

Liquidity Risk

A practical approach

Performance Measurement, Attribution & Risk Conference
London, 15.06.2011

Agenda

1. Definition and overview
2. Controlling based on static data – The IDS approach
3. Liquidity controlling for equities (based on turnover figures)
4. Liabilities side of the funds
5. Conclusions

Definition and Overview

- Market Liquidity Risk. This is the risk of losing a certain amount of money when liquidating one or more positions in a portfolio. In financial terms, the loss is generated by the difference between the price at which the financial asset is marked and the price at which it can be sold.
- The Liquidity Risk Paradox. Information on bid/asks, book and volumes is only available for liquid instruments, i.e. financial assets that trade on a daily basis in fairly transparent markets or trading venues. This information is not available for the most opaque and illiquid instruments. In other words, the financial information required to calibrate the “traditional” models of measurement of liquidity risk is not available for the instruments where a measure of this risk is mostly needed.

[Source: Dario Cintioli (Statpro): Market Liquidity risk: A scenario based approach]

Liquidity Risk Reporting

What Asset Managers should know about their funds

- Asset side of a fund

Which part of the assets could be difficult to sell?

- Liabilities side of a fund

Is the fund likely to face cash outflows? Of which amount?

... and how do these data match?

→ Answers help to identify potentially critical funds.

Liquidity risk controlling is a necessity

Regulatory and economic reasons

- Increased perception of regulatory requirements on liquidity controlling
- Experiences from latest financial crisis:
 - even „healthy“ assets can only be sold with markdowns
 - missing liquidity not abstract issue but concrete threat
- Monitoring of liquidity risk in investment funds is a regulatory and economic necessity.



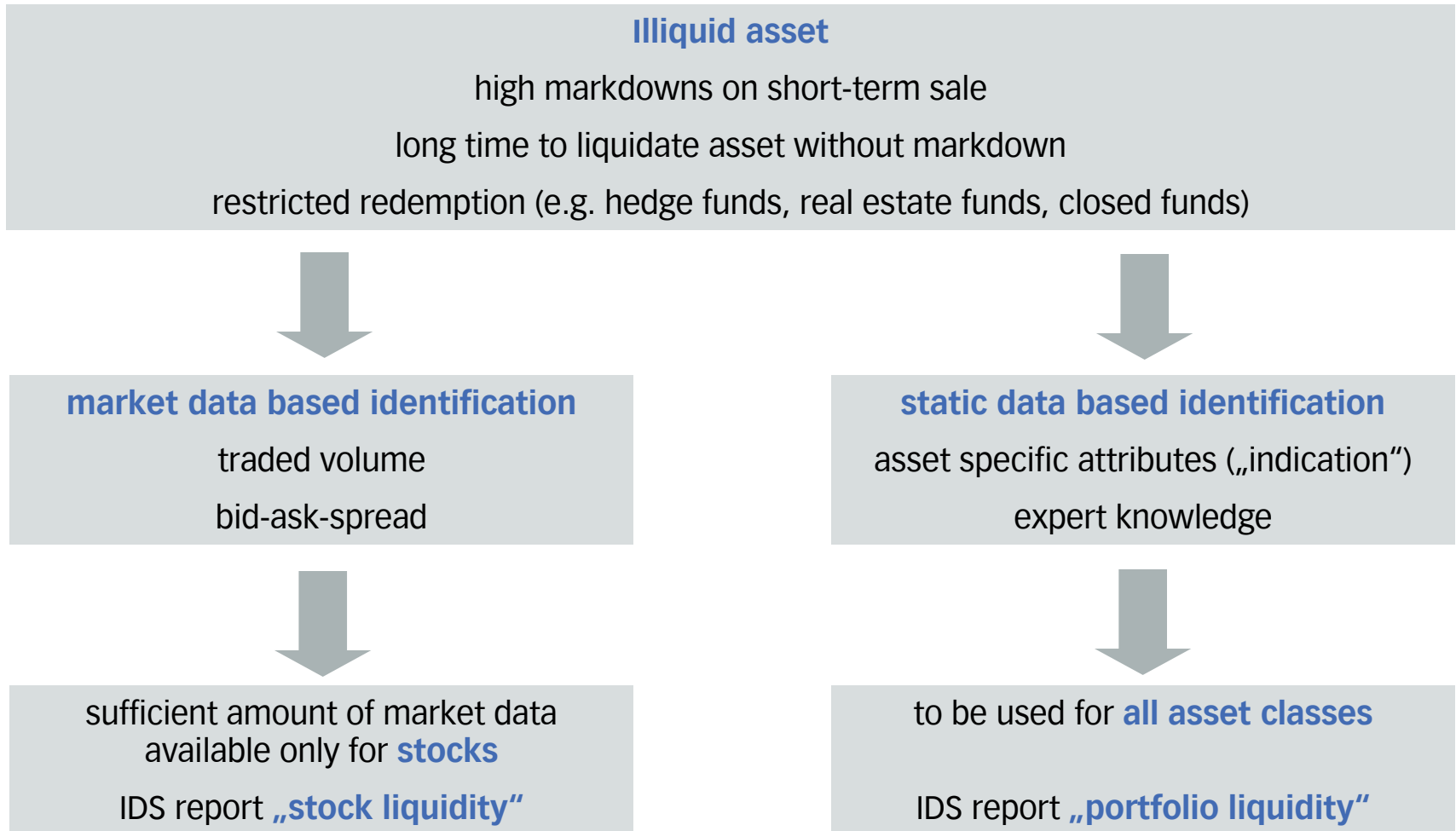
Appropriate state-of-the-art realization required
Liquidity under control

