New Trends in Asset Management

Thierry Roncalli*

*Professor of Finance, University of Evry, France

7th JIAO-JI Afterwork

Shanghai Jiao Tong University Alumni / Tongji University Shanghai Alumni

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For institutional investors (pension funds, insurance companies, sovereign wealth funds, etc.)

This is the end of the traditional asset management

The quantitative asset management has definitively taken the power

Figure: Janus Henderson

The Economist | World politics | Business & finance | Economics | Science & technology | Culture

Asset management

Active defence

A merger reflects how the fund-management industry is changing

Oct 8th 2016 | From the print edition

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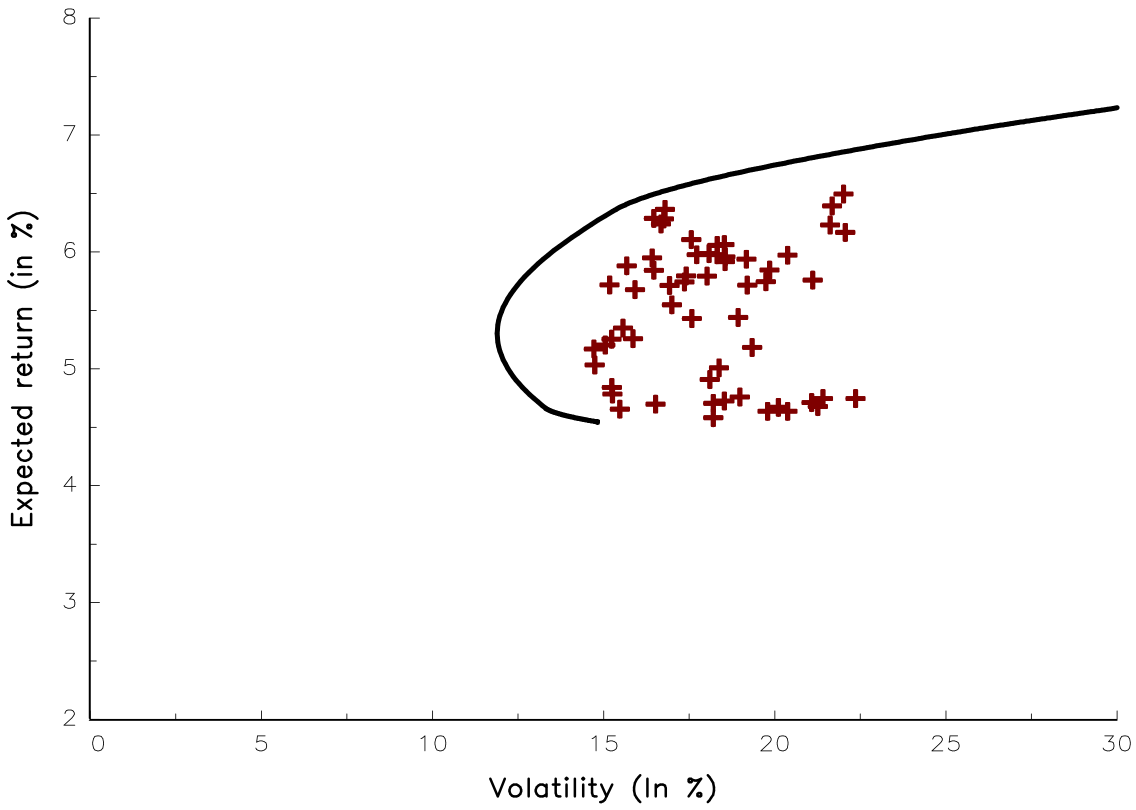
WHEN firms merge, their bosses gush Panglossian jargon. So it was with the tie-up announced this week of Henderson Global Investors, an Anglo-Australian asset manager, and Janus Capital, an American one. Janus Henderson, as the combined business will be known, will become a "truly global" asset manager that will deliver "compelling value creation", boasted its American half. Yet behind the boosterism lie the real fears of active fund managers: of losing business to passive ones—ie, those offering funds that simply track a market index. It is hard not to see the merger as, more than anything, a defensive move.

To be fair, the companies do have a strong business case for merging. Janus is deeply established in America and Japan. It is famous for having in 2014 hired Bill Gross, the "bond king", when he abruptly left Pacific Investment Management Co, PIMCO, the firm he co-founded and turned into a giant. Henderson's sales network is centred on Europe. The firms stand to gain more from selling each other's products in new markets than they will lose from stepping on each other's toes.

The efficient frontier

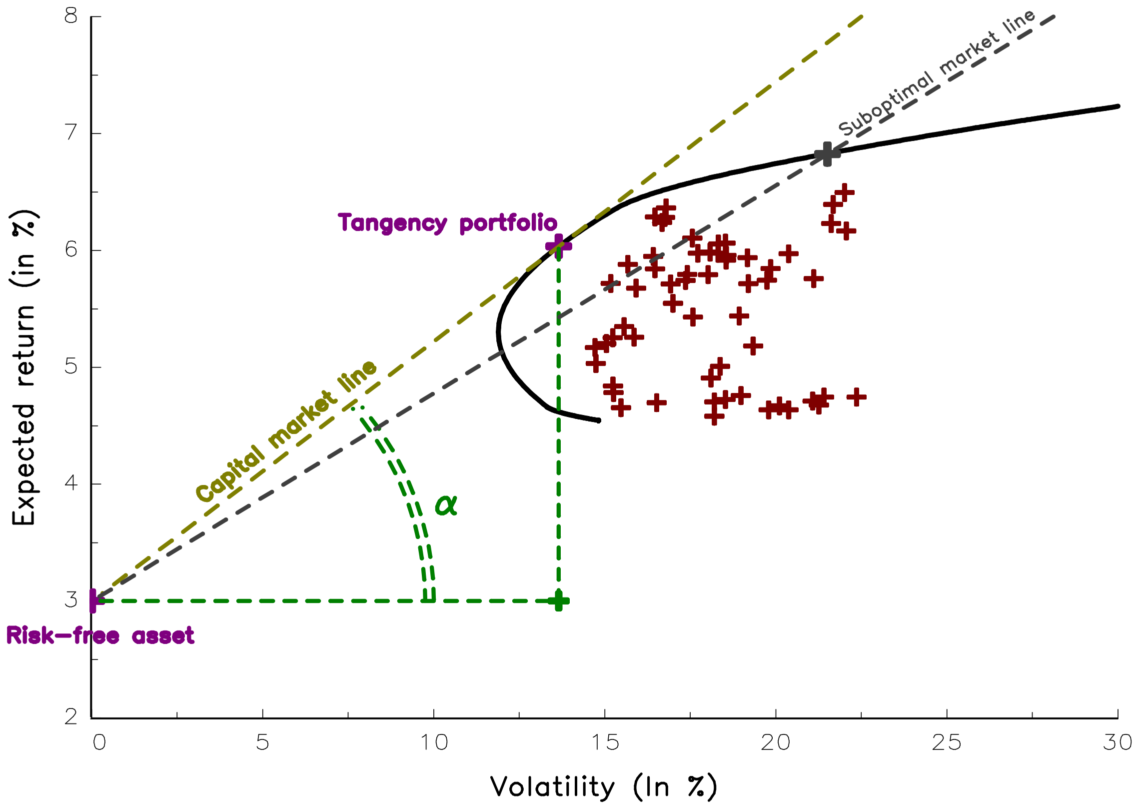


- "*the investor does (or should) consider expected return a desirable thing and variance of return an undesirable thing*"(Markowitz, 1952).
- We consider a universe of n assets. Let μ and Σ be the vector of expected returns and the covariance matrix of returns. We have:

$$\begin{aligned} & \max \mu(x) = \mu^\top x \\ \text{u.c.} \quad & \sigma(x) = \sqrt{x^\top \Sigma x} = \sigma^\star \end{aligned}$$

There isn't one optimal portfolio, but a set of optimal portfolios!

The tangency portfolio



There is one optimal (risky) portfolio!

- Tobin (1958) introduces the risk-free rate and shows that the efficient frontier is a straight line.
- Optimal portfolios are a combination of the tangency portfolio and the risk-free asset.
- *Separation theorem* (Lintner, 1965).

The market portfolio theory

- Sharpe (1964) develops the CAPM theory.
- If the market is at the equilibrium, the prices of assets are such that the tangency portfolio is the market portfolio (or the market-cap portfolio).
- Avoids assumptions on expected returns, volatilities and correlations!
- The risk premium depends on the beta:

$$\pi_i = \mu_i - r = \beta_i (\mu_M - r)$$

where:

$$\beta_i = \frac{\operatorname{cov}(R_i, R_M)}{\operatorname{var}(R_M)}$$

Passive management vs active management

How to measure the performance of active management?

$$R_F(t) = \alpha + \beta R_M(t) + \varepsilon(t)$$

The rise of cap-weighted indexation

- Jensen (1969): no alpha in mutual equity funds
- John McQuown (Wells Fargo Bank, 1971)
- Rex Sinquefield (American National Bank, 1973)

Portfolio optimization and active management

For active management, portfolio optimization continues to make sense.

However...

> *"The indifference of many investment practitioners to mean-variance optimization technology, despite its theoretical appeal, is understandable in many cases. The major problem with MV optimization is its tendency to maximize the effects of errors in the input assumptions. Unconstrained MV optimization can yield results that are inferior to those of simple equal-weighting schemes" (Michaud, 1989).*

$\boxed{\text{Are optimized portfolios optimal?}}$

$\Rightarrow$ **The mean-variance approach is certainly the most aggressive active management model.**

The emergence of risk parity

The rise of heuristic approaches

- Don't be sensitive to expected returns
- EW, MV, ERC, MDP, etc.

The rise of risk parity portfolios

- The place of risk management in asset management
- Be sensitive to Σ and not to Σ^{-1}
- Capturing risk premia in a balanced portfolio

How to be sensitive to Σ and not to Σ^{-1}?

MVO portfolios are of the following form: $x^\star \propto f\left(\Sigma^{-1}\right)$.

The important quantity is then the information matrix $\mathcal{I} = \Sigma^{-1}$.

