Nova School of Business and Economics Banco Português de Investimento

RISK MONITORING AT BPI GA

Development of an Internal Risk Monitoring System

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AGENDA

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MOTIVATION AND OBJECTIVES

Risk and **Risk Management** are not new concepts. However, recently they have been gaining more and more importance, especially since the financial crisis of 2008. The crisis uncovered several weaknesses in the risk control processes of the banking system, leading many banks to suffer heavy losses. Since then, financial institutions and regulators have been refocusing their attention to risk management issues – *a well established and developed risk management system became essential for the business running*.

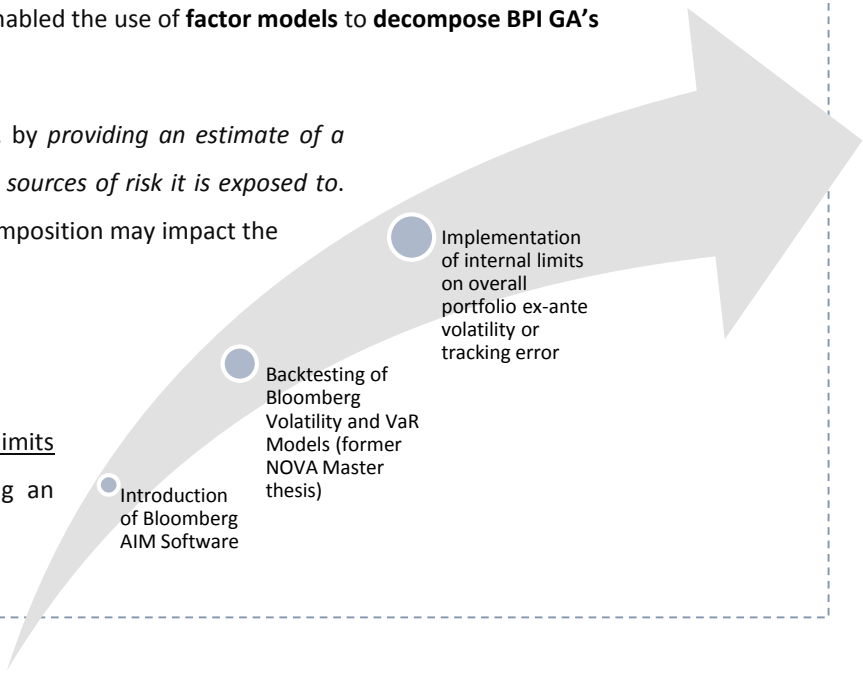
Risk Management at BPI GA

BPI Gestão de Activos (GA) and particularly the Risk Management Division are currently concerned with the **promotion of a risk culture** in the organization. The main goal is to increase portfolio managers' awareness of the particular risks they are incurring and ensure that everyone in the institution is comfortable with them, in order to prevent eventual losses due to unexpected exposures to risks.

In fact, BPI GA has already made important progresses in enhancing the cooperation between Risk and Portfolio Management teams: In particular, the introduction of *Bloomberg's software AIM* in 2013 enabled the use of **factor models** to **decompose BPI GA's portfolios' risk and return**.

This tool provides an intuitive and comprehensive approach to risk, by *providing an estimate of a portfolio's ex-ante volatility and tracking error that reflects the main sources of risk it is exposed to*. Moreover, it allows to easily perceive how changes in the portfolio composition may impact the overall level of risk.

Based on this model, BPI GA was able to implement a set of internal limits on the ex-ante level of risk for each portfolio, thereby preventing an excessive risk taking behaviour.



MOTIVATION AND OBJECTIVES

PROBLEM | *Is this sufficient?*

Although the current risk management system allows to track the overall level of risk of each portfolio and alert the portfolio managers in the event of excessive risk, it **fails** to provide a complete analysis of *where that risk is actually stemming from*.

PROJECT

In order to complement the existing risk limits, we will develop a **detailed internal risk monitoring system** to promote a **deeper understanding of the particular sources of risk** that each of BPI GA's portfolios is exposed to.
With this, the aim is to *support the portfolio managers in the assessment of the risk-return trade-off* of their investment decisions and ultimately *reinforce the risk culture within BPI GA*.

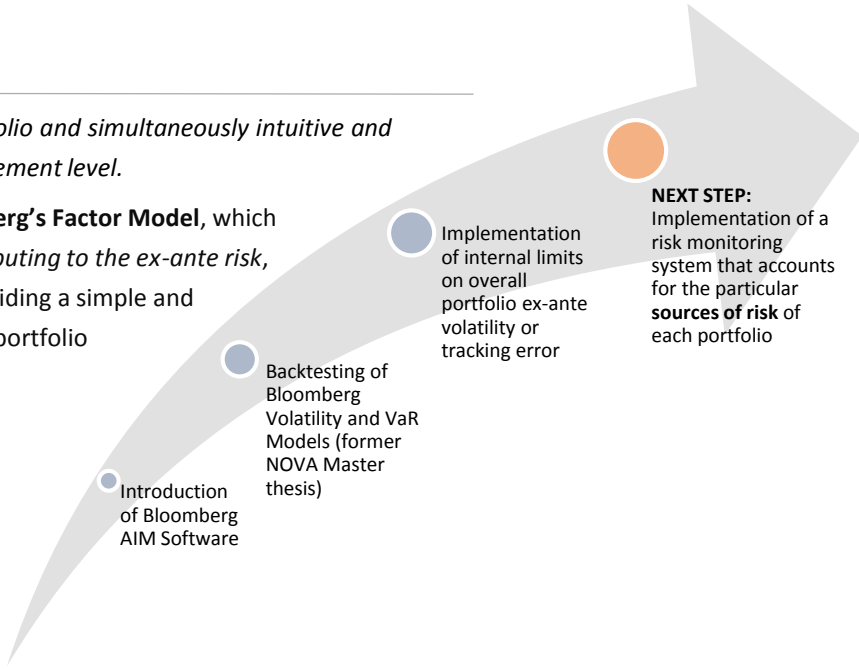
The main focus of our risk monitoring system will be the sources of market risk, since it is the most relevant type of risk faced by BPI GA. We will also study how the selected portfolios would perform under the proposed risk system in order to evaluate its potential impacts.

What kind of risk monitoring system would be most suitable?

The system needed to be tailored to the particular features of each portfolio and simultaneously intuitive and easy to interpret in order to ensure its acceptance at the portfolio management level.

The solution that would best satisfy BPI GA needs was to rely on **Bloomberg's Factor Model**, which allows the *identification and measurement of the main risk factors contributing to the ex-ante risk*, based on the portfolio's exposure to a set of risk factors. Apart from providing a simple and intuitive output, it also had the advantage of being already in use by the portfolio managers at BPI GA.

Our objective is not to establish further limits to the management that may deter their investment choices. This risk monitoring system aims at setting up a mechanism that leads to a **detailed and informative analysis** of the major causes of risk and which is able to detect and alert for atypical risk sources.



MARKET RISK

Taking risks and dealing with uncertainty is unavoidable in BPI GA's business; hence, in order to manage risk, it is important to first define it.

Financial Risk can be defined as the possibility that an investment's return will be different from what was expected. This concept of risk is usually associated with a potential negative effect over a portfolio of assets in the future[1].

There are **4 main types of Financial Risks**:

Our project focuses on **market risk** – this is the major risk that BPI GA's portfolio managers have to deal with more directly.
At a later stage, the objective is to extend the monitoring system to account for liquidity and credit risks.

Market Risk

The possibility of an investor suffering losses due to movements in the prices of securities that affect the overall performance of financial markets[2].

Market Risk Limits

In order to control financial risks and avoid potential losses, many financial institutions establish a set of limits that cap the ability of portfolio managers to take risks.

The most common **types of limits** are[3]:

- Stop-Loss Limits – Set a maximum cumulative market loss that a portfolio should not exceed in a given period; although widely used, it has the problem of being only applicable ex-post.
- Exposure Limits – Set a limit based on an exposure risk metric such as duration, convexity, delta, etc.; in spite of being forward looking, it still disregards the volatility of risk factors and correlations.
- VaR Limits – Set a maximum market loss based on its probability of occurrence; it allows to aggregate different sources of risk and accounts for the effects of leverage and correlations.

Although our aim is not to set up risk limits that are binding for the portfolio managers, we also seek to define a threshold from which they should be notified and aware that they might be excessively exposed to a certain risk factor.
Moreover, our risk monitoring system will not be based on the usual type of limits – instead, we rely on **risk contribution limits**. This should mitigate some of the drawbacks of the former by providing a prospective and detailed indication of the risks taken, with a reasonably intuitive interpretability.

[1] *Source:* GARP. (2014) *Financial Risk Manager FRM Part I – Foundations of Risk Management.* (4th ed., pp.5-10). Pearson.
[2] *Source:* GARP. (2014) *Financial Risk Manager FRM Part I – Foundations of Risk Management.* (4th ed., pp.5-10). Pearson.
[2] *Source:* Jorion, P. (2007) *Value at Risk – The New Benchmark for Managing Financial Risk.* (3rd ed., pp.13-16). McGraw-Hill.

MARKET RISK

Bloomberg's Factor Model

Factor Models are based on the principle that assets with similar characteristics should have similar levels of risk and return. Consequently, a security's return can be explained by a set of common factors that reflect the particular features of that asset (such as country, industry, size, etc.):

$$r_{nt}^{loc} = \sum_{k=1}^{K} X_{nkt} f_{kt} + \varepsilon_{nt}$$

Where:
r_{nt}^{loc} is the local excess return of asset n in period t
X_{nkt} is the exposure of asset n to factor k
f_{kt} is the return of factor k in period t
ε_{nt} is the residual of asset n's return

The Bloomberg Factor Model is based on an **implicit factor approach** – it determines factor returns through a regression of security returns on a set of pre-defined exposures to factors. In spite of being more data-intensive, this type of model gathers several advantages:

- Intuitive output – exposures reflect the assets' characteristics;
- Ability to adjust rapidly to changes in the features of the assets;
- Good out-of-sample performance.

Decomposition of Factor Returns

The model runs an OLS regression with the objective of finding the vector of factor returns that better adjusts the data, which is equivalent to minimizing the sum of the squared residuals of the above equation. This way, factor returns can be computed as:

$$\underset{f_k}{Min} \sum_{i=1}^{N} {\varepsilon_i^t}^2 = \left(\begin{bmatrix} r_1 \\ \vdots \\ r_N \end{bmatrix} - \begin{bmatrix} x_{1,1} \cdots x_{1,K} \\ \vdots \\ x_{N,1} \cdots x_{N,K} \end{bmatrix} * \begin{bmatrix} f_1 \\ \vdots \\ f_K \end{bmatrix} \right)' \left(\begin{bmatrix} r_1 \\ \vdots \\ r_N \end{bmatrix} - \begin{bmatrix} x_{1,1} \cdots x_{1,K} \\ \vdots \\ x_{N,1} \cdots x_{N,K} \end{bmatrix} * \begin{bmatrix} f_1 \\ \vdots \\ f_K \end{bmatrix} \right)$$

$$= (R - XF)'(R - XF)$$

$$\frac{\partial}{\partial F} = 0 \Rightarrow F = (X'X)^{-1}(X'R)$$

Equity Fundamental Factor Model

The Equity Model resorts to 5 types of risk factors: **market**, **country**, **industry, country, currency** and **style.**

The excess return of a stock can then be expressed as:

$$r_{nt}^{loc} = f_{mkt} + \sum_{k=1}^{K_c} X_{nkt} f_{kt} + \sum_{k=K_c+1}^{K_c+K_i} X_{nkt} f_{kt} + \sum_{k=K_c+K_i+1}^{K_c+K_i+K_s} X_{nkt} f_{kt} + \varepsilon_{nt}$$

Where:
f_{mkt} is the market factor (regression intercept)
K_c, K_i and K_s are respectively the number of countries, industries and styles

*The currency return can also be included in the expression as an additional factor

- **Market factor** – its exposure is a dummy variable equal to 1 for all stocks in the model. This factor is the predominant risk source in diversified long-only portfolios. However, in terms of active risk (when compared to a benchmark) its contribution tends to be residual unless the portfolio has a considerable position in the money market.

- **Country, industry and currency factors** – exposures to these factors are also dummy variables: each asset has an exposure of 1 to its country of issue, trading currency and industry it belongs, and 0 to all the remaining countries, currencies and industries. Industry exposures are based on the *24 GICS Level 2 membership*[1].

- **Style factors** – include several factors that characterize and differentiate the companies, such as size, momentum, value and leverage, among others[2]. To find the exposure to each factor, Bloomberg resorts to a weighted combination of several indicators; these variables have to be rescaled or standardized in order to be combined into a robust, single factor.

[1] See **Annex 1** for a list of the industries considered.
[2] See **Annex 2** for a detailed description of style factors.

MARKET RISK

Bloomberg's Factor Model

Fixed Income Fundamental Factor Model

The Fixed Income Model includes 2 types of risk factors:

Explicit Factors

Directly observable in the market, impacting all bonds
- Currency factors
- Volatility factor
- Curve factors

Implicit Factors

Estimated by the model via cross sectional regression
- Spread factors

- **Volatility factor** – may impact significantly bonds with embedded options; its exposure is defined by the bond's "volatility duration", which measures the sensitivity to changes in implied volatility.

- **Curve factors** – measure the return due to movements in the yield curve, computed from the yield changes on 9 fixed tenor points of the curve (0.5, 1, 2, 3, 5, 7, 10, 20 and 30 years) and the squared average curve change to capture 2nd order effects:

$$R_{yc} = -\sum_{i=1}^{9} KRD_i * \Delta y_i + \frac{1}{2} * OAC * (\overline{\Delta y})^2$$

R_{yc} is the return due to changes in yields
KRD_i is the Key Rate Duration at point i
Δy_i is the yield change at point i
OAC is the option-adjusted convexity
$\overline{\Delta y}$ is the average change in the yield

The exposures to curve factors are thus given by the key rate durations.

- **Spread factors** – reflect changes in the risk perception arising from forces common to all assets and from factors exclusive to each issuer. The common forces are captured by the systematic spread factors, which differ for each G6 currency and subclass of bonds – *sovereign, agency, corporate (IG and HY)* and *distressed*[1].
  For instance, for the US corporate sector, the model includes an industry-specific spread factor, a high-yield factor, a seniority factor, among others.

[1] See **Annex 3** for further details on systematic spread factors.

Covariance Matrix

Once factor returns are obtained, Bloomberg derives a factor covariance matrix. This matrix is composed by a correlation matrix and a volatility diagonal matrix:

$$\sum = V_t \times C_t \times V_t'$$

Where: $\sum$ is the factor covariance matrix
C_t is the factor correlation matrix
V_t is the diagonal factor volatility matrix

The individual factor variances and correlations are estimated through a **GARCH Model**, via Maximum Likelihood estimation:

$$\sigma_{t+1}^2 = (1-\lambda)\sigma_t^2 + \lambda f_{t+1}^2$$

Where: $\lambda = 1 - 2^{\frac{-1}{half\ life}}$
f_t is the factor return in period t-1,t

Different exponential decay weightings are employed – correlations are based on a half life of 52 weeks, whereas for factor volatilities a 26 week half life is used.

With this, the volatility of a portfolio (Ω) can be determined based on the **factor covariance matrix** and the securities' **exposures** to factors**:**

$$\Omega = X_t \times \Sigma_t \times X_t'$$

Multi-Asset Fundamental Factor Model

The Multi-Asset Model aggregates the equity and fixed income factors in a single model. However, since the construction of a covariance matrix with *K* factors from each model could result in a spurious and unstable output, Bloomberg uses only a limited set of factors – called *core-of-core factors* – which are considered to be more relevant to determine cross-asset relationships. This allows maintaining the details of each model, while capturing the interactions among asset classes in a robust way.

METHODOLOGY

The internal risk monitoring system that we propose aims at controlling the **risk factors** that most influence each portfolio's level of risk.
In order to identify the relevant factors and define appropriate limits, a common methodology is applied to the analysis of the portfolios – this way, the consistency of the results is ensured, while accounting for the particular features of each portfolio.

MAIN STEPS:

1. Evaluation of the portfolio's **legal framework** and **investment policy**.

2. **Analysis of the risk factors that determined the portfolio's ex-ante absolute and relative risk,** based on their contributions to risk (%) provided by the Bloomberg factor model.
   This assessment is based on quarterly data from the last year (08-2013 to 08-2014) in order to reflect the current risk profile of the portfolio.

3. **Definition of the type of risk to be monitored** – absolute or relative – according to the analysis performed in ① and ②.
   The decision depends mostly on whether the portfolio has a clear directional focus, i.e., if it is exposed to certain risks that are not controllable by the portfolio managers, namely due to its mandate to invest in a specific region. When the presence of these exogenous risks is significant, a relative approach is considered more suitable.

4. **Definition of the types of risk factors** to be controlled based on the analysis made in ②.

5. **Historical analysis of the contributions to risk** of the factors selected in ④.
   - This analysis is based on monthly contributions of each factor from 01-2009 to 08-2014 for equity funds and from 01-2011 for fixed income and mixed asset portfolios[1].
   - A decomposition of the factors' exposures and volatilities is also included in order to understand the major drivers of its contributions to risk.

6. **Definition of 2 warning levels** for the risk factors' contributions:
   The thresholds are primarily based on the statistical distribution of factor contributions, being adjusted whenever considered appropriate.
   - **Warning 1**: percentile 95% - should induce an analysis of the causes of the contribution level and a discussion with the portfolio manager
   - **Warning 2**: percentile 99% - should be reported to the Administration

   Under this criteria, *warnings should arise only occasionally*, when factor contributions deviate significantly from the usual values. This way, only relevant changes in the portfolio's risk profile will be captured, thus enhancing the efficiency and reliability of the monitoring system.

Our system intends to monitor the **contribution of each factor to the overall portfolio's risk,** instead of its exposure/weight, as usual. This should provide a more rigorous and complete evaluation of the sources of risk, since the contribution is a measure that combines the effects of the portfolio exposure, the factor volatility and the correlation between the risk factor and the portfolio.

$$\text{Factor } k\text{'s Contribution to Risk (\%)} = \frac{X_k^P \times \sigma(f_k) \times \rho(f_k, r_P)}{\sigma_P}$$

[1] Maximum range available on Bloomberg PORT; for the portfolios that were constituted only afterwards or that faced significant changes during this period, the analysis is based on a shorter time period.

PORTFOLIO ANALYSIS

The analysis of risk factors covered **10 portfolios** of different asset classes, which are considered representative of most of BPI GA's portfolios and also larger in size:

	Portfolio	Asset Class	Internal Benchmark	AUM[1]
EQUITY	▪ **BPI Reestruturações**	Global Equity	35%*HUI Index + 65%*SX5E Index	51 M
	▪ **BPI Ibéria**	Iberian Equity	50%*PSI20 TR Net Dividends + 50%*IBEX35 TR Net Dividends	13 M
	▪ **BPI América**	American Equity	S&P500 Net Total Return $ / ECB Euro Exchange USD	25 M
	▪ **BPI África**	African Equity	S&P Pan Africa Total Return $ / ECB Euro Exchange USD	16 M
FIXED INCOME	▪ **BPI Euro Taxa Fixa**	Eurozone Sovereign Bonds	EFFAS Bond Indices Euro Govt. All>1 Yr Total Return	43 M
	▪ **BPI Reforma Segura**	European Corporate and Sovereign IG Bonds	65%*Iboxx € Corporate Overall+ 25%*EFFAS € All>1 + 10%*EONIA Capitalization 7 Day	207 M
	▪ **BPI Obrigações de Alto Rendimento Alto Risco (OARAR)**	High Yield Bonds	50%*iBoxx Liquid Corporates Non Financials BBB Total Return Index + 50%*BarCap Euro HY 3% Issuer Constraint*Fin TR Index value Unhedged EUR	28 M
	▪ **BPI Obrigações Mundiais**	Investment Grade Bonds	75%*EONIA Capitalization Index 7 Day	20 M
MULTI-ASSET	▪ **BPI Reforma Investimento**	Several	10%*Stoxx 600 Net Total Return € + 7.5%*S&P500 Hedged € (Net TR) + 15%* IBOXX € CRP OA TR + 4.25%*EFFAS Euro Govt 1-10 Yr TR + 25%*EONIA Capitalization Index 7 Day	357 M
	▪ **BPI Vida Capitalização Moderado**	Several	40%*EONIA Capitalization Index 7 Day + 20%*MSCI World Hedge € + 40%*BarCap Global Aggregate TR Index	157 M

The risk alerts defined for each of these 10 portfolios will be used by BPI GA as a basis to extend the risk monitoring system to the remaining portfolios, based on their similarities.

[1] Assets Under Management

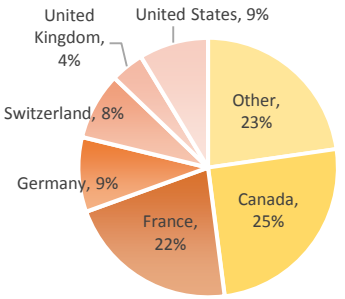
PORTFOLIO ANALYSIS

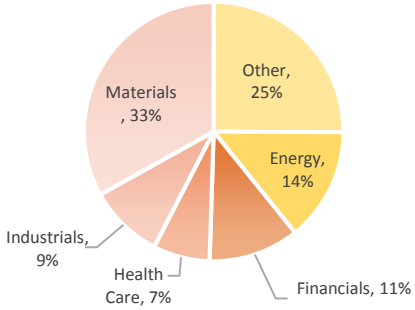
BPI Reestruturações

Portfolio Description

- **AUM:** 51 M (as of 31-08-2014)
- **Benchmark:** 35% HUI Index + 65% SX5E Index
- **Investment Policy:** invest in securities (at least 2/3 in stocks) that are likely to benefit from operational and financial restructuring or which have the potential of benefiting from the restructuring of the economic sector in which they are integrated.

Composition by Geography and Sector (as of August 31st, 2014)

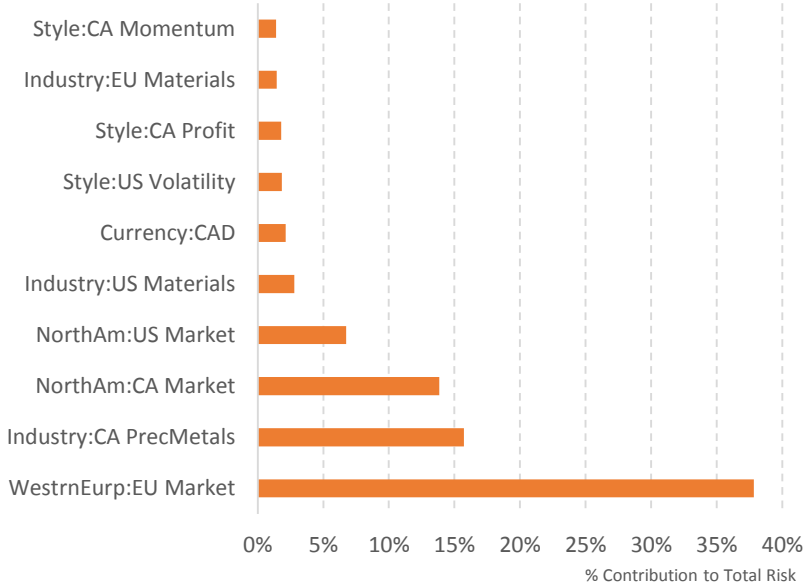




Although the portfolio is significantly invested in equities from the Materials sector, it does not have an official mandate to invest in a particular region or industry. Hence, *our analysis is conducted in terms of* ***absolute risk***.

Factor Contribution to Ex-ante Volatility – Top 10 Factors

Risk factors explain around ***93% of the volatility***[1] *of this portfolio, of which more than half comes from the exposure to the markets:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

Apart from the markets, industry factors – Precious Metals and Materials – and the Canadian Dollar are the main contributors to the portfolio's volatility.

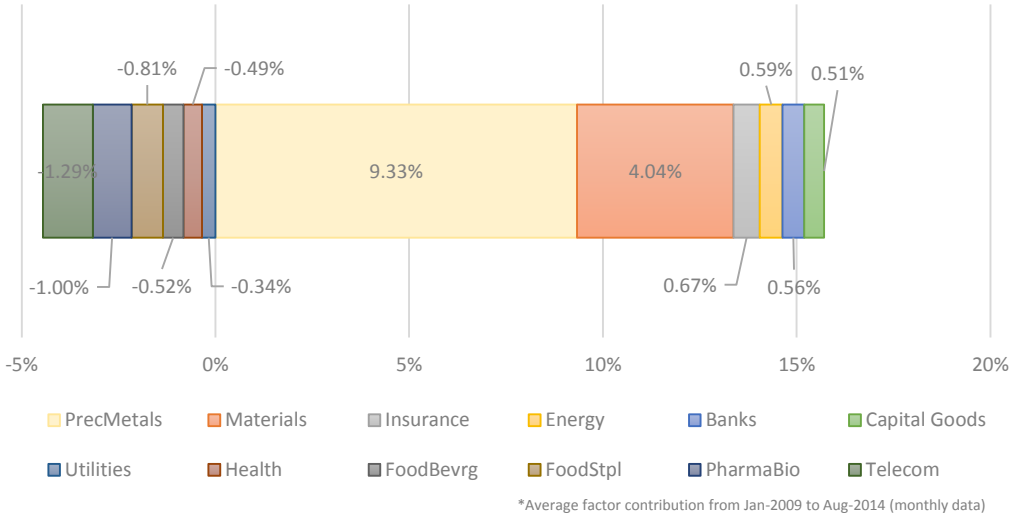
Therefore, the risk monitoring system for *BPI Reestruturações* is based on the contributions of **Industry** and **Currency factors**.

[1] Sum of contributions of all risk factors to the total ex-ante volatility. The remaining portion (7%) refers to the contribution of non-systematic factors.