Theses on liquidity controlling

- Fulfillment of **legal requirements** is a must.
- Meaningful **liquidity key figures** must be consistent and reliable.
- Framework should be **consistent** over all funds.
- **Standard reports** should be generated in an **automated** form.
- **Ad hoc reports** for risk controlling, senior management and for the requirements of the investment process should be obtainable on short notice.
- **Workflows** and controlling procedures should be efficient, such that there is spare capacity for actual controlling analyses.
- **Acceptance by the fund management** and the **integration into the management process** are **success factors**.

Illiquid assets: notion and identification

Choice of methods



Various approaches

Barclays Capital: Liquidity Cost Scores (LCS) for US Bonds

(Bid-ask spread multiplied by the option adjusted spread duration of the bond)

For non quoted bonds the LCS is taken from a comparable bond.

Statpro approach

Similar to the approach described above, but based on bid-ask spreads for instruments, for which no direct bid-ask spreads are observable, Statpro derives them from the bid-ask spreads from underlying (observable) risk factors.

In addition, so-called haircuts may be defined for individual asset classes (pricing functions).

Mathematical Theory

Acerbi, Scandolo: Liquidity Risk Theory and Coherent Measures of Risk.

Highly abstract theory of so-called coherent risk measures.

Based on unrealistic assumptions about “Marginal Supply-Demand Curves” (Bid-ask price as a function of sold quantities) .

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Portfolio liquidity: function specification

Instrument types and appraisal criteria

- **bonds and commercial papers**
 - instrument type
 - type and credit-worthiness of the issuer
 - currency
 - amount outstanding
 - on-the-run/off-the-run
- **equity**
 - indices
 - exchanges
- **derivatives, certificates**
 - underlying
 - complexity
 - transaction form (OTC, exchange-traded)
- **target funds**
 - open-end/closed-end
 - ETF?
 - UCITS-compliant?
 - instruments within the fund

