Investment Data Services

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The fundamental importance of data management for risk and performance measurement

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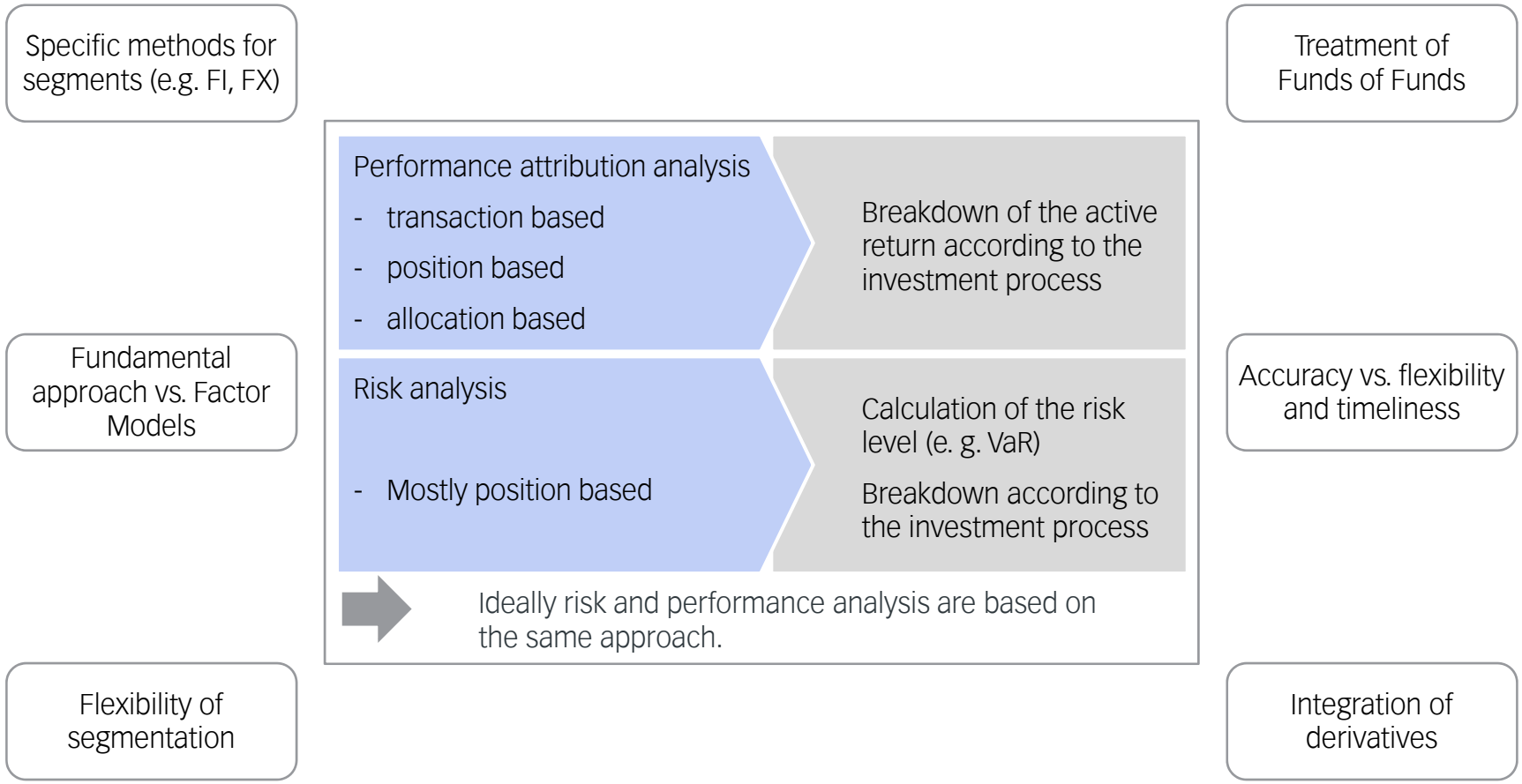
Approaches for investment analysis are primarily discussed with a focus on methods



<table>
<tr><th>Brinson (Stocks)</th><th>Bonds</th><th>Factor-based approaches</th></tr>
<tr><td>▪ Brinson, Hood, Beebower
▪ Brinson, Fachler</td><td>▪ OAS-approach
▪ Duration-based approaches
▪ Generalized Brinson approach</td><td rowspan="4"><u>APT-based approaches</u>
▪ Fundamental models

▪ Macroeconomic models

▪ Statistical models</td></tr>
<tr><td><u>Currency effects</u></td><td>- Ankrim, Hensel
- Singer, Karnosky
-„naive“ currency attribution</td></tr>
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<tr><td colspan="3">Position-based vs. Transaction-based</td></tr>
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➡ Here we do not consider the treatment of derivatives or the linkage of contributions over several periods.

