

The future of model-based equity investing *What has 20 years of quantitative investing taught us?*

UEAM - Asset Management Summer Seminar 2016
31 August 2016

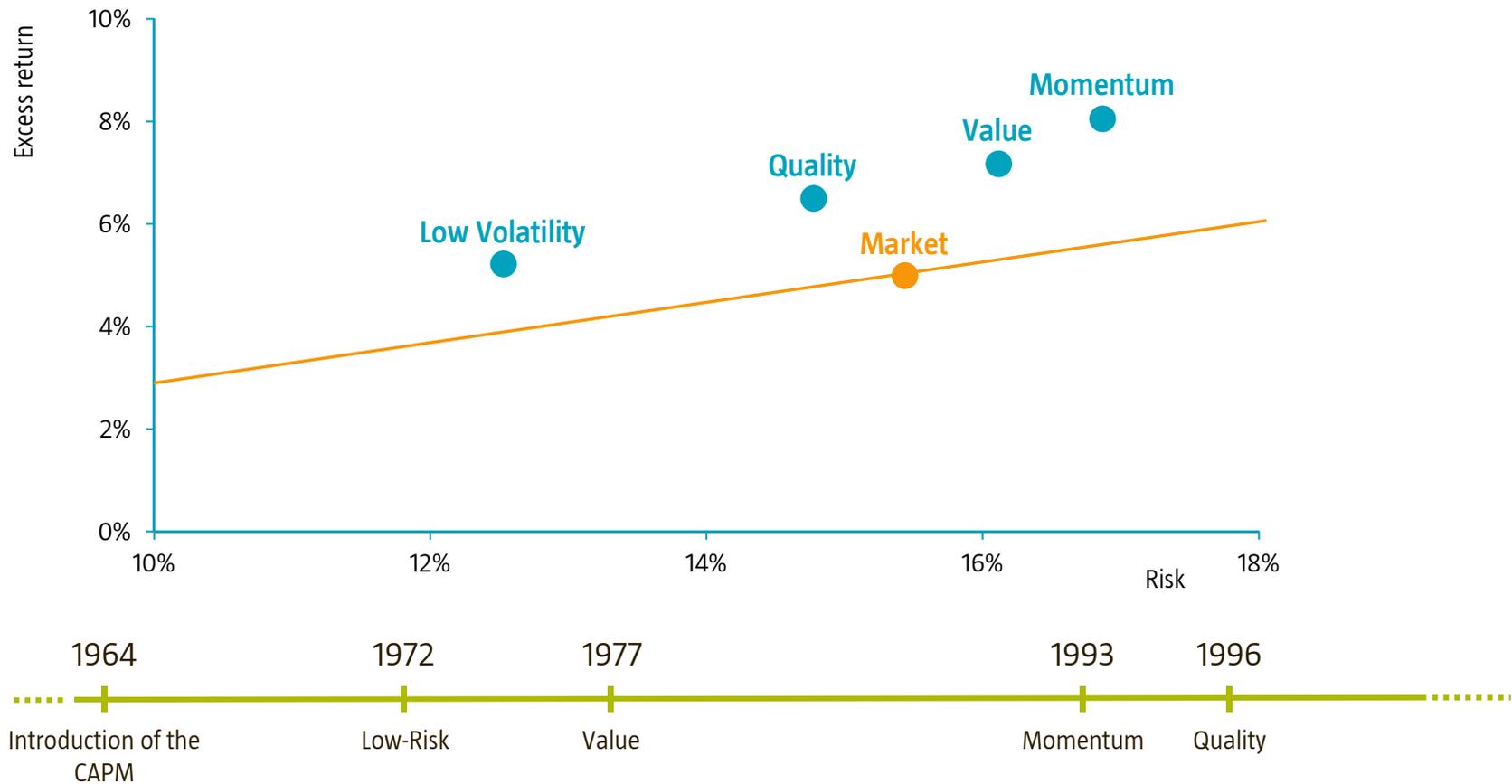
Jan de Koning, CFA, CAIA, CMT
Client Portfolio Manager Quantitative Equities

'De aderlating' (La saignée) - Quiringh van Brekelenkam (Netherlands, ±1660)