If we consider the following example: $\sigma_1 = 20\%$, $\sigma_2 = 21\%$, $\sigma_3 = 10\%$ and $\rho_{i,j} = 80\%$, we obtain the following eigendecomposition:

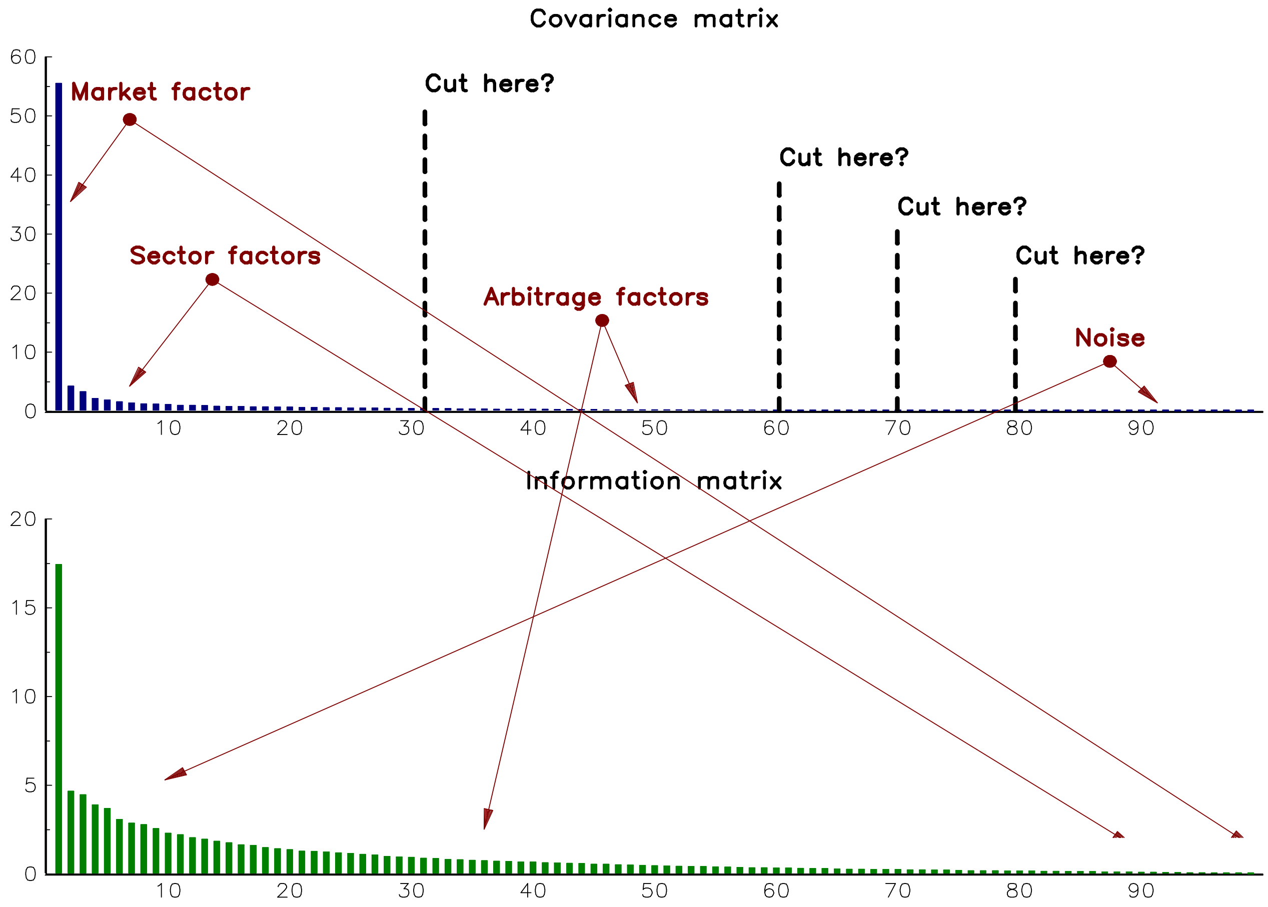
	Covariance matrix Σ			Information matrix $\mathcal{I}$		
Asset / Factor	1	2	3	1	2	3
1	65.35%	−72.29%	−22.43%	−22.43%	−72.29%	65.35%
2	69.38%	69.06%	−20.43%	−20.43%	69.06%	69.38%
3	30.26%	−2.21%	95.29%	95.29%	−2.21%	30.26%
Eigenvalue	8.31%	0.84%	0.26%	379.97	119.18	12.04
% cumulated	88.29%	97.20%	100.00%	74.33%	97.65%	100.00%

$$12.04 \equiv 1/8.31\%$$

Reverse order of eigenvectors

How to be sensitive to Σ and not to Σ^{-1}?

Figure: PCA applied to the stocks of the FTSE index (June 2012)



Risk allocation

Let $x = (x_1, \ldots, x_n)$ be the weights of n assets in the portfolio. Let $\mathcal{R}(x_1, \ldots, x_n)$ be a coherent and convex risk measure. We have:

$$\begin{aligned}
\mathcal{R}(x_1, \ldots, x_n) &= \sum_{i=1}^{n} x_i \cdot \frac{\partial \mathcal{R}(x_1, \ldots, x_n)}{\partial x_i} \\
&= \sum_{i=1}^{n} \mathrm{RC}_i(x_1, \ldots, x_n)
\end{aligned}$$

Let $b = (b_1, \ldots, b_n)$ be a vector of budgets such that $b_i \geq 0$ and $\sum_{i=1}^{n} b_i = 1$. We consider two allocation schemes:

1. Weight budgeting (WB)
$$x_i = b_i$$
2. Risk budgeting (RB)
$$\mathrm{RC}_i = b_i \cdot \mathcal{R}(x_1, \ldots, x_n)$$

Original risk parity with the volatility risk measure

Let Σ be the covariance matrix of the assets returns. We assume that the risk measure $\mathcal{R}(x)$ is the volatility of the portfolio $\sigma(x) = \sqrt{x^\top \Sigma x}$. We have:

$$\begin{aligned}
\frac{\partial \mathcal{R}(x)}{\partial x} &= \frac{\Sigma x}{\sqrt{x^\top \Sigma x}} \\
\mathrm{RC}_i(x_1, \ldots, x_n) &= x_i \cdot \frac{(\Sigma x)_i}{\sqrt{x^\top \Sigma x}} \\
\sum_{i=1}^n \mathrm{RC}_i(x_1, \ldots, x_n) &= \sum_{i=1}^n x_i \cdot \frac{(\Sigma x)_i}{\sqrt{x^\top \Sigma x}} = x^\top \frac{\Sigma x}{\sqrt{x^\top \Sigma x}} = \sigma(x)
\end{aligned}$$

The risk budgeting portfolio is defined by this system of equations:

$$\mathrm{RC}_i(x) = x_i \cdot \frac{(\Sigma x)_i}{\sigma(x)} = b_i \cdot \sigma(x)$$

An example

Illustration

- 3 assets
- Volatilities are respectively 30%, 20% and 15%
- Correlations are set to 80% between the 1$^{\rm st}$ asset and the 2$^{\rm nd}$ asset, 50% between the 1$^{\rm st}$ asset and the 3$^{\rm rd}$ asset and 30% between the 2$^{\rm nd}$ asset and the 3$^{\rm rd}$ asset
- Budgets are set to 50%, 20% and 30%
- For the ERC (Equal Risk Contribution) portfolio, all the assets have the same risk budget

Weight budgeting (or traditional) approach

Asset	Weight	Marginal Risk	Risk Contribution Absolute	Risk Contribution Relative
1	**50.00%**	29.40%	14.70%	70.43%
2	**20.00%**	16.63%	3.33%	15.93%
3	**30.00%**	9.49%	2.85%	13.64%
Volatility			20.87%	

Risk budgeting approach

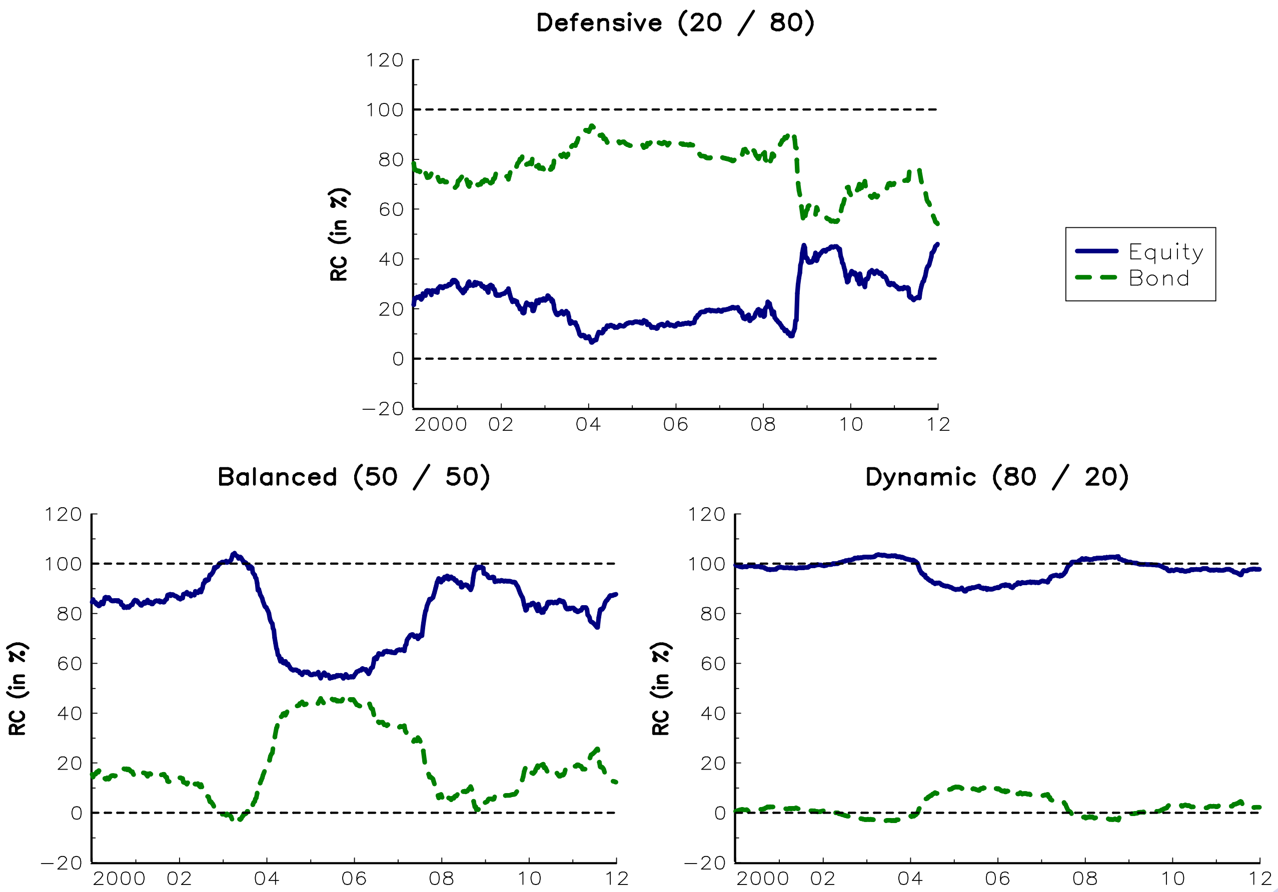
Asset	Weight	Marginal Risk	Risk Contribution Absolute	Risk Contribution Relative
1	31.15%	28.08%	8.74%	**50.00%**
2	21.90%	15.97%	3.50%	**20.00%**
3	46.96%	11.17%	5.25%	**30.00%**
Volatility			17.49%	

ERC approach

Asset	Weight	Marginal Risk	Risk Contribution Absolute	Risk Contribution Relative
1	19.69%	27.31%	5.38%	**33.33%**
2	32.44%	16.57%	5.38%	**33.33%**
3	47.87%	11.23%	5.38%	**33.33%**
Volatility			16.13%	

The case of diversified funds

Figure: Equity (MSCI World) and bond (WGBI) risk contributions



- Contrarian constant-mix strategy
- Deleverage of an equity exposure
- Low risk diversification
- No mapping between fund profiles and investor profiles
- Static weights
- Dynamic risk contributions

Diversified funds
=
Marketing idea?