Different approaches show pros and cons depending on the objective of the analysis

Position-based attribution analysis

Pro

- Requirements on the data quality less strict
  → This facilitates the implementation
- Position data are in general available on a timely basis
  → Analyses are available on a timely basis
- High flexibility in regard to the underlying segmentation

Contra

- Aggregated performance (active return) is only an approximation to the active return (computed from an accounting perspective)

→ Better fit to the Investment process

Transaction-based attribution analysis

Contra

- Strict requirements on the data quality
  → Implementation effort can be considerable
- Consistent transaction data are often available only with a time lag

Pro

- Aggregated performance corresponds to the official active return

→ Consistent client reporting

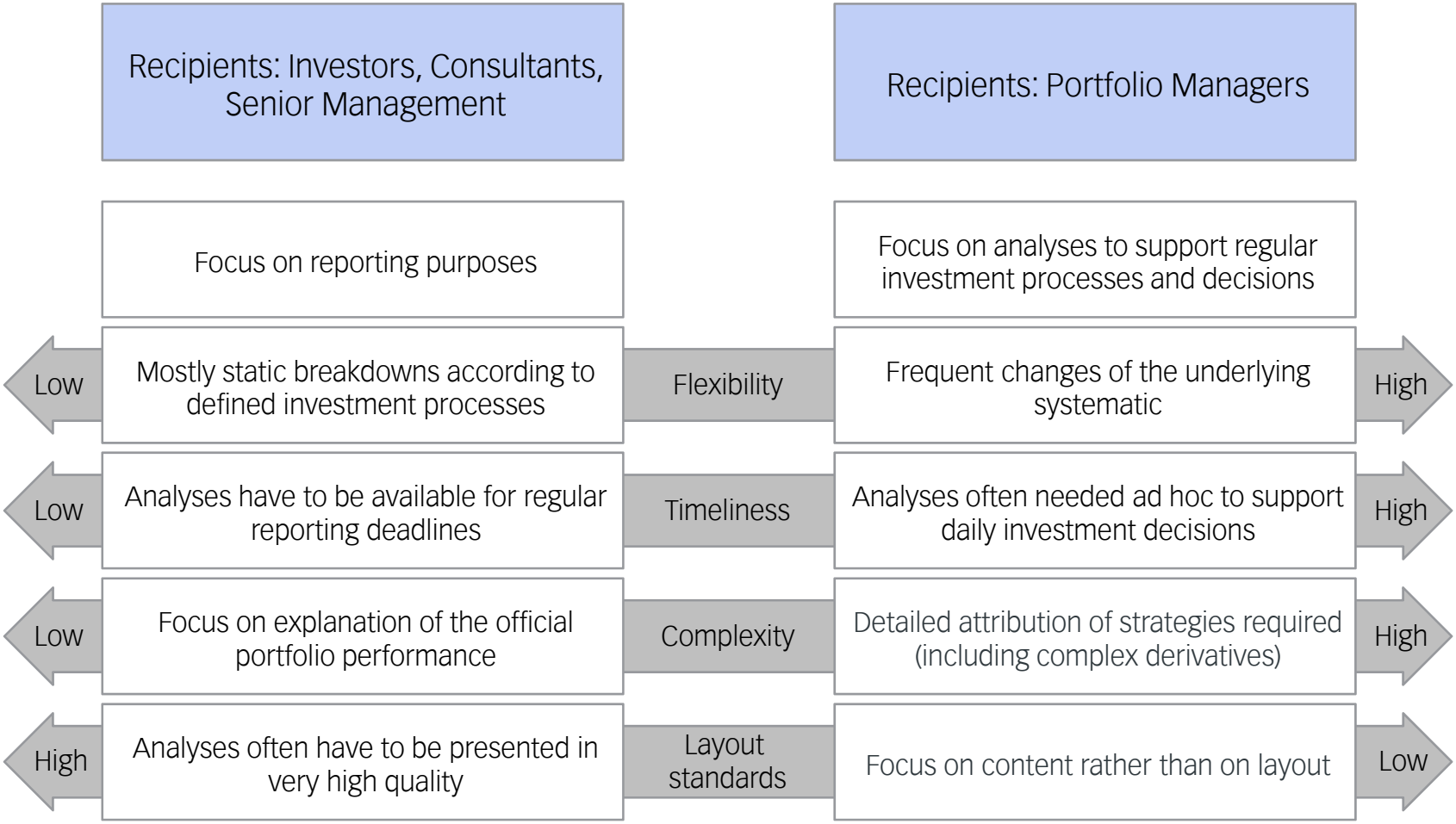
Risk & attribution analysis – *not* only a methodical problem

- In practice, professionals face substantial differences between methodical questions and the requirements on the implementation of a system.