CONTRIBUTION BY INDUSTRY FACTOR

Factor Contribution to Risk (% of Total Risk)

Precious Metals is the industry factor that has clearly contributed more to the historical ex-ante volatility of the portfolio, followed by **Materials.**



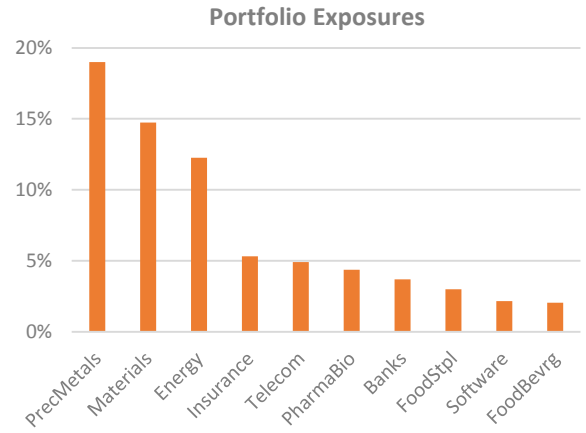
*Average factor contribution from Jan-2009 to Aug-2014 (monthly data)

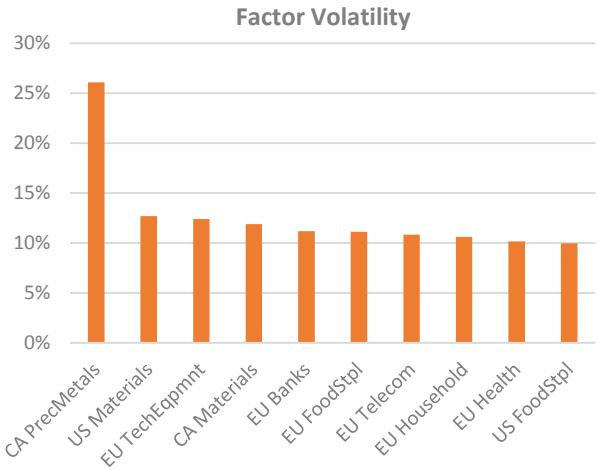
Warnings are close to the 95% and 99% percentiles but slightly adjusted downwards in order to capture better eventual deviations of industries other than Precious Metals and Materials, which clearly influence the percentile distribution. Although Precious Metals would be systematically above the warning, this is a risk already acknowledged and accepted by BPI GA.

KEY STATISTICS | Contributions by Industry Factor: (monthly observations of each industry factor's contribution from Jan-2009 to Aug-2014)	
Average Contribution	0.61%
Standard Deviation	2.58%
Maximum	19.15%
Minimum	-3.79%
Percentile 95%	**5.10%**
Percentile 99%	**13.70%**

Warning 1	**4%**
Warning 2	**10%**

Both **Precious Metals** and **Materials** have a large weight in the portfolio; Precious Metals also exhibited a huge factor volatility when compared to other industries. This justifies its high contribution to risk.



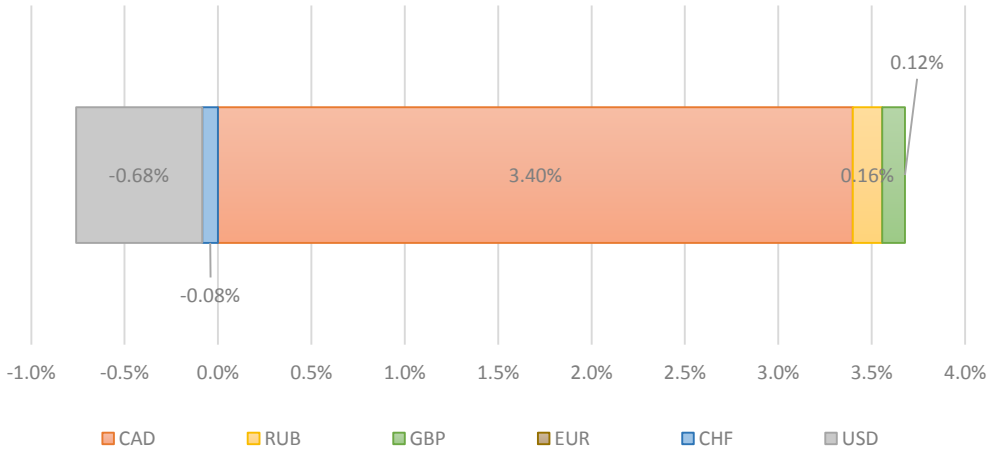


*Average portfolio exposures to industry factors and average factor volatilities from Jan-2009 to Aug-2014 (monthly data)

CONTRIBUTION BY CURRENCY FACTOR

Factor Contribution to Risk (% of Total Risk)

The **Canadian Dollar (CAD)** is by far the currency factor that influenced more the ex-ante volatility of the portfolio:



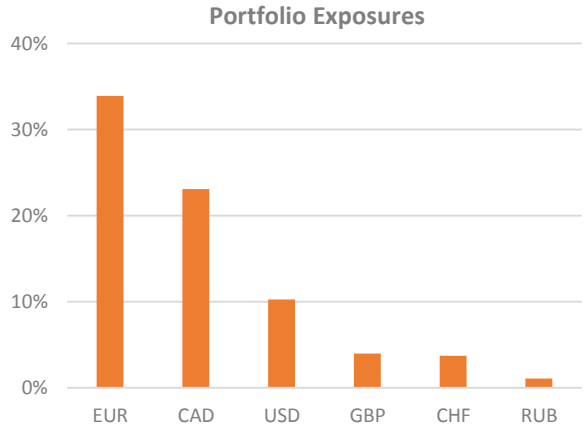
*Average factor contribution from Jan-2009 to Aug-2014 (monthly data)

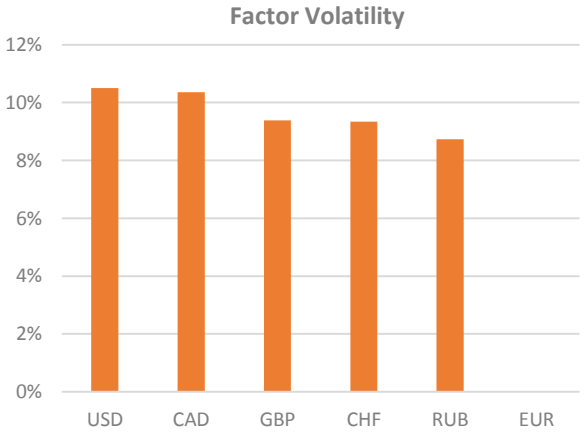
Again, the warnings are adjusted in order to compensate for the effect of the CAD and to be more in line with the recent levels of currency contributions:

KEY STATISTICS | Contributions by Currency Factor: (monthly observations of each currency factor's contribution from Jan-2009 to Aug-2014)	
Average Contribution	0.63%
Standard Deviation	1.69%
Maximum	6.41%
Minimum	-1.57%
Percentile 95%	**3.93%**
Percentile 99%	**6.30%**

Warning 1	**3%**
Warning 2	**7%**

The high contribution of the **CAD** is mostly due to its large weight in the portfolio; the USD also has a considerable weight but it turns out to reduce the overall risk due to its negative correlation with the portfolio.





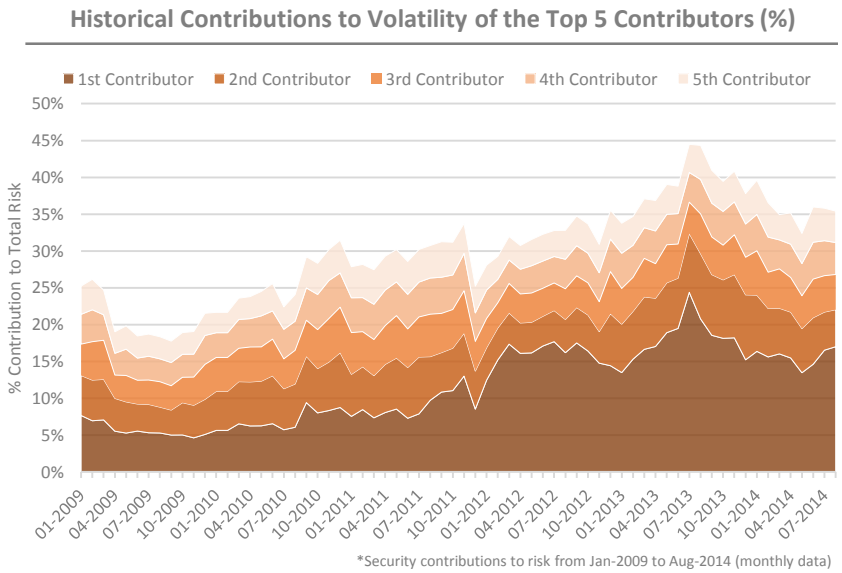
*Average portfolio exposures to currency factors and average factor volatilities from Jan-2009 to Aug-2014 (monthly data)

CONTRIBUTION BY SECURITY

In spite of being a portfolio with 60 securities on average, the risk is concentrated in a small number of stocks – in the last year, the **5 main contributors** to the volatility represented over **28% of the risk** of the fund.

Moreover, historically, *the high contribution to risk has not been compensated by a larger return* – TNX CN contributed on average with 11.6% of the risk in the last 5 years, while having a negative contribution to the portfolio return (-4.97% on average).

*Therefore, we have decided to complement the analysis of the main risk factors with the monitoring of the contributions by security, in order to alert the portfolio manager in the event of **excessive concentration of risk**.*



*Security contributions to risk from Jan-2009 to Aug-2014 (monthly data)

Based on historical data, we propose a rule similar to the UCITS legal restriction[1]: a maximum of **10% for the individual securities' contribution to the volatility** and an **aggregate limit of 25% to the sum of the contributions of all securities with a contribution above 5%**. By including an aggregate warning, the degree of concentration can be assessed more accurately.

KEY STATISTICS | Contributions by Security :
(monthly observations of top 5 contributors from Jan-2009 to Aug-2014)

	Individual Contribution by Security	Aggregate Contribution of Securities with Contribution >5%
Average Contribution	6.02%	18.29%
Standard Deviation	3.78%	8.11%
Maximum	24.38%	35.04%
Minimum	2.76%	0.00%
Percentile 75%	**6.02%**	**22.23%**
Percentile 95%	**16.20%**	**31.65%**

In this case, the warnings are set between the percentiles 75% and 95% since the statistical analysis is based on extreme observations only (contributions of the top 5 contributors instead of all portfolio securities).

Warnings:

Individual Contribution	**10%**
Aggregate Contribution	**25%**

[1] The weight of a single security cannot exceed 10% of the portfolio and all securities weighting more than 5% cannot represent, in total, more than 40% of the portfolio.

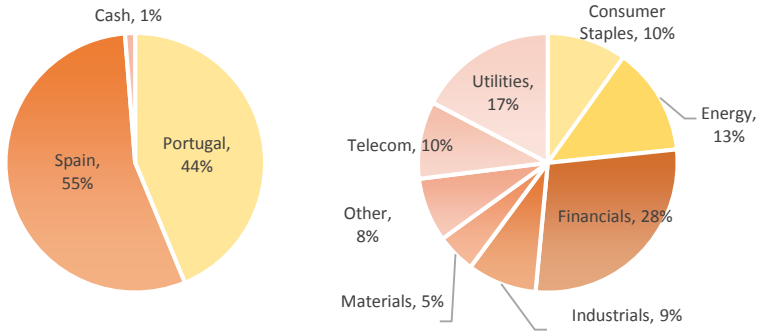
PORTFOLIO ANALYSIS

BPI Ibéria

Portfolio Description

- **AUM:** 12.8 M (as of 31-08-2014)
- **Benchmark:** 50% PSI20 + 50% IBEX 35
- **Investment Policy:** invest in Iberian equities, with no sectorial restrictions. The main constraint is the UCITS legal rule.

Composition by Geography and Sector (as of August 31st, 2014)



Since the portfolio clearly has a directional focus – the particular risks of Iberian markets (such as the concentration on the banking sector) are intrinsic to the fund and already expected by investors – *our analysis addresses the **relative risk***.

CAPPED BENCHMARK

Problem

Given that both PSI20 and IBEX35 Indexes include a small number of securities, the benchmark of this portfolio also has a considerable degree of concentration. Hence, *BPI Ibéria*'s management team is unable to replicate the exact composition of the benchmark due to the UCITS legal constraint, thereby creating an **inevitable source of tracking error**.
This is the typical justification provided by the management whenever a high level of TE is reached.

In order to analyse properly the sources of active risk, the **effect of legal rules should be dissociated** from the management's intentional active bets.

Solution

We propose a new, capped benchmark, where the weights of the official benchmark are adjusted such that the UCITS rule would be always fulfilled. This allows obtaining the ***investable portfolio*** *for BPI GA which is the closest possible from the official benchmark*.

The adjustment is performed according to the methodology followed by the S&P Indexes, as described in the paper *S&P Dow Jones Indices: Index Mathematics Methodology.*
*(see **Annex 4** for the details on the adjustment process)*

The correlation between the portfolio and the capped benchmark is 1.75 percentage points higher than the correlation with the official benchmark (96.7% vs 95%).

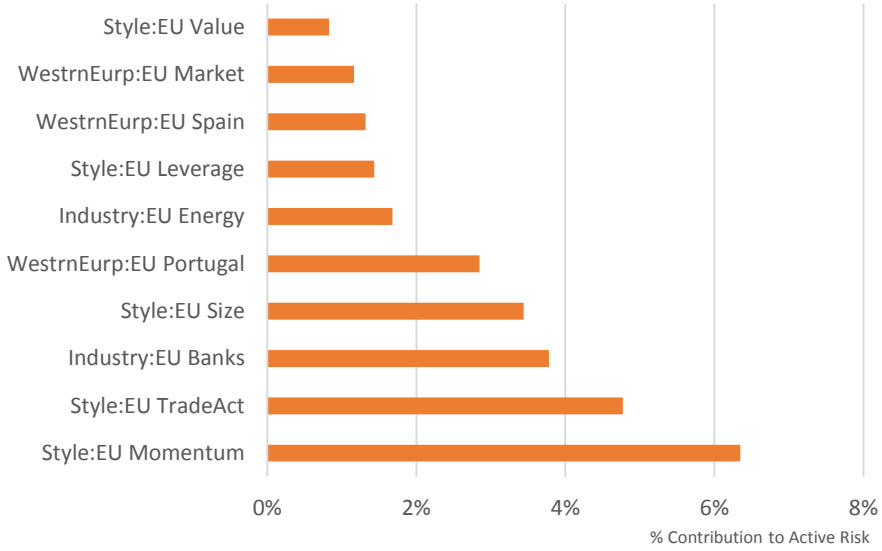
The risk analysis of *BPI Ibéria* that follows is therefore based on this capped benchmark, to allow a proper identification of the sources of active risk.

PORTFOLIO ANALYSIS

BPI Ibéria

Factor Contribution to Ex-ante Tracking Error – Top 10 Factors

*Risk factors explain about **29% of the portfolio's tracking error versus our adjusted benchmark.***
The low explanatory power of the model in this portfolio is the result of its considerable degree of concentration, as non-systematic risk gains more relevance due to the lower diversification effect.



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

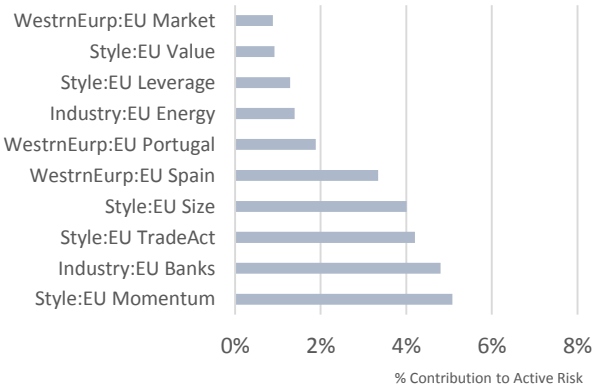
Style factors – namely Momentum, Trading Activity and Size – and the industry factor Banks are the main contributors to the portfolio's relative risk.

Hence, the risk monitoring for *BPI Ibéria* is based on the contributions of **Style** and **Industry factors**. To account for the risks deriving from its concentration, a monitoring of individual securities' contribution to risk was also included.

A relative risk factor analysis performed against the **official benchmark** shows that *the most relevant factor contributors to the portfolio's tracking error are still identical*, with only slight differences in the contribution levels.

This suggests that the UCITS rule does not constrain significantly the portfolio managers' investment decisions. Hence, their active risks – which were so far unclear whether they resulted from deliberate choices or indeed justified by the legal constraint – are confirmed to be mostly an active bet.

Factor Contribution to Ex-ante Tracking Error under the Original Benchmark – Top 10 Factors

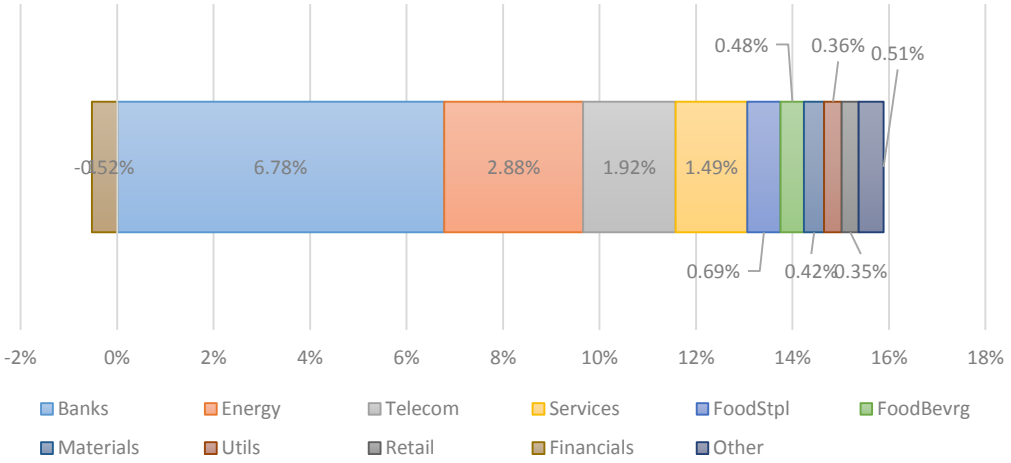


*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

CONTRIBUTION BY INDUSTRY FACTOR

Factor Contribution to Risk (% of Active Risk)

Banks have a major contribution to the portfolio's relative risk when compared to other industry factors.



*Average factor contribution from Jan-2010 to Aug-2014 (monthly data)

Since the outstanding contribution of Banks clearly bias the quartiles, warnings are adjusted downwards in order to capture better potential deviations in other industries:

KEY STATISTICS | Contributions by Industry Factor:
(monthly observations of industry factors' contributions from Jan-2010 to Aug-2014)

	Individual	Aggregate[1]
Average Contribution	0.84%	13.48%
Standard Deviation	2.46%	6.25%
Maximum	21.22%	27.06%
Minimum	-3.54%	1.72%
Percentile 95%	**5.79%**	**23.86%**
Percentile 99%	**10.86%**	**26.26%**

Individual Contribution:

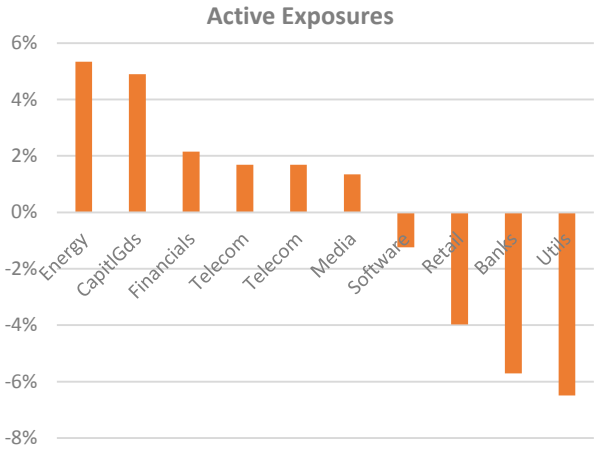
Warning 1	**5%**
Warning 2	**10%**

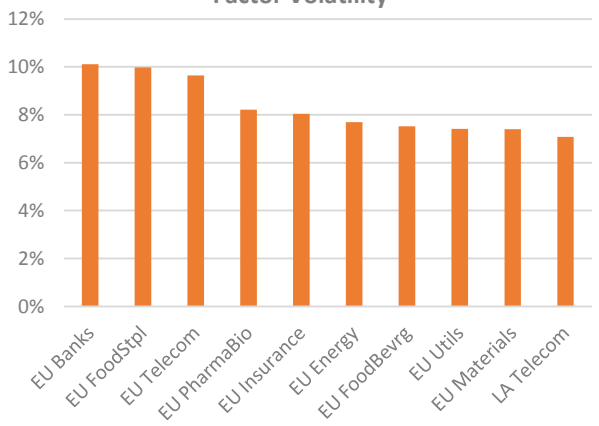
Aggregate Contribution:

Warning 1	**15%**
Warning 2	**20%**

[1] Warnings on the aggregate contribution of all factors of the same type are included whenever the analysis concerns the relative risk, in order to detect simultaneous deviations in more than one factor that may be significant but not sufficiently large to be captured by an individual warning .

A high factor volatility, combined with a large underweighting versus the benchmark, explains the huge contribution of **Banks** to the tracking error.



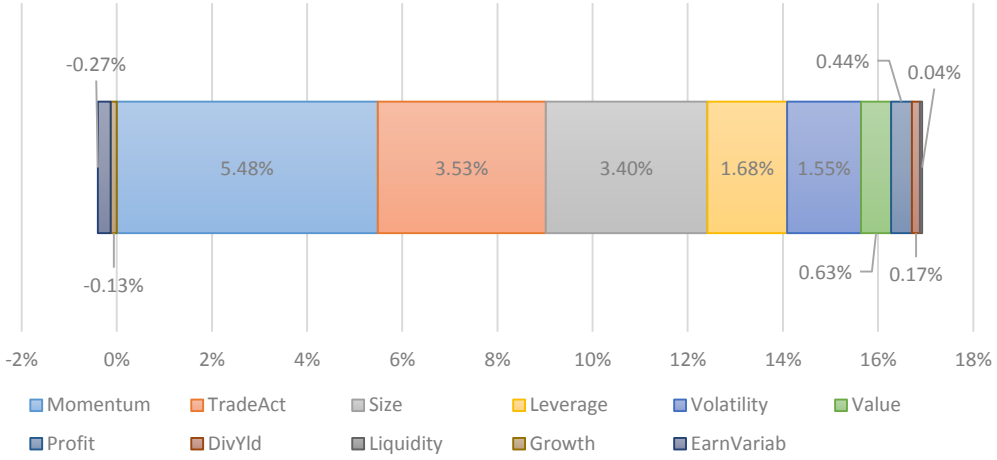


*Average active exposures to industry factors and average factor volatilities from Jan-2010 to Aug-2014 (monthly data)

CONTRIBUTION BY STYLE FACTOR

Factor Contribution to Risk (% of Active Risk)

Momentum, Trading Activity and **Size** are the style factors that contribute more to the portfolio's tracking error.



*Average factor contribution from Jan-2010 to Aug-2014 (monthly data)

KEY STATISTICS | Contributions by Style Factor:
(monthly observations of style factors' contributions from Jan-2010 to Aug-2014)

	Individual	Aggregate
Average Contribution	1.55%	17.05%
Standard Deviation	2.93%	7.11%
Maximum	14.07%	32.24%
Minimum	-3.23%	4.28%
Percentile 95%	**7.76%**	**27.91%**
Percentile 99%	**12.12%**	**32.08%**

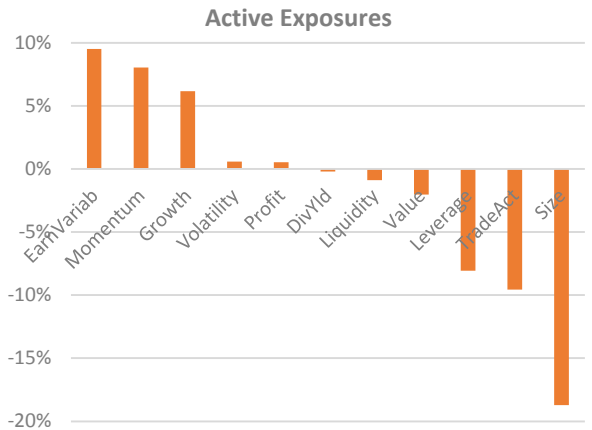
Individual Contribution:

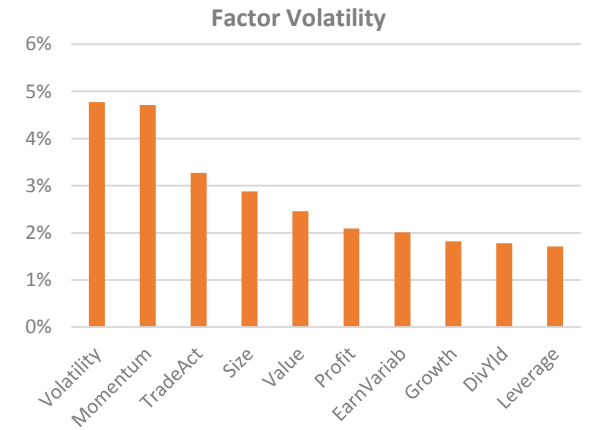
Warning 1	**7%**
Warning 2	**10%**

Aggregate Contribution:

Warning 1	**25%**
Warning 2	**30%**

The contributions of **Momentum** and **Trading Activity** are explained by the combined effect of high factor volatility and high active exposure (overweight on Momentum and underweight on TradeAct). Although the exposure to **Size** is even more significant, this factor entails less risk than the formers.





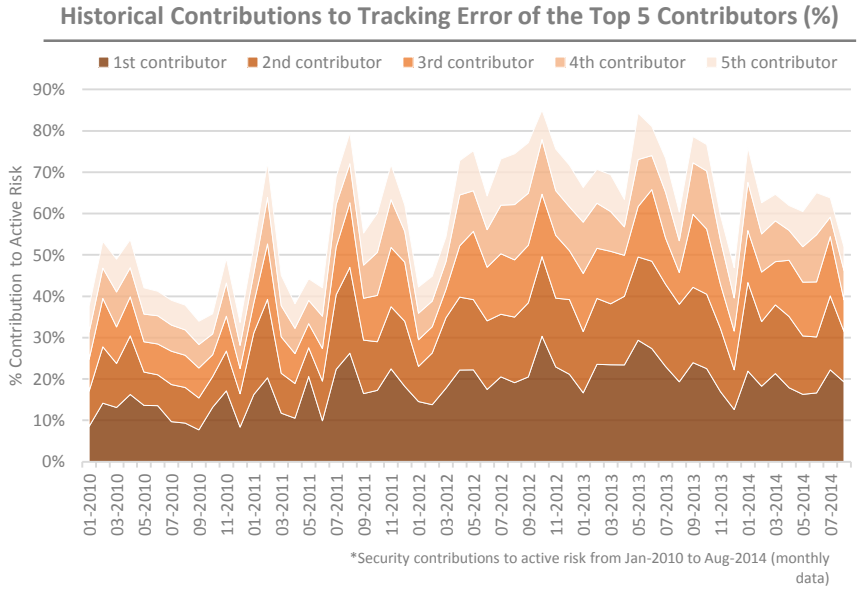
*Average active exposures to style factors and average factor volatilities from Jan-2010 to Aug-2014 (monthly data)

CONTRIBUTION BY SECURITY

Having an average of 29 securities since the beginning of 2010, the portfolio's degree of dispersion is limited. In fact, most of the risk has been concentrated on a small number of stocks – the top 5 contributors accounted for 43% of the TE.