Reducing volatility and maximizing diversification

The ERC portfolio is the solution of this optimization program:

$$
\begin{aligned}
x^{\star} & = & \arg\min \frac{1}{2} x^{\top} \Sigma x \\
& \text{u.c.} & \left\{ \begin{array}{l} \sum_{i=1}^{n} \ln x_i \geq \kappa \\ \mathbf{1}^{\top} x = 1 \\ x \geq \mathbf{0} \end{array} \right.
\end{aligned}
$$

$\Rightarrow$ **Trade-off between volatility reduction and weight diversification.**

The ERC portfolio is located between MV and EW portfolios:

$$
\begin{array}{ll}
x_i = x_j & \text{(EW)} \\
\partial_{x_i} \mathcal{R}(x) = \partial_{x_j} \mathcal{R}(x) & \text{(MV)} \\
\mathrm{RC}_i = \mathrm{RC}_j & \text{(ERC)}
\end{array}
$$

and we have:

$$
\sigma(x_{\mathrm{mv}}) \leq \sigma(x_{\mathrm{erc}}) \leq \sigma(x_{\mathrm{ew}})
$$

What is the original risk parity strategy

Equity smart beta

- Stock volatility risk measure
- ERC Eurostoxx 50 Index, etc.

✔

Bond smart beta

- Credit volatility risk measure
- RB EGBI Index, etc.

✔

Diversified funds

- Asset volatility risk measure
- Naive risk parity funds.

✔

$\Rightarrow$ The original risk parity strategy is a portfolio allocation approach to harvest risk premia across or within asset classes in the most efficient way.

Risk parity = risk premium parity = diversification

. . . and what it is not

Absolute return strategy

- All Weather Fund (Bridgewater Associates)
- Risk parity funds: AQR, Invesco, Lyxor, Raiffeisen, etc.

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⇒ **The original risk parity strategy is NOT an absolute return strategy.**

What is the rationale for factor investing?

How to define risk factors?

Risk factors are common factors that explain the variance of expected returns

- 1964: Market or MKT (or BETA) factor
- 1972: Low beta or BAB factor
- 1981: Size or SMB factor
- 1985: Value or HML factor
- 1991: Low volatility or VOL factor
- 1993: Momentum or WML factor
- 2000: Quality or QMJ factor

Factor investing is a subset of smart (new) beta

What is the rationale for factor investing?

At the security level, there is a lot of idiosyncratic risk or alpha:

	Common Risk	Idiosyncratic Risk
GOOGLE	47%	53%
NETFLIX	24%	76%
MASTERCARD	50%	50%
NOKIA	32%	68%
TOTAL	89%	11%
AIRBUS	56%	44%

Source: Cazalet and Roncalli (2014)

What is the rationale for factor investing?

- Jensen (1968):

$$\bar{\alpha} = -\text{fees}$$

- Hendricks *et al.* (1993) – **Hot Hands in Mutual Funds**:

$$\operatorname{cov}(\alpha_t, \alpha_{t-1}) > 0$$

  where:

$$\alpha_t = R(t) - \beta_M R_M(t)$$

$\Rightarrow$ The persistence of the performance of active management is due to the **persistence of the alpha**

What is the rationale for factor investing?

- Grinblatt *et al.* (1995) – **Momentum investors versus Value investors**

  "*77% of mutual funds are momentum investors*"

- Carhart (1997):

$$\operatorname{cov}(\alpha_t, \alpha_{t-1}) = 0$$

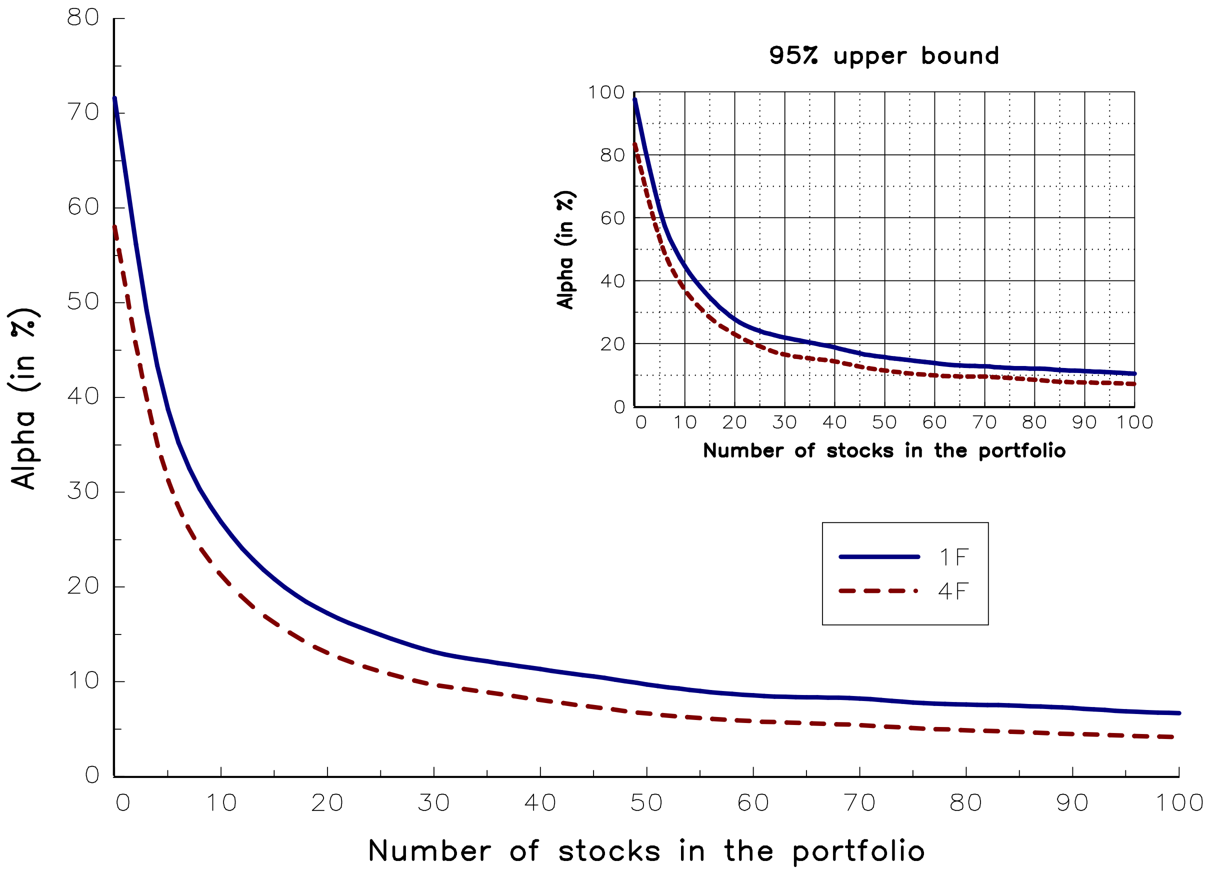
  where:

$$\alpha_t = R(t) - \beta_M R_M(t) - \beta_{SMB} R_{SMB}(t) - \beta_{HML} R_{HML}(t) - \beta_{WML} R_{WML}(t)$$

$\Rightarrow$ The (short-term) persistence of the performance of active management is due to the (short-term) **persistence of the performance of risk factors**

What is the rationale for factor investing?

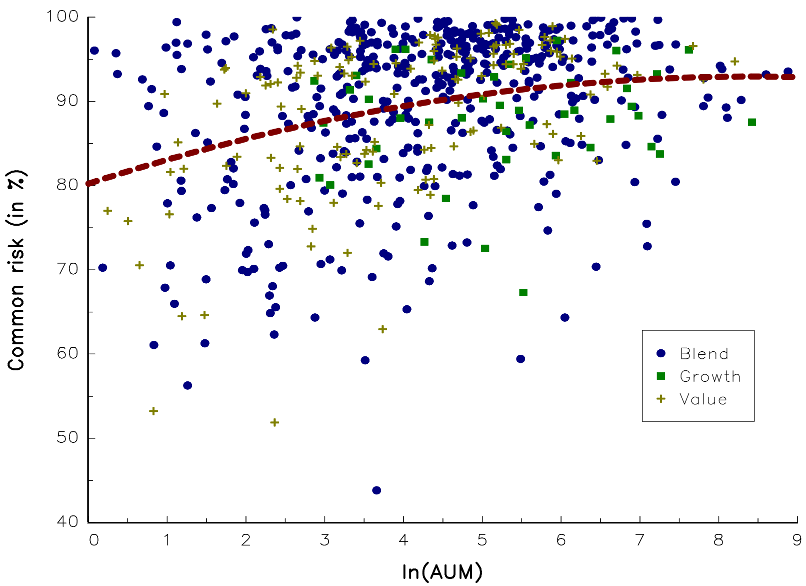
Figure: Alpha decreases with the number of holding assets



Source: Cazalet and Roncalli (2014)

What is the rationale for factor investing?

Figure: What proportion of return variance is explained?



Source: Cazalet and Roncalli (2014)

How many bets are there in large portfolios of institutional investors?

1986 Less than 10% of institutional portfolio return is explained by security picking and market timing (Brinson *et al.*, 1986)

2009 Professors' Report on the Norwegian GPFG: Risk factors represent 99.1% of the fund return variation (Ang *et al.*, 2009)

What is the rationale for factor investing?

What lessons can we draw from this?

Idiosyncratic risks and specific bets disappear in (large) diversified portfolios. Performance of institutional investors is then exposed to risk factors.

Alpha is not scalable, but risk factors are scalable.

$\Rightarrow$ Risk factors are the only bets that are compatible with diversification.

A subset of smart beta

Table: Definition of Smart Beta

Risk Factor	Market Risk Factor	Other Risk Factors
Beta	Traditional Beta (Old Beta)	Alternative Betas (New Betas)
Smart Beta	CW, EW, MDP, ERC MV	SMB, HML, WML, BAB, QMJ

Facts and fantasies

Main fact

Risk factors are a powerful tool to understand the cross-section of (expected) returns.

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Facts and fantasies

Fact

- Common risk factors explain more variance than idiosyncratic risks in diversified portfolios.
- Some risk factors are more relevant than others, for instance SMB, HML and WML.
- Risk premia are time-varying and low-frequency mean-reverting. The length of a cycle is between 3 and 10 years.
- The explanatory power of risk factors other than the market risk factor has declined over the last few years, because Beta has been back since 2003.

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Facts and fantasies

Fact

- Long-only and long/short risk factors have not the same behavior. This is for example the case of BAB and WML factors.
- Risk factors are local, not global. It means that risk factors are not homogeneous. For instance, the value factors in US and Japan cannot be compared (distressed stocks versus quality stocks).
- Factor investing is not a new investment style. It has been largely used by asset managers and hedge fund managers for a long time.

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Facts and fantasies

Main fantasy

- There are many rewarded risk factors.

✗

Facts and fantasies

Fantasy

- Risk factors are not dependent on size. It is a fantasy. Some risk factors present a size bias, like the HML risk factor.
- HML is much more rewarded than WML.
- WML exhibits a CTA option profile. This is wrong. The option profile of a CTA is a long straddle whereas WML presents some similarities to a short call exposure.
- Long-only risk factors are more risky than long/short risk factors. This is not always the case. For instance, the risk of the long/short WML factor is very high.

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Facts and fantasies

Fantasy

- HML is riskier than WML. It is generally admitted in finance that contrarian strategies are riskier than trend-following strategies. However, this is not always the case, such as with the WML factor, which is exposed to momentum crashes.