Model-based equity investing: Factor portfolios show higher return-risk ratios

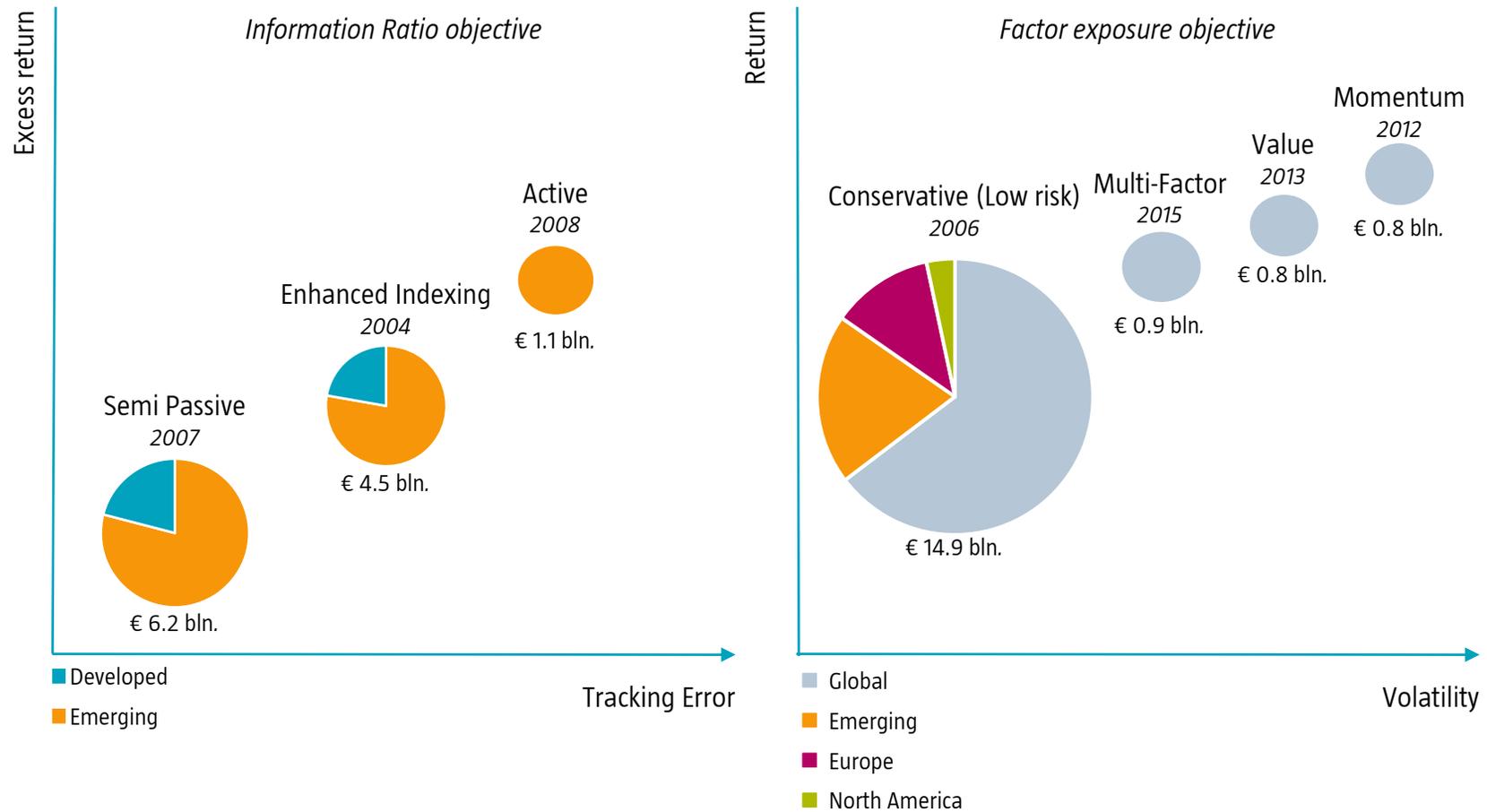
Historical performance of generic factors – 1963 - 2014



From Blitz, "Factor Investing Revisited", *Journal of Index Investing*, 2015. Performance figures for generic U.S. value-weighted factor portfolios from 1963:07 to 2014:12. Quality is defined as the equal weighted combination of the Profitability and Investment factor portfolios.

Model-based equity investing: Clients demand different solutions

Robeco Quantitative Equities: € 28.4 billion AuM & € 1.8 billion AuA – As of end of June 2016



Model-based equity investing: Requires focused portfolio managers and researchers

