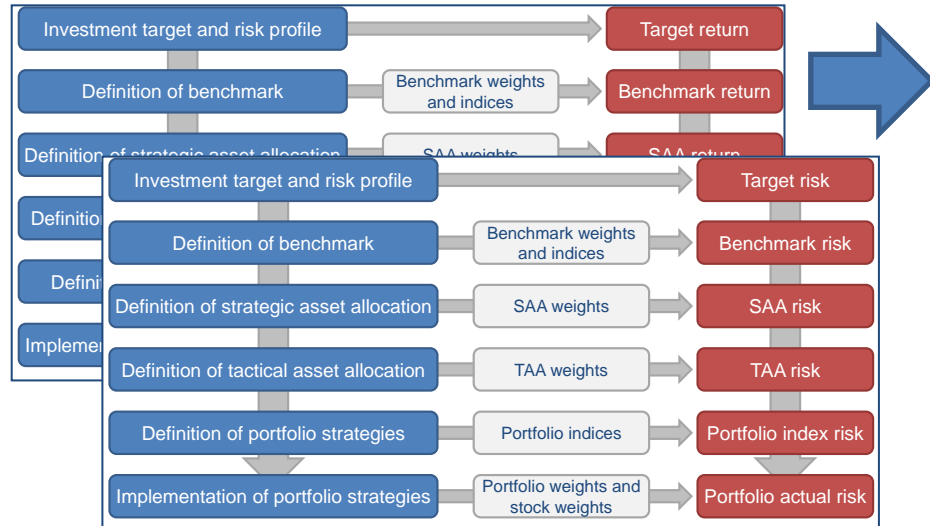
(2/2)

| Management effects to excess risk | Asset allocation effect | Stock picking effect | Interaction effect | Total effects |
|-----------------------------------|-------------------------|----------------------|--------------------|---------------|
| Domestic Equities | -0.76% | -0.02% | 0.07% | -0.82% |



How to bring return & risk attribution together

Comprehensive performance attribution – An example (1/4)



How much absolute or excess risk is coming from each asset class, each decision and each decision maker? And what where the consequences on the expected return?

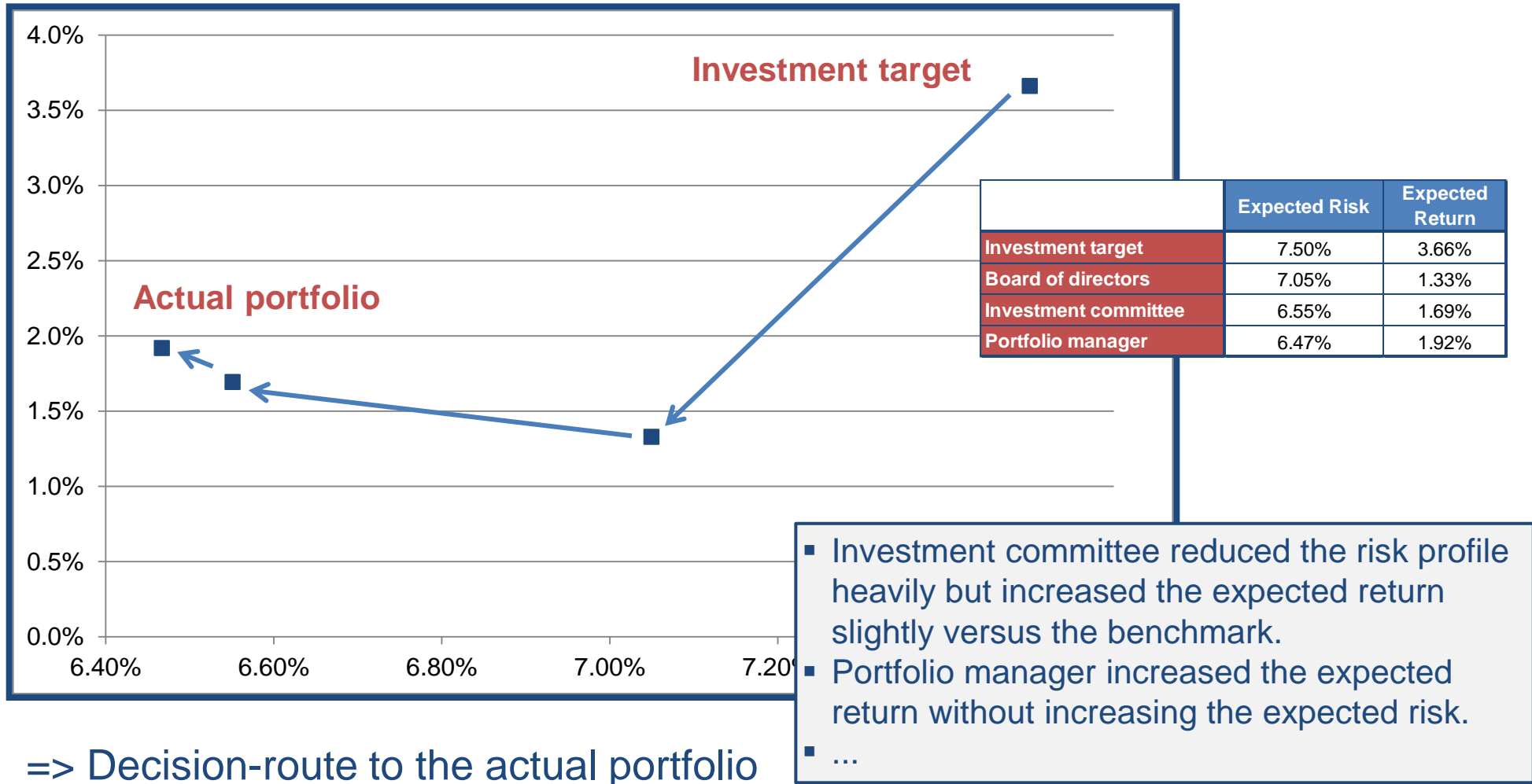
| | Expected Risk | Expected Return |
|----------------------|---------------|-----------------|
| Investment target | 7.50% | 3.66% |
| Board of directors | 7.05% | 1.33% |
| Investment committee | 6.55% | 1.69% |
| Portfolio manager | 6.47% | 1.92% |