- Strategic asset allocation with risk factors is easier than strategic asset allocation with asset classes. This is not easy, in particular in a long-only framework. Estimating the alpha, beta and idiosyncratic volatility of a long-only risk factor remains an issue, implying that portfolio allocation is not straightforward.

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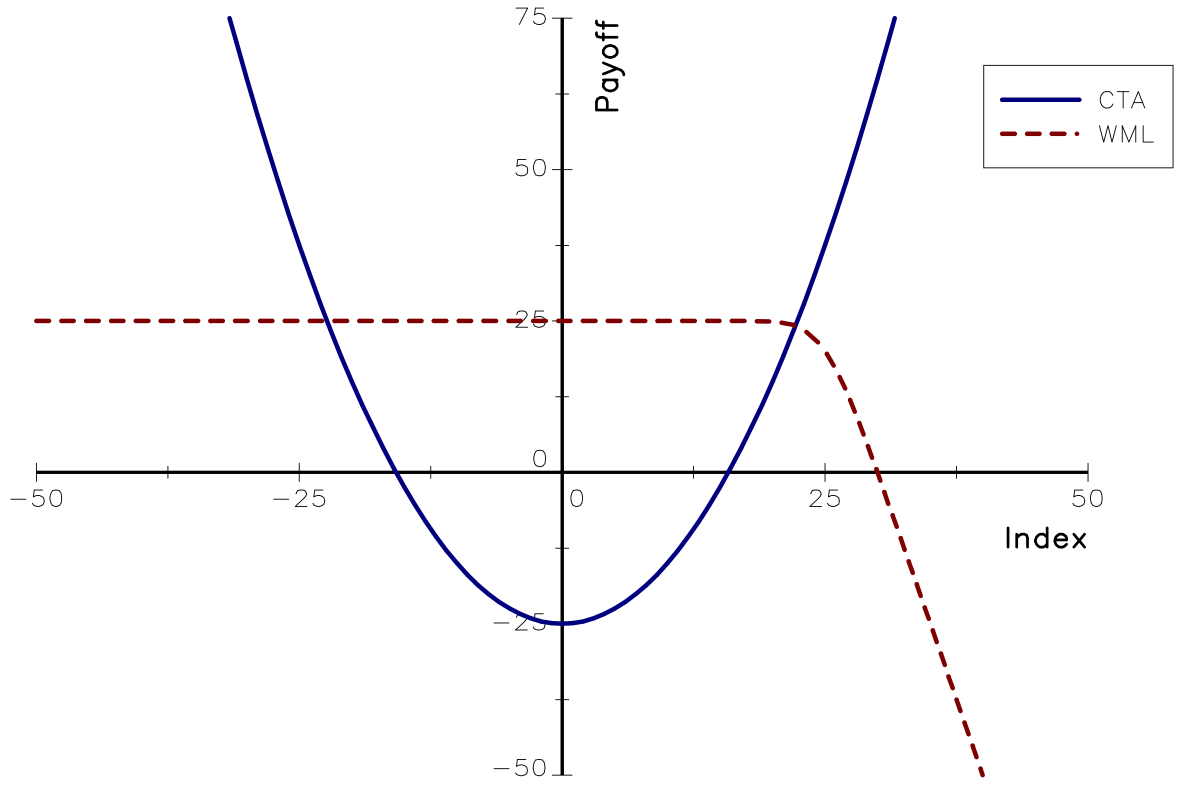
Facts and fantasies

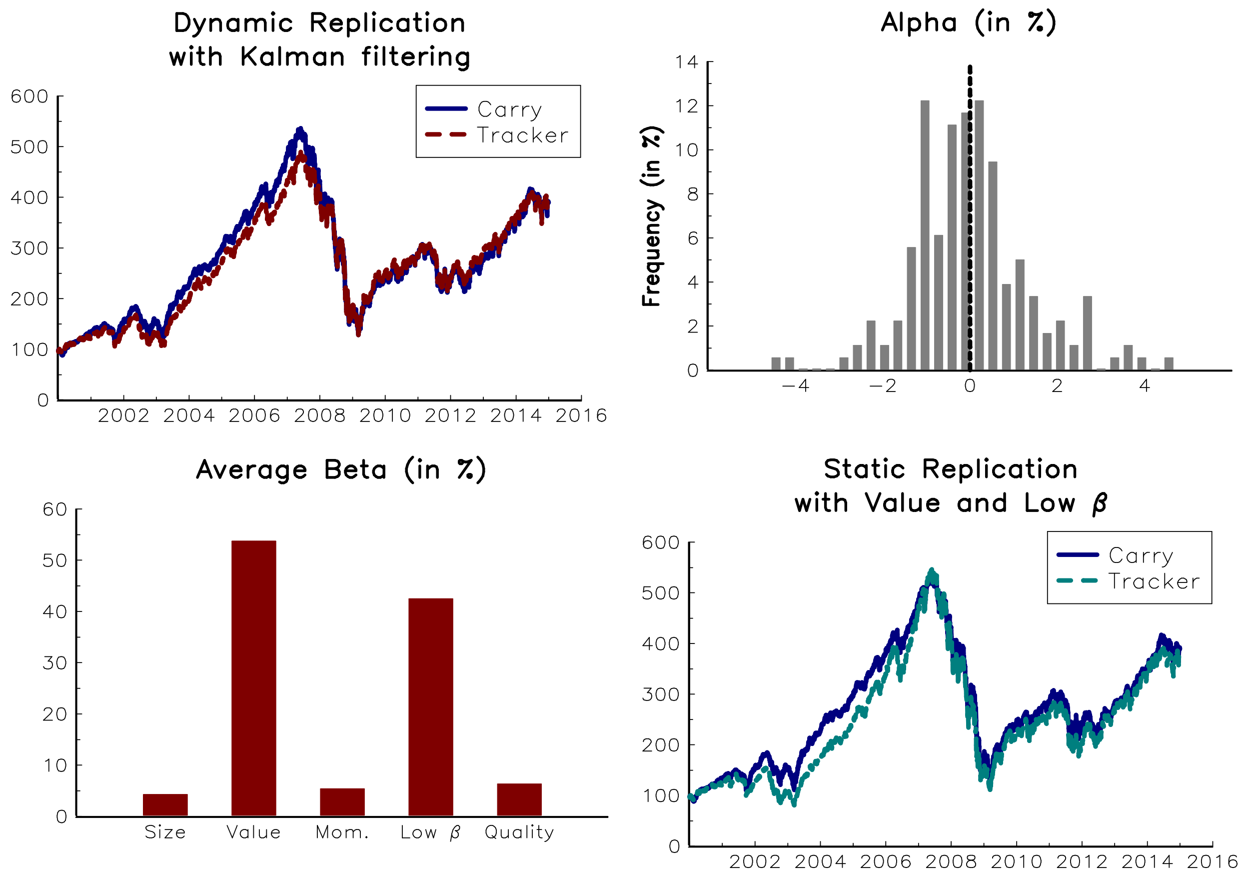
Figure: WML does not exhibit a CTA option profile



Source: Cazalet and Roncalli (2014)

Facts and fantasies

Figure: Value, low beta and carry risk factors are not orthogonal



Source: Cazalet and Roncalli (2014)

A new opportunity for active managers

- Active management does not reduce to stock picking
- Understanding the diversification of equity portfolios
- Stock investing $\ll$ Sector investing $\ll$ Factor investing
- New tactical products

A new opportunity for active managers

Figure: Heatmap of risk factors (before 2008)

2000	2001	2002	2003	2004	2005	2006	2007	2008
Value 25.5%	Value 6.2%	Momentum -3.3%	Value 66.9%	Low Beta 31.1%	Size 32.1%	Momentum 39.1%	Momentum 10.1%	Low Beta -40.9%
Size 23.9%	Momentum -1.7%	Low Beta -6.8%	Size 40.6%	Value 30.4%	Value 31.5%	Size 34.3%	Market 2.7%	Momentum -41.4%
Quality 9.5%	Low Beta -2.0%	Value -18.7%	Momentum 27.5%	Momentum 30.1%	Quality 27.9%	Low Beta 31.5%	Quality 1.8%	Market -43.6%
Low Beta 6.2%	Size -7.5%	Size -18.9%	Low Beta 23.9%	Quality 29.5%	Momentum 26.5%	Value 25.5%	Low Beta -1.0%	Size -49.0%
Market -2.2%	Quality -9.1%	Quality -26.0%	Quality 19.9%	Size 28.7%	Low Beta 26.1%	Quality 24.1%	Size -4.4%	Quality -53.9%
Momentum -2.3%	Market -15.5%	Market -30.7%	Market 15.3%	Market 12.2%	Market 26.1%	Market 19.6%	Value -9.0%	Value -63.6%

Source: Richard and Roncalli (2015)

A new opportunity for active managers

Figure: Heatmap of risk factors (after 2008)

2008	2009	2010	2011	2012	2013	2014	2015	2016
Low Beta -40.9%	Value 65.7%	Quality 25.3%	Low Beta -2.2%	Quality 24.0%	Momentum 29.8%	Size 11.5%	Size 16.1%	Momentum -3.0%
Momentum -41.4%	Size 51.6%	Momentum 22.2%	Quality -3.2%	Momentum 24.0%	Value 28.4%	Value 10.8%	Quality 16.1%	Low Beta -7.1%
Market -43.6%	Quality 42.7%	Size 19.2%	Market -8.1%	Value 18.7%	Quality 21.0%	Quality 8.6%	Low Beta 15.7%	Market -7.2%
Size -49.0%	Market 31.6%	Low Beta 17.9%	Momentum -9.1%	Market 17.3%	Market 19.8%	Low Beta 8.1%	Momentum 12.3%	Quality -7.7%
Quality -53.9%	Momentum 22.3%	Market 11.1%	Size -25.0%	Low Beta 15.8%	Low Beta 17.0%	Market 6.8%	Market 8.2%	Size -12.1%
Value -63.6%	Low Beta 18.8%	Value 7.3%	Value -35.3%	Size 10.7%	Size 13.9%	Momentum 5.2%	Value -1.5%	Value -14.8%

Source: Richard and Roncalli (2015)

Skewness risk premia & market anomalies

- A risk premium is a compensation for being exposed to a non-diversifiable risk (e.g. equity risk premium vs bond risk premium)
- Risk factors are the systematic components that explain the return variation of diversified portfolios (e.g. the Fama-French-Carhart risk factors)
- A market anomaly is a strategy that exhibits a positive excess return, which is not explained by a risk premium (e.g. the trend-following strategy)