Portfolio Management

Michael Strating
Head Quantitative Equities



26 years experience

Pim van Vliet, PhD
Conservative Equities



16 years experience

Rob van Bommel
Factor Investing



26 years experience

Tim Dröge
Emerging Markets



17 years experience

Arlette van Ditshuizen
Conservative Equities



19 years experience

Willem Jellema, CFA
Factor Investing,
Momentum



15 years experience

Wilma de Groot, CFA
Emerging Markets



15 years experience

Jan Sytze Mosselaar, CFA
Conservative Equities



12 years experience

Machiel Zwanenburg
Developed Markets



17 years experience

Arnoud Klep
Conservative Equities



15 years experience

Maarten Polfliet, CEFA
Conservative Equities,
Value



17 years experience

Research

David Blitz, PhD
Head Selection Research



21 years experience

Joop Huij, PhD
Head Factor Investing
Research



14 years experience

Weili Zhou, CFA
Selection Research



14 years experience

Simon Lansdorp, PhD
Factor Investing Research



8 years experience

Bart van der Grient
Selection Research



9 years experience

Viorel Roscovan, PhD
Factor Investing Research



12 years experience

**Matthias Hanauer,
PhD, CFA**
Selection Research



7 years experience

Georgi Kyosev
Factor Investing Research



5 years experience

Dennis Karstanje, PhD
Selection Research



6 years experience

Mark Voermans, CEFA
Factor Investing Research



17 years experience

Laurens Swinkels, PhD
Quant Research



18 years experience

Research talent pool



< 5 years experience

Jornt Beetstra, CFA
Data management



18 years experience

Client Portfolio Management

Tom Naaijken
Region focus: Asia-Pacific



19 years experience

Frank Wirds, CFA
Region focus: Asia-Pacific



10 years experience

Bernhard Breloer, PhD
Region focus:
Germany/Switzerland



7 years experience

Jan de Koning, CFA, CAIA
Region focus: Europe



9 years experience

Dedicated Support

Portfolio Implementation
7 Investment Professionals
11 years experience (average)

Global Trade Execution
7 Investment Professionals
14 years experience (average)

Model-based equity investing: The importance of a well-defined investment philosophy

Our quantitative investment strategies are based on the following beliefs:

Evidence-based Research

- > Identify factors that are rewarded with superior risk-adjusted performance
- > Use long-term global data sets to confirm or falsify research findings



Research

Economic Rationale

- > Move beyond statistical patterns to understand economic drivers
- > Enhance proven quantitative factors to avoid non-rewarded risks



Understand

Prudent Investing

- > Manage easily explainable portfolios using a proprietary algorithm
- > Prevent unnecessary trading costs to enhance returns in the long run



Prudence

Model-based equity investing: Investment philosophy in action – Conservative Equities

Concerns involved with generic low-volatility approaches:

Ignoring the price actually paid or business momentum

- > Example: A low-volatility stock that has a P/E of 40
- > Example: A low-volatility stock that is on a downward trend
- > Deeper issue: Going against the proven factors value and momentum

Ignoring changing characteristics of stocks

- > Example: A low-volatility stock that recently issued a lot of debt
- > Deeper issue: Reliance on backward-looking, statistical risk measures

Too much reliance on correlation-based portfolio construction methodologies

- > Black box optimizers might result in high turnover and exposure to high-volatility stocks

Robeco's Conservative Equities strategies are designed to effectively address such issues

Conservative equity strategy: Stock selection model ranking output

Simplified ranking example based on a selection of variables

Selection of variables	Model	Low-risk				Valuation		Momentum	
	Rank 0-100%	Volatility	Beta	Distance-to-default	Dividend yield	Price momentum			
Top-ranked stocks									
Swiss Re AG	0.1%	16.4%	0.83	7.2	7.8	10.5%			
Nippon Telegraph & Telephone Corp	1.0%	21.0%	0.68	6.8	2.2	18.5%			
Home Depot Inc/The	1.4%	17.2%	0.90	6.6	1.9	18.5%			
Bank of Montreal	2.3%	14.8%	0.80	5.4	4.6	0.9%			
Travelers Cos Inc/The	2.7%	13.6%	0.80	7.1	2.4	12.2%			
AT&T Inc	3.2%	14.6%	0.57	8.3	5.5	7.6%			
Toronto-Dominion Bank/The	3.8%	14.4%	0.74	5.9	3.9	-0.4%			
Iberdrola SA	4.0%	19.3%	0.94	8.0	4.2	7.5%			
American Electric Power Co Inc	4.2%	16.1%	0.41	6.6	3.8	4.9%			
Vinci SA	4.5%	20.4%	1.03	6.2	3.0	5.4%			
Reckitt Benckiser Group PLC	5.6%	16.5%	0.61	9.0	2.1	2.0%			
O'Reilly Automotive Inc	6.3%	20.4%	0.90	5.6	0.0	17.1%			
Bottom-ranked stocks									
Union Pacific Corp	79.8%	20.8%	1.06	4.9	3.1	-29.1%			
Nokia OYJ	82.3%	39.6%	1.49	4.7	2.1	-10.2%			
CSX Corp	83.6%	23.9%	1.27	3.9	3.2	-27.7%			
Sony Corp	86.3%	35.6%	1.47	3.2	0.4	-20.5%			
Citigroup Inc	88.4%	23.0%	1.37	4.3	0.5	-1.8%			
Netflix Inc	91.0%	51.5%	1.75	2.1	0.0	45.9%			
Valeant Pharmaceuticals International In	97.8%	44.0%	0.74	1.7	0.0	-37.5%			