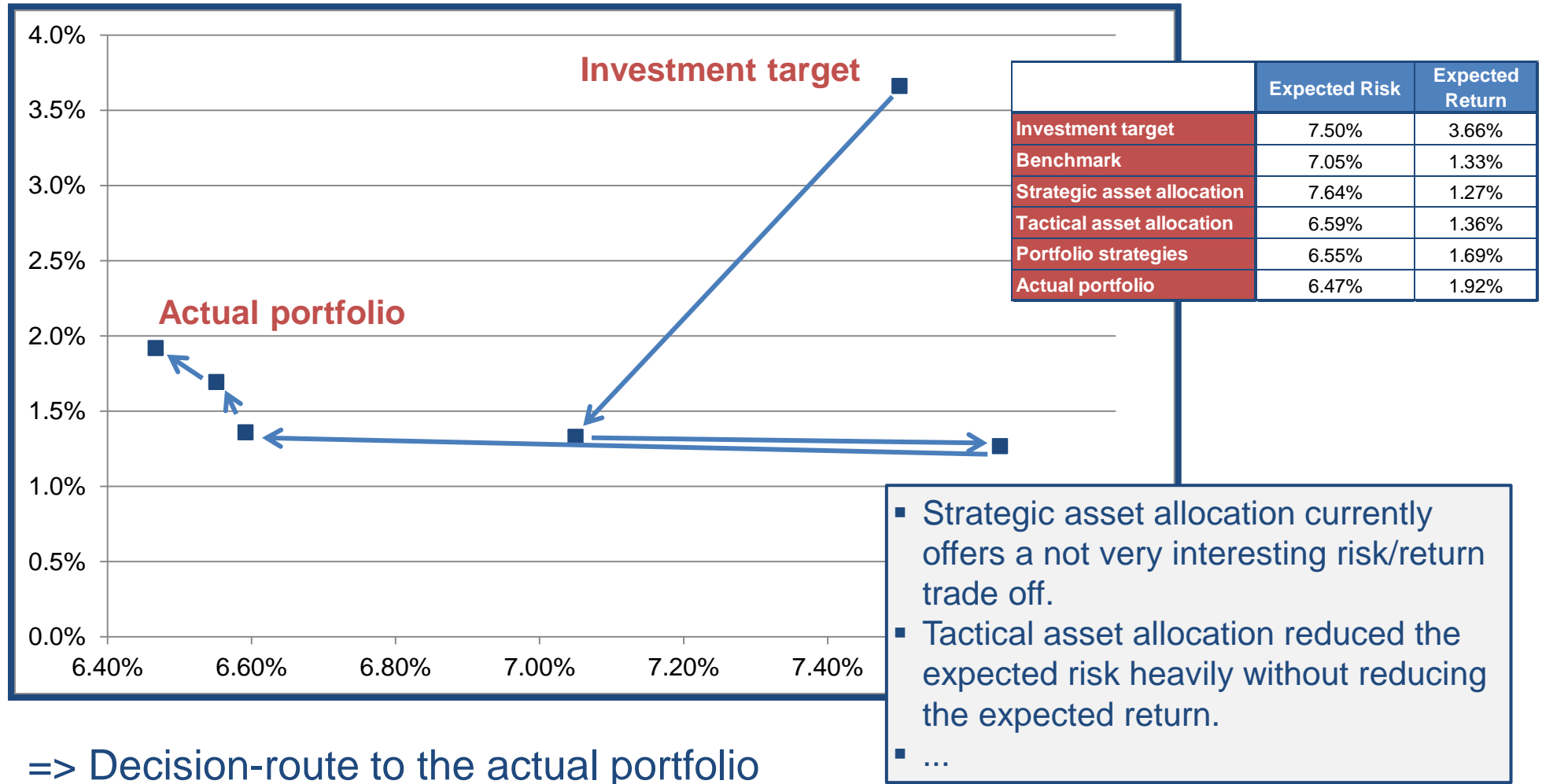
| | Expected Risk | Expected Return |
|----------------------------|---------------|-----------------|
| Investment target | 7.50% | 3.66% |
| Benchmark | 7.05% | 1.33% |
| Strategic asset allocation | 7.64% | 1.27% |
| Tactical asset allocation | 6.59% | 1.36% |
| Portfolio strategies | 6.55% | 1.69% |
| Actual portfolio | 6.47% | 1.92% |

Interpretations.