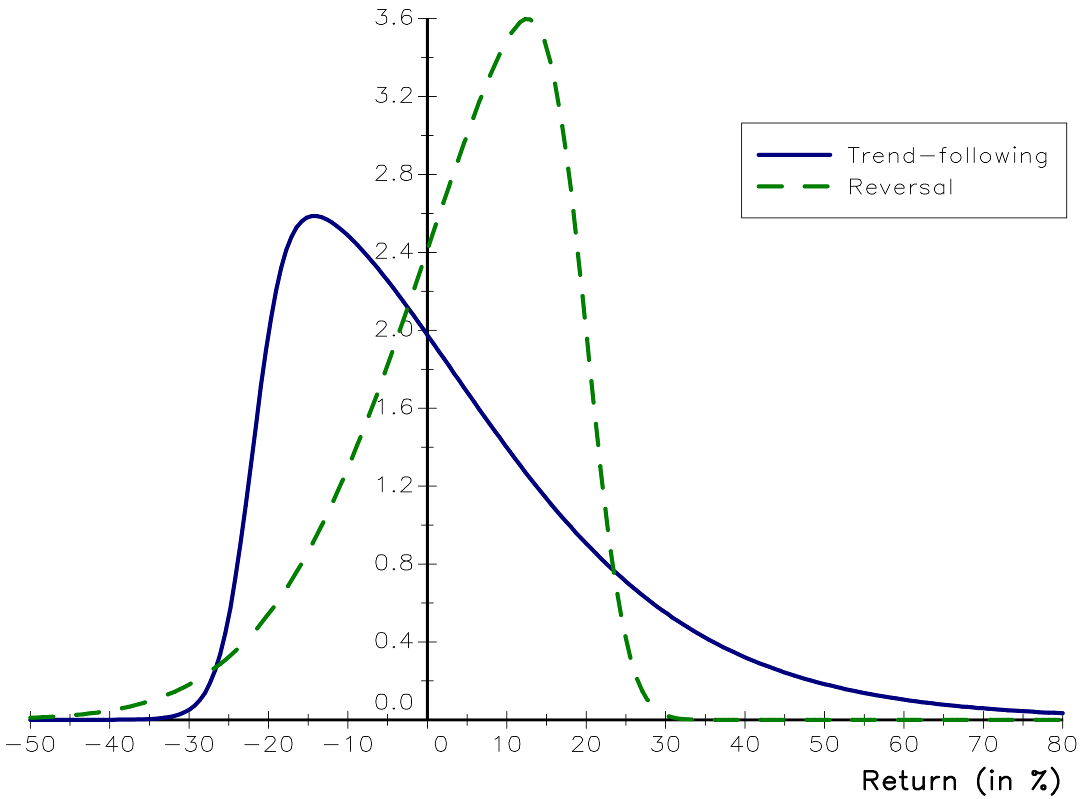
Risk premia and market anomalies are generally risk factors
The converse is not true

$\Rightarrow$ The cat bond premium is a risk premium, but it is not a risk factor
$\Rightarrow$ A risk factor may have a positive or negative excess return

Skewness risk premia & market anomalies

Consumption-based model

A risk premium is a compensation for accepting risk in bad times.



- The equity premium puzzle (1900-2000)
- The bond premium puzzle (2000-2015)
- Are size, value and momentum factors risk premia?
- The cat bond risk premium

Skewness risk premia & market anomalies

Characterization of alternative risk premia

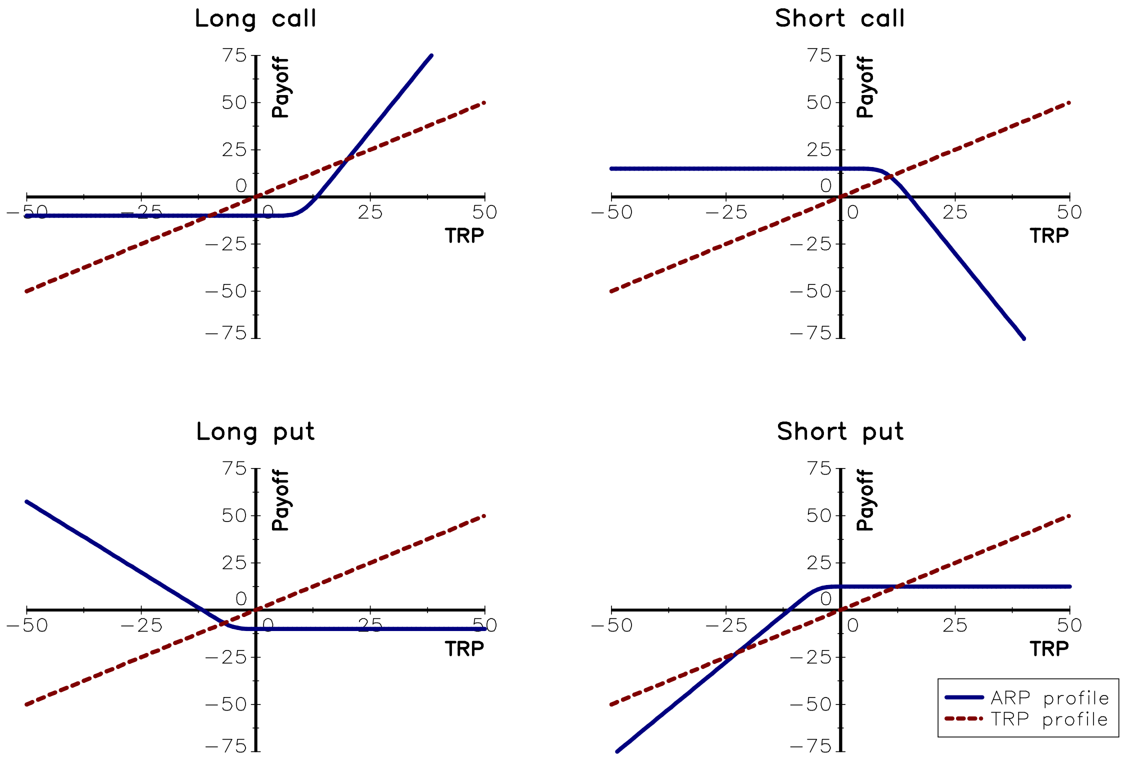
- An alternative risk premium (ARP) is a risk premium, which is not traditional
  - Traditional risk premia (TRP): equities, sovereign/corporate bonds
  - Currencies and commodities are not TRP
- The drawdown of an ARP must be positively correlated to bad times
  - Risk premia $\neq$ insurance against bad times
  - (SMB, HML) $\neq$ WML
- Risk premia are an increasing function of the volatility and a decreasing function of the skewness

In the market practice, alternative risk premia recovers:

1. Skewness risk premia (or pure risk premia), which present high negative skewness and potential large drawdown
2. Markets anomalies

Skewness risk premia & market anomalies

Figure: Which option profile may be considered as a skewness risk premium?



- ~~Long call~~ (risk adverse)
- ~~Short call~~ (market anomaly)
- ~~Long put~~ (insurance)
- Short put

⇒ SMB, HML, ~~WML~~, ~~BAB~~, ~~QMJ~~

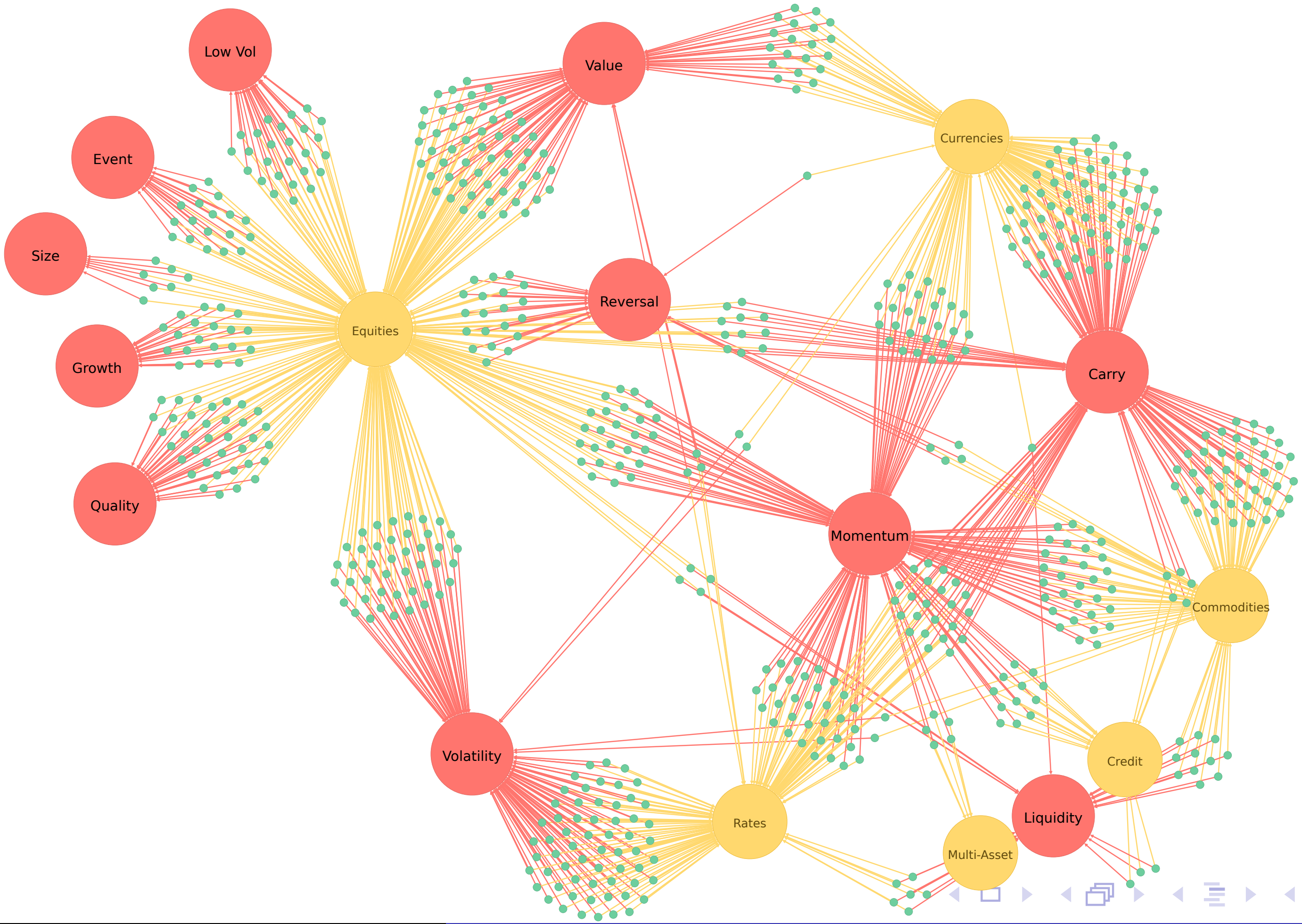
~~Value~~Carry and momentum everywhere

Figure: Mapping of ARP candidates

Risk Factor	Equities	Rates	Credit	Currencies	Commodities
Carry	Dividend Futures High Dividend Yield	FRB TSS CTS	FRB	FRB	FRB TSS CTS
Liquidity	Amihud liquidity	Turn-of-the-month	Turn-of-the-month		Turn-of-the-month
Momentum	Cross-section Time-series	Cross-section Time-series	Time-Series	Cross-section Time-series	Cross-section Time-series
Reversal	Time-series Variance	Time-series		Time-series	Time-series
Value	Value	Value	Value	PPP Economic model	Value
Volatility	Carry Term structure	Carry Term structure		Carry	Carry
Event	Buyback Merger arbitrage				
Growth	Growth				
Low volatility	Low volatility				
Quality	Quality				
Size	Size				

~~Value~~Carry and momentum everywhere

Figure: Graph database of bank's proprietary indices



~~Value~~Carry and momentum everywhere

What is the problem?