- Complexity is largely driven by the investment process, respectively by the requirements placed on the analysis to mirror this process:
  - involved (fixed income) instruments
  - strategies involving derivatives

- The spectrum is very broad. The following provides a rough illustration of the extreme positions:

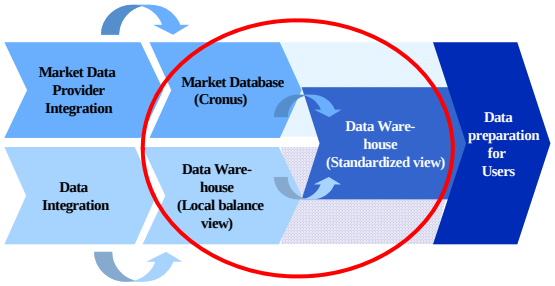
Example: Requirements of different recipients of attribution analysis – and impacts on the underlying technical solution



Requests from the business side raise demands on the entire technical infrastructure

- Flexibility of IT systems and processes
- Qualified personnel – in methodical and technical aspects
- Valuation routines for complex derivatives
- The required additional market data
- Harmonized input data (holdings, market data)
- Harmonized valuation dates

Example 1: Standardization of instrument data from different BO systems and data vendors



Goal:

- ➔ **Creation of an homogeneous view on investments / issuer**
- ➔ **Enrichment by using market data**
- ➔ **Comprehensive analyses**

E.g. Corporate Ownership List, Exposure reports

Original-Investment

Investment	External identifier	Type
Deutsche Bank AG,NPV (Regd)	ISIN DE0005140008	Stock
DEUTSCHE BANK AG N-AKT	WKNR 514000	Stock
DE0003930798	ISIN DE0003930798	Bond
BANKERS TRUST NEW YORK	ISIN US0663651075	Stock
Bankers Trust /94	ISIN XS0053728878	Bond

Standard Investment

Investment	S&P Rating	Duration
Deutsche Bank AG Akt.		
DEUT 2,75% 1205	AA-	2.74938
Bankers Trust Corp. Akt.		
Bankers Trust 3,8125%	NA	0.05605

Company (Issuer)

Company	S&P Rating	Parent Company
Deutsche Bank AG	AA-	Deutsche Bank AG
Bankers Trust Corp.	A+	Deutsche Bank AG

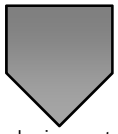
Market Database (Cronus)

Investment	WKNR	ISIN	SEDOL	S&P Rating	Duration	Prices
Deutsche Bank AG Akt.	514400	DE0005140008	6178774			38,89
DEUT 2,75% 1205	393079	DE0003930798	7343344	AA-	2.74938	39,46
Bankers Trust 3,8125%		XS0053728878		NA	0.05605	40,20

Data standardization – practical example

One single investment and its heterogenous representations in the backoffice systems:

backoffice ID	backoffice asset ID	backoffice asset name	asset class	asset class description	quoted on	identifier
1111	A0GN3W_00000_GBP_0	Großbritannien Treasury Stock 06/16	111	Schuldverschreibungen, Anleihen, Obligationen	ISIN	GB00B0V3WX43
2084	LCGBP02494	UNITED KINGDOM	BOND	?	ISIN	GB00B0V3WX43
2083	JCXUK0067	UK 4.0000% Gilt Sep 2016	BOND	?	ISIN	GB00B0V3WX43
2086	MLCEF296277	TREASURY	BOND	?	ISIN	GB00B0V3WX43
2319	GB00B0V3WX43	Großbritannien LS-Treasury Stock 2006(16)	WPF_040_2001_	Festverzinsliche Wertpapiere , festverzinste Anleih , Anleihen (Obligationen, Sc	ISIN	GB00B0V3WX43
2251	008816B25	UK GILT 4 9/07/16	TSY	Treasury	ISIN	GB00B0V3WX43
2253	008816B25	UK GILT 4 9/07/16	TSY	TREASURY	ISIN	GB00B0V3WX43
2239	771838_NOR	GILT 4% 07/09/16	BONDS (FIXED RATE)	?	ISIN	GB00B0V3WX43
2350	A0GN3W_00000_GBP_0	Großbritannien Treasury Stock 06/16	111	SCHULDVERSCHR, ANLEIHEN, OBLIGATIONEN	ISIN	GB00B0V3WX43
2318	GB00B0V3WX43	Großbritannien LS-Treasury Stock 2006(16)	WPF_040_2001_	Festverzinsliche Wertpapiere , festverzinste Anleih , Anleihen (Obligationen, Sc	ISIN	GB00B0V3WX43
2356	B0V3WXII3	UK TSY 4 2016 BONDS 09/16 4.	10	GOVERNMENT ISSUES	ISIN	GB00B0V3WX43
2365	B0V3WXII3	UK TSY 4 2016 BONDS 09/16 4.	10	GOVERNMENT ISSUES	ISIN	GB00B0V3WX43
2351	A0GN3W_00000_GBP_0	Großbritannien Treasury Stock 06/16	111	SCHULDVERSCHR, ANLEIHEN, OBLIGATIONEN	ISIN	GB00B0V3WX43
2512	771838	GILT 4% 07/09/16	BONDS (FIXED RATE)	?	ISIN	GB00B0V3WX43
2587	GB00B0V3WX43	UK TSY 4% 2016 UKT 4 09/07/16	111	Debentures, bonds, and German public sector mortg	ISIN	GB00B0V3WX43
2609	019038W	UK(GOVT OF) 4% STK 07/09/2016 GBP100	UKGILT	UK GILT	SEDOL	B0V3WX4
2607	019038W	UK(GOVT OF) 4% STK 07/09/2016 GBP100	UKGILT	UK GILT	SEDOL	B0V3WX4
2584	45103-0_GBP	UKT 4 09/07/16	GOV BOND	?	ISIN	GB00B0V3WX43
2599	019038W	UK(GOVT OF) 4% STK 07/09/2016 GBP100	UKGILT	UK GILT	SEDOL	B0V3WX4
2619	COEF2962779	United Kingdom Gilt 4.00% Due 2016-Sep-07	FI55	GOVERNMENT, TREASURY	SEDOL	B0V3WX4
2593	LPCGBP02494	UNITED KINGDOM	N/A	?	ISIN	GB00B0V3WX43
2690	LCGBP02494	UNITED KINGDOM	0	?	ISIN	GB00B0V3WX43



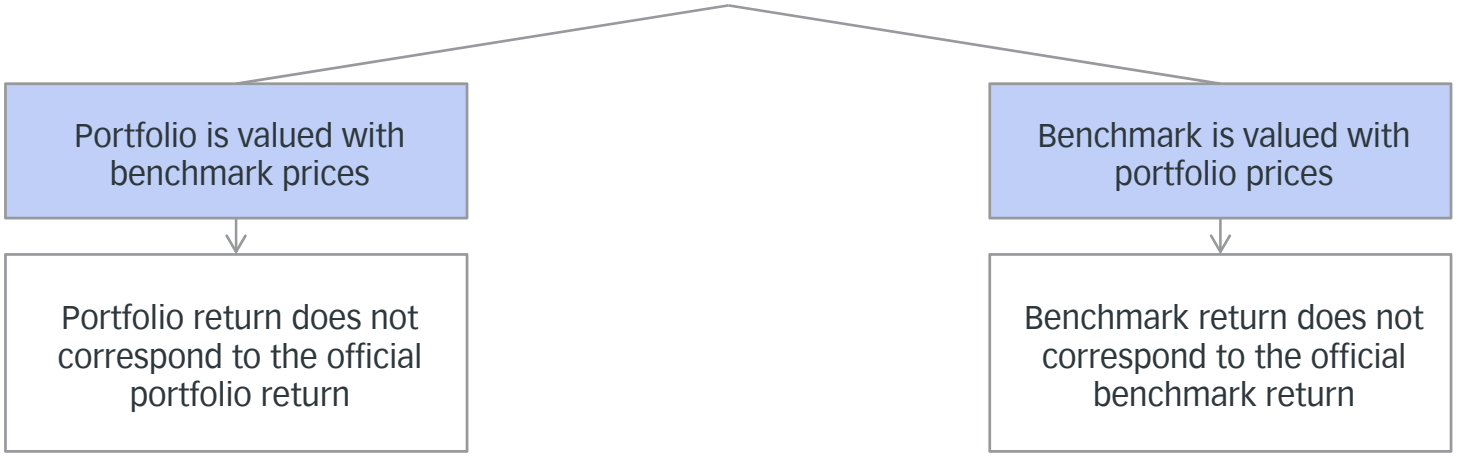
One single investment and its one single representation within the IDS platform:

IDS ID	IDS asset name	IDS asset class	IDS asset class description
502379	UK TSY 4% 2016 4.000% 07.09.2016	BB99	FIXED INCOME, BOND, -, -

Example 2: Valuation issues

- Different valuation times for portfolio and benchmark instruments lead to a valuation differential that obscures the analysis effects.
- Therefore, the usage of consistent pricing (in terms of sources and valuation times) are of central importance.