system of rules for the classification of individual assets

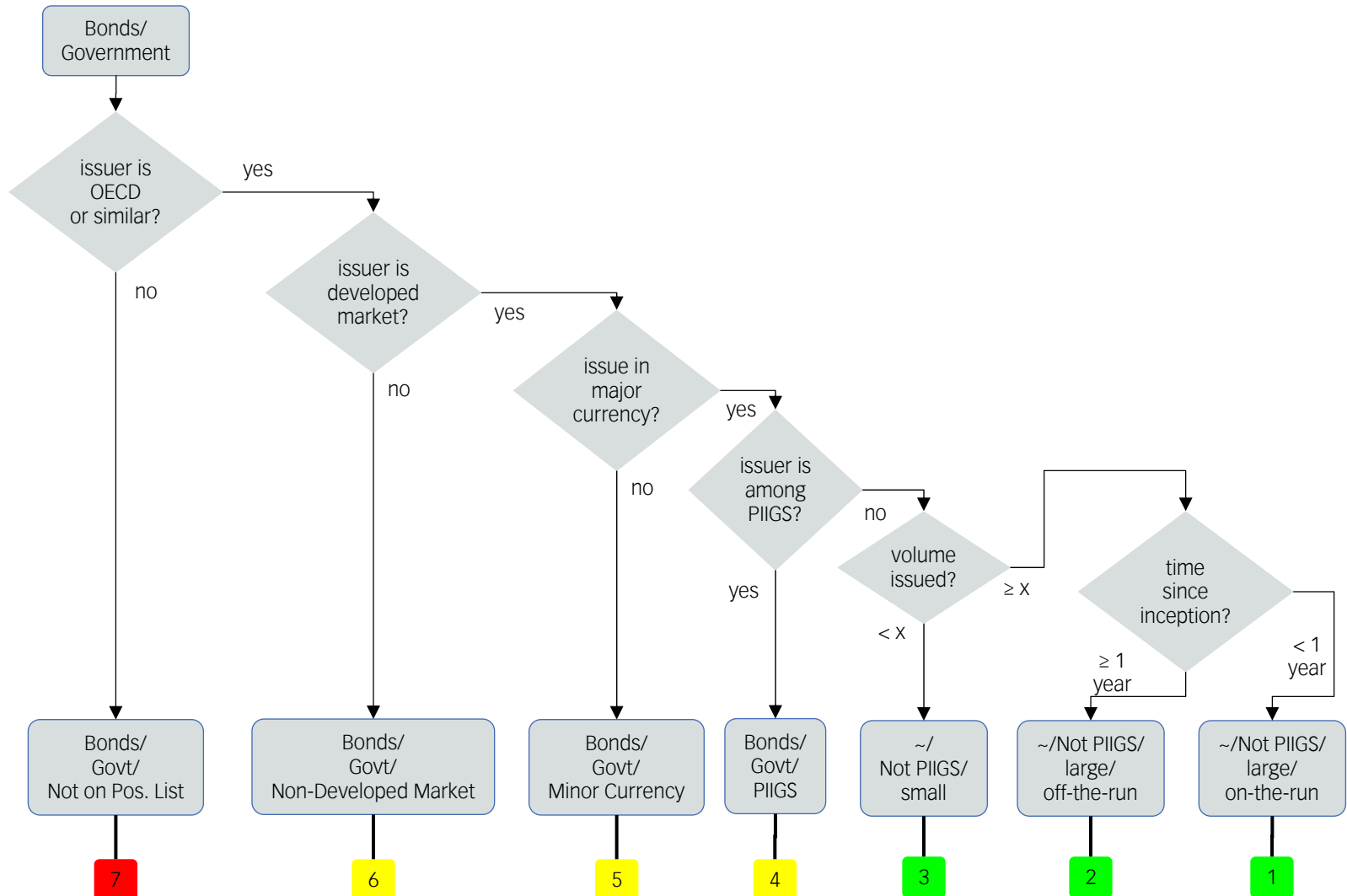
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accompanying list of known (il)liquid securities

e.g. target funds with a lock-up period, real estate funds with deferred redemptions, ...

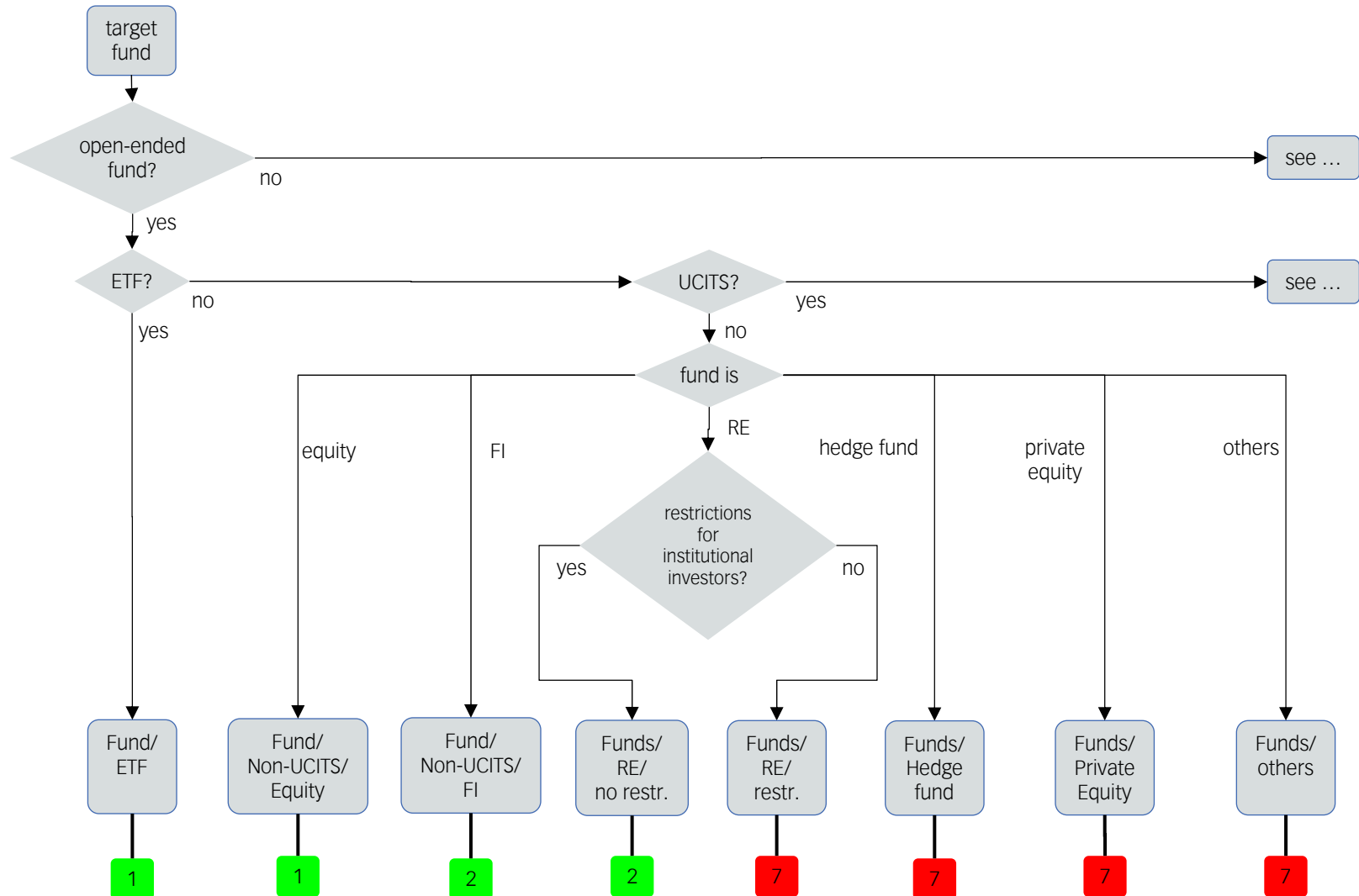
Portfolio liquidity: function specification