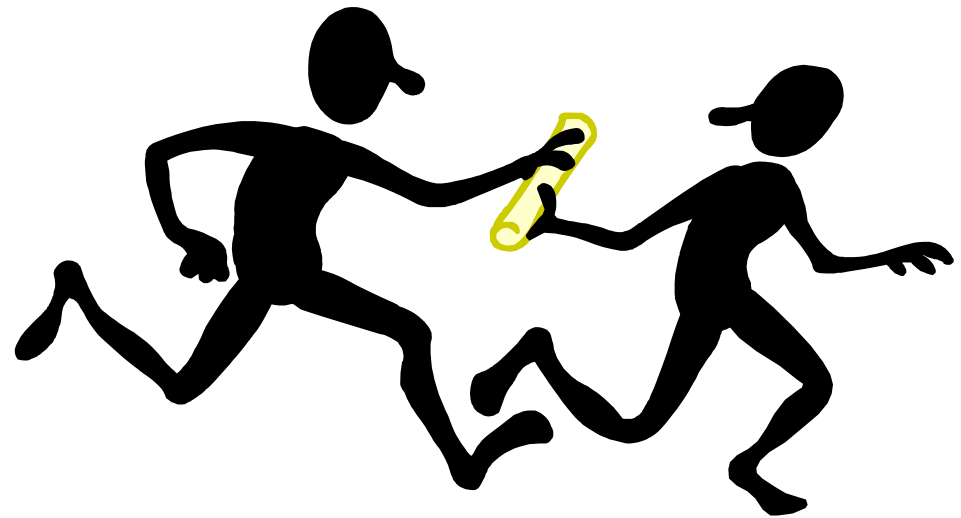
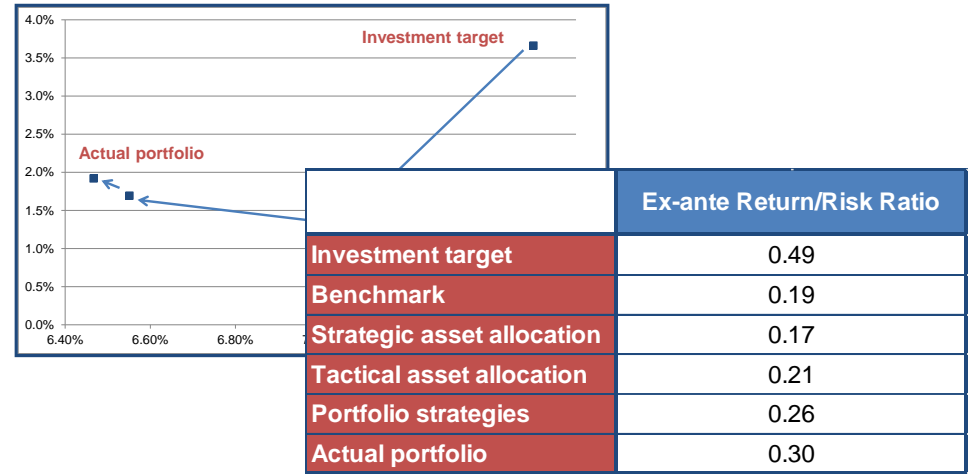
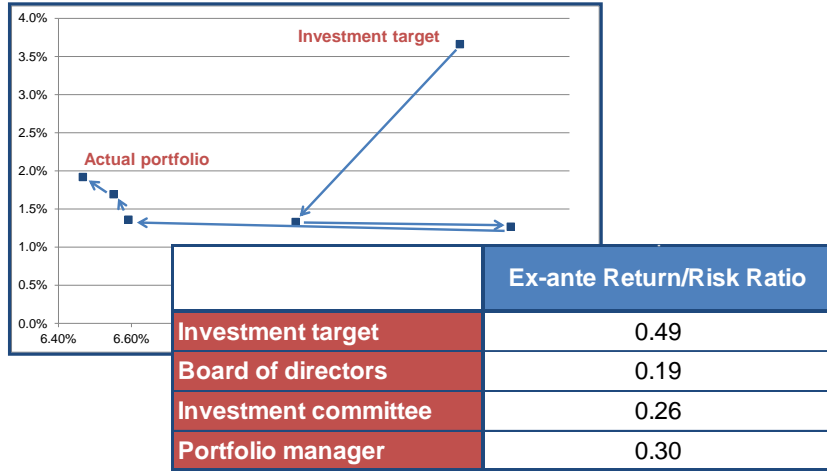
Comprehensive performance attribution – An example (2/4)



Comprehensive performance attribution – An example (3/4)



Comprehensive performance attribution – An example (4/4)



Comments and questions

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Contact details and disclaimer

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