Additionally, the securities that most contributed to the relative risk did not necessarily yield a higher return – ITX SM (Inditex) accounted for 13.17% of the relative risk since 2010 while having an average contribution of -4.50% to the active return of the portfolio.

With this, a set of warnings on security contributions is suggested. Being a stock picking fund, this should provide the management with a better understanding on the risk-return trade-offs.



*Security contributions to active risk from Jan-2010 to Aug-2014 (monthly data)

The monitoring of the securities' contribution to risk is again based on a rule similar to the UCITS Rule: a limit of **15% to the contribution of each individual security** and a maximum **aggregate contribution of 50% for all securities with a contribution above 10%**.

KEY STATISTICS | Contributions by Security :
(monthly observations of top 5 contributors from Jan-2010 to Aug-2014)

	Individual Contribution by Security	Aggregate Contribution of Securities with Contribution >10%
Average Contribution	11.95%	42.62%
Standard Deviation	5.28%	25.13%
Maximum	30.33%	84.29%
Minimum	4.65%	0.00%
Percentile 75%	**15.63%**	**64.03%**
Percentile 95%	**22.20%**	**75.97%**

These thresholds are considerably higher when compared to other portfolios being analysed. The adjustment is justified by the exceptional degree of concentration of this portfolio – these warnings should therefore provide more meaningful information to the management.

Warnings:

Individual Contribution	**15%**
Aggregate Contribution	**50%**

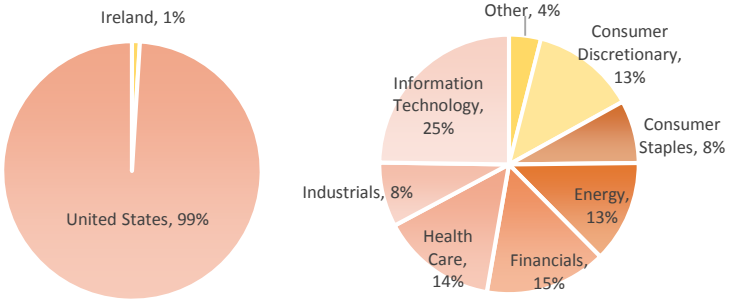
PORTFOLIO ANALYSIS

BPI América

Portfolio Description

- **AUM:** 25 M (as of 31-08-2014)
- **Benchmark:** S&P500 Index
- **Investment Policy:** invest in securities (at least 2/3 in stocks) issued by entities located in the USA or Canada or which are admitted to trading in these markets.

Composition by Geography and Sector (as of August 31st, 2014)



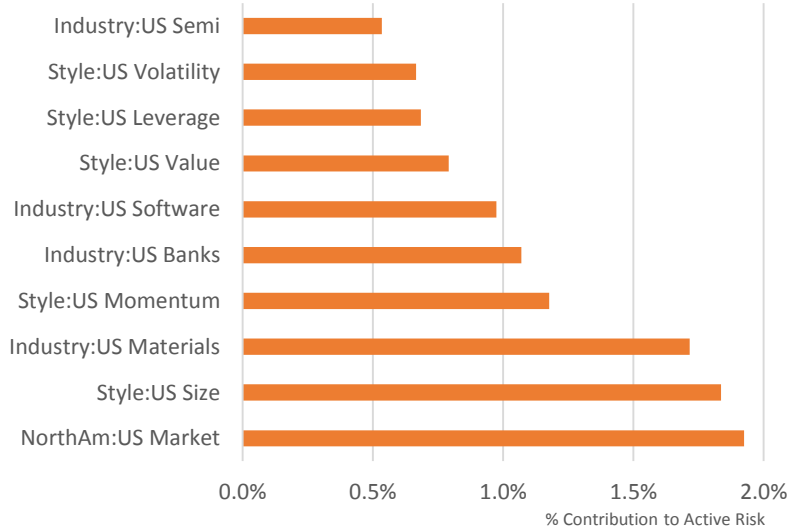
Since this is a directional portfolio focused on a particular geography, *our analysis is conducted in terms of **relative risk*** – the risk of North American equities is intrinsic to the nature of the portfolio and therefore should be offset by the benchmark.

[1] Investment decisions are determined using an optimization process that minimizes the TE and includes restrictions on deviations relative to the benchmark in terms of sector and security's active weights.

Factor Contribution to Ex-ante Tracking Error – Top 10 Factors

*Risk factors explain only around **16% of the tracking error** of this portfolio.* Due to the quantitative approach[1] followed by the management team, the portfolio tracks closely its benchmark and hence most of the relative risk comes from non-systematic factors.

Nonetheless, an analysis of risk factors is still important and may actually be helpful for the management to improve their optimization process in a way that accounts for the risks incurred.



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

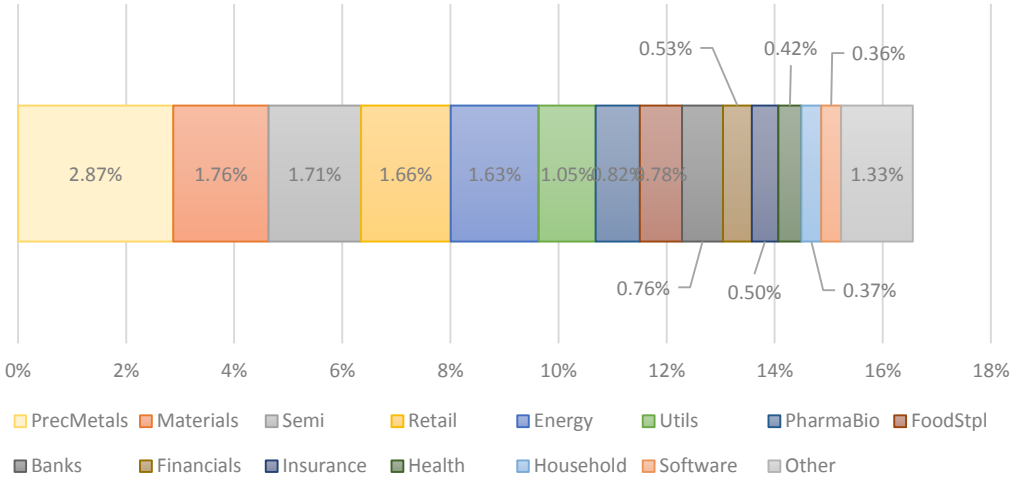
Apart from the US market, industry factors – Materials and Banks – and style factors – Size and Momentum – are the main contributors to the portfolio's tracking error.

Therefore, the risk monitoring system for *BPI América* is focused on the contributions of **Industry** and **Style factors**.

CONTRIBUTION BY INDUSTRY FACTOR

Factor Contribution to Risk (% of Active Risk)

The contributions of each industry factor to the relative risk are fairly spread out; only **Precious Metals** and **Materials** have a slightly higher average contribution.



*Average factor contribution from Apr-2009 to Aug-2014 (monthly data)

Although the restrictions on active weights imposed by the management team already prevent large deviations in industry exposures, our monitoring system, based on contributions, should capture better the impacts on the portfolio's risk. Plus, it may help detecting operational errors in their optimization process.

KEY STATISTICS | Contributions by Industry Factor:
(monthly observations of industry factors' contributions from Apr-2009 to Aug-2014)

	Individual	Aggregate
Average Contribution	0.62%	15.10%
Standard Deviation	1.30%	7.50%
Maximum	8.74%	32.31%
Minimum	-3.34%	5.82%
Percentile 95%	**3.27%**	**29.60%**
Percentile 99%	**5.77%**	**31.72%**

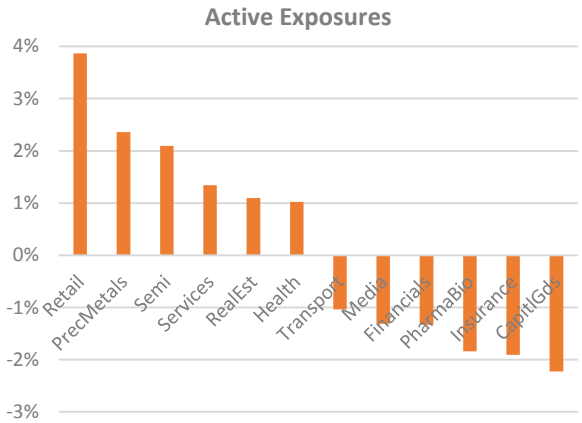
Individual Contribution:

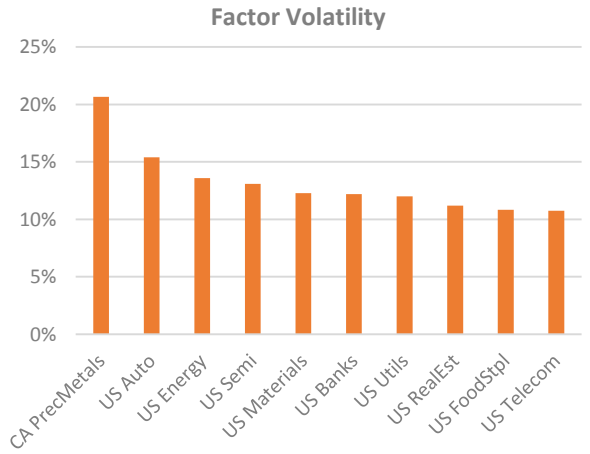
Warning 1	**4%**
Warning 2	**6%**

Aggregate Contribution:

Warning 1	**20%**
Warning 2	**30%**

Precious Metals and **Retail** have the largest average active weights. **Materials** do not show up in the graph even though it also had a large active weight, as the portfolio shifted from a large overweighting to a short active position on this sector.
Precious Metals also exhibited a huge factor volatility.



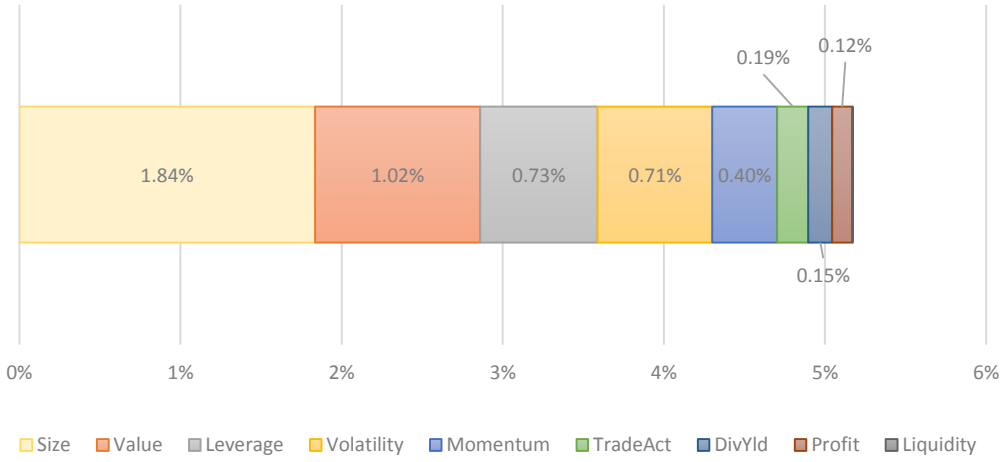


*Average active exposures to industry factors and average factor volatilities from Apr-2009 to Aug-2014 (monthly data)

CONTRIBUTION BY STYLE FACTOR

Factor Contribution to Risk (% of Active Risk)

Size is clearly the style factor that contributes more to the relative risk:



*Average factor contribution from Apr-2009 to Aug-2014 (monthly data)

The contributions of style factors changed significantly from 2013 onwards: the 5-year average contribution of all style factors reached 34%, while when accounting for the last 1.5 years only, it decreases to 6%. Hence, we focus our statistical analysis on a shorter period of time in order to be more consistent with the current portfolio's risk profile:

KEY STATISTICS | Contributions by Style Factor:
(monthly observations of style factors' contributions from Jan-2013 to Aug-2014)

	Individual	Aggregate
Average Contribution	0.67%	6.34%
Standard Deviation	1.35%	4.24%
Maximum	9.50%	16.40%
Minimum	-1.56%	-0.35%
Percentile 95%	**3.39%**	**16.17%**
Percentile 99%	**5.13%**	**16.35%**

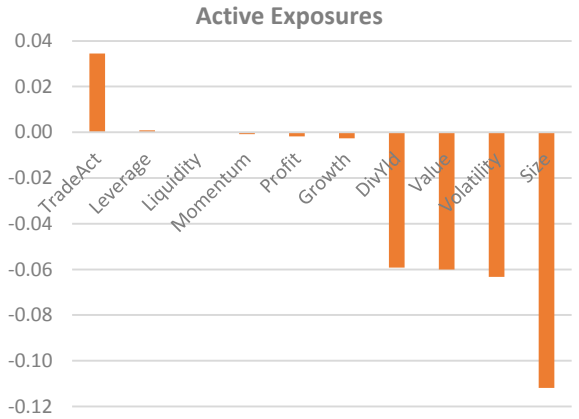
Individual Contribution:

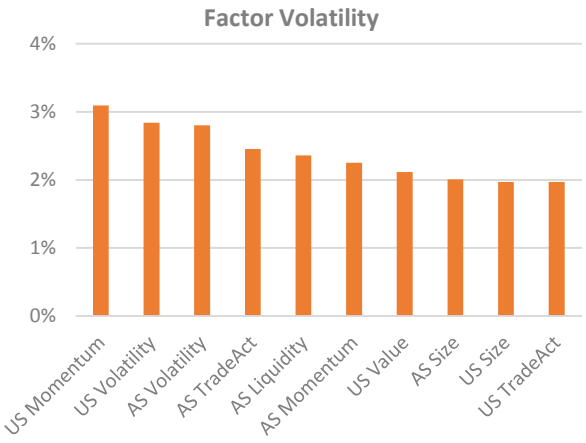
Warning 1	**4%**
Warning 2	**6%**

Aggregate Contribution:

Warning 1	**20%**
Warning 2	**25%**

The bet on smaller companies than the benchmark's leads to a large underweighting on **Size**, which justifies its significant contribution to risk.





*Average active exposures to style factors and average factor volatilities from Jan-2013 to Aug-2014 (monthly data)

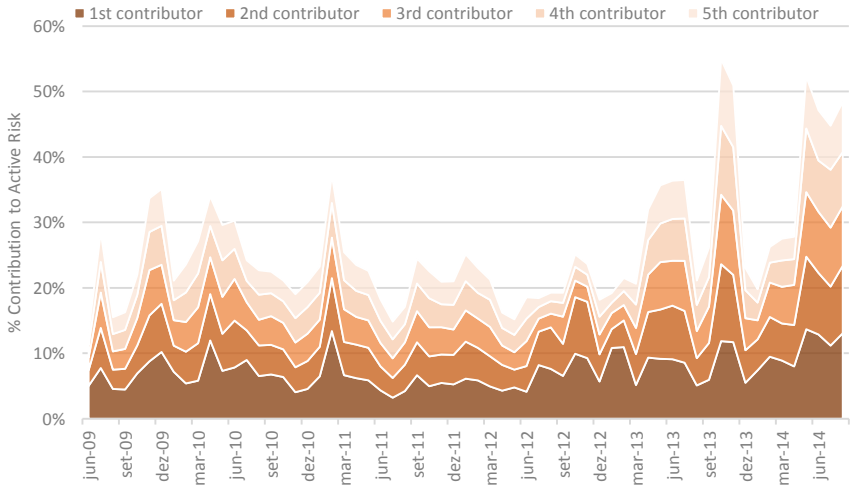
CONTRIBUTION BY SECURITY

Although the portfolio tends to follow the benchmark quite closely, since 2013 there has been some significant deviations when looking at the securities individually – the risk is now much more concentrated in a few set of stocks.

In the last year, the **5 main contributors** to the tracking error **contributed to 37% of the relative risk** while accounting for only 12% of the fund's total value.

Hence, an analysis of the historical contributions of each security to the risk ex-ante allows to identify deviations from the benchmark which may not be reflected in the contributions of the risk factors.

Historical Contributions to Tracking Error of the Top 5 Contributors (%)



*Security contributions to active risk from Jun-2009 to Aug-2014 (monthly data)

Similarly to the previous funds, we suggest a cap of **10% to the individual contribution of each security to the tracking error** and an **aggregate limit of 25% to the sum of the contributions of all securities with a contribution above 5%**.

KEY STATISTICS | Contributions by Security :
(monthly observations of top 5 contributors from Jun-2009 to Aug-2014)

	Individual Contribution by Security	Aggregate Contribution of Securities with Contribution >5%
Average Contribution	5.23%	15.66%
Standard Deviation	2.49%	15.38%
Maximum	13.68%	54.92%
Minimum	1.30%	0.00%
Percentile 75%	**6.36%**	**21.79%**
Percentile 95%	**10.23%**	**48.30%**

Warnings are set between the 75% and 95% percentiles since the analysis is already based on extreme observations only (contributions of the top 5 contributors instead of all portfolio securities):

Warnings:

Individual Contribution	**10%**
Aggregate Contribution	**25%**

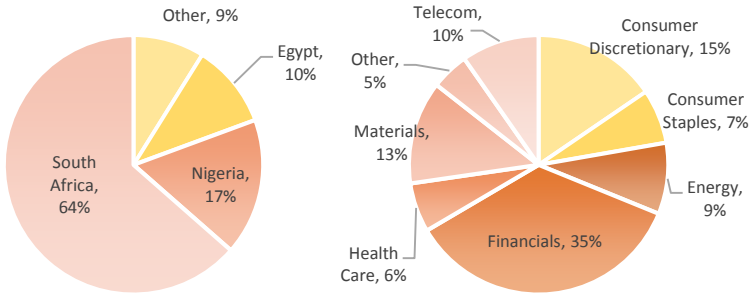
PORTFOLIO ANALYSIS

BPI África

Portfolio Description

- **AUM:** 16.3 M (as of 31-08-2014)
- **Benchmark:** S&P Pan Africa Total Return Index USD / ECB Euro Exchange USD
- **Investment Policy:** invest in equities issued by entities located in the African continent (at least 50%) or which develop significant activities in that region; no country or sectorial restrictions.

Composition by Geography and Sector (as of August 31st, 2014)



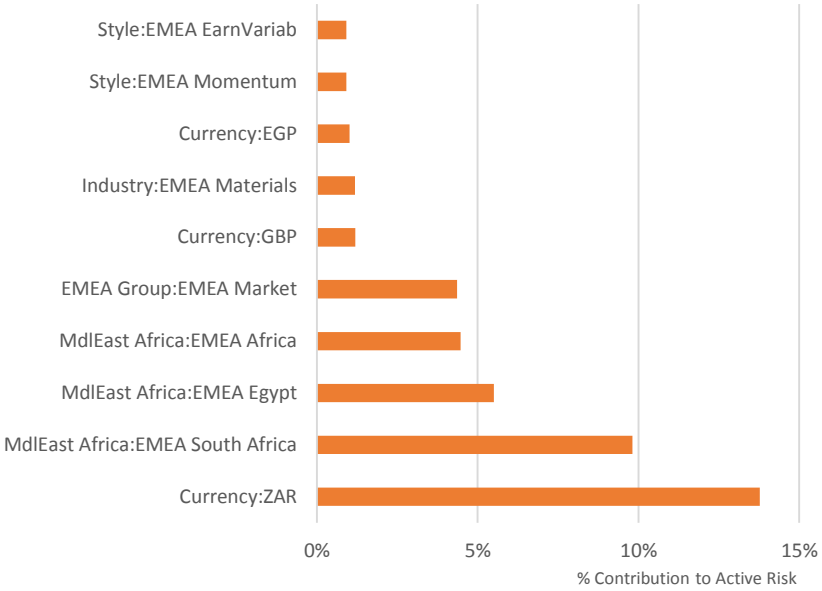
Since this is a directional fund, *the analysis is conducted in terms of **relative risk*** – the risk of African markets is unavoidable and thus not relevant to evaluate the actual risk incurred by the management.

However, as the constituents of the official benchmark (S&P Pan Africa) are not available on Bloomberg, **a proxy benchmark was created** for the purpose of assessing the portfolio's sources of tracking error *(see **Appendix 5** for further details)*.

The proxy is a composite of 2 indexes:
- 85% S&P Emerging Middle East & Africa
- 15% Nigeria Stock Exchange Index

Factor Contribution to Ex-ante Tracking Error – Top 10 Factors

*Risk factors explain around **47% of the relative risk** of this portfolio against our proxy benchmark:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

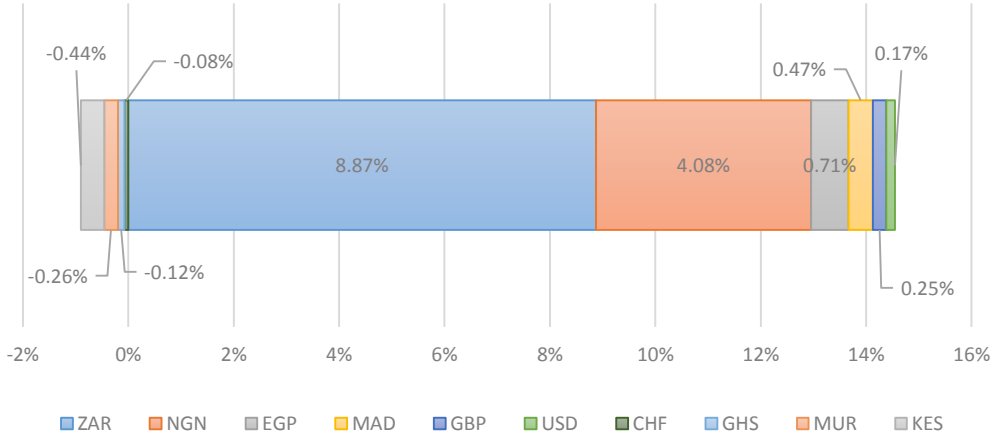
Apart from the country market factors, currency (ZAR) and industry factors (MEA Materials) are the main contributors to the portfolio's tracking error.

Hence, we suggest the monitoring of the contributions of **Currency** and **Industry factors**. Country factors are not included since its contributions would be overlapping with the currency factors.

CONTRIBUTION BY CURRENCY FACTOR

Factor Contribution to Risk (% of Active Risk)

The **South African Rand** (ZAR) is responsible for most of the contribution of currency factors to the relative risk:



*Average factor contribution from May-2009 to Aug-2014 (monthly data)

Warnings are adjusted downwards in order to capture better eventual deviations of currencies other than the ZAR, which clearly bias the percentiles. Although the contribution of ZAR would be permanently above the warning, the underweighting on this currency is a strategic choice already assumed by BPI GA.

KEY STATISTICS | Contributions by Currency Factor:
(monthly observations of currency factors' contributions from May-2009 to Aug-2014)

	Individual	Aggregate
Average Contribution	1.03%	13.66%
Standard Deviation	4.02%	9.62%
Maximum	38.89%	43.88%
Minimum	-3.84%	0.14%
Percentile 95%	**7.30%**	**34.20%**
Percentile 99%	**20.52%**	**39.64%**

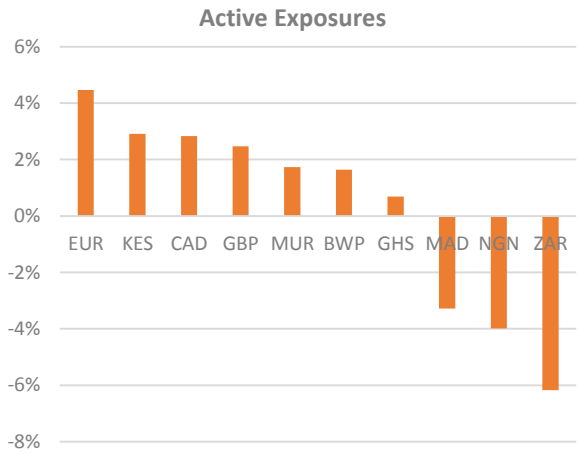
Individual Contribution:

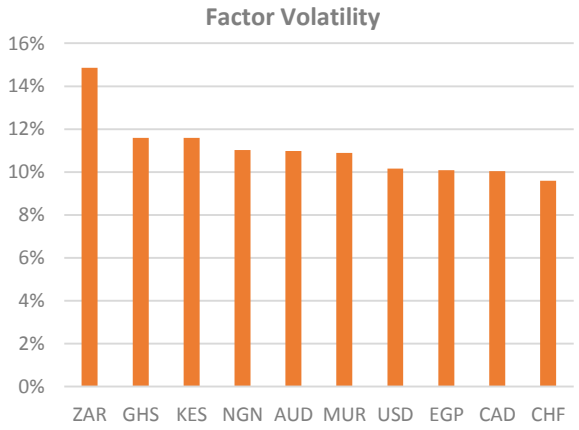
Warning 1	**5%**
Warning 2	**10%**

Aggregate Contribution:

Warning 1	**35%**
Warning 2	**40%**

The large underweighting on **ZAR** versus the benchmark, combined with its high factor volatility, explains the outstanding contribution of this currency to the active risk.