Example: government bonds



Portfolio liquidity: function specification

Example: target funds



Reporting (1/2)

Which funds have the highest share of illiquid positions?

Liquidity Report for [Asset Manager] as at 01/31/2011							
			Portfolio Net Asset Value	Market Liquidity Stratification in % of NAV			
Fund Id	Portfolio Name	Portfolio Currency	in EUR	liquid	fairly liquid	not liquid	not classifiable
3	Portfolio #3	EUR	703.858.403	68,38%	13,06%	18,56%	0,00%
1	Portfolio #1	EUR	1.164.064.927	58,20%	27,99%	13,82%	0,00%
2	Portfolio #2	EUR	1.656.211.961	72,20%	19,87%	7,93%	0,00%
9	Portfolio #9	EUR	938.289.979	77,98%	20,65%	1,23%	0,13%
5	Portfolio #5	EUR	3.969.589.990	83,20%	15,93%	0,79%	0,09%
11	Portfolio #11	EUR	495.739.445	79,11%	19,98%	0,71%	0,20%
8	Portfolio #8	EUR	3.383.256.737	82,20%	17,21%	0,48%	0,10%
10	Portfolio #10	EUR	805.370.675	82,25%	17,41%	0,30%	0,05%
4	Portfolio #4	EUR	170.230.811	100,00%	0,00%	0,00%	0,00%
6	Portfolio #6	EUR	59.109.441	100,00%	0,00%	0,00%	0,00%
7	Portfolio #7	EUR	26.471.946	100,00%	0,00%	0,00%	0,00%
...

Consistent overview of potential critical funds across all funds irrespective of the security classes.