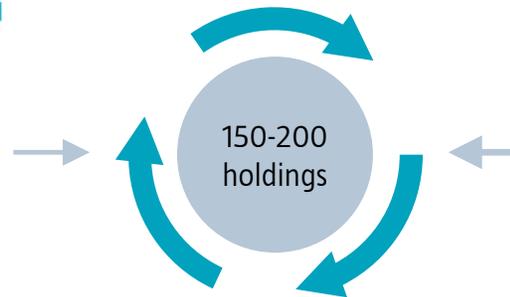
Source: Robeco. Sample of Global AC stocks with market capitalization > 20 billion EUR, data as of February 2016

Conservative equity strategy: From stock ranking to optimal portfolio

Ranking model

Selection of variables	Model	Low-risk			Valuation		Momentum
	Rank 0-100%	Volatility	Beta	Distance-to-default	Dividend yield	Price momentum	
Top-ranked stocks							
Swiss Re AG	0.1%	16.4%	0.83	7.2	7.8	10.5%	
Nippon Telegraph & Telephone Corp	1.0%	21.0%	0.68	6.8	2.2	18.5%	
Home Depot Inc/The	1.4%	17.2%	0.90	6.6	1.9	18.5%	
Bank of Montreal	2.3%	14.8%	0.80	5.4	4.6	0.9%	
Travelers Cos Inc/The	2.7%	13.6%	0.80	7.1	2.4	12.2%	
AT&T Inc	3.2%	14.6%	0.57	8.3	5.5	7.6%	
Toronto Dominion Bank/The	3.8%	14.4%	0.74	5.9	3.9	-0.4%	
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Vinci SA	4.5%	20.4%	1.03	6.2	3.0	5.4%	
Rockitt Benelux Group PLC	5.6%	16.5%	0.61	9.0	2.1	2.0%	
Infiniti Automotive Inc	6.3%	20.4%	0.90	5.6	0.0	17.1%	
Bottom-ranked stocks							
Union Pacific Corp	79.8%	20.8%	1.06	4.9	3.1	-29.7%	
Nokia OY	82.3%	39.6%	1.49	4.7	2.1	-10.2%	
CSX Corp	83.6%	23.9%	1.27	3.9	3.2	-27.7%	
Sony Corp	86.3%	33.4%	1.40	3.2	0.4	-20.5%	
Citigroup Inc	88.4%	23.0%	1.37	4.3	0.5	-1.8%	
Netflix Inc	91.0%	51.5%	1.75	2.1	0.0	45.9%	
Valeant Pharmaceuticals International Inc	97.8%	44.0%	0.74	1.7	0.0	-37.5%	

Client portfolio



Robeco portfolio algorithm

- > Sell stocks when bottom 40% ranked
- > Maximum single stock weight 2.0%
- > No positions in most distressed companies
- > Limits relative versus MSCI market index:
 - > 10% Region/country
 - > 10% (Sub)sector
 - > 20% Size groups (small/mid/large)
- > Maximum 20% outside MSCI market index
- > ESG score equal or better than market index

Obtain maximum exposure to top-ranked stocks given research-based concentration limits

Portfolio management: Low turnover and enhanced returns

Robust approach

- > Target weights depending on liquidity and market capitalization
- > Diversified portfolio to reduce stock specific risk
- > No correlation estimates required

Logically explainable portfolio positions and trades

- > Based on ranking and portfolio construction algorithm

Low turnover

- > Result of sell driven ranking approach
- > 25% one-way per annum expected

Be cautious with correlations

Higher turnover

- > Excessive trading can erode alpha*

Exposure to high-volatility stocks

- > Poorer returns due to buying low correlation, high-volatility stocks**

Black box

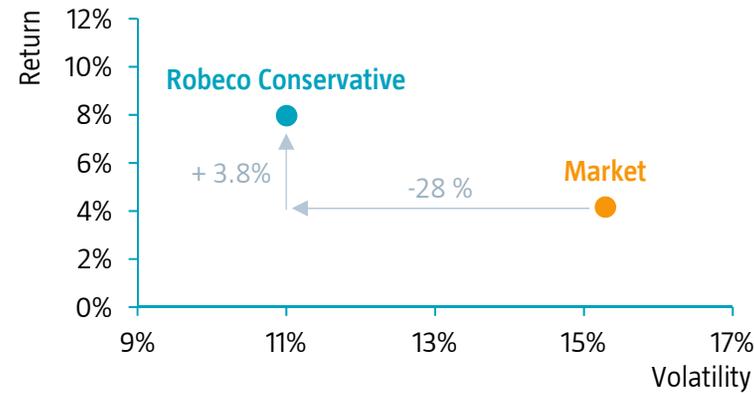
- > Difficult to explain individual positions/trades

* Van Vliet, Pim, and David Blitz (2015), "Low turnover: a virtue of low volatility", Robeco Research paper.