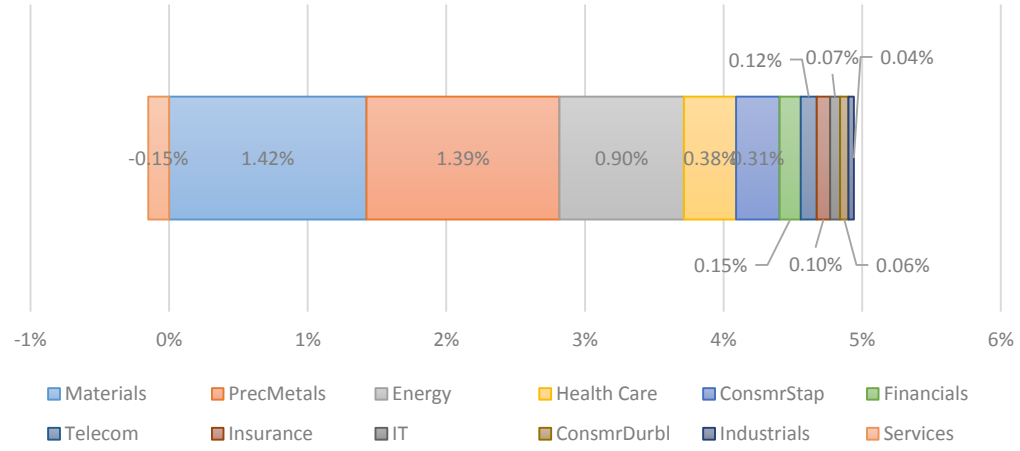


*Average portfolio exposures to currency factors and average factor volatilities from May-2009 to Aug-2014 (monthly data)

CONTRIBUTION BY INDUSTRY FACTOR

Factor Contribution to Risk (% of Active Risk)

Materials and **Precious Metals** have historically a larger contribution to the tracking error when compared to other industry factors, followed by **Energy**.



*Average factor contribution from May-2009 to Aug-2014 (monthly data)

KEY STATISTICS | Contributions by Industry Factor:
(monthly observations of industry factors' contributions from May-2009 to Aug-2014)

	Individual	Aggregate
Average Contribution	0.38%	4.40%
Standard Deviation	0.80%	2.37%
Maximum	6.78%	9.66%
Minimum	-2.02%	0.17%
Percentile 95%	**1.97%**	**7.93%**
Percentile 99%	**3.27%**	**9.14%**

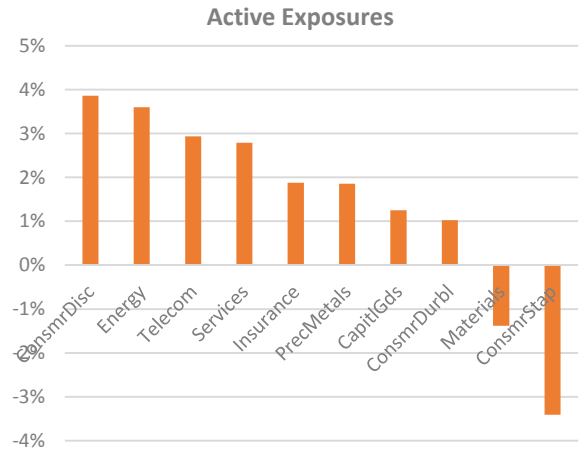
Individual Contribution:

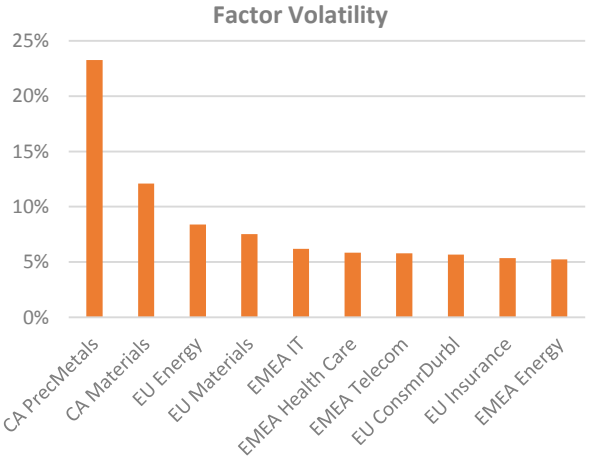
Warning 1	**1.5%**
Warning 2	**3%**

Aggregate Contribution:

Warning 1	**8%**
Warning 2	**10%**

The underweighting on **Materials** versus the benchmark (which deepened further in the last years), the overweighting on **Energy** and the high factor volatility of **Precious Metals** explain the risk contributions of these factors.





*Average portfolio exposures to industry factors and average factor volatilities from May-2009 to Aug-2014 (monthly data)

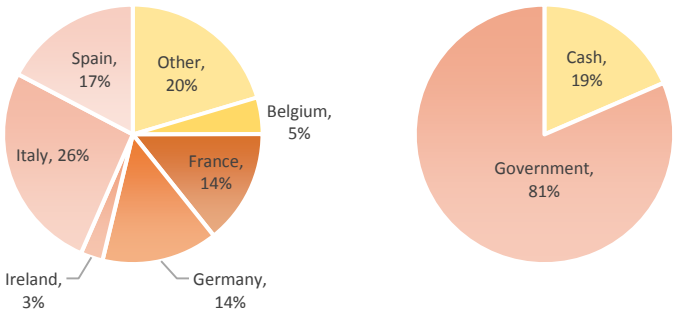
PORTFOLIO ANALYSIS

BPI Euro Taxa Fixa

Portfolio Description

- **AUM:** 42.6 M (as of 31-08-2014)
- **Benchmark:** EFFAS Bond Indices Euro Govt All > 1 Year TR
- **Investment Policy:** invest in fixed income securities denominated in euros (mostly sovereign bonds), with the intent of exploring the higher returns offered by longer term rates.
- **Portfolio Duration:** 5.85 (as of 31-08-2014)

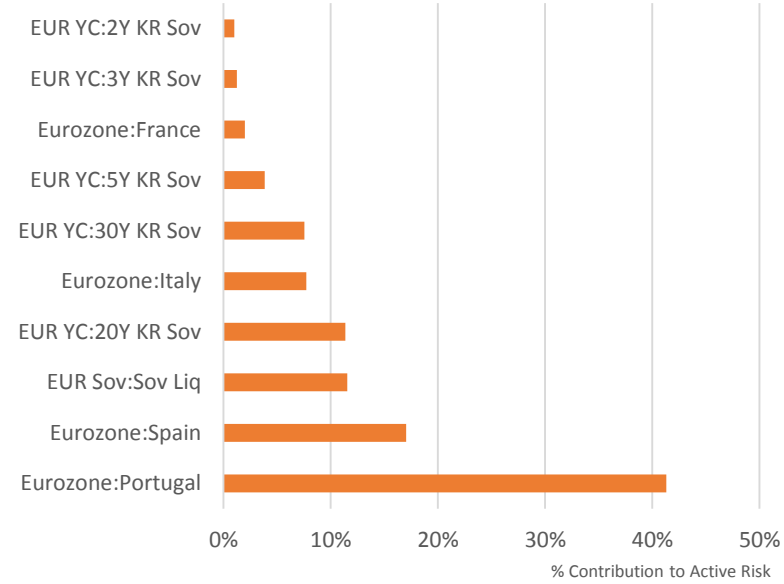
Composition by Geography and Sector (as of 31st August 2014)



Since the portfolio is focused on Eurozone bonds, and thus inevitably exposed to the risks of the European debt market, *our analysis is conducted in terms of **relative risk**.*

Factor Contribution to Ex-ante Tracking Error – Top 10 Factors

*Risk factors account for around **90% of the tracking error** of this portfolio:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

Peripheral countries (Portugal, Spain and Italy) and longer key rate durations (20Y and 30Y) are the main contributors to the portfolio's tracking error.

Country Spread and **Duration factors** are the main focus of our risk monitoring system for *BPI Euro Taxa Fixa.*

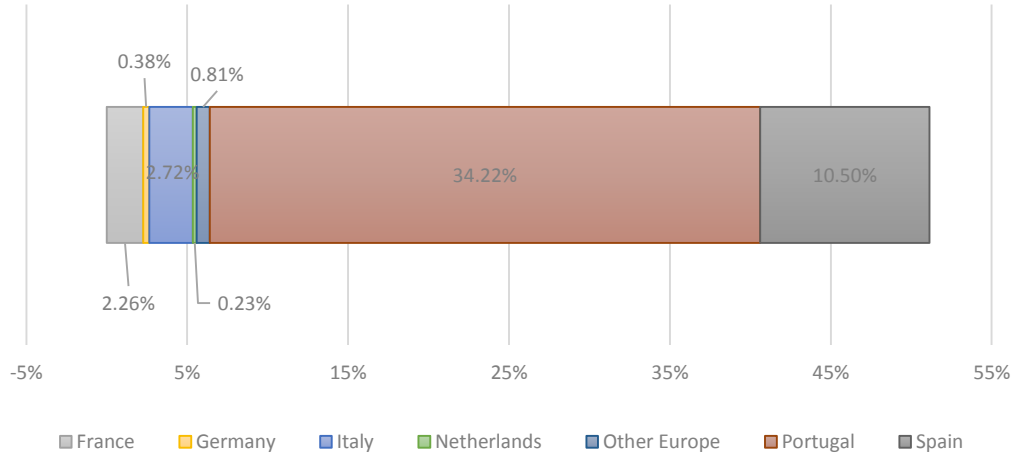
PORTFOLIO ANALYSIS

BPI Euro Taxa Fixa

CONTRIBUTION BY COUNTRY SPREAD FACTOR

Factor Contribution to Risk (% of Active Risk)

Portugal is clearly the country that has historically driven the portfolio's relative risk:



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

Warnings are adjusted downwards in order to mitigate the effect of the contributions of Portugal, which significantly influence the percentiles:

KEY STATISTICS | Contributions by Country Factor:
(monthly observations of country spread factors' contributions from Jan-2011 to Aug-2014)

	Individual	Aggregate
Average Contribution	6.06%	54.57%
Standard Deviation	19.57%	22.98%
Maximum	95.13%	91.46%
Minimum	-33.34%	10.75%
Percentile 95%	**48.47%**	**81.86%**
Percentile 99%	**91.43%**	**90.72%**

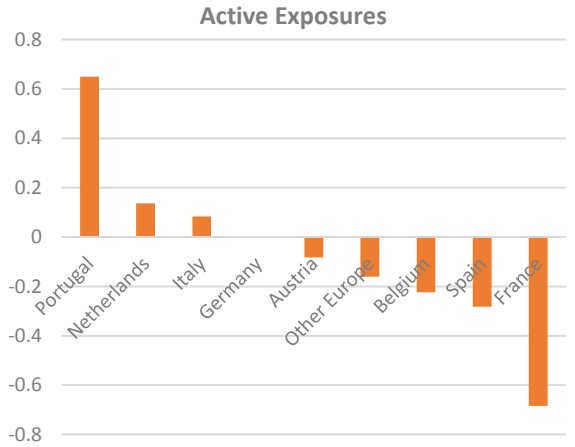
Individual Contribution:

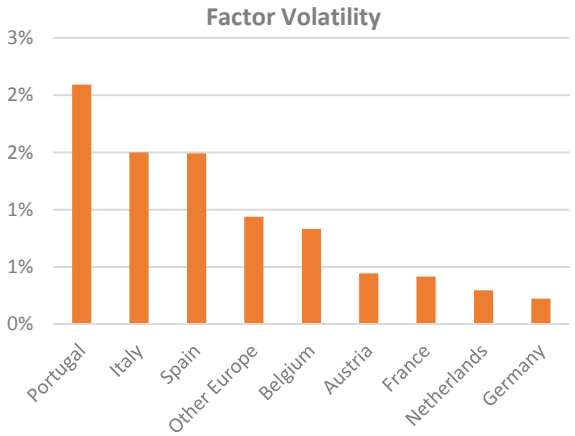
Warning 1	**7%**
Warning 2	**15%**

Aggregate Contribution:

Warning 1	**75%**
Warning 2	**85%**

The combined effect of a high factor volatility and a considerable overweighting versus the benchmark explains the contribution to the TE of the **Portuguese Spread**. The underweighting on France is also quite significant, but offset by its low level of risk.



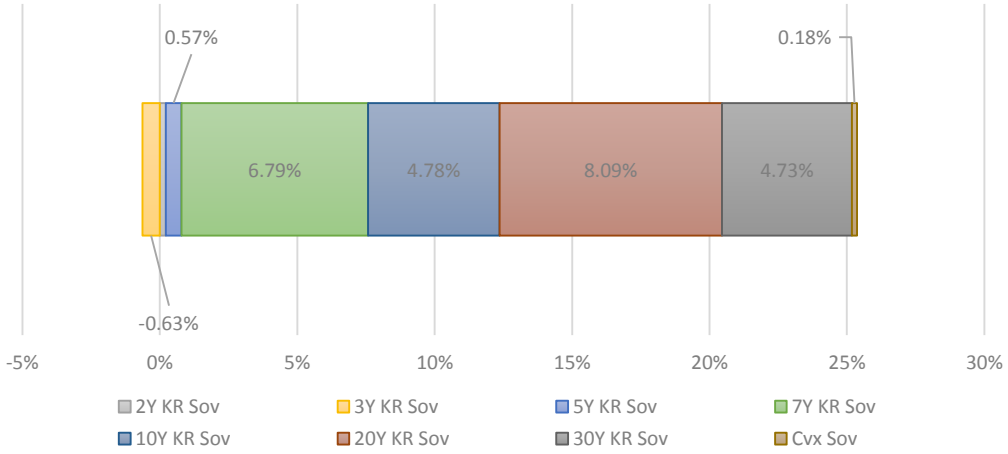


*Average active exposures to country factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY YIELD CURVE FACTOR

Factor Contribution to Risk (% of Active Risk)

7Y and **20Y** key rate durations are the yield curve factors contributing more to the portfolio's tracking error.



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

Given the recent decrease in the overall yield curve contributions, warnings are adjusted downwards:

KEY STATISTICS | Contributions by Curve Factor:
(monthly observations of yield curve factors' contributions from Jan-2011 to Aug-2014)

	Individual	Aggregate
Average Contribution	2.74%	24.65%
Standard Deviation	11.78%	27.02%
Maximum	68.18%	91.24%
Minimum	-51.30%	-0.27%
Percentile 95%	**28.72%**	**78.89%**
Percentile 99%	**40.85%**	**87.41%**

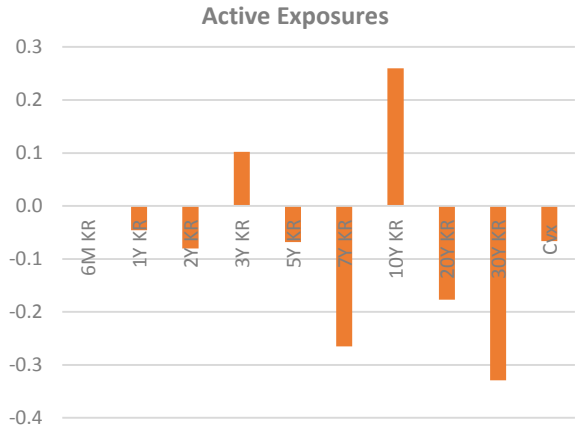
Individual Contribution:

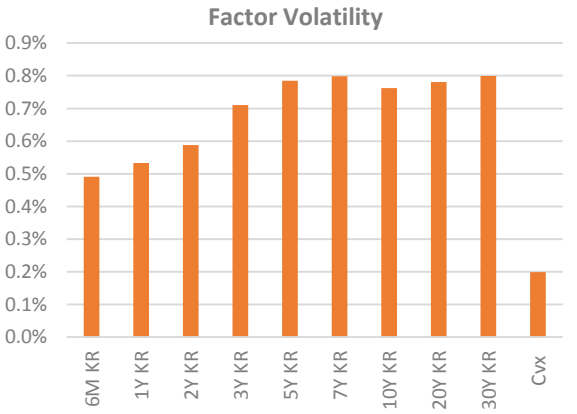
Warning 1	**15%**
Warning 2	**20%**

Aggregate Contribution:

Warning 1	**75%**
Warning 2	**85%**

The large active exposure to **7Y** and **20Y** key rate durations justifies its larger contributions to risk (average exposure is higher for 30Y KRD but the former two often shift from a positive to a negative active weight).





*Average active exposures to yield curve factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

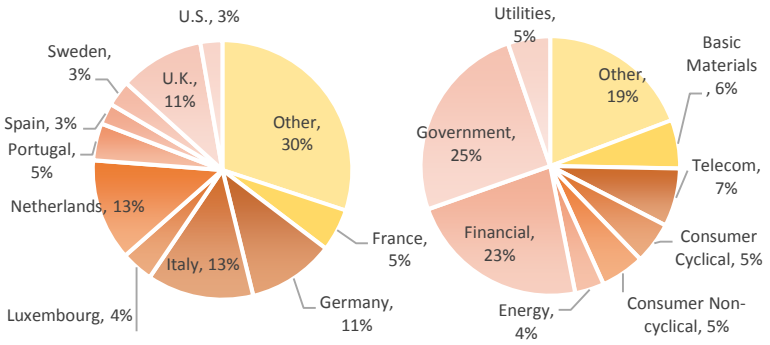
PORTFOLIO ANALYSIS

BPI Reforma Segura

Portfolio Description

- **AUM:** 207 M (as of 31-08-2014)
- **Benchmark:** 65% Iboxx € Corporate Overall + 25% EFFAS € All > 1 + 10% EONIA Capitalization 7 Day
- **Investment Policy:** invest on European fixed income securities that have a high return potential in the medium and the long term
- **Portfolio Duration:** 3.29 (as of 31-08-2014)

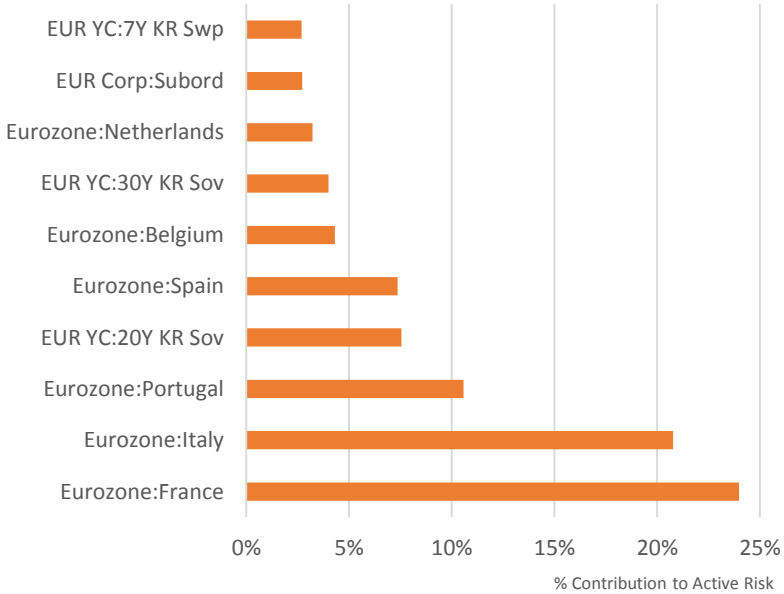
Composition by Geography and Sector (as of 31st August 2014)



Because the portfolio is, by construction, exposed to the risk of European bonds, *our analysis is focused on the* ***relative risk*****.**

Factor Contribution to Ex-ante Tracking Error – Top 10 Factors

Risk factors explain around ***93% of the TE*** *of this portfolio:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

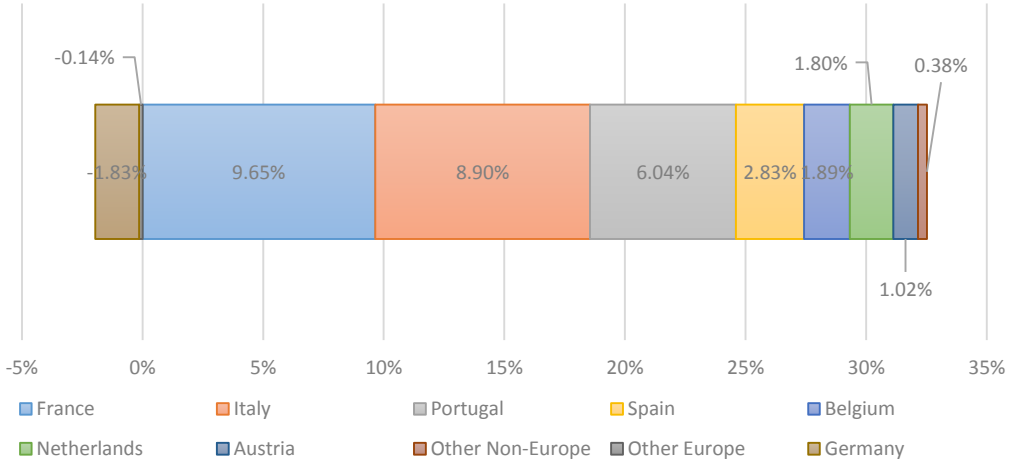
The tracking error is mostly explained by deviations in country factors – France, Italy and Portugal – and in the 20Y key rate duration.

Therefore, the risk monitoring for BPI Reforma Segura is primarily based on the contributions of **Country Spread** and **Duration factors.**

CONTRIBUTION BY COUNTRY SPREAD FACTOR

Factor Contribution to Risk (% of Active Risk)

France and **Italy** are the country factors that have contributed more to the historical ex-ante tracking error:



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

Warnings are adjusted downwards in order to capture better eventual deviations of country spreads other than France and Italy, which clearly impact the percentiles:

KEY STATISTICS | Contributions by Country Factor:
(monthly observations of country spread factors' contributions from Jan-2011 to Aug-2014)

	Individual	Aggregate
Average Contribution	3.06%	30.56%
Standard Deviation	8.30%	32.91%
Maximum	50.18%	111.23%
Minimum	-8.98%	-13.82%
Percentile 95%	**20.18%**	**98.53%**
Percentile 99%	**36.74%**	**109.15%**

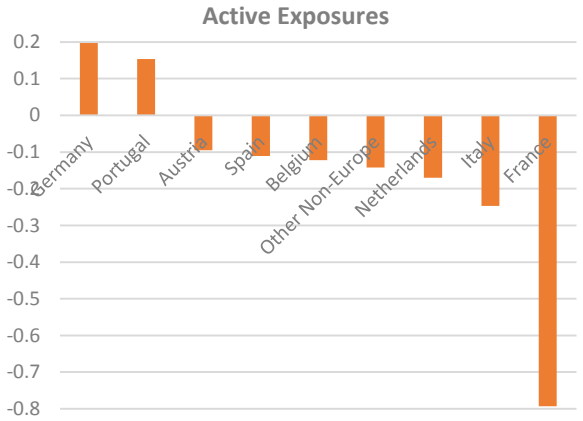
Individual Contribution:

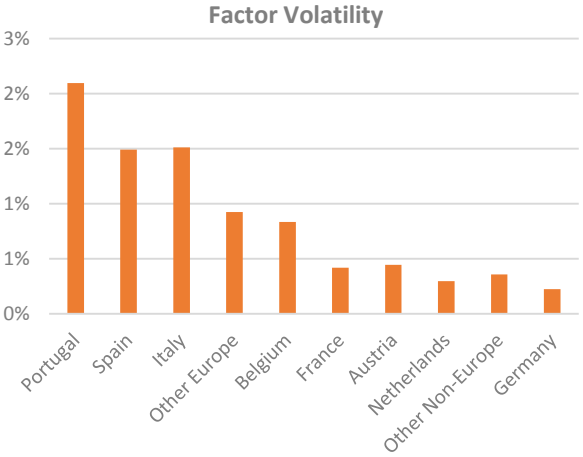
Warning 1	**25%**
Warning 2	**35%**

Aggregate Contribution:

Warning 1	**70%**
Warning 2	**80%**

While the contribution of **France** derives mainly from its huge underweighting versus the benchmark, the risk associated to the **Italian spread** is mostly justified by a high factor volatility.



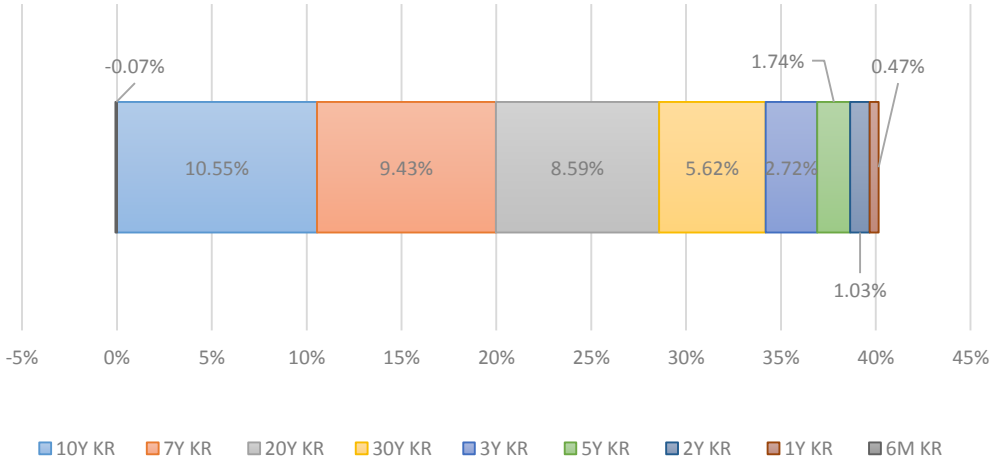


*Average active exposures to country factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY YIELD CURVE FACTOR

Factor Contribution to Risk (% of Active Risk)

The **7Y** and the **10Y** Key Rate Durations are the curve factors that mostly determined the portfolio's relative risk:



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

Aggregate warnings are adjusted downwards so as to reflect the recent, lower level of yield curve contributions:

KEY STATISTICS | Contributions by Yield Curve Factor:
(monthly observations of yield curve factors' contributions from Jan-2011 to Aug-2014)

	Individual	Aggregate
Average Contribution	4.45%	40.07%
Standard Deviation	8.30%	26.93%
Maximum	31.89%	93.36%
Minimum	-16.76%	-1.40%
Percentile 95%	**22.99%**	**81.70%**
Percentile 99%	**26.39%**	**92.15%**

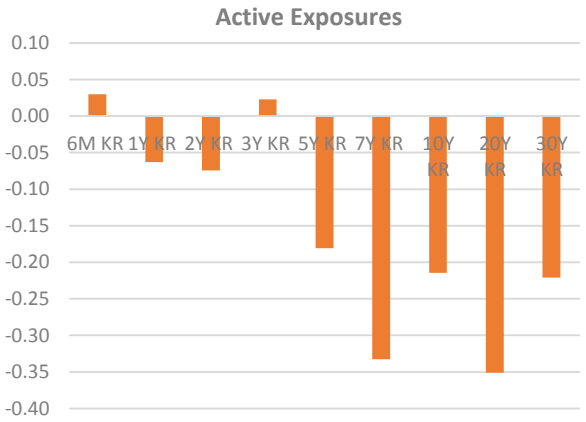
Individual Contribution:

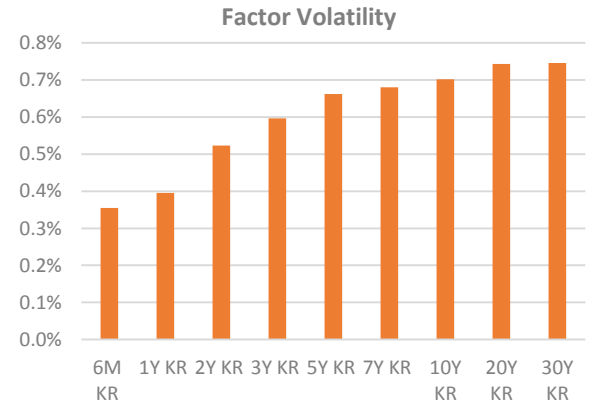
Warning 1	**20%**
Warning 2	**25%**

Aggregate Contribution:

Warning 1	**70%**
Warning 2	**80%**

As the portfolio is significantly **short on larger maturities** when compared to the benchmark, these key rate durations explain a higher share of the tracking error.