- For traditional risk premia, the cross-correlation between several indices replicating the TRP is higher than 90%
- For alternative risk premia, the cross-correlation between several indices replicating the ARP is between -80% and 100%

Examples (2000-2015)

- In the case of the equities/US traditional risk premium, the cross-correlation between S&P 500, FTSE USA, MSCI USA, Russell 1000 and Russell 3000 indices is between 99.65% and 99.92%
- In the case of the equities/volatility/carry/US risk premium, the cross-correlation between the 14 short volatility indices is between -34.9% and 98.6% (mean $= 43.0\%$, $Q_3 - Q_1 > 35\%$)

~~Value~~Carry and momentum everywhere

The identification protocol

Step 1 Define the set of relevant indices (qualitative due diligence).

Step 2 Given an initial set of indices, the underlying idea is to find the subset, whose elements present very similar patterns. For that, we use the deletion algorithm using the $\mathbf{R}^2$ statistic:

$$R_{k,t} = \alpha_k + \beta_k R_t^{(-k)} + \varepsilon_{k,t} \quad \Rightarrow \quad \mathbf{R}_k^2$$

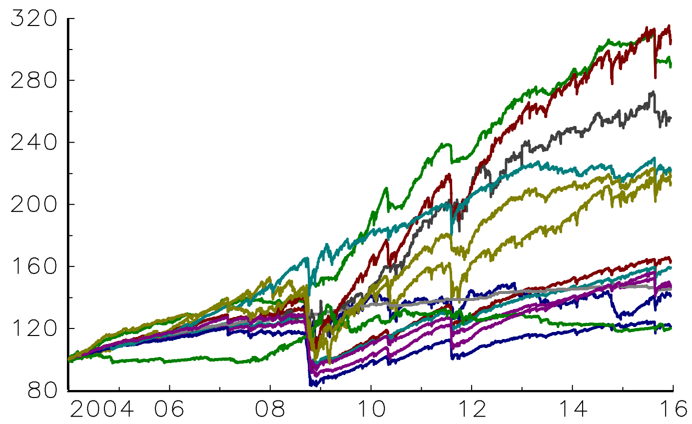
Step 3 The algorithm stops when the similarity is larger than a given threshold for all the elements of the subset (e.g. $\mathbf{R}_k^2 > \mathbf{R}_{\min}^2 = 70\%$).

Step 4 The generic backtest of the ARP is the weighted average of the performance of the subset elements

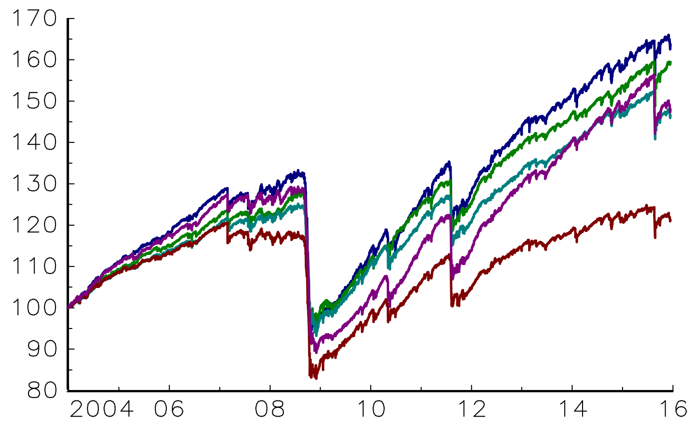
~~Value~~Carry and momentum everywhere

Illustration with the equities/volatility/carry/US risk premium

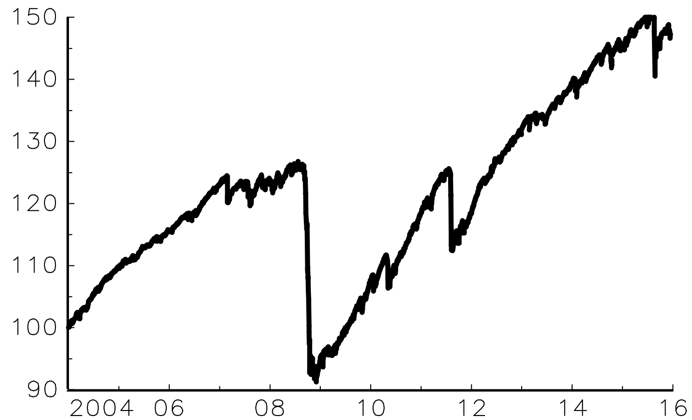
Indices after the 1st step



Selected indices after the 3rd step



Generic cumulative return



- Barclays (BXIISVUE) 90.2%
- Citi (CIISEVCU) 92.4%
- Citi (CIISEVWU) 97.0%
- JP Morgan (AIJPSV1U) 93.4%
- SG (SGIXVPUX) 94.9%

~~Value~~Carry and momentum everywhere

Figure: Mapping of **relevant** ARP

Risk Factor	Equities	Rates	Credit	Currencies	Commodities
Carry	~~Dividend Futures~~ High Dividend Yield	FRB TSS ~~CTS~~	~~FRB~~	FRB	FRB TSS ~~CTS~~
Liquidity	~~Amihud liquidity~~	~~Turn-of-the-month~~	~~Turn-of-the-month~~		Turn-of-the-month
Momentum	Cross-section Time-series	~~Cross-section~~ Time-series	~~Time-Series~~	~~Cross-section~~ Time-series	Cross-section Time-series
Reversal	Time-series ~~Variance~~	~~Time-series~~		~~Time-series~~	~~Time-series~~
Value	Value	~~Value~~	~~Value~~	PPP Economic model	~~Value~~
Volatility	Carry Term structure	Carry ~~Term structure~~		~~Carry~~	~~Carry~~
Event	~~Buyback~~ Merger arbitrage				
Growth	Growth				
Low volatility	Low volatility				
Quality	Quality				
Size	Size				

~~Value~~Carry and momentum everywhere

- ~~Value~~ Carry and momentum everywhere
- Some ARP candidates are not relevant (e.g. liquidity premium in equities, rates and currencies; reversal premium using variance swaps; value premium in rates and commodities; dividend premium; volatility premium in currencies and commodities; correlation premium; seasonality premium.)
- Hierarchy of ARP

Equities	value, carry, low volatility, volatility/carry, momentum, quality, growth, size, event, reversal
Rates	volatility/carry, momentum, carry
Currencies	carry, momentum, value
Commodities	carry, momentum, liquidity

- Carry recovers different notions: FRB, TSS and CTS

The skewness puzzle

- ARP are not all-weather strategies:
  - Extreme risks of ARP are high and may be correlated
  - Aggregation of skewness is not straightforward

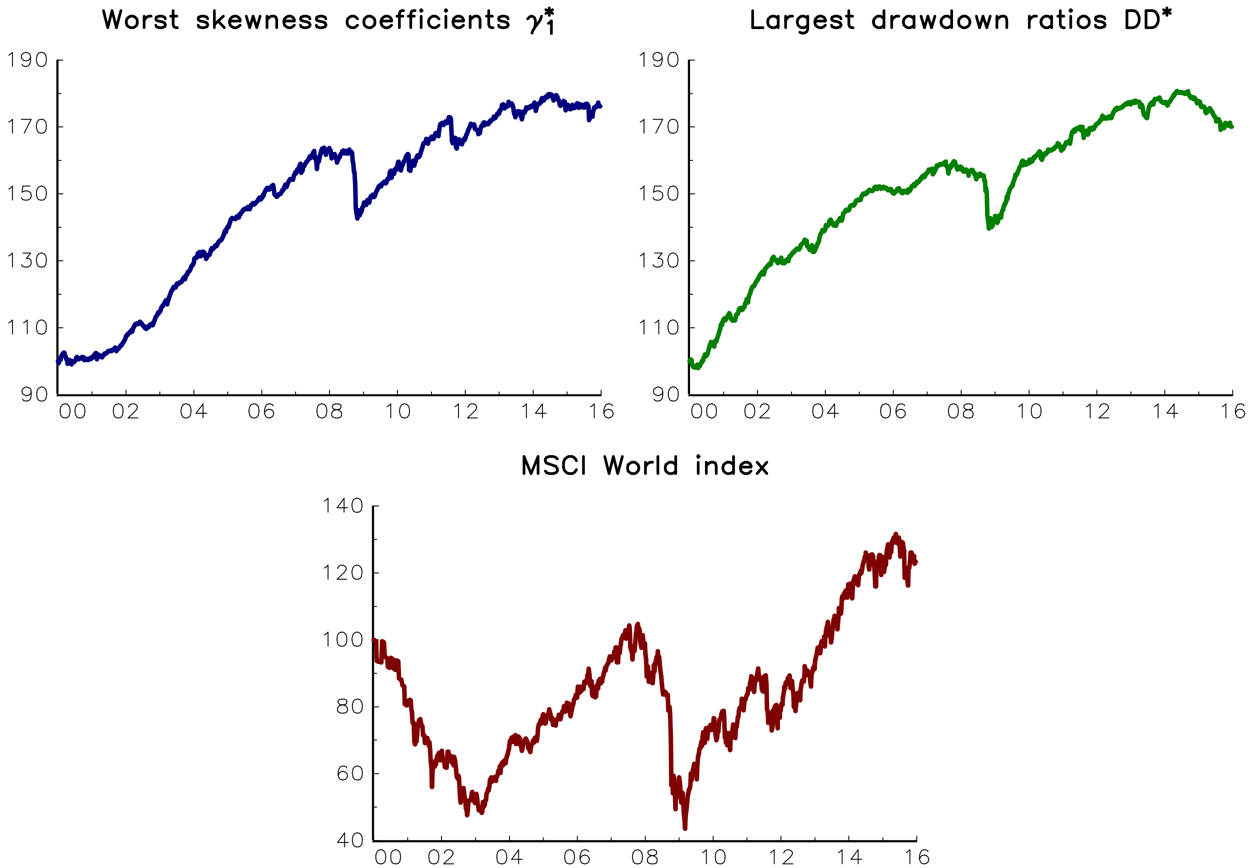
Skewness aggregation $\neq$ volatility aggregation

When we accumulate long/short skewness risk premia in a portfolio, the volatility of this portfolio decreases dramatically, but its skewness risk generally increases!