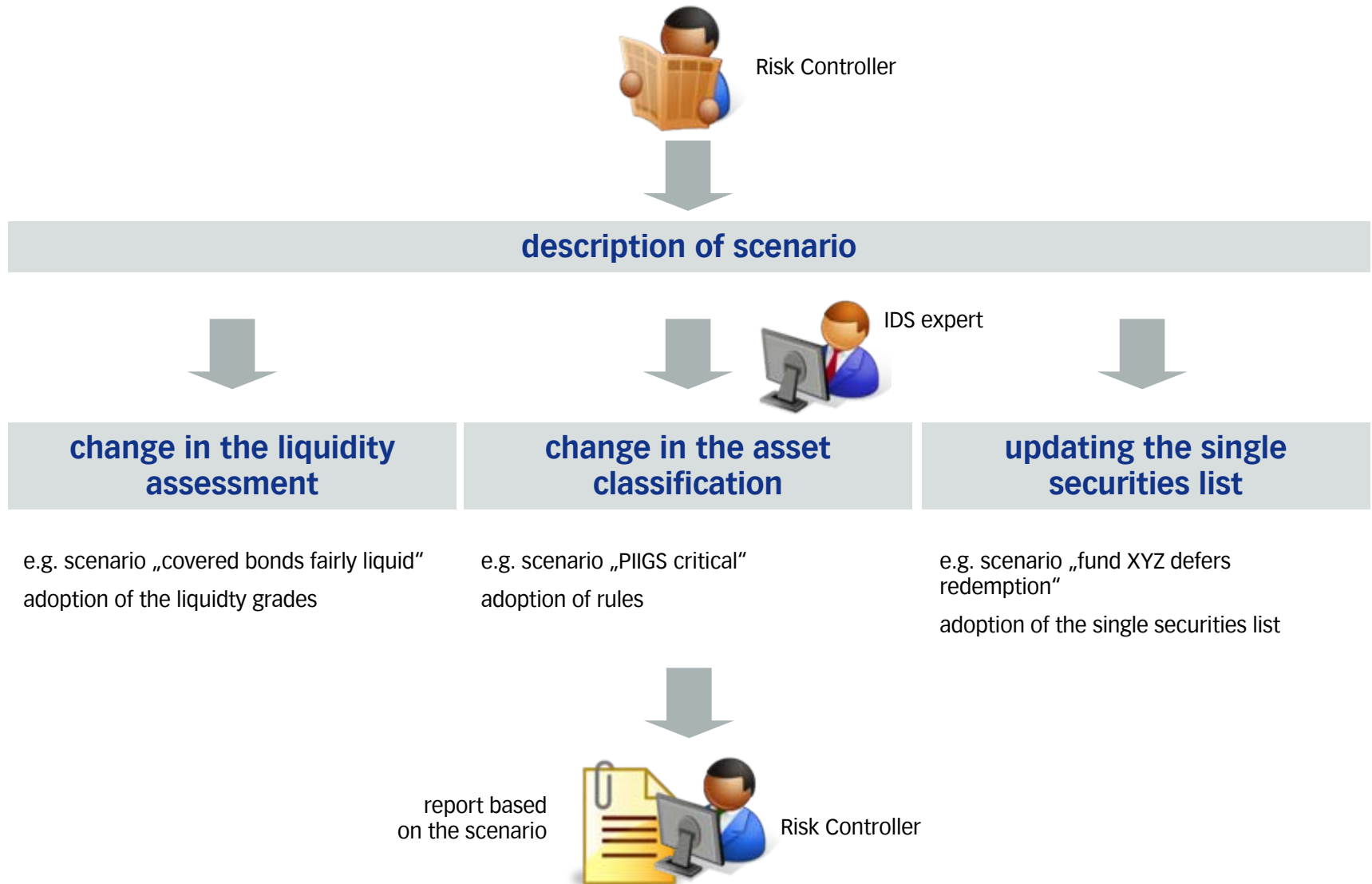
Reporting (2/2)

Liquidity layering of an investment fund

Fund 3 (Portfolio #3) as at 01/31/2011				
		Market Value	Liquidity	
Isin	Asset Name	in EUR		
	EUR Cash	622.811	1	
US0000000000	Govt Bond #1	1.355.622	1	
XS0000000000	ABS #1	2.422.833	8	
XS0000000000	ABS #2	361.176	8	
GB0000000000	Govt Bond #2	3.544.110	2	
DE0000000000	Govt Bond #3	1.266.733	2	
GB0000000000	Govt Bond #4	2.448.111	1	
FR0000000000	Govt Bond #5	1.517.622	2	
US0000000000	Govt Bond #6	2.344.918	2	
US0000000000	Corp Bond #1	422.119	3	
DE0000000000	Corp Bond #2	526.811	4	
...	
3 Portfolio #3		703.858.403	3,4	

Portfolio Overview			
Liquidity		% of NAV	
1	liquid	17,89%	68,38%
2		22,41%	
3		28,08%	
4	fairly liquid	6,33%	13,06%
5		4,10%	
6		2,63%	
7	not liquid	13,45%	18,56%
8		5,11%	
9	not classifiable	0,00%	0,00%
10		0,00%	