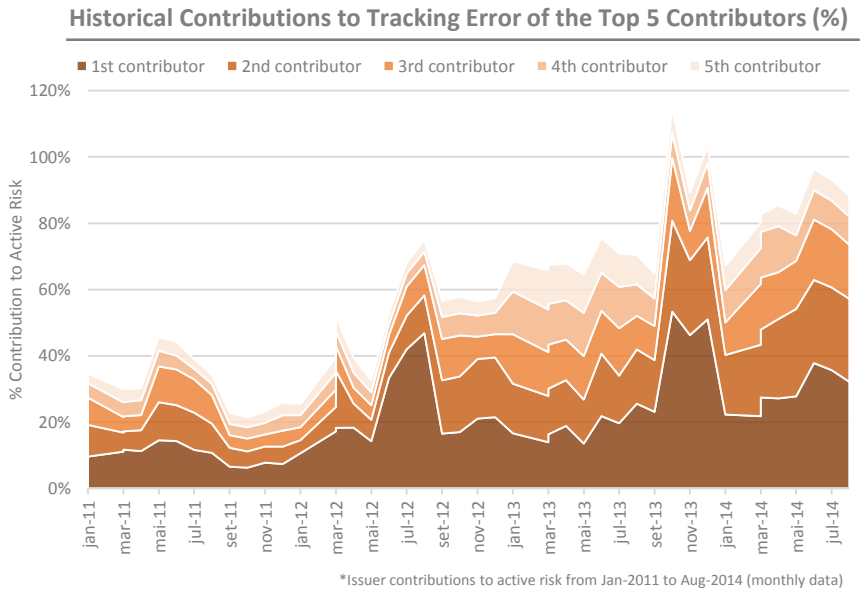
*Average active exposures to yield curve factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY ISSUER

In addition to the exposures to yield curve and spread factors, concentration is another potential source of risk, especially for bond portfolios of corporate issuers. Thus, an analysis of the contributions to risk by issuer is also conducted.

Indeed, in spite of investing in a large number of distinct securities and issuers – around 250 issuers in total as of Aug-2014 – the tracking error of *BPI Reforma Segura* is highly concentrated on a small number of issuers.
Furthermore, the level of risk concentration has been increasing considerably – during the last year, the **5 main contributors** reached over **87% of the % contribution to the tracking error**.

Therefore, the warnings for the main risk factors are complemented with the monitoring of the contributions by issuer.



*Issuer contributions to active risk from Jan-2011 to Aug-2014 (monthly data)

Similarly to the rule applied on the contributions by security in equity portfolios, we propose a maximum level of **20% to the individual contribution to the TE** by issuer and an **aggregate limit of 50% to the sum of the contributions of all issuers with a contribution above 15%**.

KEY STATISTICS | Contributions by Issuer:
(monthly observations of top 5 contributors from Jan-2011 to Aug-2014)

	Individual Contribution by Issuer	Aggregate Contribution of Issuers with Contribution >15%
Average Contribution	11.78%	29.06%
Standard Deviation	8.93%	28.45%
Maximum	53.34%	99.72%
Minimum	2.65%	0.00%
Percentile 75%	**14.93%**	**43.21%**
Percentile 95%	**27.42%**	**77.85%**

The warnings are set between the 75% and 95% percentiles since the analysis is already based on extreme observations only (contributions of the top 5 contributors instead of all portfolio issuers).

Warnings:

Individual Contribution	**20%**
Aggregate Contribution	**50%**

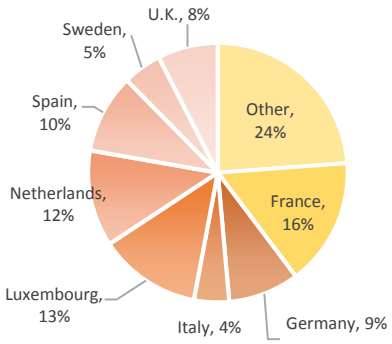
PORTFOLIO ANALYSIS

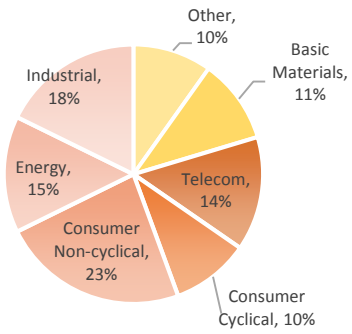
BPI OARAR

Portfolio Description

- **AUM:** 27.5 M (as of 31-08-2014)
- **Benchmark:** 50% iBoxx Liquid Corporates Non-Financials BBB Total Return Index + 50% BarCap Euro HY 3% Issuer Constraint*Fin TR Index value Unhedged EUR
- **Investment Policy:** invest in fixed income securities (at least 50% in bonds) issued by all types of entities, with a particular focus on high yield securities (rating below BBB- or non-rated bonds with similar credit quality).
- **Portfolio Duration:** 3.74 (as of 31-08-2014)

Composition by Geography and Sector (as of 31st August 2014)

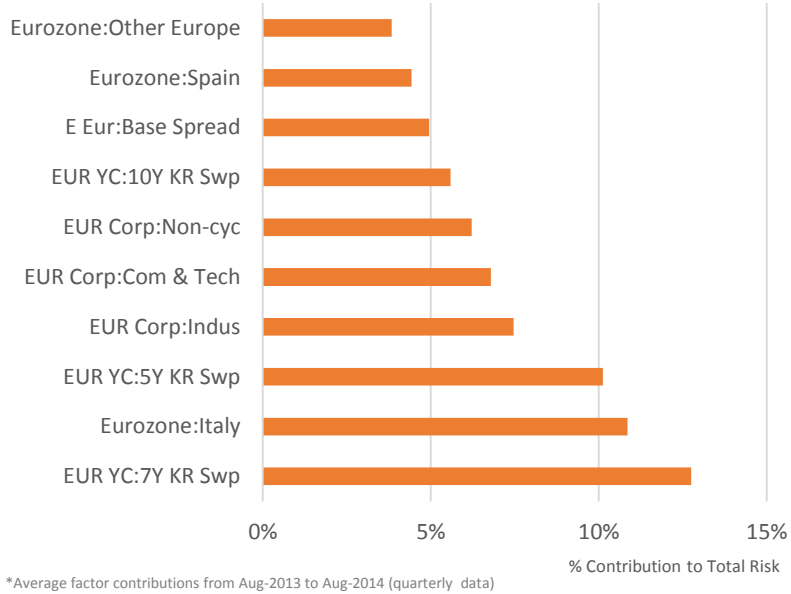




Although the portfolio is oriented to invest in a particular sub-class of fixed income securities – *high-yield bonds* – it does not have a mandate to invest in a specific region or economic sector. As there is no clear, intrinsic source of risk linked to the nature of the portfolio, *our analysis addresses the **absolute risk**.*

Factor Contribution to Ex-ante Volatility – Top 10 Factors

*Risk factors are almost entirely responsible for the portfolio's absolute risk, explaining **99% of the volatility**:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

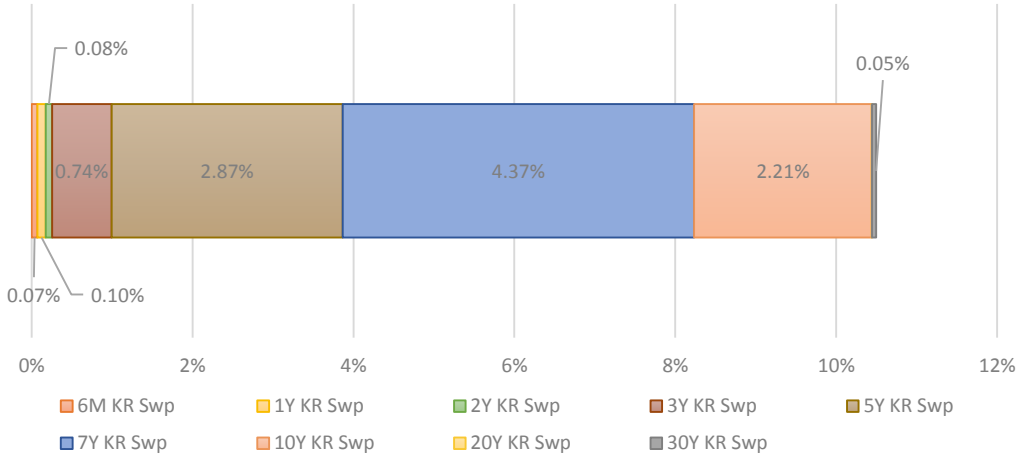
5Y and 7Y Key Rate Durations, as well as the spreads of Italy and Industrial sector are the main contributors to the portfolio's volatility.

Therefore, the risk monitoring system for *BPI OARAR* focuses on the contributions of **Yield Curve, Country Spread** and **Industry Spread factors**.

CONTRIBUTION BY YIELD CURVE FACTOR

Factor Contribution to Risk (% of Total Risk)

The **5Y** and particularly the **7Y Key Rate Durations** are the factors that contributed more to the volatility of the portfolio:



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

Although from a perspective of absolute risk the portfolio is inevitably exposed to yield curve risk, in this case an aggregate warning is also considered appropriate as it may detect eventual concentration on longer maturities, which also carry substantially more risk.

Warnings are adjusted upwards in order to reflect the current features of the portfolio, as the contributions of curve factors increased significantly since 2013:

KEY STATISTICS | Contributions by Yield Curve Factor:
(monthly observations of yield curve factors' contributions from Jan-2011 to Aug-2014)

	Individual	Aggregate
Average Contribution	1.22%	10.50%
Standard Deviation	3.65%	18.53%
Maximum	21.91%	46.65%
Minimum	-4.26%	-9.51%
Percentile 95%	**9.63%**	**37.16%**
Percentile 99%	**15.37%**	**43.49%**

Individual Contribution:

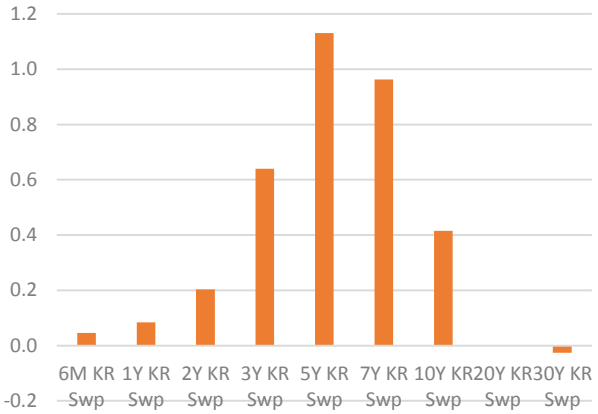
Warning 1	**15%**
Warning 2	**20%**

Aggregate Contribution:

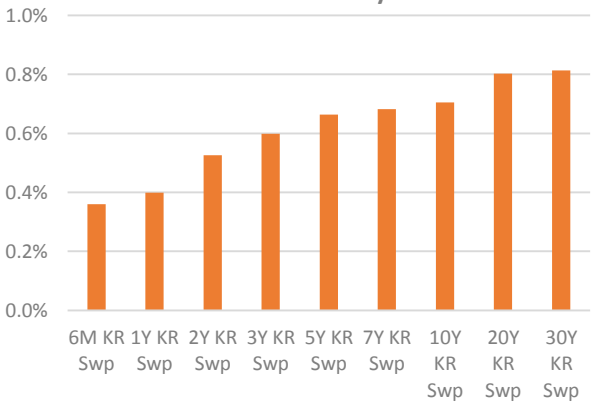
Warning 1	**40%**
Warning 2	**50%**

The portfolio is considerably exposed to both the **5Y** and **7Y** tenor points. Although the exposure to the 5Y KRD is higher, the risk associated with a longer maturity makes the contribution of the 7Y KRD more significant.

Portfolio Exposures



Factor Volatility

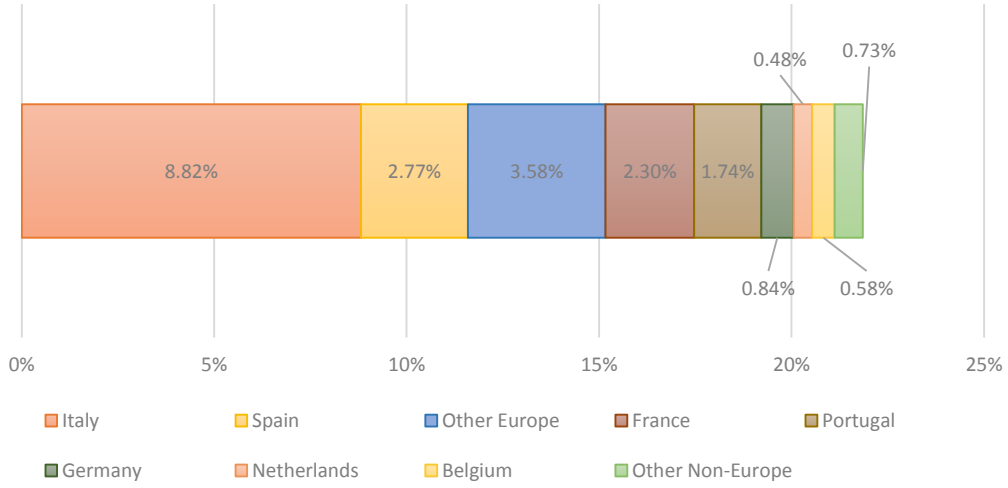


*Average portfolio exposures to yield curve factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY COUNTRY SPREAD FACTOR

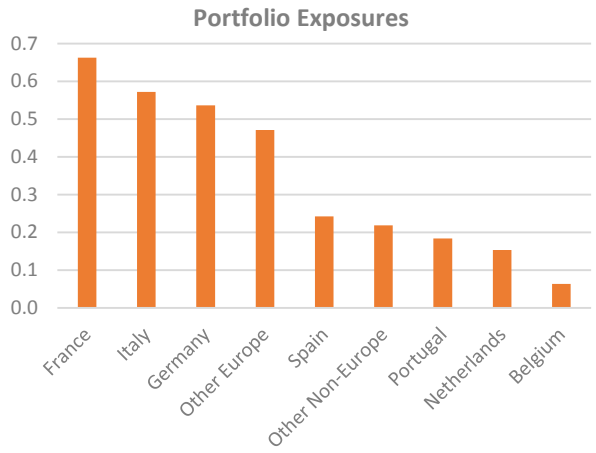
Factor Contribution to Risk (% of Total Risk)

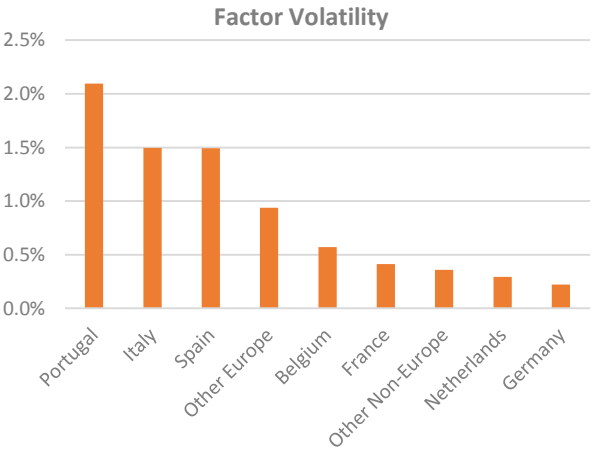
Italy is clearly the country that most contributes historically to the volatility of the portfolio:



*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

A combination of high exposure and high factor volatility explains the outstanding contribution of **the Italian spread**. Although France has a comparatively larger weight in the portfolio, its contribution to risk is not meaningful due to the lower factor volatility.





*Average portfolio exposures to country spread factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

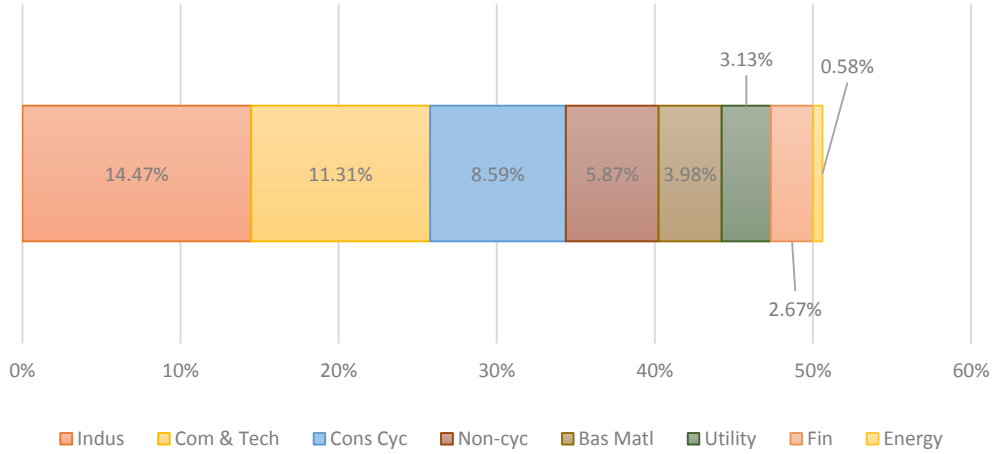
KEY STATISTICS | Contributions by Country Factor: (monthly observations of each country spread factor's contribution from Jan-2011 to Aug-2014)	
Average Contribution	2.59%
Standard Deviation	3.51%
Maximum	18.37%
Minimum	-0.73%
Percentile 95%	**11.78%**
Percentile 99%	**15.10%**

Warning 1	**10%**
Warning 2	**15%**

CONTRIBUTION BY INDUSTRY SPREAD FACTOR

Factor Contribution to Risk (% of Total Risk)

Industrials and **Communication & Technology** are the industries contributing more to the volatility ex-ante.



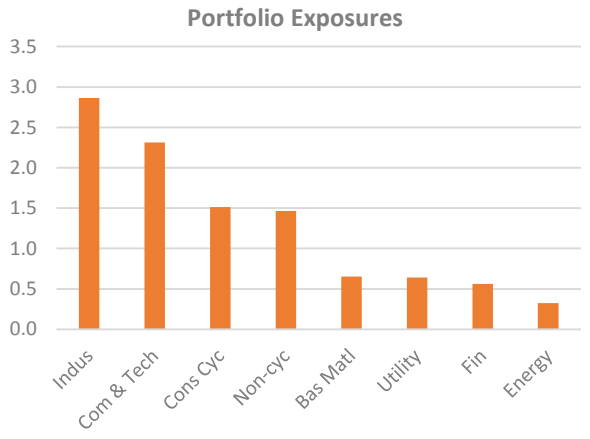
*Average factor contribution from Jan-2011 to Aug-2014 (monthly data)

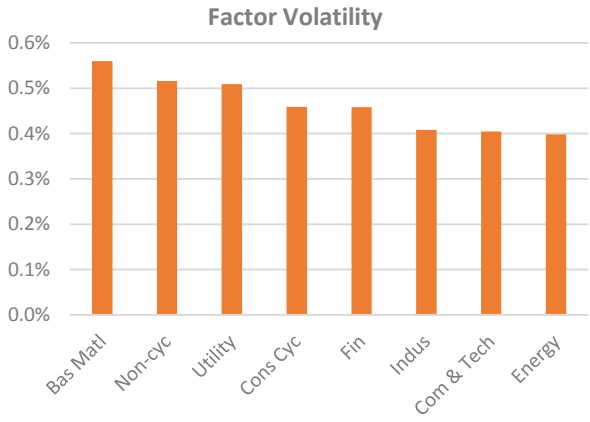
Warnings are adjusted downwards to have a more meaningful impact on the portfolio, as the contributions of these factors decreased considerably since 2013::

KEY STATISTICS | Contributions by Industry Factor: (monthly observations of each industry spread factor's contribution from Jan-2011 to Aug-2014)	
Average Contribution	6.92%
Standard Deviation	6.33%
Maximum	28.76%
Minimum	-0.24%
Percentile 95%	**21.87%**
Percentile 99%	**27.03%**

Warning 1	**15%**
Warning 2	**20%**

The relatively larger exposure to issuers from the **Industrials** and **Com&Tech** sectors justifies its higher contributions to risk.



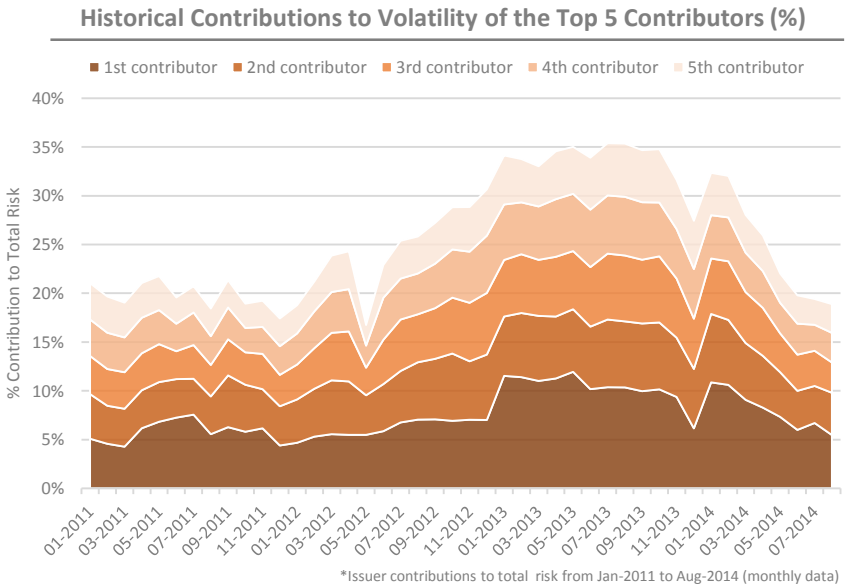


*Average portfolio exposures to industry spread factors and average factor volatilities from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY ISSUER

Although currently *BPI OARAR*'s degree of risk concentration by issuer seems to be milder when compared to other BPI GA's fixed income portfolios, historically there has been a period – during 2013 – when the contributions spiked: the 5 major issuer contributors accounted for **more than 30% of the portfolio risk**, while representing less than 14% of the total weight.

Hence, the inclusion of a warning mechanism based on the contributions by issuer is considered relevant, in order to ensure that such spikes in the risk concentration can be detected ex-ante.



*Issuer contributions to total risk from Jan-2011 to Aug-2014 (monthly data)

Similarly to the previously analysed portfolios, a warning of **10%** to each issuer's **individual contribution to the volatility** is complemented with an **aggregate limit of 25% for the sum of the contributions of all issuers with a contribution above 5%**.

KEY STATISTICS | Contributions by Issuer:
(monthly observations of top 5 contributors from Jan-2011 to Aug-2014)

	Individual Contribution by Issuer	Aggregate Contribution of Issuers with Contribution >5%
Average Contribution	5.16%	16.15%
Standard Deviation	1.93%	11.79%
Maximum	11.95%	35.39%
Minimum	2.11%	0.00%
Percentile 75%	**6.04%**	**26.66%**
Percentile 95%	**9.98%**	**34.76%**

Warnings:

Individual Contribution	**10%**
Aggregate Contribution	**25%**

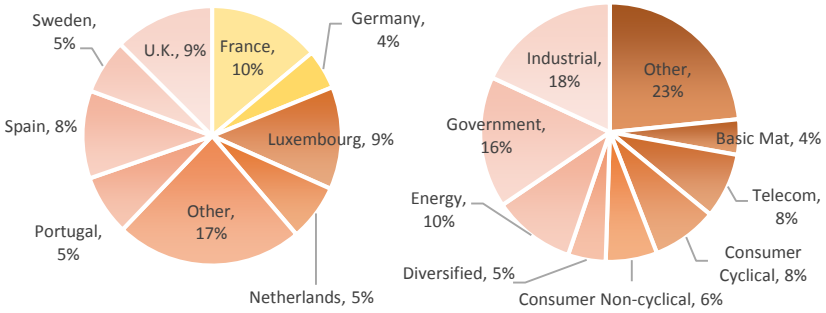
PORTFOLIO ANALYSIS

BPI Obrigações Mundiais[1]

Portfolio Description

- **AUM:** 19.9 M (as of 31-08-2014)
- **Benchmark:** 75% EONIA Capitalization Index 7 Days
- **Investment Policy:** invest in fixed income securities (at least 66%), both sovereign and corporate, without any country or maturity restrictions.
- **Portfolio Duration:** 3.41 (as of 31-08-2014)

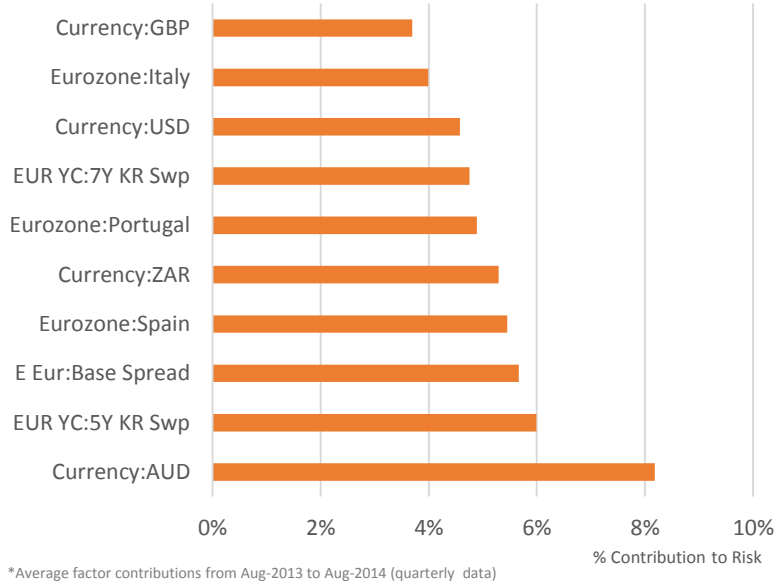
Composition by Geography and Sector (as of 31st August 2014)



Having as benchmark an effective overnight rate merely to ensure a minimum return, the portfolio has no particular investment focus. Thus, *our analysis is conducted in terms of **absolute risk***.