Two principal alternatives



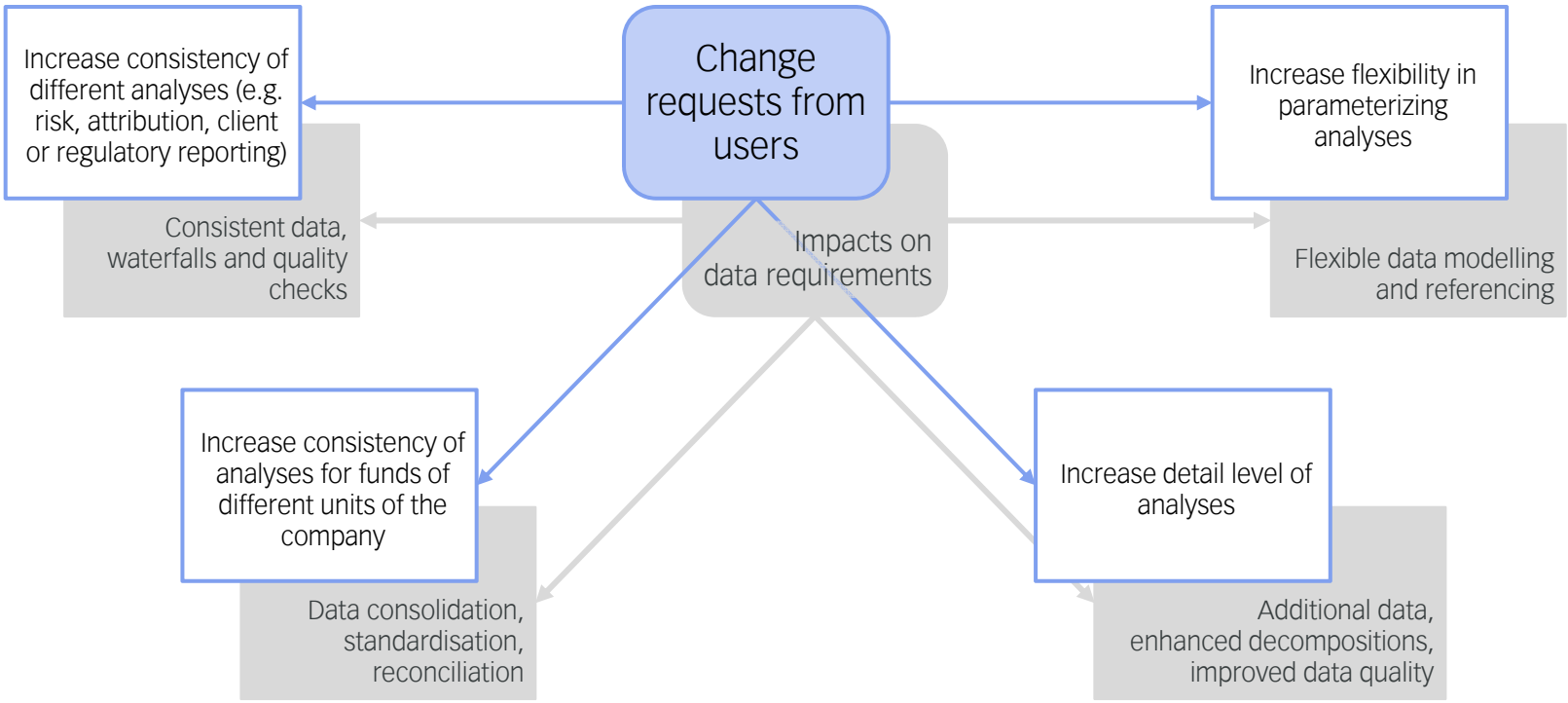
➡ A solution in which the custodian values portfolio holdings with identical pricing sources as for the benchmark(s) is often not given in practice.