$\Rightarrow$ Skewness diversification $\neq$ volatility diversification

The skewness puzzle

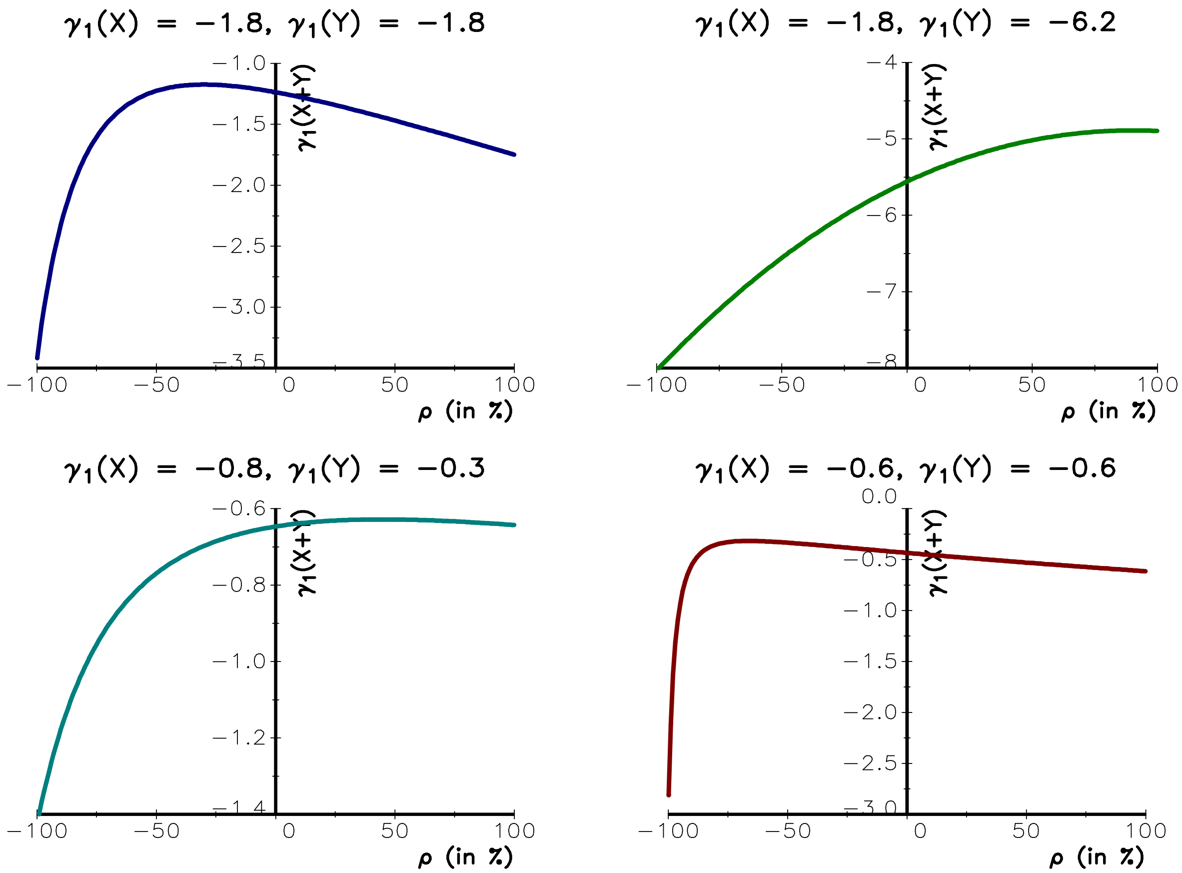
Figure: Skewness aggregation of L/S alternative risk premia



Source: HPRZ (2016)

The skewness puzzle

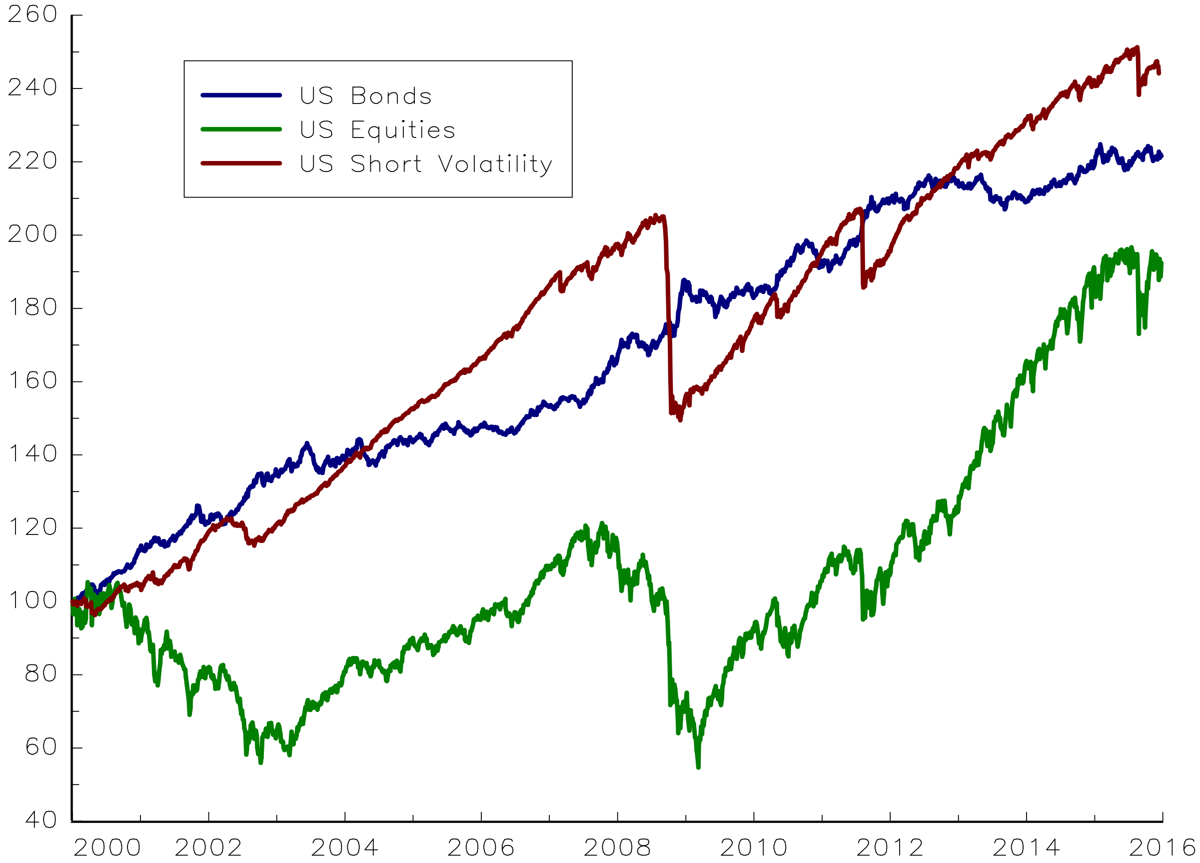
Figure: Skewness aggregation in the case of the bivariate log-normal distribution



Source: HPRZ (2016)

The skewness puzzle

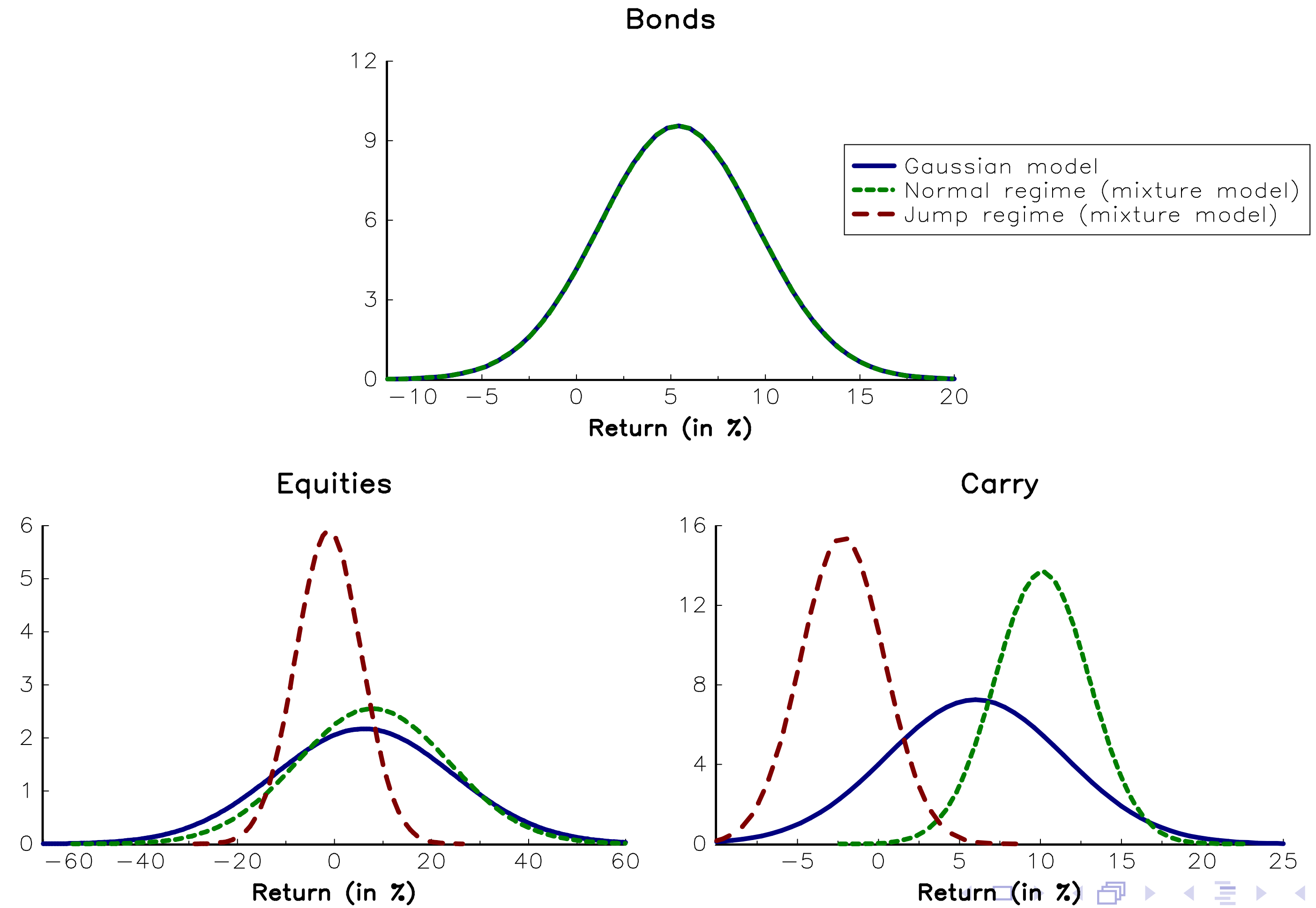
Figure: Cumulative performance of US bonds, US equities and US short volatility



Source: BKR (2016)