Factor Contribution to Ex-ante Volatility – Top 10 Factors

*Risk factors explain around **96% of the volatility** of this portfolio:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

Currency (namely AUD and ZAR), country spread (peripheral EU countries) and curve factors (5Y and 7Y) are the major determinants of the portfolio's volatility.

Therefore, the risk monitoring for *BPI Obrigações Mundiais* is based on the contributions of **Currency**, **Country Spread** and **Duration factors**. We also find important to monitor the contribution to risk of each issuer in order to avoid excessive risk concentration.

[1] Due to the change in management team in 2013 which led to significant transformations in the portfolio, only data from 2013 is considered for the purpose of this analysis.

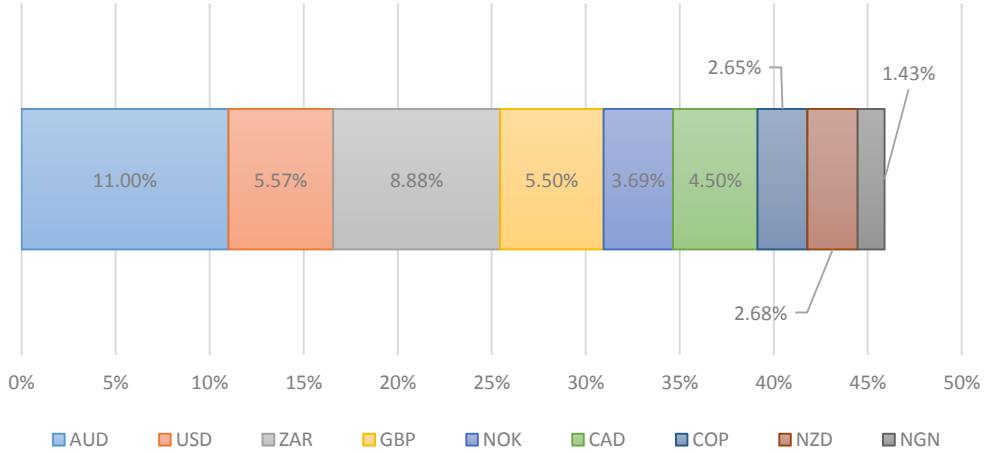
PORTFOLIO ANALYSIS

BPI Obrigações Mundiais

CONTRIBUTION BY CURRENCY FACTOR

Factor Contribution to Risk (% of Total Risk)

Being a portfolio that invests globally, *BPI Obrigações Mundiais* is exposed to the risks of several currencies. In particular, the **Australian Dollar** (AUD) and the **South African Rand** (ZAR) are the currency factors that have contributed more to the volatility:



*Average factor contribution from Jan-2013 to Aug-2014 (monthly data)

Warnings are adjusted downwards in order to be more consistent with the current risk profile of the fund, since it has been subject to significant changes.

As the management faces an internal cap on foreign exchange exposures, an aggregate warning is also considered relevant to help assessing the overall currency risk.

KEY STATISTICS | Contributions by Currency Factor:
(monthly observations of currency factors' contributions from Jan-2013 to Aug-2014)

	Individual	Aggregate
Average Contribution	4.15%	44.63%
Standard Deviation	4.61%	21.03%
Maximum	20.52%	76.49%
Minimum	-0.01%	3.23%
Percentile 95%	**12.60%**	**72.87%**
Percentile 99%	**18.62%**	**75.77%**

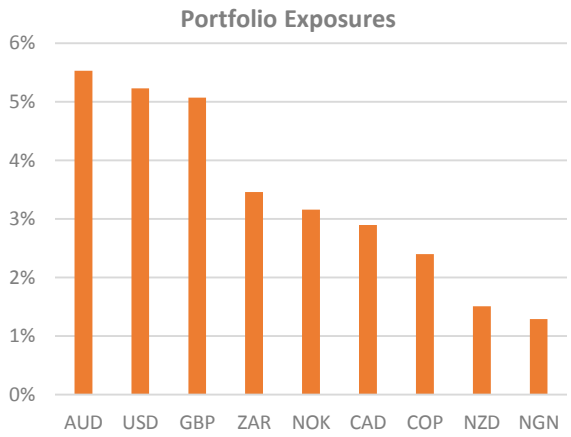
Individual Contribution:

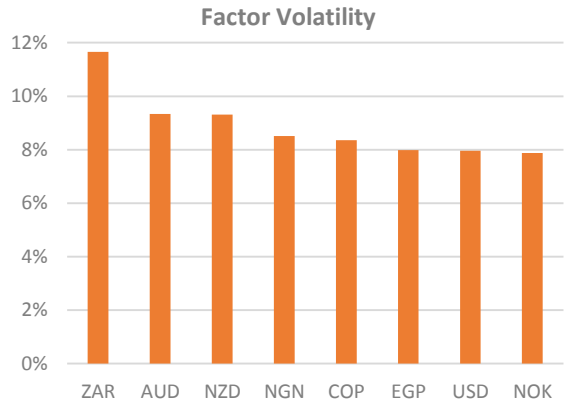
Warning 1	**10%**
Warning 2	**15%**

Aggregate Contribution:

Warning 1	**40%**
Warning 2	**50%**

The high contributions to risk of **AUD** and **ZAR** result from both a high factor volatility and a high weight in the portfolio.



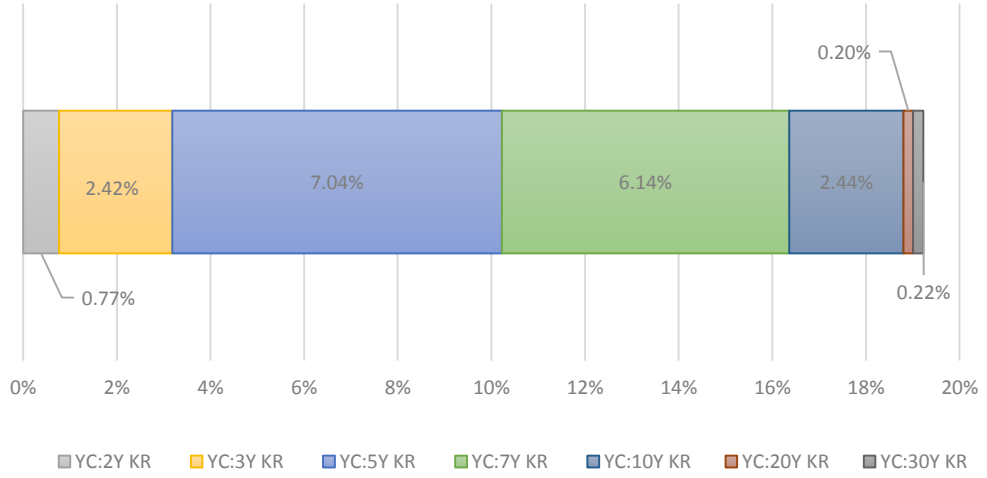


*Average portfolio exposures to currency factors and average factor volatilities from Jan-2013 to Aug-2014 (monthly data)

CONTRIBUTION BY YIELD CURVE FACTOR

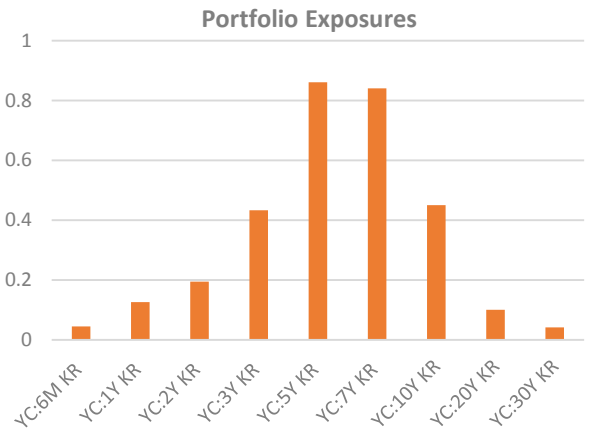
Factor Contribution to Risk (% of Total Risk)

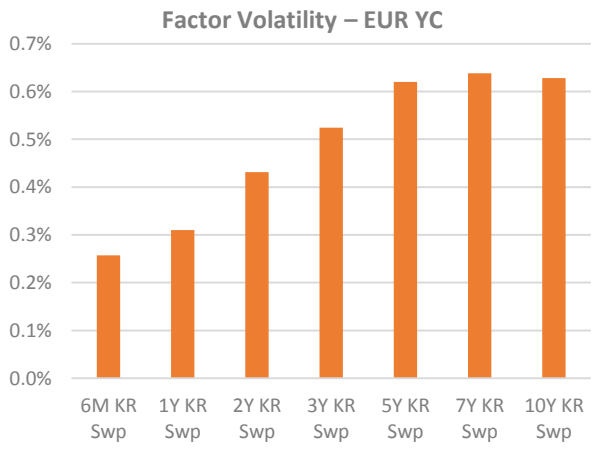
The **5Y** and the **7Y Key Rate Durations** are the curve factors that contributed more to the portfolio's volatility:



*Average factor contribution from Jan-2013 to Aug-2014 (monthly data)

Yield Curve risk stems mainly from the **5Y** and **7Y key rate durations**, as the portfolio is particularly exposed to these maturities.





*Average portfolio exposures to yield curve factors and average factor volatilities from Jan-2013 to Aug-2014 (monthly data)

KEY STATISTICS | Contributions by Yield Curve Factor:
(monthly observations of yield curve factors' contributions from Jan-2013 to Aug-2014)

	Individual	Aggregate
Average Contribution	2.19%	19.74%
Standard Deviation	3.19%	9.39%
Maximum	15.52%	37.14%
Minimum	-0.11%	5.27%
Percentile 95%	**9.56%**	**33.74%**
Percentile 99%	**13.86%**	**36.46%**

Individual Contribution:

Warning 1	**10%**
Warning 2	**15%**

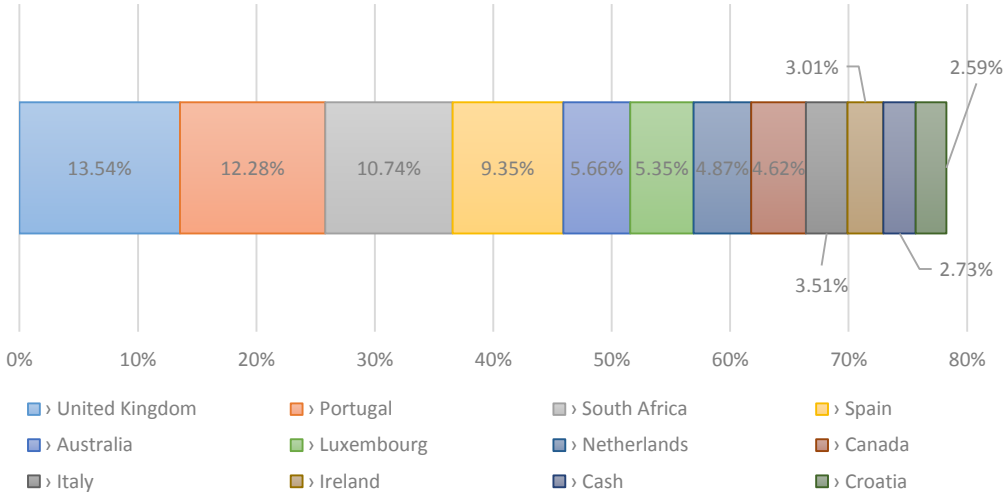
Aggregate Contribution:

Warning 1	**35%**
Warning 2	**40%**

CONTRIBUTION BY COUNTRY

Contribution to Risk (% of Total Risk)

Although Bloomberg's Fixed Income Model does not segregate countries as individual risk factors, except for the Eurozone, an analysis of risk contributions by country is considered relevant since typically fixed income securities are sizably impacted by country spreads. Thus, in this case, the contributions to risk are calculated directly from the portfolio's securities and not through a factor decomposition[1].



*Average factor contribution from Jan-2013 to Aug-2014 (monthly data)

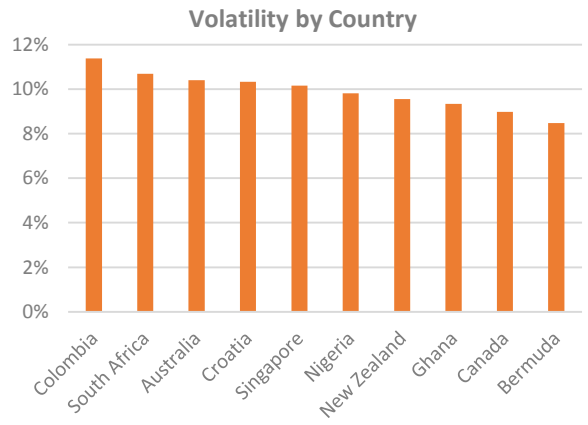
KEY STATISTICS | Contributions by Country:
(monthly observations of each country's contribution from Jan-2013 to Aug-2014)

Average Contribution	4.16%
Standard Deviation	4.35%
Maximum	20.81%
Minimum	-0.51%
Percentile 95%	**14.14%**
Percentile 99%	**17.70%**

Warning 1	**15%**
Warning 2	**20%**

[1] The contribution of each country is given by the sum of the contributions of all securities held in the portfolio that are domiciled in that country so this may also account for the impact of other factors correlated with those securities as the individual effect of the country cannot be isolated.

UK and **Portugal** are the main contributors to the volatility by country, due to its large weight in the portfolio; the contribution of **South African bonds** is also significant, but mostly due to the country's inherent volatility.



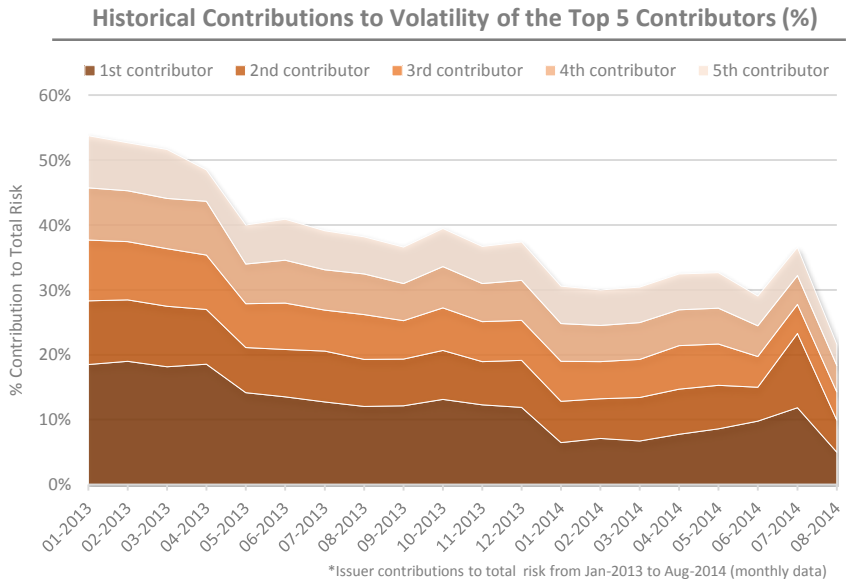
*Average portfolio weights and average volatilities by country from Jan-2013 to Aug-2014 (monthly data)

CONTRIBUTION BY ISSUER

In spite of being composed by an average of 59 issuers, it can be noticed that most of the portfolio's risk is concentrated on a relatively small number of issuers: the top 5 contributors represent approximately **38% of the portfolio's volatility**.

Additionally, some of the issuers that most contributed to the absolute risk did not have an upside in terms of return.

Even though the issuer concentration seems to be in a downward path, given the historically high level of contributions, a deeper analysis and monitoring should not be disregarded.



*Issuer contributions to total risk from Jan-2013 to Aug-2014 (monthly data)

The monitoring of the individual issuers' contribution to risk will be based on a set of warnings arising whenever the **risk contribution of a single issuer exceeds 10%** or when the aggregate contribution of **all issuers with a contribution higher than 5% exceeds 40%.**

KEY STATISTICS | Contributions by Issuer:
(monthly observations of top 5 contributors from Jan-2013 to Aug-2014)

	Individual Contribution by Issuer	Aggregate Contribution of Issuers with Contribution >5%
Average Contribution	7.58%	40.40%
Standard Deviation	3.17%	14.23%
Maximum	19.00%	53.73%
Minimum	3.24%	0.00%
Percentile 75%	**8.11%**	**50.95%**
Percentile 95%	**13.58%**	**53.56%**

Since the size of the portfolio has been recently in an growing path, the degree of concentration is expected to further decrease in the future. For now, these higher thresholds are more meaningful for the portfolio manager; but as the risk monitoring process is intended to be dynamic, the warnings can afterwards be adjusted accordingly.

Warnings:

Individual Contribution	**10%**
Aggregate Contribution	**40%**

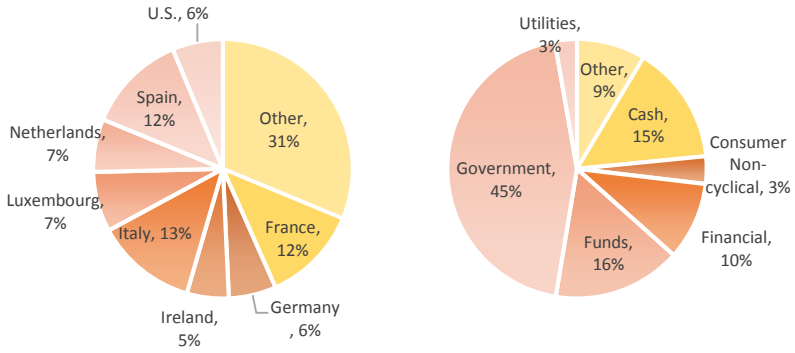
PORTFOLIO ANALYSIS

BPI Reforma Investimento PPA

Portfolio Description

- **AUM:** 357 M (as of 31-08-2014)
- **Benchmark:** 10% Stoxx 600 Net TR € + 7.5% S&P500 Hedged € (Net TR) + 15% IBOXX € CRP OA TR + 4.25% EFFAS Euro Govt 1-10 Yr TR + 25% EONIA Capitalization Index 7 Day
- **Investment Policy:** invest in fixed income securities with fixed and floating coupons and stocks.
  - Minimum of 50% invested in investment grade bonds
  - Maximum of 25% invested in equities

Composition by Geography and Sector (as of August 31st, 2014)



Since the overall portfolio does not have a mandate to invest in a particular sector or region, our risk monitoring system addresses primarily its **absolute risk**.

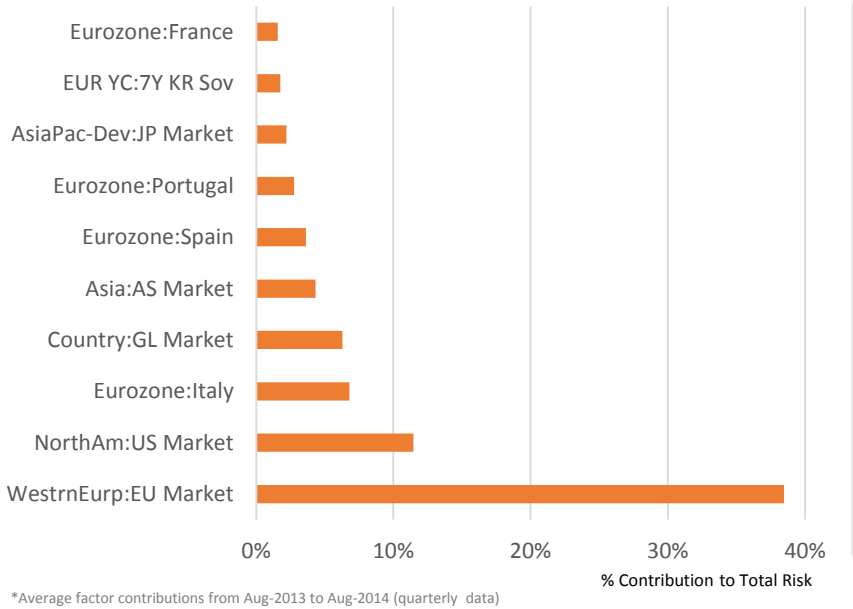
However, this portfolio has the peculiarity of being composed by **7 *"books"***: these are sub-funds also managed by BPI GA which invest in a specific subclass of assets. The management team of *BPI Reforma Investimento* is responsible for the allocation among these books, but does not have direct influence over the investment decisions of each of them individually.

Book	Asset Class	Benchmark
• **Acções BPI Europa**	European stocks	Stoxx 600
• **Acções Zona Euro**	Eurozone stocks	EuroStoxx
• **Acções Europa F. Terceiros**	Funds of European stocks (excluding BPI-GA's funds)	Stoxx 600
• **Acções BPI EUA**	US stocks	S&P500 Hedged
• **Acções Ásia ex-Japão**	Asian stocks (excluding Japan)	i-Shares MSCI Asia ex-Japan
• **Obrigações Corporates IG**	Investment grade European corporate bonds	Iboxx Corporate Overall
• **Obrigações Governos EFFAS 1-10**	European government bonds < 10Y	EFFAS 1-10

Hence, the risk monitoring system for *BPI Reforma Investimento* is complemented with individual assessments of the **books' major risk factors.** Given that each of them has a clear focus on a particular asset class and geography and a specific benchmark, these additional warnings are set in terms of **relative risk**.

Factor Contribution to Ex-ante Volatility – Top 10 Factors

*Risk factors explain around **99% of the volatility** of this portfolio:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

Equity markets explain over half of the portfolio's volatility, followed by Country spread factors – namely the Italian and Spanish spreads.

Problem:

Even though Bloomberg's systematic factors present a huge explanatory power in this portfolio, the model poses one constraint for our risk analysis in multi-asset funds:

The **Bloomberg Multi-Asset Model** results from a combination of the Equity and Fixed Income Factor Models and therefore the factors are specific to each model. Hence, ***there is no risk factor that aggregates the exposures from the two asset classes***, even though the source of the risk may be similar.

For instance, there is no factor that captures jointly the exposure to Portugal – the model provides two separate factors – *Country: Portugal* and *Eurozone: Portugal* – for equity and fixed income securities, respectively.

Thus, in case the portfolio becomes too exposed to a specific country or sector via both equity and fixed income, a separate analysis may not be able to capture the actual extent of that risk.

Solution

The contributions by country and by sector are analyzed directly from the composition of the portfolio, i.e., the contribution of one country is obtained as the sum of the contributions of all securities held from that country, instead of relying on their exposures to the corresponding country risk factor.

→**Advantage** – the contribution of each country/sector accounts for the risks coming from both the equity side and fixed income side.

→**Drawback** – the impact of each factor on volatility cannot be dissociated from other factors that may be correlated with the securities that fall under a certain country or sector and thus the contributions may be overestimated[1].

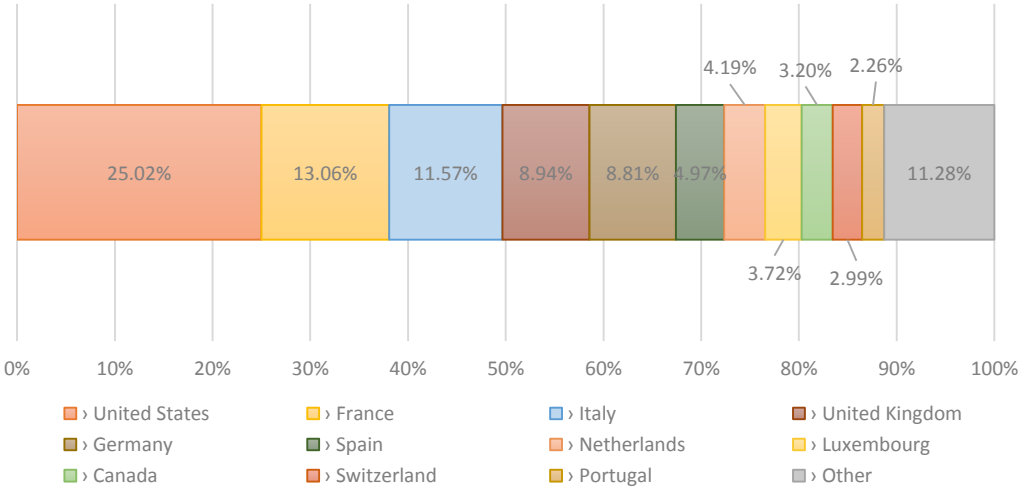
An analysis of the **factor contribution to volatility by asset class** is also included not to disregard the different nature of risks arising from equity and fixed income securities.

[1] The contributions of all countries sum to 100% as the risk if fully distributed among all portfolio securities according to their country of domicile. Under a factor decomposition approach, the independent effect of a country can be estimated so the total contribution is typically below 100% as there are other factors affecting the total risk.

CONTRIBUTION BY COUNTRY

Contribution to Risk (% of Total Risk)

The **United States** is the country that has contributed more to the portfolio's risk, followed by **France** and **Italy**. These three countries jointly account for half of the historical ex-ante volatility.