Example 3: Where does the complexity come from?
Some examples from IDS

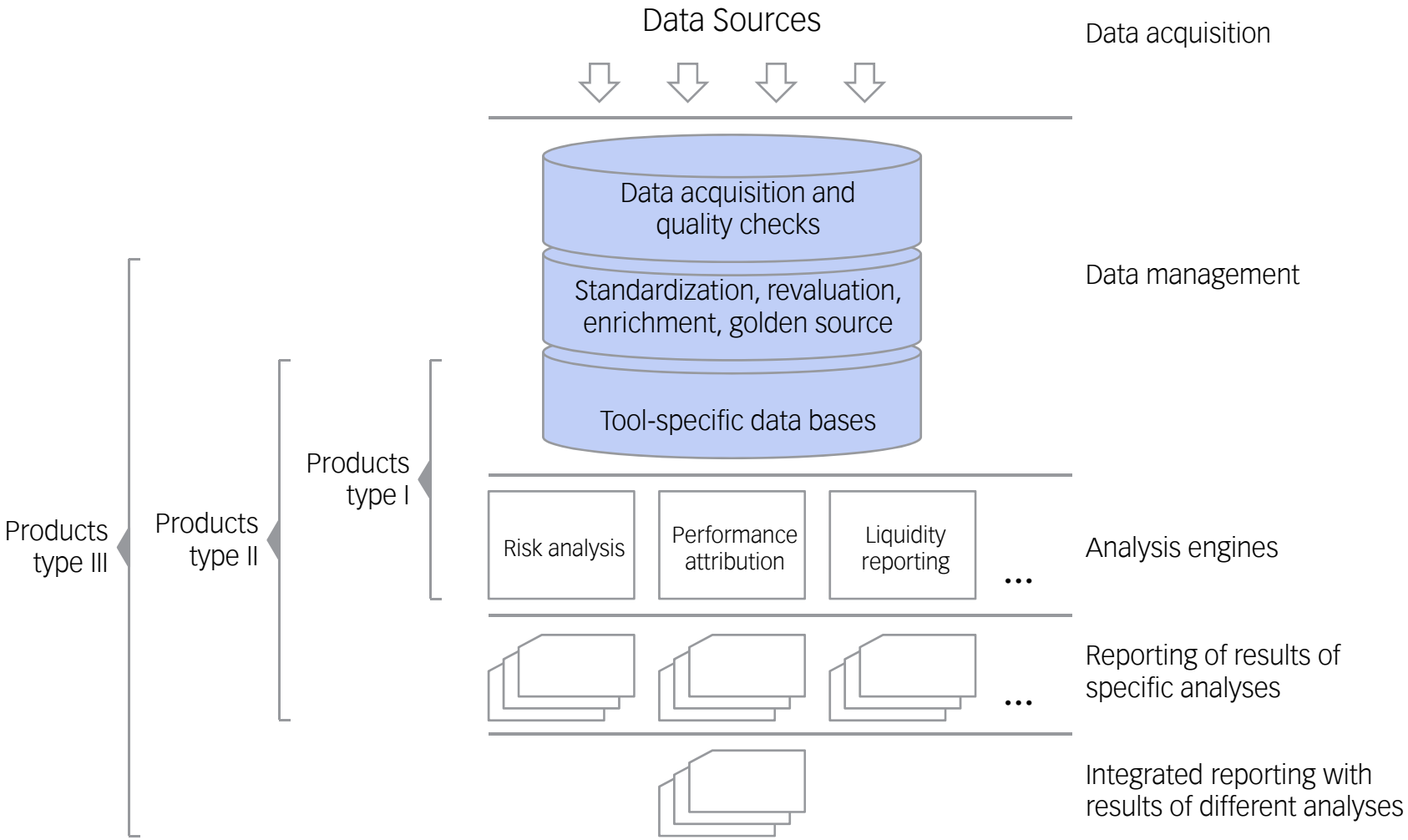
Callable fixed to float bonds	• When a floater, these bonds are equipped with termination rights for the issuer. • As basic interest rate movements are irrelevant in this phase, standard valuation approaches fail. • A new valuation methodology was developed at IDS.
Treatment of Long and short positions	• Client requested that long and short positions are reported separately. • This is challenging, as the attributes „long“ and „short“ are dynamical attributes, rather than statical ones. • This was implemented independently of the standard system.
Currency overlays	• Very common are also client requests to implement bespoke methodologies for (currency) overlay effects and fixed income attribution (especially in the field of high yield bonds).

➡ Such requirements are often made during the implementation phase and even in the production phase!