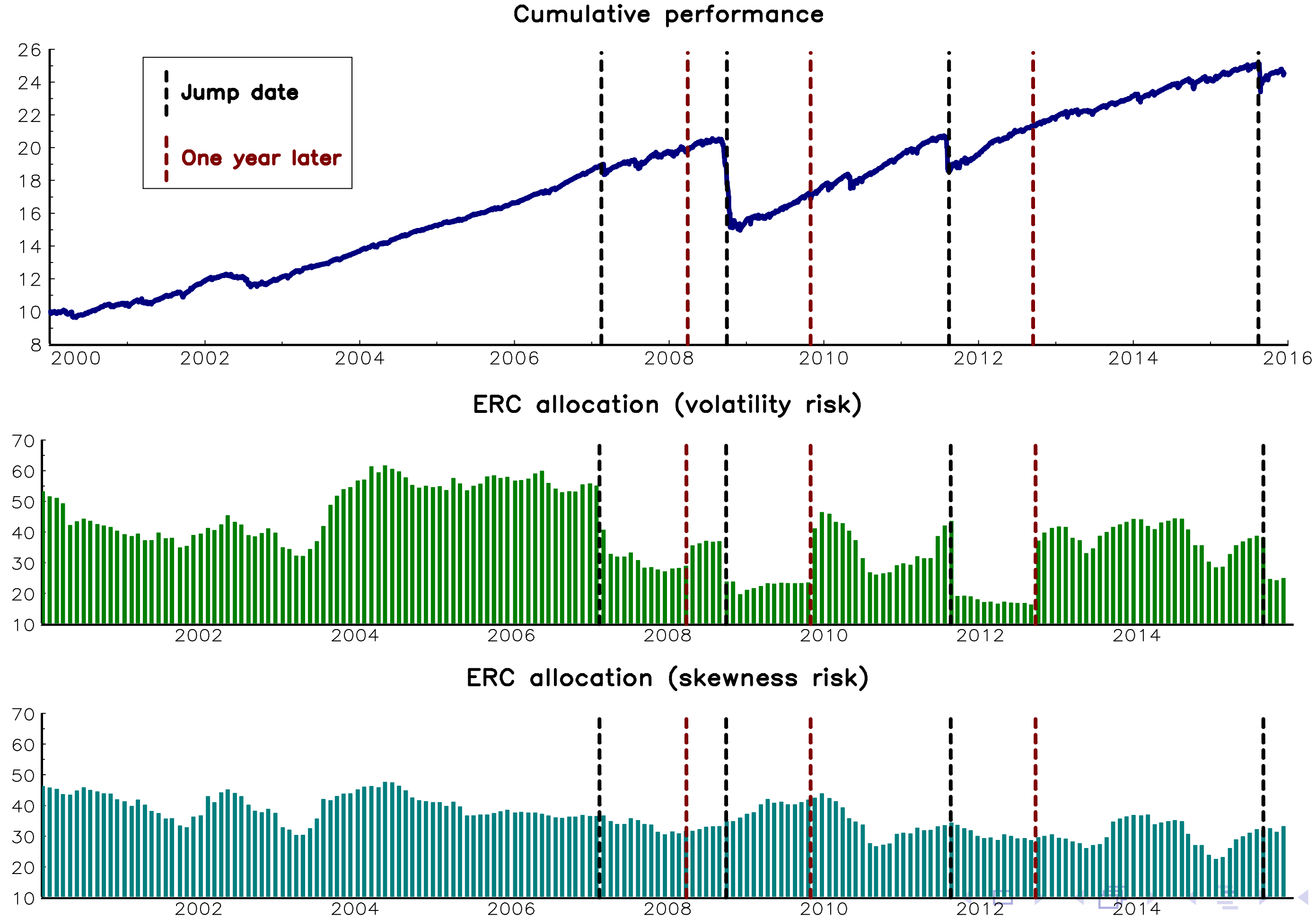
The skewness puzzle

Figure: Comparison of Gaussian and mixture models



The skewness puzzle

Figure: Comparison of the carry allocation



Volatility hedging versus skewness hedging

Table: Volatility and skewness risks of risk-based portfolios (weekly model)

Portfolio	MV	MV	ERC	MES
Model	Gaussian (full sample)	Jump model Normal	Jump model Mixture	Jump model Mixture
Bonds	63.26%	36.05%	52.71%	100.00%
Equities	2.23%	0.00%	10.36%	0.00%
Carry	34.51%	63.95%	36.93%	0.00%
$\sigma(x)$	2.62%	2.33%	2.75%	4.17%
γ_1	-2.75	-19.81	-6.17	0.00

Source: BKR (2016)

The arithmetics of skewness

$$-(36.05\% \times 0.17 + 0\% \times 0.44 + 63.95\% \times 5.77) = -19.81$$

The lost generation of value investors

The value of value investors

- A value strategy exhibits a high skewness risk ($\simeq$ default risk)
- Markets need value investors in order to exist, because they are the only investors who are able to reverse the market (in a bull market, but more important in a bear market)
- Value investors also provide liquidity
- Markets have to reward value investors

Since 2008

- The equity market has not rewarded value investors
- The bond/credit market has rewarded value investors
- Who are the value investors in illiquid markets?

$\Rightarrow$ **The number of value investors decreases dramatically!**

The diversification enigma

Consider a portfolio with 2 assets: $R = x_1 R_1 + x_2 R_2$. We have:

$$\mathrm{var}(R) = x_1^2 \sigma_1^2 + x_2^2 \sigma_2^2 + 2 x_1 x_2 \rho \sigma_1 \sigma_2$$

Best solution in terms of volatility diversification

- Long-only portfolios:

$$\rho = -1$$

- Long/short portfolios:

$$\rho = 0$$

$\Rightarrow$ Long/short portfolio management can not mimick long-only portfolio management

The notion of diversification is not universal

The impact of low/negative interest rates

Gordon-Shapiro (or dividend discount) model

The stock price P is equal to:

$$P = \frac{D}{r - g}$$

where D is the current dividend, g is the growth rate of dividends and r is the interest rate. When $r - g \approx 0$, P goes to ∞.

$\Rightarrow$ The level of interest rates has an impact on all asset classes (equities, sovereign bonds, credit, commodities)

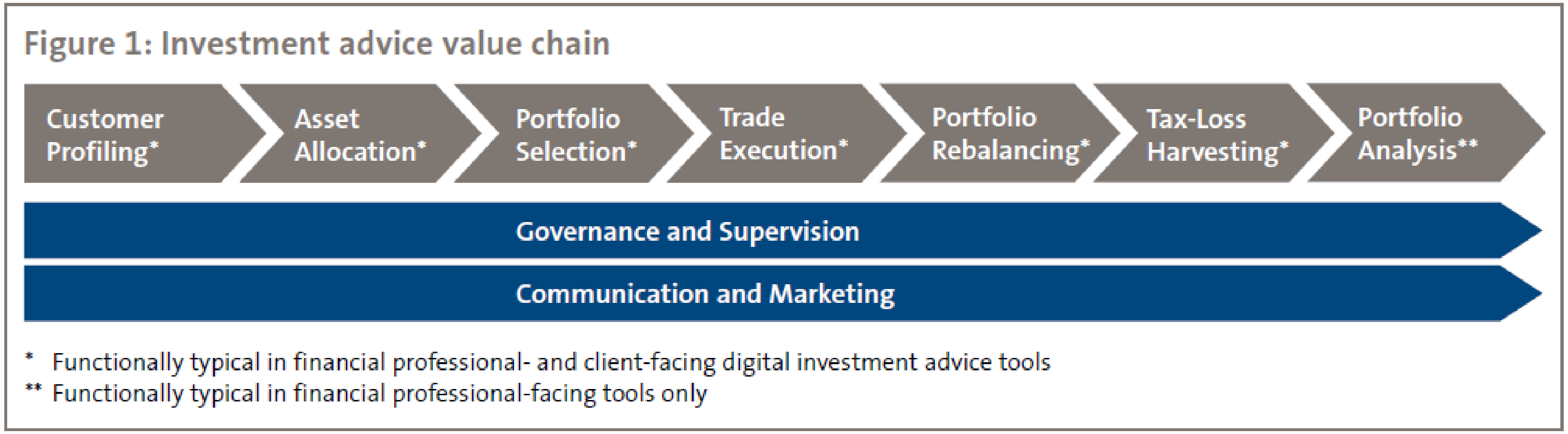
$\Rightarrow$ The "low-long-rate-high-asset-prices"(Shiller, 2007)

$\Rightarrow$ In low interest rate environment, investors have a greater appetite for risk taking and reach for yield (Lian *et al.*, 2016)

Interest rates are not always included in quantitative models

The rise of robo-advisors

- US: Betterment, Wealthfront, Personal Capital, FutureAdvisor, Schwab Intelligent Portfolios, Vanguard Personal Advisor, TradeKing Advisors, SigFig, Hedgeable, etc.
- UK: Nutmeg, Scalable Capital, True Potential, Wealthify, Wealth Horizon, Wealth Wizards, etc.
- France: Marie Quantier, Yomoni, WeSave (Anatec), Advize, Fundshop, etc.



Source: FINRA (2016)

The rise of robo-advisors

- The response of the quantitative asset management for individual/household investors
- Mass customization (Martellini, 2016)
- The problem of distribution costs:

$$\text{retrocession payments} \Rightarrow \text{fee-based models?}$$

The liability dilemma

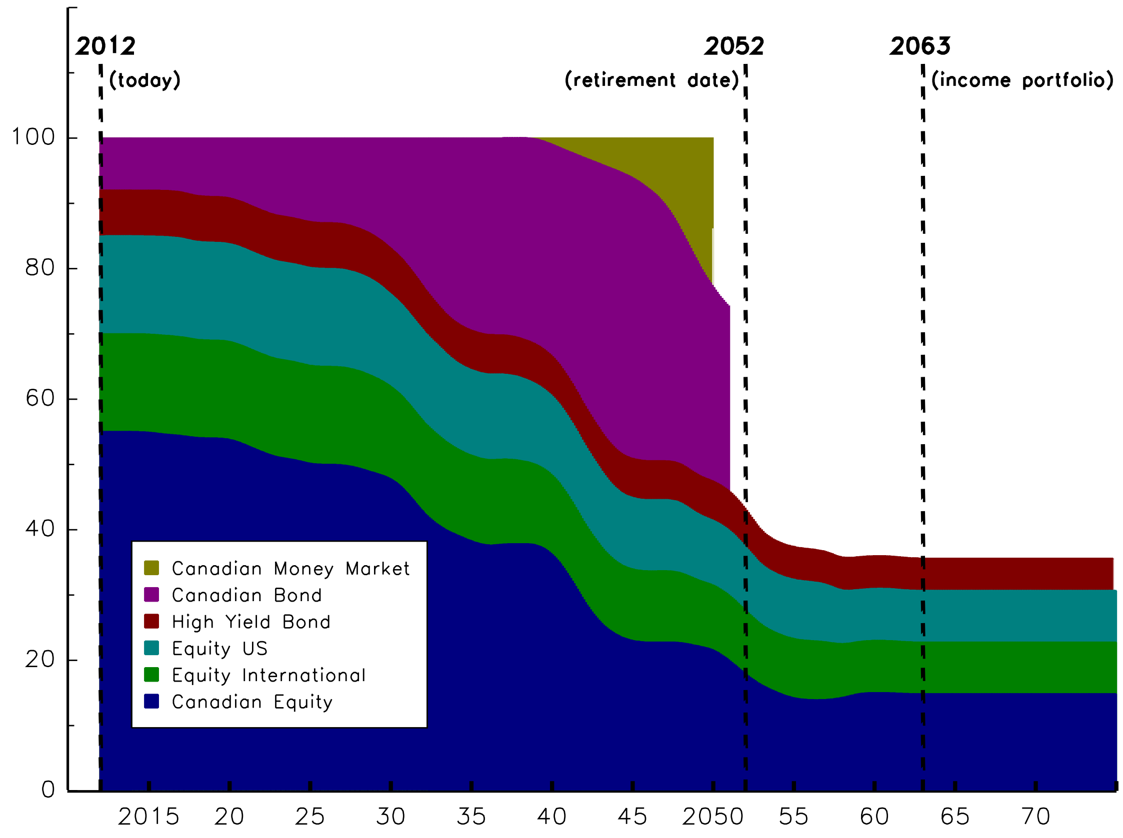
Liabilities change portfolio management

- Target-date funds (TDF)
- Liability-driven investment (LDI)
- Goal based investing (GBI)

This is one of the big challenge of (quantitative) asset management

The liability dilemma

Figure: Allocation of the Fidelity ClearPath® 2045 Retirement Portfolio



Source: `www.fidelity.ca`.

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