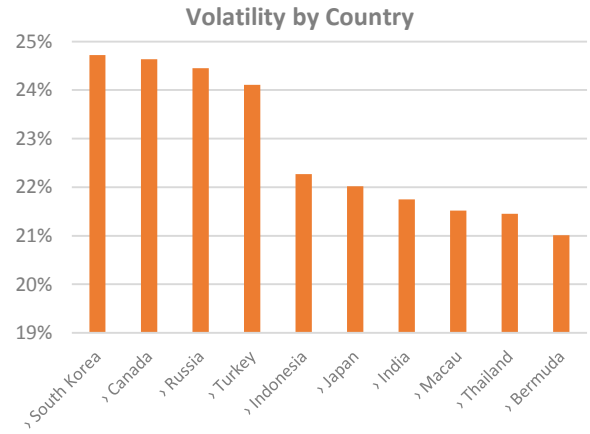
*Average contribution from Jan-2011 to Aug-2014 (monthly data)

As the number of observations is particularly high given the broad geographic scope of the fund, the warning 2 is set slightly below the pre-defined percentile in order to capture better potential increases in the contributions of other countries.

KEY STATISTICS | Contributions by Country: (monthly observations of each country's contribution from Jan-2011 to Aug-2014)	
Average Contribution	2.39%
Standard Deviation	5.11%
Maximum	36.81%
Minimum	-0.09%
Percentile 95%	**12.09%**
Percentile 99%	**29.28%**

Warning 1	**12.5%**
Warning 2	**25%**

The contributions of **US, France** and **Italy** are mostly justified by its large weighting in the portfolio. **Germany** has actually the highest share but it contributes less to the overall risk due to the lower volatility.

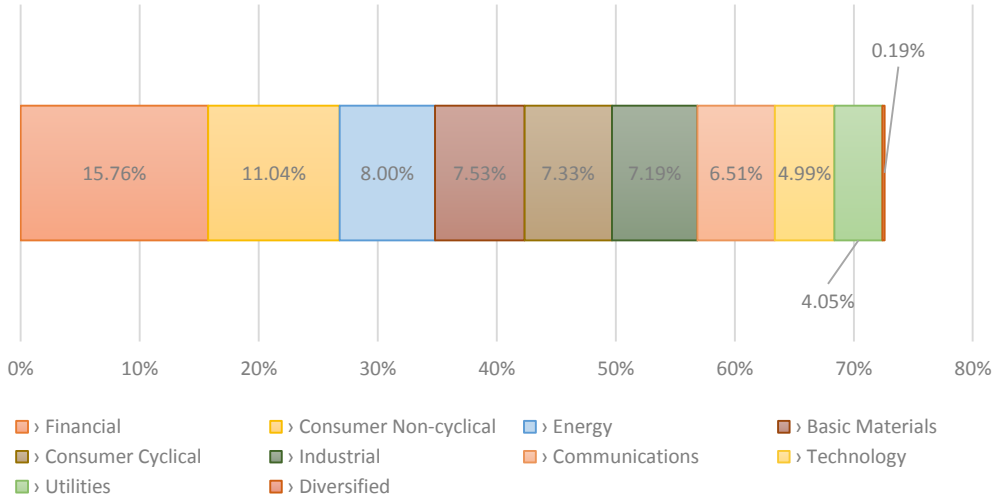


*Average portfolio weights and average volatilities by country from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY INDUSTRY

Contribution to Risk (% of Total Risk)

The **Financial** sector is the industry that historically has contributed more to the volatility of the portfolio, followed by **Consumer Non-cyclical**.



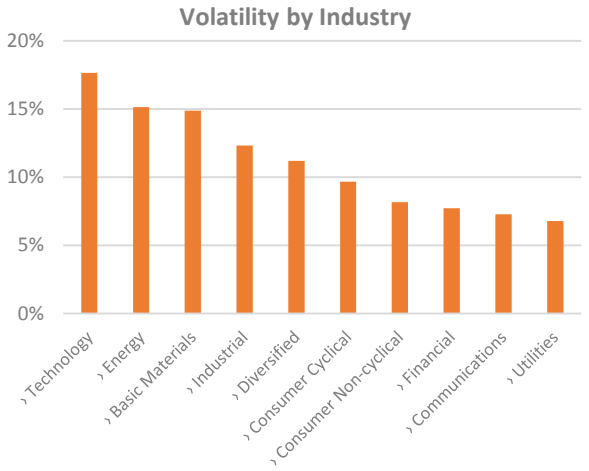
*Average contribution from Jan-2011 to Aug-2014 (monthly data)

Warnings are adjusted downwards in order to account for the bias induced by Financials over the percentile distribution, particularly in the most recent period:

KEY STATISTICS | Contributions by Industry: (monthly observations of each industry's contribution from Jan-2011 to Aug-2014)	
Average Contribution	7.26%
Standard Deviation	4.27%
Maximum	21.40%
Minimum	0.03%
Percentile 95%	**16.13%**
Percentile 99%	**20.72%**

Warning 1	**12%**
Warning 2	**20%**

The contribution to risk of the **Financial** sector results from its large weight in the portfolio when compared to other industries.



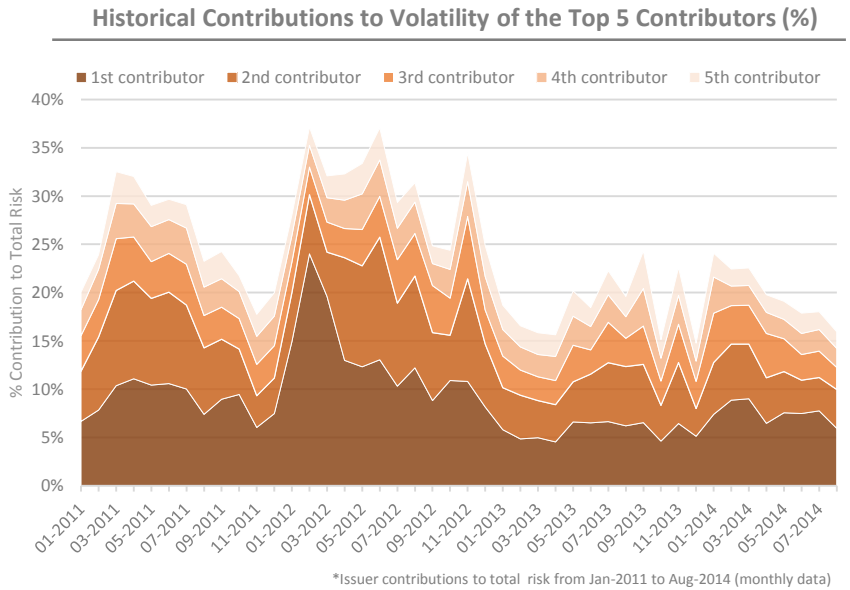
*Average portfolio weights and average volatilities by industry from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY ISSUER

Given the particular features of this portfolio – based on a composition of books managed by distinct teams – keeping track and managing concentration risk turns out to be an even more complex task. Therefore, the historical contributions to volatility by issuer have been analyzed to assess the portfolio's degree of concentration:

In 2012, the portfolio reached its peak in terms of issuer risk concentration, with the **top 5 contributors representing more than 30% of the ex-ante risk**. Although the contributions of these issuers have been in a decreasing path, they still account for roughly 20% of the volatility, in a portfolio composed of around 1700 issuers.

Hence, similarly to the previously analyzed portfolios, a set of alerts on the contributions by issuer is considered appropriate.



*Issuer contributions to total risk from Jan-2011 to Aug-2014 (monthly data)

The proposed monitoring of the individual issuers' contributions to risk is based on a set of warnings arising whenever the **risk contribution of a single issuer exceeds 10%** or when the aggregate contribution of **all issuers with a contribution higher than 5% exceeds 25%.**

KEY STATISTICS | Contributions by Issuer:
(monthly observations of top 5 contributors from Jan-2011 to Aug-2014)

	Individual Contribution by Issuer	Aggregate Contribution of Issuers with Contribution >5%
Average Contribution	4.80%	13.59%
Standard Deviation	3.24%	7.76%
Maximum	24.02%	30.14%
Minimum	1.52%	0.00%
Percentile 75%	**6.12%**	**19.45%**
Percentile 95%	**10.64%**	**25.72%**

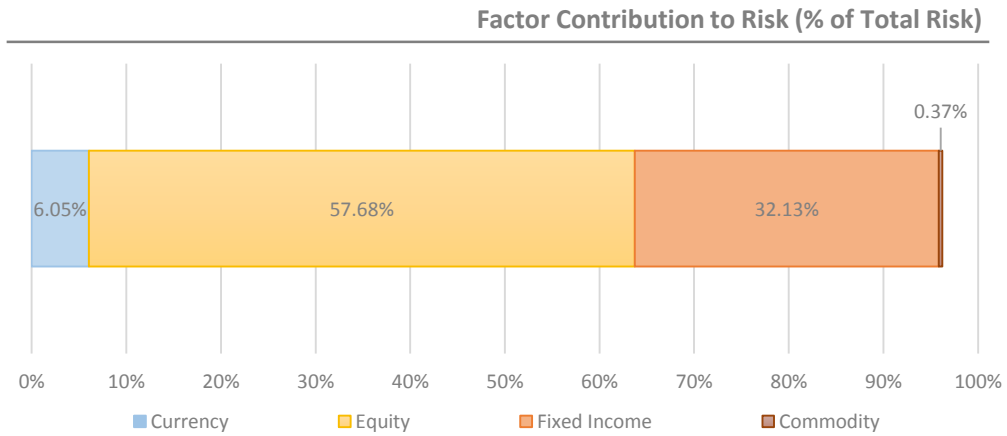
Warnings:

Individual Contribution	**10%**
Aggregate Contribution	**25%**

CONTRIBUTION BY ASSET CLASS

Since the portfolio's investment policy imposes some restrictions on the amounts invested on each class of assets, it is important that the management is aware of how each one is impacting the total risk of the portfolio.

Thus, we suggest two warning levels for the contributions by asset class – **equity, fixed income and currency**[1]. The total contribution of each class is retrieved from the Bloomberg factor model, as the *sum of the contributions of all risk factors that class is exposed to*.



*Average contribution from Jan-2011 to Aug-2014 (monthly data)

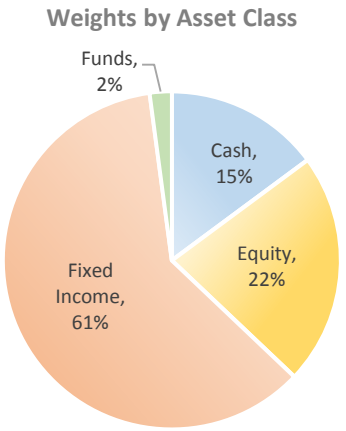
KEY STATISTICS | Contributions by Asset Class:
(monthly observations of each asset class' contribution from Jan-2011 to Aug-2014)

	Equity	Fixed Income	Currency
Average Contribution	57.68%	32.13%	6.05%
Standard Deviation	10.37%	9.03%	5.02%
Maximum	74.67%	52.69%	20.95%
Minimum	36.84%	18.93%	-0.31%
Percentile 95%	**73.12%**	**48.94%**	**14.32%**
Percentile 99%	**74.67%**	**52.42%**	**19.19%**

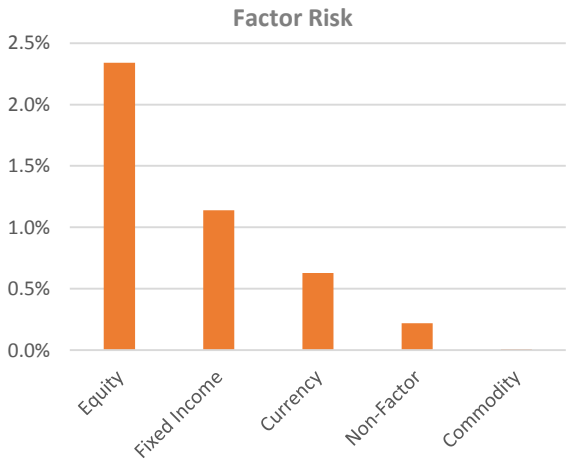
Warning 1	**70%**	**45%**	**15%**
Warning 2	**80%**	**50%**	**20%**

[1] The commodity class is disregarded due to its residual contribution and weighting in the portfolio.

Although equity accounts for **less than ¼ of the fund's market value**, historically it has been contributing with **more than half of the volatility** ex-ante.



*Portfolio weights by asset class as of Aug-2014



*Factor volatility*Exposure as of Aug-2014

BOOKS | FACTOR CONTRIBUTION TO TRACKING ERROR

For each of the 7 books, a historical analysis of the **relative risk factors** is conducted, similar to the ones performed for equity and fixed income portfolios. A set of warnings is defined for the contributions of each of them, based on the type of factors that are considered the most relevant to monitor given the particular features of the book.

			Individual Contribution		Aggregate Contribution		
		Risk Factor	Warning 1	Warning 2	Warning 1	Warning 2	Period of Analysis
Equity Books	Acções BPI Europa	Country	3%	5%	15%	20%	01-2009 – 08-2014
		Industry	3%	5%	20%	25%	
		Style	7%	12%	15%	25%	
	Acções Zona Euro	Country	5%	8%	15%	25%	01-2012 – 08-2014
		Industry	3%	5%	15%	20%	
		Style	7%	12%	20%	25%	
	Acções Europa Fundos Terceiros	Currency	4%	7%	10%	15%	01-2012 – 08-2014
		Industry	4%	8%	15%	20%	
		Style	10%	15%	25%	30%	
	Acções BPI EUA	Industry	4%	6%	20%	30%	04-2009 – 08-2014
		Style	4%	6%	20%	25%	
		Security	10%	-	25%	-	
	Acções Ásia ex-Japão	Currency	4%	8%	20%	25%	02-2014 – 08-2014 (due to change of management team in 02-2014)
		Country	8%	12%	25%	30%	
		Style	2%	4%	7%	10%	
Fixed Income Books	Obrigações Corporates IG	Yield Curve	20%	25%	70%	80%	01-2012 – 08-2014
		Country Spread	20%	30%	75%	85%	
	Obrigações Governos EFFAS 1-10	Yield Curve	20%	25%	40%	50%	01-2012 – 08-2014
		Country Spread	15%	30%	60%	70%	
		Inflation Spread	30%	35%	-	-	

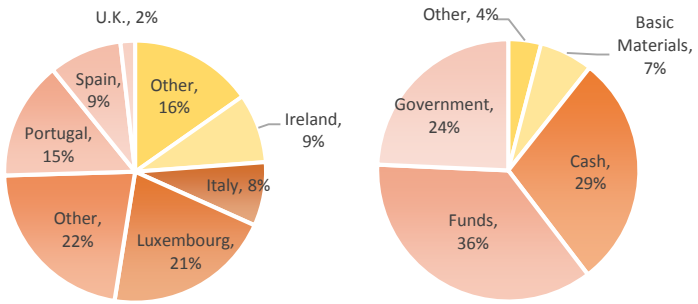
PORTFOLIO ANALYSIS

BPI Seguro de Capitalização Moderado

Portfolio Description

- **AUM:** 156.7 M (as of 31-08-2014)
- **Benchmark:** 40% EONIA Capitalization Index 7 Day + 20% MSCI World Hedge € + 40% BarCap Global Aggregate TR Index
- **Investment Policy:** invest in a diverse range of instruments, with a particular focus on the money market, bonds (convertible, fixed and variable coupon), stocks and alternative investments (hedge funds, real estate, private equity and commodities).
  - Maximum of 80% invested in fixed coupon bonds
  - Maximum of 50% invested in variable coupon bonds
  - Maximum of 40% invested in equities
  - Maximum of 10% invested in hedge funds and 5% in real estate

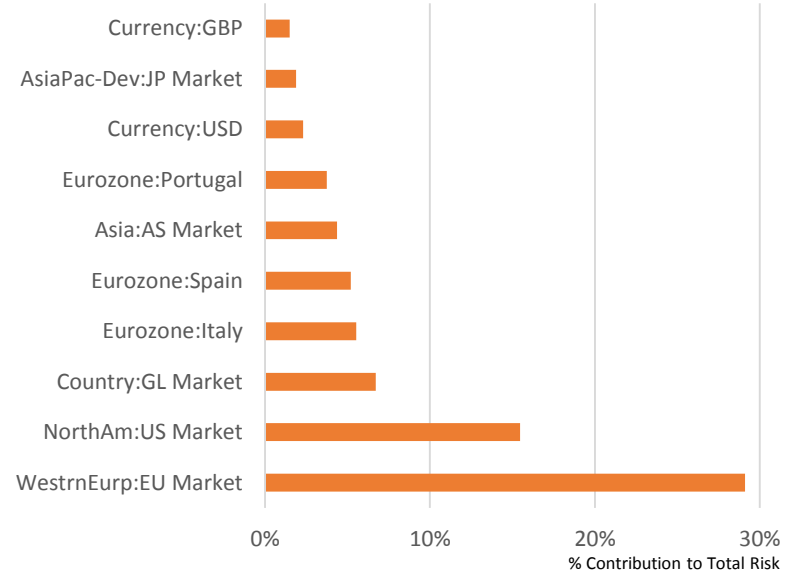
Composition by Geography and Sector (as of August 31st, 2014)



As the portfolio is allowed to invest in securities from any region and industrial sector, *our analysis is conducted in terms of* ***absolute risk***.

Factor Contribution to Ex-ante Volatility – Top 10 Factors

Risk factors explain around ***97% of the volatility*** *of this portfolio:*



*Average factor contributions from Aug-2013 to Aug-2014 (quarterly data)

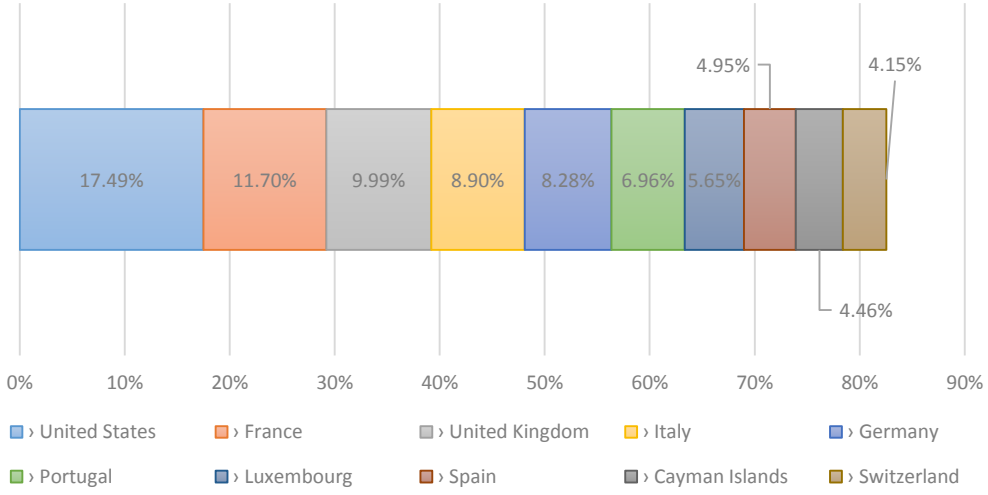
Market and country spread factors are the main contributors to the absolute risk. However, being a multi-asset portfolio, the model treats each asset class separately, being unable to aggregate the risk stemming from the same country or industry in a single factor (as explained in the previous analysis of *BPI Reforma Investimento*).

Given this, the risk monitoring system for *BPI Capitalização Moderado* is also based on the direct **contributions by country and industry**, instead of relying on factor contributions. Nonetheless, in order to account for the particular risks of each asset type, the total factor contribution for each class is also monitored.

CONTRIBUTION BY COUNTRY

Contribution to Risk (% of Total Risk)

The **United States** is the country that has been contributing more to the volatility of the portfolio, followed by **France**.

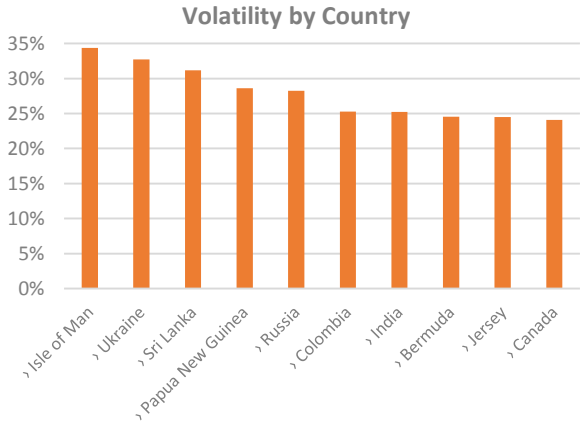


*Average contribution from Jan-2011 to Aug-2014 (monthly data)

KEY STATISTICS | Contributions by Country: (monthly observations of each country's contribution from Jan-2011 to Aug-2014)	
Average Contribution	2.07%
Standard Deviation	4.55%
Maximum	41.77%
Minimum	-0.03%
Percentile 95%	**11.18%**
Percentile 99%	**24.06%**

Warning 1	**10%**
Warning 2	**20%**

The contributions of the **US** and **France** are mostly due to its large weighting in the portfolio; the volatility coming from the first should also be higher as the investment in the US is mostly in equities.

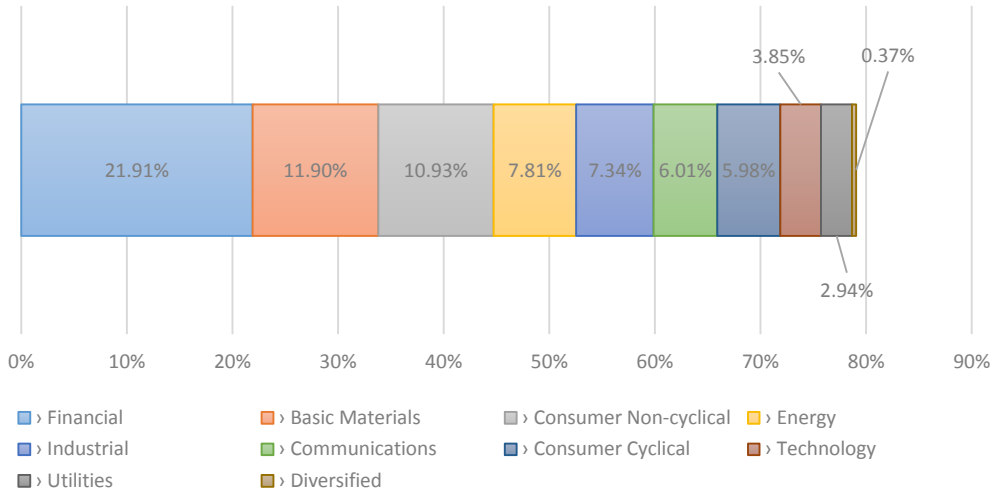


*Average portfolio weights and average volatilities by country from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY INDUSTRY

Contribution to Risk (% of Total Risk)

Financials are responsible for the largest share in the contributions of industries to the ex-ante volatility:



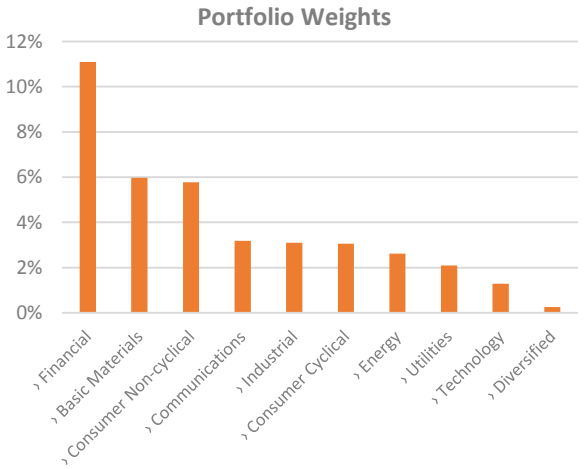
*Average contribution from Jan-2011 to Aug-2014 (monthly data)

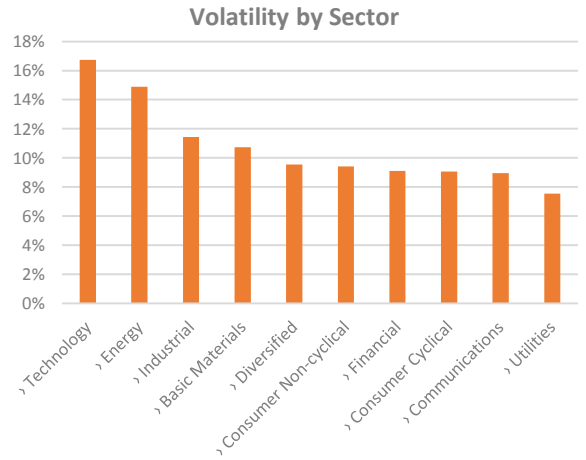
Warnings are adjusted downwards in order to detect potential deviations of sectors other than the Financial, which has a significant impact over the statistical results:

KEY STATISTICS | Contributions by Industry: (monthly observations of each industry's contribution from Jan-2011 to Aug-2014)	
Average Contribution	7.91%
Standard Deviation	6.73%
Maximum	46.56%
Minimum	0.13%
Percentile 95%	**19.64%**
Percentile 99%	**36.34%**

Warning 1	**15%**
Warning 2	**20%**

Although the securities held are not particularly volatile when compared to other industries, the considerably higher weight of the **Financial** sector explains its contribution to total risk.

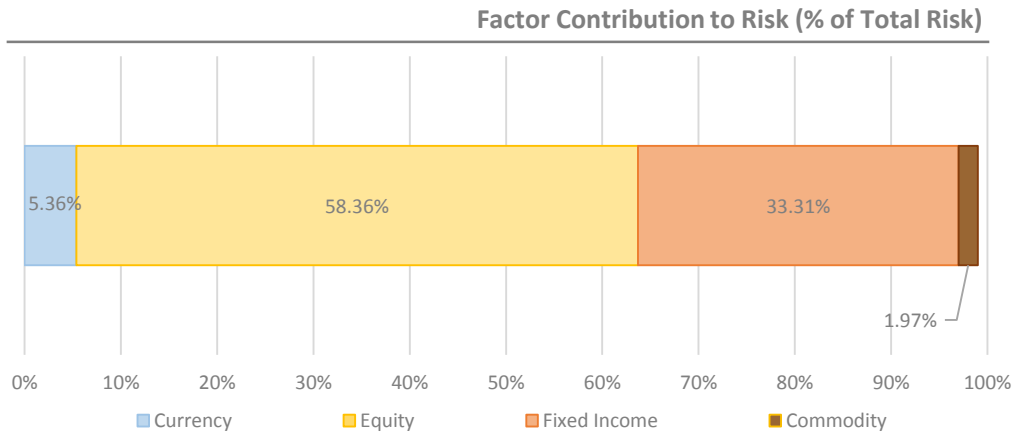




*Average portfolio weights and average volatilities by sector from Jan-2011 to Aug-2014 (monthly data)

CONTRIBUTION BY ASSET CLASS

As each asset class has a distinct underlying level of riskiness, the asset allocation decision should account for how much risk arises from each of them. This is particularly important for *BPI Capitalização Moderado* since the portfolio has a predefined risk profile with some constraints on the weights of certain instruments. Hence, we propose a risk monitoring system that controls the total factor **contribution to risk from equity, fixed income and currency classes**[1].