Changing requests from the business site usually come with additional requirements on underlying data



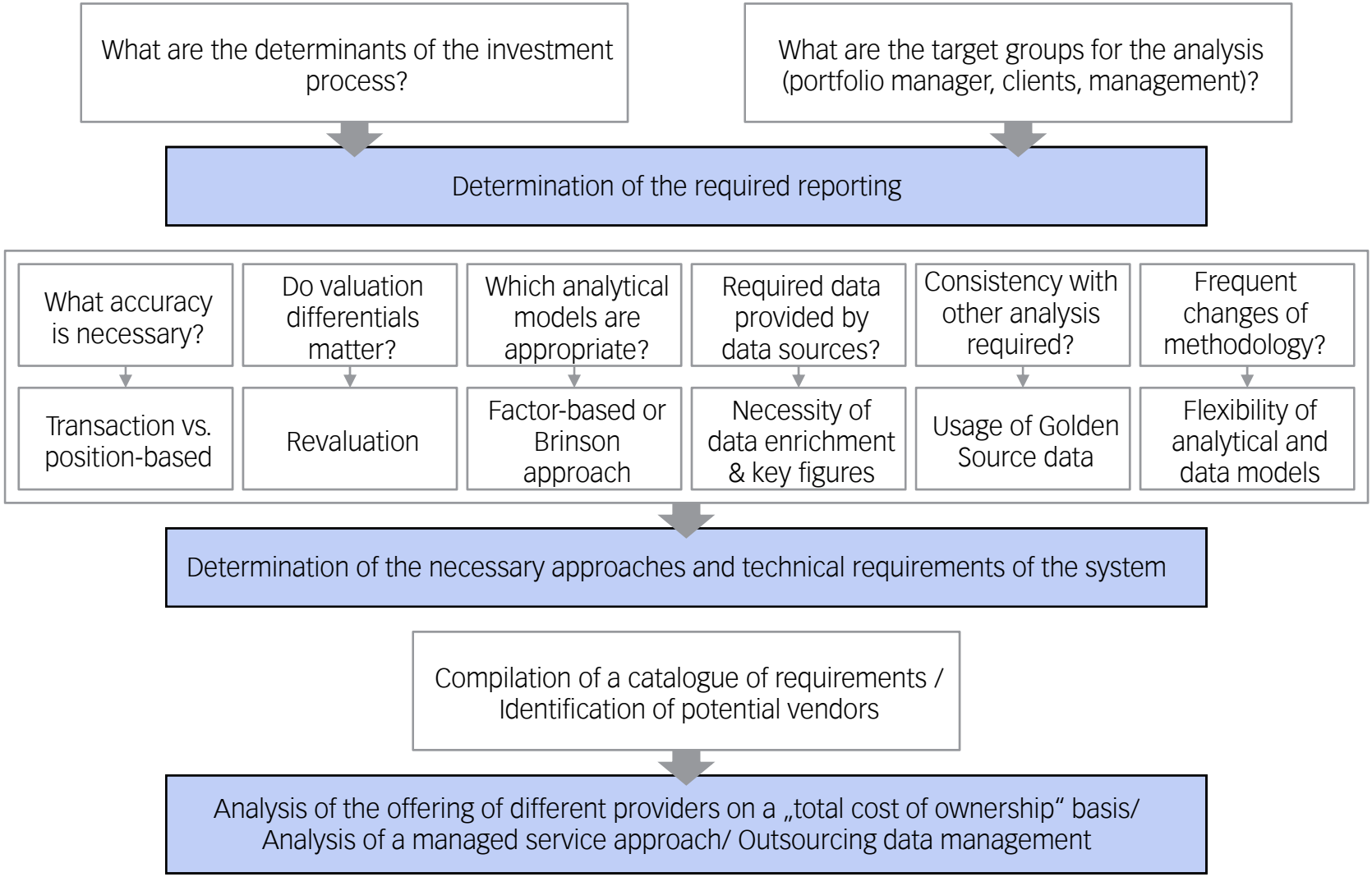
The market provides a variety of analytical tools – with differences in the level of vertical integration



Which product fits best the needs of an investment firm?

- All these types of products come with different functionalities – and different pricing schemes.
- As data management is a critical point for system implementation, an investment firm needs to have a realistic assessment of its capabilities in this area.
- Each firm must determine which type of product provides a solution with the best fit to its needs and capacities.
- In order to benchmark the price of a specific product and its service, internal costs for all components must be taken into account.