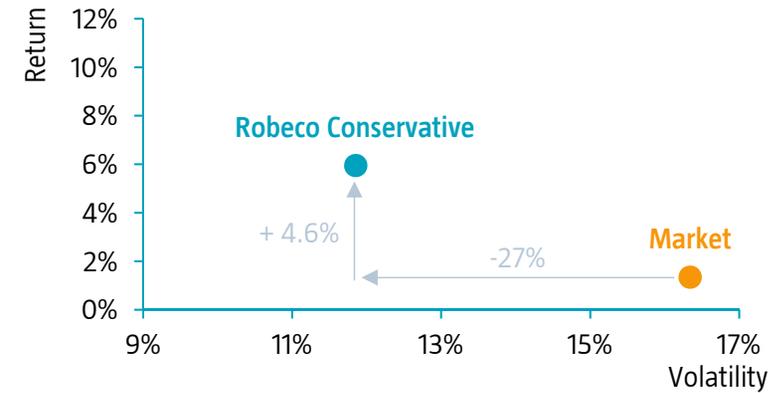
** Blitz, David, Dennis Karstanje, and Pim van Vliet (2015), "Be cautious with correlations in low-volatility strategies", Robeco Research paper.

Conservative Equities track record: Consistent results in different markets

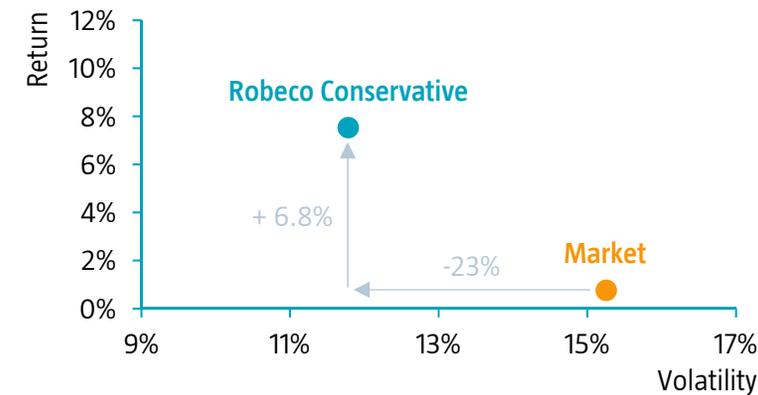
Global - Since October 2006



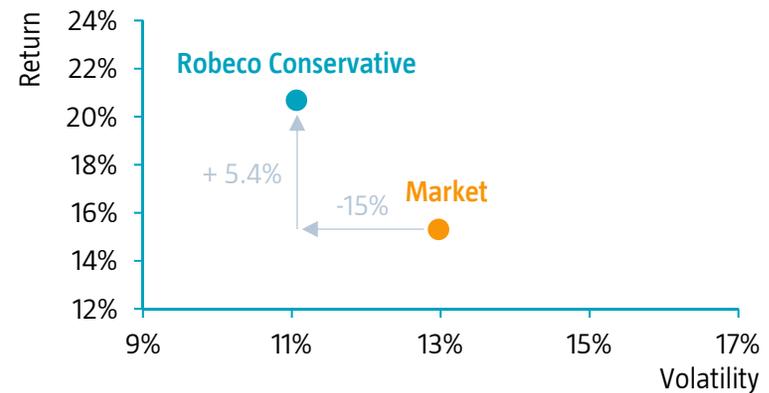
Europe - Since September 2007



Emerging markets - Since February 2011



United States - Since December 2013



Source: Robeco Performance Measurement and MSCI as of 30 June 2016. Monthly data, gross of fees, based on net asset values of the institutional share classes of the regional Robeco Conservative Strategies since inception (Global: September 2006, Emerging Markets: February 2011, European: September 2007, US: April 2014). The value of your investments may fluctuate. Results obtained in the past are no guarantee for the future.

Future of model-based equity portfolios: advanced integration of client preferences

Example case study: How to integrate sustainability investing in a Conservative Equities portfolio?