Scenario analyses



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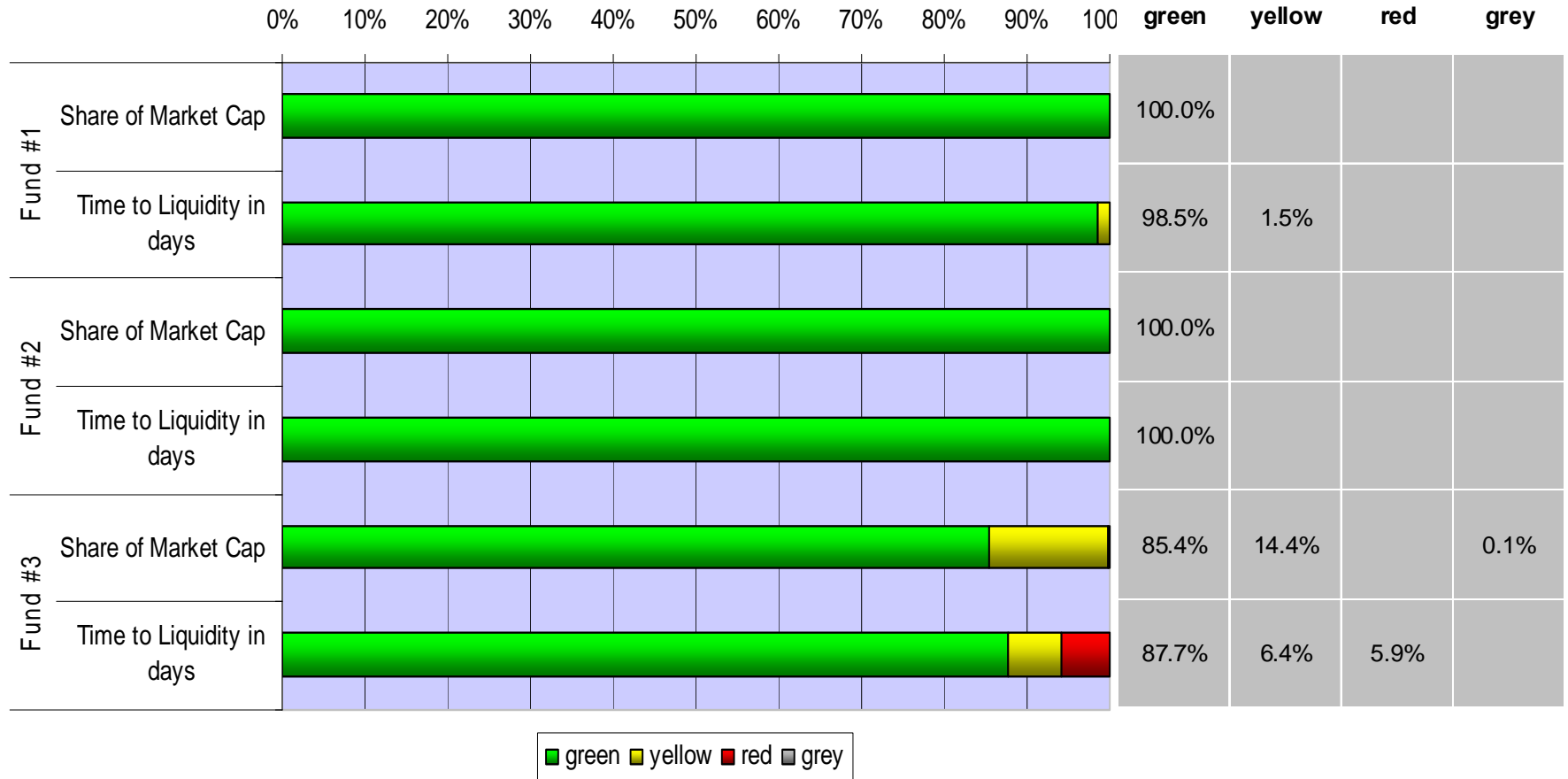
Equity Liquidity: Function Specification

Identification of critical situations

- Good availability of market data **for equities** via exchanges.
- Critical situations must be revealed:
 - A high share in illiquid titles (e.g. small caps, stocks on exotic exchanges) in a fund can make it hard to increase the cash position.
 - A fund or a group of funds may contain a large share of the total market cap of a company, which could make it tough to liquidate a large portion over a short period → usually not in the focus of the fund manager.
- Relevant market data:
 - Average **turnover volume** of a stock in a historical period (e.g. over 1, 5, or 20 days).
 - **Market cap** / free float.
- Liquidity key figures / filter:
 - **Time to liquidity** (held position/average traded volume).
 - Share of the **Market cap**.

Equity liquidity: Reporting

Liquidity layering of the funds



Grey: insufficient data availability.