Selection processes have to consider these aspects systematically



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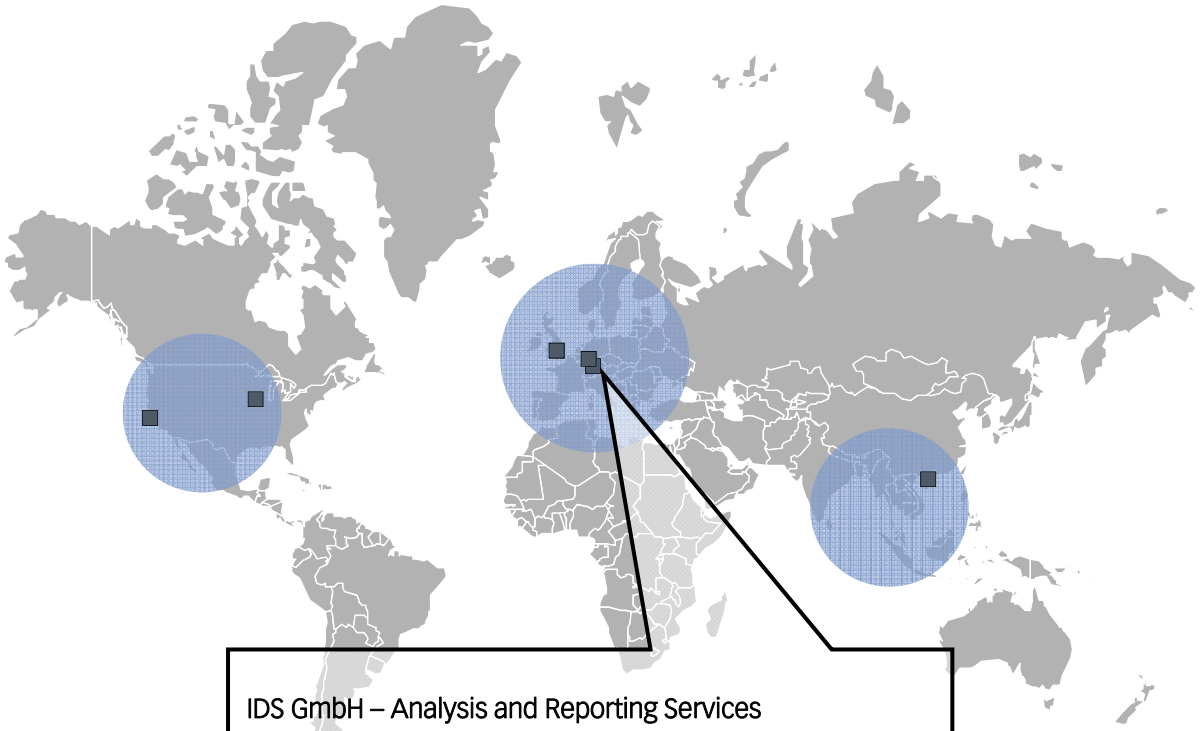
IDS is a managed service provider operating worldwide



IDS GmbH – Analysis and Reporting Services

- 100% subsidiary of Allianz SE
- established in 2001
- Munich, Frankfurt/Main, London, Minneapolis, San Francisco and Hong Kong
- About 290 employees from more than 30 nations with sector-specific background

Regions

74% Europe

16% Asia

10% USA

Industry

70% Asset Managers

12% Insurance Companies

9% Banks

9% Other Sectors

Segmentation

61% Allianz Group

39% Third Party

Statistics based on legal entities as at December 31, 2012

IDS provides operational investment controlling services

Asset Managers	Banks	Institutional Investors
Portfolio Manager, Fund Accounting Department, Compliance Officers, Marketing/Sales, Product Specialists, Account Manager, Investment Controlling	Compliance Officers, Controller, Custodian Bank/Fund-Controlling, Sales/Account Management	COOs/CFOs/CIOs of Insurance Companies, Pension Funds, Corporate Treasury, Foundations

Operational Investment Controlling Services

One-stop shop | Flexible and high-grade | Consistent over all reports | Short set-up and processing times

Data Management	Risk	Performance	Reporting
▪ Fund Data Hub ▪ Customized Benchmarks ▪ Golden Source	▪ Market Risk Measurement ▪ UCITS III guideline ▪ Market Risk Analysis ▪ Liquidity Reporting ▪ Guarantee Fund Controlling	▪ Performance Measurement ▪ Performance Attribution ▪ Outperformance Fee ▪ Composite Calculation ▪ GIPS Service ▪ Peer Group Analysis ▪ Stock Option Plans	▪ Fact Sheets ▪ KID ▪ Shareholder Reports ▪ Institutional Reporting, e.g., Investment Committee Reporting, Regulatory Reporting ▪ Solvency II Reporting ▪ Pension Fund Reporting ▪ Customized Reporting