Multiple-ways of implementing sustainability criteria in model-based equity portfolios:

- > Negative screening: exclusion of companies that rank low on sustainability criteria
- > Engagement: aim to create long-term shareholder value by entering into a dialogue with companies
- > Positive screening: take sustainability criteria into account when constructing a portfolio
- > Impact investing: enhancing a specific sustainability footprint (e.g. lower CO₂, Waste, Water) of a portfolio

Requirements of envisioned solution:

- > Conservative equity risk and return characteristics
- > Outspoken sustainability profile

Ingredients available:

- > RobecoSAM as a supplier of sustainability information
- > 10 years of experience in managing a Conservative Equities portfolio
- > Experienced team of quantitative researchers



Future of model-based equity portfolios: advanced integration of client preferences

Solution: a Conservative equities portfolio with an outspoken sustainability profile on three dimensions

ESG Score

- > Sustainability scores in-house developed by RobecoSAM*
- > Stocks with higher sustainability are more likely to be selected in the portfolio
- > Portfolio has total sustainability score at least 20% higher than reference index

Impact scores

- > 20% better environmental footprint on four impact measures: CO2 emissions, Energy use, Water use & Waste output

Value based investing

- > No investments in weapons production, alcohol & tobacco ($\pm 5\%$ of benchmark weight)

The Role for Model-based Asset Management: a summary and conclusion

Model-based equity investing

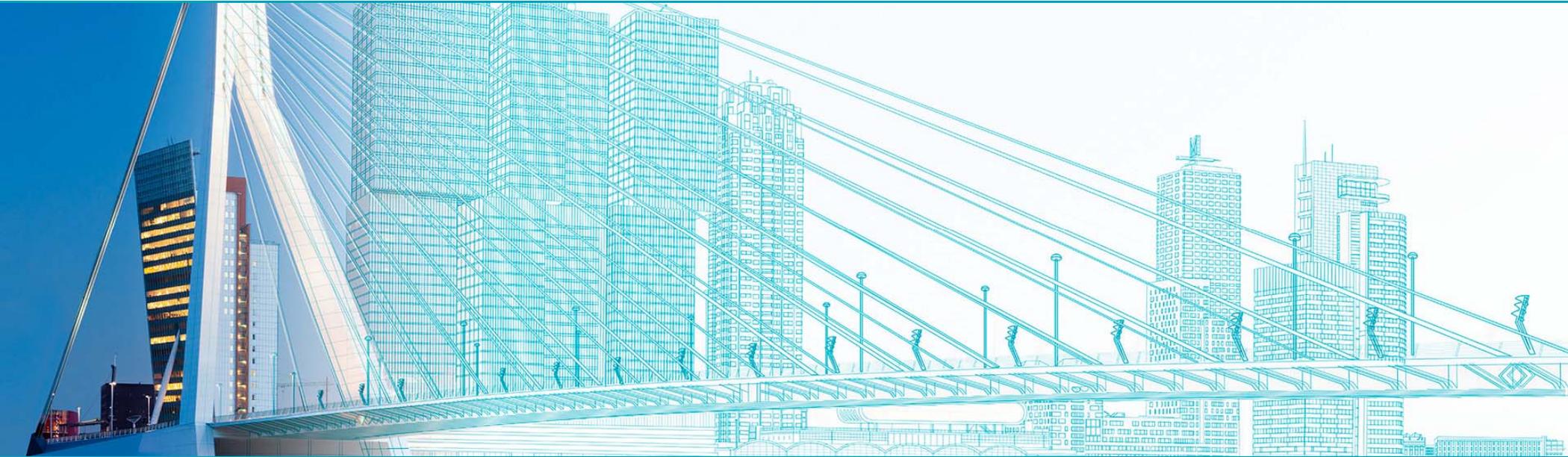
- > Model-based equity portfolios = evidence based investing
- > Harvesting factor premiums that exist due to human behavior in a systematic way
- > Advantage of lower cost and higher potential alpha's

Key-ingredients for any model-based equity solution

- > Extensive experience within an organization committed to quantitative investing
- > Don't underestimate the importance of a team culture and investment philosophy
- > Robeco Quant: 'Keep things as simple as possible and only complex as needed'

The formula for the future?