Equity liquidity: Reporting

Liquidity layering of the funds

9/3/2009	Fund #5	percentage of the fund	% of overall holdings in that pos.	Share of market capitalization		Time to liquidity (days)	
				Fund	Total	Fund	Total
ISIN	Name						
stocks with the highest weightings in terms of market cap						↓	
DE0006483001	LINDE AG AKTIEN	2,3%	1,0%	0,0%	4,2%	0,0	3,9
BE0003821387	DEVGEN N.V.	0,8%	5,1%	0,2%	3,6%	0,3	6,8
DE000ENAG999	E.ON AG NA	2,1%	0,1%	0,0%	3,1%	0,0	3,4
DE0007235301	SGL CARBON AG AKTIEN	2,5%	16,2%	0,0%	2,9%	0,0	1,3
DE0007218406	SOLAR MILLENNIUM AG	0,9%	23,7%	0,1%	2,6%	0,2	5,1
DE0007568578	SFC SMART FUEL CELL	1,0%	38,3%	0,5%	2,2%	3,4	15,1
DE0007461006	PVA TEPLA AG	0,7%	11,4%	0,2%	1,9%	0,4	5,4
DE0008430026	MUENCH RUECKVERS VNA	1,9%	0,3%	0,0%	1,6%	0,0	1,2
DE0007830572	DALDRUP+SOEHNE AG	2,3%	34,7%	0,3%	1,4%	1,7	8,2
DE0007236101	SIEMENS AG NA	1,6%	0,1%	0,0%	1,2%	0,0	0,9
	Sum		16,2%				
stocks with the worst time to market						↓	
DE000A0SFRU1	FLORA ECOPOWER NEU	0,1%	16,2%			39,8	296,5
DE0007568578	SFC SMART FUEL CELL	1,0%	38,3%	0,5%	2,8%	3,4	15,1
DE0007461006	PVA TEPLA AG	0,7%	31,4%	0,2%	17,4%	0,4	14,8
BE0003821387	DEVGEN N.V.	0,8%	9,6%	0,2%	14,5%	0,3	12,9
DE0007830572	DALDRUP+SOEHNE AG	2,3%	32,0%	0,3%	1,6%	1,7	7,6
DE000ENAG999	E.ON AG NA	2,1%	0,1%	0,0%	9,3%	0,0	4,0
DE0006483001	LINDE AG AKTIEN	2,3%	1,0%	0,0%	12,9%	0,0	3,8
DE000A0MVL8	ENVITEC BIOGAS O.N.	0,7%	25,2%	0,1%	0,5%	0,5	3,6
DE0007218406	SOLAR MILLENNIUM AG	0,9%	14,2%	0,1%	2,4%	0,2	3,1
CA05858H1047	BALLARD PWR SYS	0,8%	81,2%	0,1%	0,2%	1,0	1,7
	Sum		11,7%				
Instrument with insufficient data							
DE000A0SFRU1	FLORA ECOPOWER NEU	0,1%	16,2%			39,8	296,5
	Sum		0,1%				

Equity liquidity: Reporting

Liquidity layering of the overall holdings according to position size

9/3/2009	All Funds			Market Cap		Time to sale	
ISIN	Name	Market Value	#Funds	%	Signal	in days	Signal

20 largest equity positions

DE000ENAG999	E.ON AG NA	965,925,329 €	209	1.5%	●	1.6	●
DE0005557508	DT TELEKOM AG NA	614,823,206 €	198	1.2%	●	1.2	●
DE0008404005	ALLIANZ SE VNA O.N.	590,688,942 €	206	1.9%	●	1.2	●
DE0007236101	SIEMENS AG NA	453,938,364 €	196	1.0%	●	0.8	●
DE0005140008	DEUTSCHE BANK AG NA	390,028,242 €	189	2.0%	●	0.9	●
DE0007037129	RWE AG STAMMAKTEN	351,878,886 €	160	1.0%	●	0.9	●
DE0005151005	BASF SE O.N.	341,623,995 €	180	1.3%	●	0.9	●
DE0007664005	VOLKSWAGEN AG ST	305,488,482 €	27	0.3%	●	0.2	●
DE0007100000	DAIMLER AG NA O.N.	304,829,365 €	183	1.1%	●	0.7	●
FR0000120271	TOTAL S.A.	289,396,668 €	183	0.3%	●	0.4	●
DE0007164600	SAP AG O.N.	282,240,449 €	184	0.8%	●	0.9	●
DE0005752000	BAYER AG AKTIEN	244,210,876 €	185	0.7%	●	0.5	●
FR0000131104	BNP PARIBAS INH.	237,792,614 €	160	0.5%	●	0.6	●
DE0008430026	MUENCH RUECKVERS VNA	231,200,075 €	152	1.1%	●	0.8	●
NL0000303600	ING GROEP NV CVA	177,055,062 €	157	1.0%	●	0.7	●
CH0038863350	NESTLE NAM.	160,754,996 €	101	0.1%	●	0.3	●
ES0178430E18	TELEFONICA INH.	153,992,277 €	157	0.2%	●	0.1	●
DE0006483001	LINDE AG AKTIEN	147,504,095 €	111	1.3%	●	1.2	●
CH0012005267	NOVARTIS NAM	127,689,515 €	97	0.1%	●	0.2	●
IT0003132476	ENI S P A AZIONI	118,560,029 €	159	0.2%	●	0.2	●

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Future Outflows

Criteria to be investigated

- Qualitative criteria

Are there indicators that investors might wish to have shares redeemed?