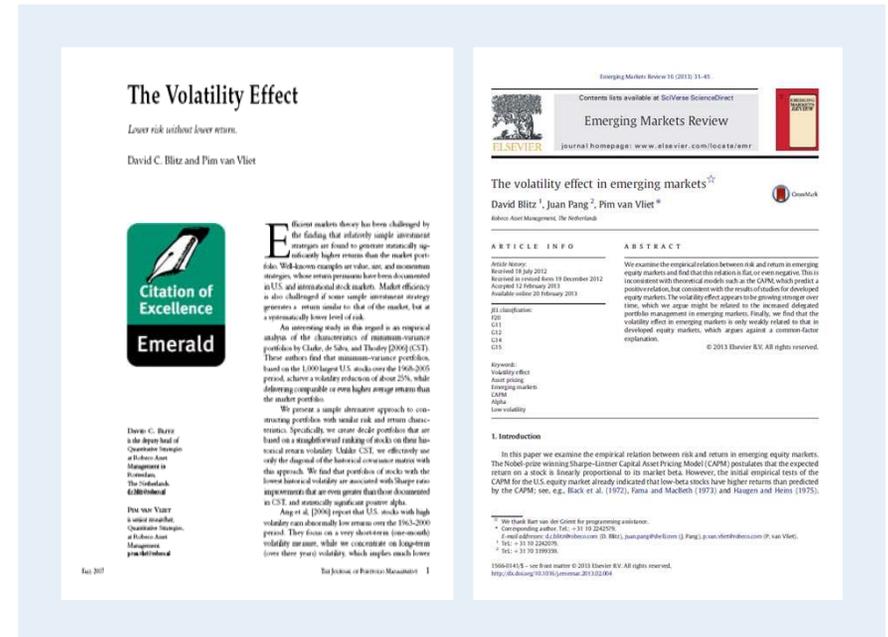
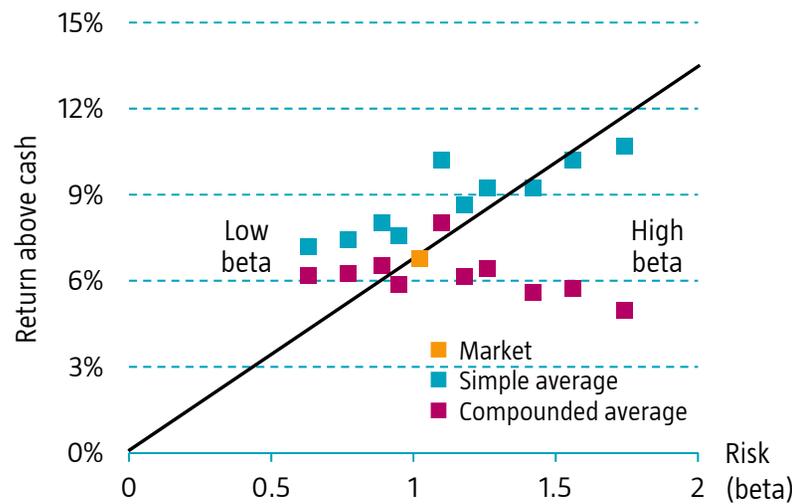
- > Portfolio construction 2.0: clients unique demand require bespoke solutions
- > Mass-customized model-based equity portfolios
- > Need for simplicity and transparency will remain



Appendix

Introduction: Low-risk provides better risk-adjusted returns

Risk-return relationship US, 1931-2002



- > The 2004 PhD thesis by Pim van Vliet shows that the beta effect, anomaly documented in the 1970s*, has not disappeared over time**
- > Award winning research by Robeco confirms the beta effect for global markets and documents a related 'volatility effect': "Low-volatility stocks earn higher Sharpe ratios in the long term"***
- > Robeco researchers were the first to publish key results about volatility effects in emerging markets****

* Black, Jensen, and Scholes (1972), "The Capital Asset Pricing Model: Some Empirical Tests", Studies in the Theory of Capital Markets. Fama, and MacBeth (1973), "Risk, Return, and Equilibrium: Empirical Tests", Journal of Political Economy. Haugen, and Heins (1975), "Risk and the Rate of Return on Financial Assets: Some Old Wine in New Bottles", Journal of Financial and Quantitative Analysis.

** Van Vliet, Pim (2004), "Downside Risk and Empirical Asset Pricing", PhD thesis Erasmus School of Economics.

*** Blitz, David and Pim van Vliet (2007), The Volatility Effect: Lower Risk Without Lower Return, Journal of Portfolio Management, pp. 102-113

**** Blitz, David, Juan Pang, and Pim van Vliet (2013), "The Volatility Effect in Emerging Markets", Emerging Markets Review.

Product range

	Global Developed	Global All Country	European	Continental	US	Emerging Markets
Legal status	Lux SICAV - UCITS IV Dutch Inst. Fund Dutch NV - UCITS IV	Lux SICAV - UCITS IV	Lux SICAV - UCITS IV	Lux SICAV - UCITS IV	Lux SICAV - UCITS IV Dutch NV	Lux SICAV - UCITS IV
Performance objective	Sharpe ratio focus	Sharpe ratio focus	Sharpe ratio focus	Sharpe ratio focus	Sharpe ratio focus	Sharpe ratio focus
Number of stocks in portfolio	200	200	150	150	150	200
Tracking error limit	n.a	n.a	n.a	n.a	n.a	n.a.
Country limit	10%	10%	10%	10%	10%	10%
Sector limit	10%	10%	10%	10%	10%	10%
Size limit	20%	20%	20%	20%	20%	20%
Beta	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8	0.5-0.8
Expected turnover (single)	25%	25%	25%	25%	25%	25%
Currency policy	Open	Open	Open	Open	Open	Open
Inception date	September 2006	December 2011	August 2007	May 2016	December 2013	February 2011
AuM (30-06-2016)						
> Discretionary accounts	EUR 7,304 million	EUR 538 million	-	-	-	EUR 237 million
> Pooled vehicles	EUR 1,240 million	EUR 637 million	EUR 1,772 million	EUR 3 million	EUR 457 million	EUR 2,741 million

Track record: Robeco Global Developed Conservative Equities (in EUR)

31-07-2016	Return			Volatility		Return/volatility	
	3 Year	5 Year	Inception	5 Year	Inception	5 Year	Inception
Global Conservative Equities	17.8%	15.3%	8.4%	9.6%	10.9%	1.60	0.77
MSCI World	12.9%	11.3%	4.8%	12.2%	15.1%	0.92	0.32
MSCI World MinVol	16.9%	13.4%	6.9%	9.7%	10.7%	1.39	0.64

	YTD	2015	2014	2013	2012	2011	2010
Global Conservative Equities	6.6%	16.4%	26.5%	17.1%	9.1%	6.9%	13.8%
MSCI World	1.9%	10.4%	19.5%	21.2%	11.4%	-5.7%	8.7%
MSCI World MinVol	10.5%	16.8%	23.2%	10.4%	4.7%	4.7%	9.2%

Source: Robeco Performance Measurement. Monthly data since inception October-06, gross of fees, based on net asset value of Robeco Institutional Conservative Equity Fund. The fund and reference indices are unhedged for currency risk as of June 30 2012. The value of your investments may fluctuate. Results obtained in the past are no guarantee for the future. MSCI Minimum Volatility base currency for optimization is EUR. Inception date of this index is April 2008, prior index data based on backfilled results as provided by MSCI.

Track record: Robeco European Conservative Equities (in EUR)

31-07-2016	Return			Volatility		Return/volatility	
	3 Year	5 Year	Inception	5 Year	Inception	5 Year	Inception
European Conservative Equities	11.7%	11.6%	5.9%	10.3%	11.8%	1.12	0.50
MSCI Europe	6.9%	7.4%	1.7%	13.3%	16.2%	0.55	0.10
MSCI Europe MinVol	12.1%	10.8%	4.5%	10.2%	12.1%	1.06	0.37
	YTD	2015	2014	2013	2012	2011	2010
European Conservative Equities	-1.7%	15.5%	13.4%	20.0%	15.6%	-1.6%	10.6%
MSCI Europe	-4.0%	8.2%	6.8%	19.8%	15.6%	-9.3%	6.4%
MSCI Europe MinVol	-1.1%	15.4%	15.2%	16.5%	10.4%	1.7%	4.3%

Source: Robeco Performance Measurement. Monthly data since inception September-07, gross of fees, based on net asset value of Robeco European Conservative Equity Fund. The fund and reference indices are unhedged for currency risk as of June 30 2012. The value of your investments may fluctuate. Results obtained in the past are no guarantee for the future. MSCI Minimum Volatility base currency for optimization is EUR. Inception date of this index is June 2011, prior index data based on backfilled results as provided by MSCI.

Track record: Robeco Emerging Conservative Equities (in EUR)

31-07-2016	Return			Volatility		Return/volatility	
	3 Year	5 Year	Inception	5 Year	Inception	5 Year	Inception
Emerging Conservative Equities	6.7%	7.8%	8.6%	12.0%	11.6%	0.65	0.74
MSCI Emerging Markets	5.6%	2.3%	2.1%	15.5%	15.0%	0.15	0.14
MSCI Emerging MinVol	5.6%	6.4%	7.0%	12.1%	11.8%	0.52	0.60
			YTD	2015	2014	2013	2012
Emerging Conservative Equities			10.2%	-4.4%	16.4%	-1.8%	22.7%
MSCI Emerging Markets			8.6%	-5.2%	11.4%	-6.8%	16.4%
MSCI Emerging MinVol			6.0%	-2.0%	15.1%	-4.4%	20.4%

Source: Robeco Performance Measurement. Monthly data since inception March 2011, gross of fees, based on net asset value of Robeco Emerging Conservative Equities I EUR. All figures in EUR. The value of your investments may fluctuate. Results obtained in the past are no guarantee for the future. MSCI Minimum Volatility base currency for optimization is USD.

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