- Quantitative indicators

Is there statistical evidence on future outflows?

→ Criteria help to identify potentially critical funds

Qualitative criteria for future outflows

- **Investors' structure**

retail/ institutional/ own funds/ seed money

- direct contact to institutional investors (especially in one-investor-funds) helps to keep the investor in the fund or at least to forecast outflows
- own investing funds may serve as a buffer

- **Fund strength**

fund performance, market performance, fund ratings

- funds with bad performance or investments in bear markets are more likely to face withdrawals
- bad rating or downgrade will influence investors and sales partners

- **Sales focus**

- sales partners recommend to sell fund shares
- institutional investors announce withdrawals

Quantitative indicators for future outflows

- **outflows in the last day/ week/ month**
 - shows problems as soon as they occur
 - only backward looking
- **Long-term outflow VAR/ expected shortfall**
 - investigate historical outflows with Extreme Value Theory (EVT)
 - results show little variation over time
- **Conditional outflow VAR/ expected shortfall**
 - include information from EVT and autoregressive model
 - output is based on long-term data and reacts on short-term events

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Controlling Process

How to incorporate diverse information into a controlling process

- Different kinds of information with different impact
 - historical outflows are not necessarily a guide to future behavior
 - qualitative data like sales focus will override other characteristics
- Possible issues
 - spurious accuracy of quantitative data may lead to false conclusions
 - information from different sources is needed on a regular basis
 - impact of non-quantitative input data is difficult to be assessed

→ Conclusions

- An **integral view** is needed to see the whole image.
- Reporting shows critical funds subject to **further investigation** or **special care**.
- As always in risk management, **sound processes** have to complement a **robust technical solution**.

Appendix

IDS GmbH – Analysis and Reporting Services

Premium solutions for institutional investors and asset managers.

IDS GmbH – Analysis and Reporting Services (IDS) is a managed-service provider focusing on the provision of best-in-class operational investment controlling services.

IDS is an internationally operating provider of operational investment controlling services for institutional investors and asset managers. We offer our clients a wide range of premium solutions for performance and risk analysis, investment compliance and consolidated reports. We also take care of all the related business processes in keeping with our managed-service approach. Our broad understanding of our clients' business and technical needs is one of the key elements of our value proposition.

Unique company strategy

We offer seamless solutions across the entire investment management value chain. Our unbiased analyses and reports conform with the latest standards and aim at fulfilling the needs of decision makers. All results, ranging from individual investments through to different portfolio aggregation levels, are based on the same set of data. This means that our clients are able to draw conclusions from our analyses and reports – whether on the basis of individual results or of documentation for their investment committee meetings – safe in the knowledge that they are free of inconsistencies.

Custom-tailored solutions

Thanks to our significant investments in infrastructure, processes and in our employees over the years, we can provide the required implementation and reporting capacities.

Product Overview

Risk	Performance	Reporting	Data Management
<ul style="list-style-type: none">▪ Market Risk Measurement▪ DerivateV / UCITS III-guideline▪ Market Risk Analysis▪ Liquidity Reporting▪ Guarantee Fund Controlling	<ul style="list-style-type: none">▪ Performance Measurement▪ Performance Attribution▪ Outperformance Fee▪ Composite Calculation▪ GIPS Service▪ Allocation oriented Performance Attribution▪ Peer Group Analysis▪ Stock Option Plans	<ul style="list-style-type: none">▪ Factsheets▪ KID▪ Solvency Reporting▪ VAG Reporting: Investment funds §54d VAG▪ Major Shareholding Reporting▪ Pension Fund Reporting▪ Customized Reporting	<ul style="list-style-type: none">▪ Fund Data Hub / GroMiKV▪ Customized Benchmarks▪ Controlling specific market data (yield and credit curves for long maturities and illiquid markets, inflation rates)

Contact

Dr. Bernd Fischer

+49 69 263 - 14317

bernd.fischer@idsffm.com

Managing Director
IDS GmbH – Analysis and Reporting Services
Mainzer Landstraße 11-13
60329 Frankfurt/Main
<http://www.investmentdataservices.com>