*Average contribution from Jan-2011 to Aug-2014 (monthly data)

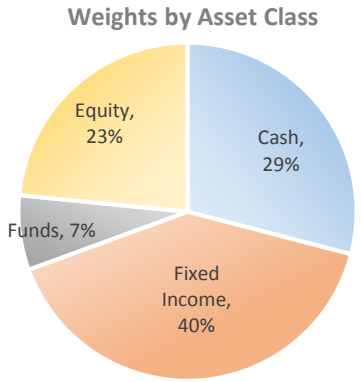
KEY STATISTICS | Contributions by Asset Class:
(monthly observations of each asset class' contribution from Jan-2011 to Aug-2014)

	Equity	Fixed Income	Currency
Average Contribution	58.36%	33.31%	5.36%
Standard Deviation	11.19%	11.24%	5.52%
Maximum	76.27%	61.40%	17.03%
Minimum	33.26%	16.42%	-0.96%
Percentile 95%	**73.12%**	**56.05%**	**15.76%**
Percentile 99%	**76.24%**	**60.10%**	**16.84%**

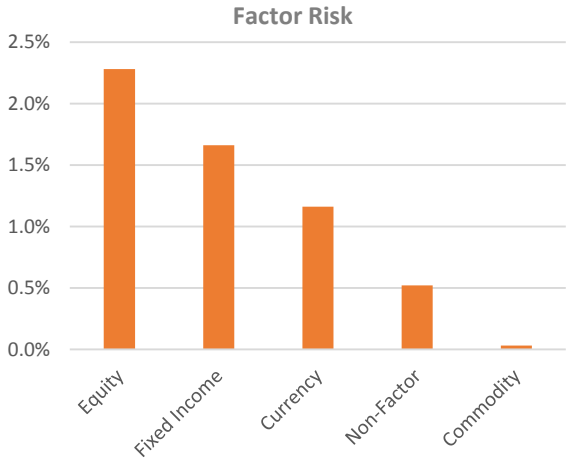
Warning 1	**70%**	**50%**	**15%**
Warning 2	**80%**	**60%**	**20%**

[1] The commodity class is disregarded due to its residual contribution and weighting in the portfolio.

Historically, **Equity carried a contribution to risk that is more than twice the share it has in the portfolio's value**. Conversely, the weight on Fixed Income is almost in line with its contribution to risk.



*Portfolio weights by asset class as of Aug-2014



*Factor volatility*Exposure as of Aug-2014

BACKTESTING

How would have the portfolios historically performed if the risk monitoring system had been in place?

In order to assess the potential impact of the proposed risk monitoring system, **3 portfolios are tested** – for each type of warning, a hypothetical portfolio is created **adjusting the historical weights** (monthly observations) whenever the contributions exceed the warnings.

		Individual Contribution			Aggregate Contribution			
	Warning Type	Warning		% below*	Warning		% below*	Main Adjustments
		1	2		1	2		
1 **BPI Reestruturações** (Equity)	Industry Factor	4%	10%	94.0%	-	-		Contributions of Precious Metals and Materials
	Currency Factor	3%	7%	91.9%	-	-		Contributions of Canadian Dollar
	Security	10%		89.7%	25%		78.4%	Several adjustments
2 **BPI Euro Taxa Fixa** (Fixed Income)	Country Spread Factor	7%	15%	79.5%	75%	85%	77.3%	Contributions of Italy, Portugal and Spain
	Yield Curve Factor	15%	20%	89.1%	75%	85%	93.1%	Contributions of 7Y, 10Y and 20Y Key Rate Durations
3 **BPI Reforma Investimento** (Multi-Asset)	Country	12.5%	25%	95.4%				Contributions of US, France, Italy, Germany and UK
	Industry	12%	20%	89.8%				Contributions of Financials and Consumer Non-Cyclical
	Issuer	10%		91.2%	25%		92.3%	Contributions of Italian and German Governments
	Asset Class -Equity -Fixed Income -Currency				 70% 45% 15%	 80% 50% 20%	 84.9% 87.8% 95.8%	Contributions of Equity (in 2014) and Fixed Income (in 2012)

*% of observations below warning 1

Performance Measures

Absolute Risk (1, 3)		Relative Risk (2)	
Cumulative Return	$\prod_i (1 + R_{P,i}) - 1$	**Cumulative Active Return**	$\prod_i [1 + (R_{P,i} - R_{B,i})] - 1$
Volatility ex-Post (annualized) ▪ rolling window of 26 weeks	$\sigma^{R_P}_{i,i+26} \times \sqrt{52}$	**Tracking Error ex-Post** (annualized) ▪ rolling window of 26 weeks	$\sigma^{R_P - R_B}_{i,i+26} \times \sqrt{52}$
Info Sharpe Ratio ▪ rolling window of 26 weeks[1]	$\frac{\prod_i^{i+26} (1 + R_{P,i}) - 1}{\sigma^{R_P}_{i,i+26} \times \sqrt{26}}$	**Information Ratio** ▪ rolling window of 26 weeks[2]	$\frac{\prod_i^{i+26} [1 + (R_{P,i} - R_{B,i})] - 1}{\sigma^{R_P - R_B}_{i,i+26} \times \sqrt{26}}$
where $R_{P,i}$ is the weekly return of the adjusted portfolio on week *i*		where $R_{B,i}$ is the weekly return of the benchmark on week *i* $R_{P,i} - R_{B,i}$ is the weekly active return of the adjusted portfolio on week *i*	

[1] Cumulative return of the last 26 weeks divided by the volatility of the last 26 weeks)

[2] Cumulative active return of the last 26 weeks divided by the tracking error of the last 26 weeks

Main Steps	
	1 Identify all the observations (monthly contributions) when the warning levels were exceeded.
	2 Compute the **portfolio weights that would set the contributions exceeding the warning to the maximum proposed level**, using the Solver tool in Excel (analytical or trial-and-error solutions).
	3 Upload the portfolio with the adjusted positions on Bloomberg's PORT tool and **measure the risk/return performance** against the original portfolio. The adjusted portfolio is rebalanced on a monthly basis.

*Depending on whether the warnings being adjusted are single security/issuer contributions (a) or risk factor contributions (b), the new vector of weights in **step** ② is determined using one of **two different methodologies**:*

a) Adjustments to Contributions by Security and Issuer[1]

$$Security\ n\text{'s Contribution to Risk (\%)} = \frac{w_n \times \sigma_n \times \rho(r_n, r_P)}{\sigma_P}$$

Where:
- w_n is security *n*'s weight on the portfolio
- σ_n is security *n*'s volatility
- $\rho(r_n, r_P)$ is security *n*'s correlation with the portfolio
- σ_P is the portfolio volatility

2.1. For each security *i* that exceeds the proposed limit, **the new weight w_i that sets its % contribution to the maximum level** is computed as:

$$w_i^{new} = \frac{\max contribution\ (\%) \times \sigma_P^{new}}{\sigma_i \times \rho(r_i, r_P)}$$

2.2. The **change in w_i is then redistributed proportionally** among the remaining securities (w_j), such that:

$$w_j^{new} = w_j^{historical} + \Delta_{w_i} \frac{w_j^{historical}}{1 - w_i^{historical}}$$

Where $\Delta_{w_i} = w_i^{new} - w_i^{historical}$

In case any security exceeds the warning level after this redistribution, its new weight will also be set in such a way that its contribution equals the maximum.

2.3. Because the portfolio's volatility changes as the weights are adjusted, σ_P is also an unknown variable of the model which depends on the new vector of weights that will be determined. Thus the **new portfolio volatility** is given by:

$$\sigma_P^{new} = \sum_n w_n^{new} \times \sigma_n \times \rho(r_n, r_P)$$

The new security contributions are set as a % of this new volatility, reflecting the decrease in risk associated with the lower weight attributed to the largest contributors.

For the **warnings on issuer contributions**, the adjustment is similar – the contribution to volatility of issuer *k* is the sum of the contributions of all securities issued by *k* and therefore its new weight computed in step 2.1. has to be redistributed proportionally for each security according to its share on issuer *k*'s original portfolio weight.

[1]Warnings by country and sector for *BPI Reforma Investimento* are not based on factor exposures and therefore the adjustments also follow the methodology described in this section.

b) Adjustments to Factor Contributions

$$\text{Factor } k\text{'s Contribution to Risk (\%)} = \frac{X_k^P \times \sigma(f_k) \times \rho(f_k, r_P)}{\sigma_P}$$

with $X_k^P = w_P' \beta_k$

Where:
- X_k^P is the portfolio's exposure to the risk factor *k*
- w_P is the vector of portfolio weights
- β_k is the matrix of exposures of securities to factors
- $\sigma(f_k)$ is factor *k*'s volatility
- $\rho(f_k, r_P)$ is factor *k*'s correlation with the portfolio
- σ_P is the portfolio volatility

From the Bloomberg factor model

2.1. For each factor *k* that exceeds the proposed contribution limit, the **new portfolio exposure to factor *k* that sets its % contribution to the maximum level** is computed as:

$$X_k^{P,new} = \frac{max\ contribution\ (\%) \times \sigma_P^{new}}{\sigma(f_k) \times \rho(f_k, r_P)}$$

2.2. In order to achieve the desired portfolio exposure, **the weights of all securities exposed to factor *k* are adjusted** – the total change in the portfolio exposure is distributed proportionally among them, according to their share on the historical portfolio exposure:

$$x_k^{i,new} = x_k^{i,historical} + \Delta(X_k^P) \frac{x_k^{i,historical}}{X_k^{P,historical}}$$

$$w_i^{new} = \frac{x_k^{i,new}}{\beta_k^i}$$

Where:
- $\Delta(X_k^P) = X_k^{P,new} - X_k^{P,historical}$
- $X_k^P = \sum_i x_k^i = \sum_i w_i \beta_k^i$
- w_i is security *i*'s weight on the portfolio
- β_k^i is security *i*'s exposure to factor *k*
- x_k^i is security *i*'s weighted exposure to factor *k*

2.3. Then, **the total change in the portfolio weights is redistributed** among the securities exposed to the remaining factors which did not exceed the limit:

- When the factors' exposures are dummy variables, the distribution is straightforward – this is the case of the industry factors, for which the change in the exposure of one industry can be redistributed proportionally among the remaining industry factors.
- When the same security is exposed to more than one factor of the same type, the adjustment is less evident. This is the case of the yield curve factors, where each bond may be exposed to more than one key rate duration (KRD), depending on its maturity; the criteria used was to redistribute the total change only among the bonds with maturity shorter than the KRD factor being adjusted.

2.4. Given the new factor exposures, the **new portfolio's factor volatility** ($\sigma_{f,P}$) is given by:

$$\sigma_{f,P}^{new} = \sum_k X_k^{P,new} \times \sigma(f_k) \times \rho(f_k, r_P)$$

The **total portfolio volatility** is then calculated as[1]:

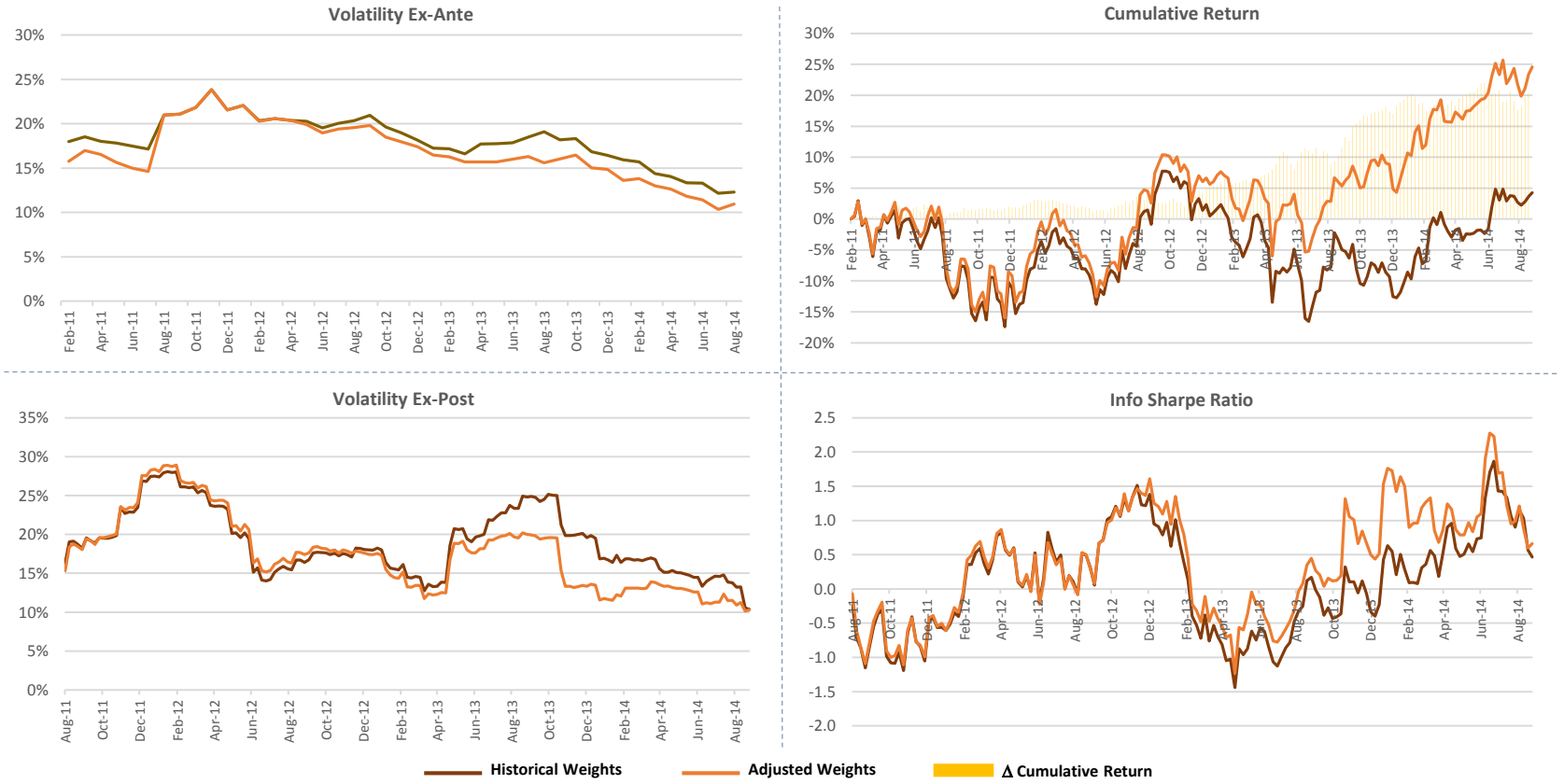
$$\sigma_P^{new} = \sum_k X_k^{P,new} \times \sigma(f_k) \times \rho(f_k, r_P) + \sum_i w_i^{new} \times \sigma(\varepsilon_i) = \sqrt{\sigma_{f,P}^{new\,2} + \sigma_{\varepsilon,P}^2}$$

The new factor contributions are therefore computed as a % of this new portfolio volatility.

For *BPI Euro Taxa Fixa, w*here the risk monitoring addresses the **relative risk**, the same methodology is adopted for the contributions to the tracking error – thus these adjustments are performed on the factors' *active exposures* and securities' *active weights*.

[1]For the purpose of this analysis, non-factor risk ($\sigma_{\varepsilon,P}$) is assumed to remain constant along the adjustment process.

ADJUSTMENTS TO CONTRIBUTIONS OF INDUSTRY AND CURRENCY FACTORS[1]

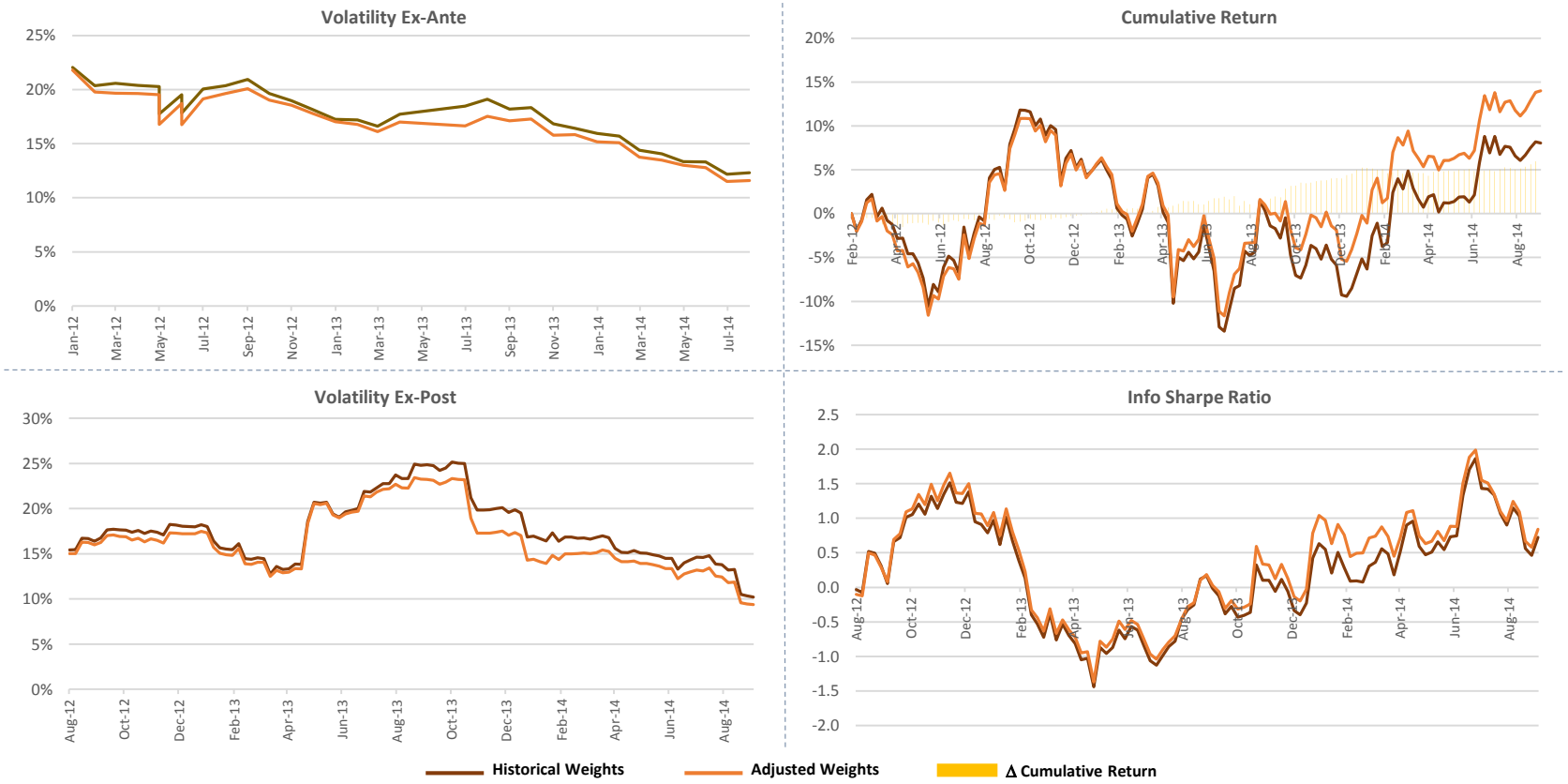


- Both **ex-ante and ex-post volatility would decrease** after the adjustments to factor contributions, being the difference particularly meaningful from 2013 onwards – by year-end, the difference in the annualized ex-post volatility would reach **more than 600 basis points**.
- The cumulative return would also improve significantly from 2013 onwards under the proposed adjustments – the **total return** from 2011 to Aug-2014 **would increase from 4% to 25%**.
- *Thus, during this period, **the risk** incurred by betting on the industries of Precious Metals and Materials **was not compensated by an upside in terms of return**, as shown by the differences in the info Sharpe ratio.*

		Historical Weights	Adjusted Weights	
Volatility	2011-2014	18.60%	17.47%	✓
	2013-2014	17.42%	14.50%	
Total Return	2011-2014	4.25%	24.61%	✓
	2013-2014	3.18%	17.50%	
Info Sharpe Ratio	2011-2014	0.229	1.408	✓
	2013-2014	0.183	1.207	

[1] Since both the industry and currency factors exceeding the warnings are correlated – most of the stocks of Precious Metals and Materials sectors are simultaneously exposed to the Canadian Dollar – adjustments to the first type of factors were sufficient to bring also the contributions of currency factors below the proposed warnings.

ADJUSTMENTS TO CONTRIBUTIONS BY SECURITY



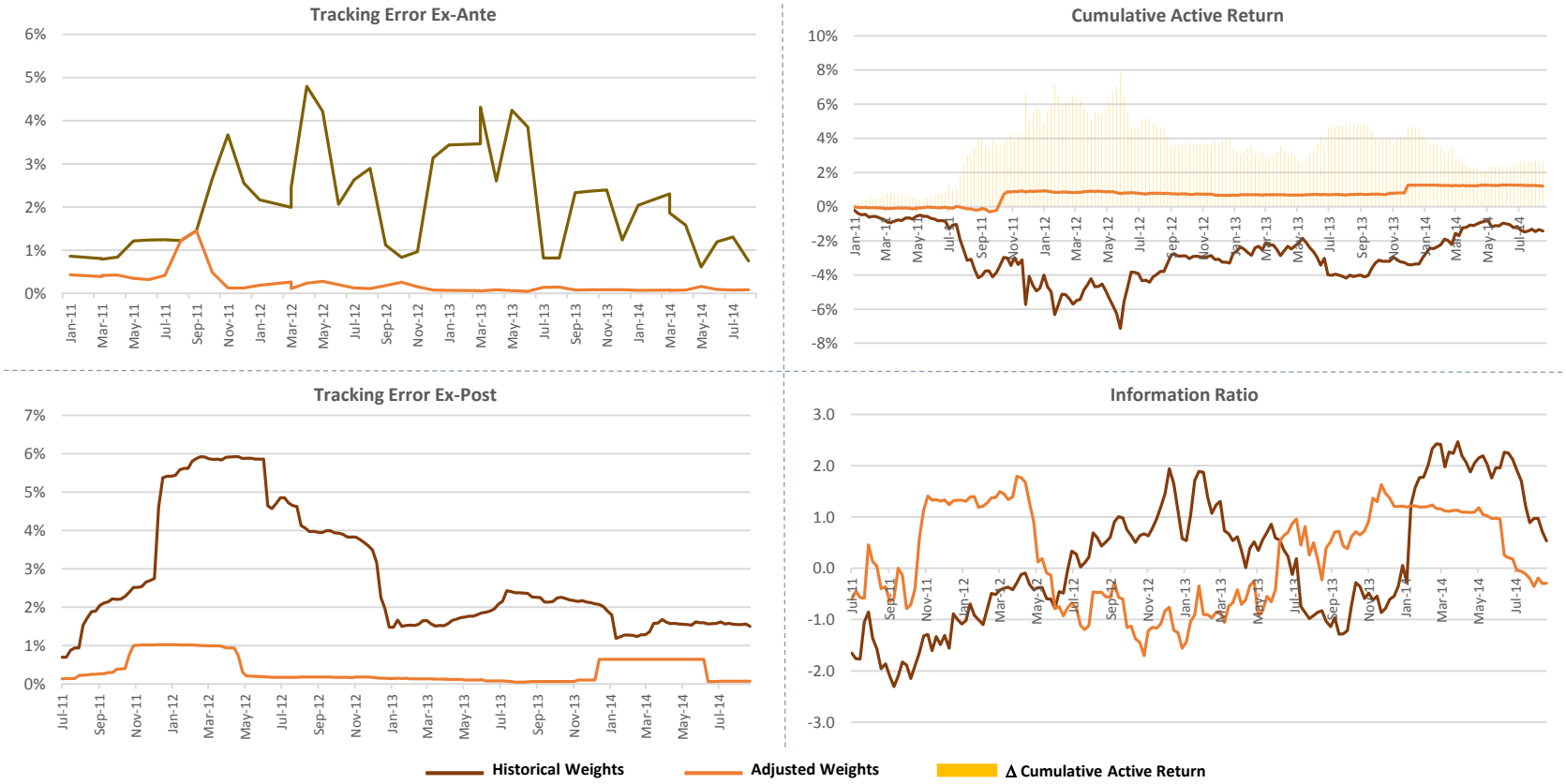
- Both **ex-ante and ex-post volatility would decrease** after the adjustments to security contributions, particularly from the 2nd half of 2013 – the annualized observed volatility would achieved a difference as high as **280 basis points** in January 2014.
- The total return of the portfolio would also increase from 2013 onwards – TNX CN and RGLS US were two of the main contributors to volatility which suffered a large drop in prices in September. If the risk monitoring had been in place since 2012, the portfolio would have yielded **a substantially higher total return**: **15.7%** versus the historical **10%.**
- **The risk-return relationship would therefore improve as well.**

		Historical Weights	Adjusted Weights	
Volatility	2012-2014	16.75%	15.77%	✓
	2013-2014	17.32%	16.09%	
Total Return	2012-2014	8.07%	14.02%	✓
	2013-2014	3.08%	8.80%	
Info Sharpe Ratio	2012-2014	0.482	0.889	✓
	2013-2014	0.178	0.547	

BACKTESTING

BPI Euro Taxa Fixa

ADJUSTMENTS TO CONTRIBUTIONS OF YIELD CURVE AND COUNTRY FACTORS[1]



- Both **ex-ante and ex-post TE would decrease substantially** after the adjustments to factor contributions: since the portfolio is much more concentrated than the benchmark (31 versus 333 securities as of Aug-2014), each adjustment has a huge impact on relative risk. The largest difference would occur in the beginning of 2012, when the actual TE reached almost 6% whereas after the adjustments it would be close to 1%.
- The **cumulative active return would also improve** – although after the adjustments the portfolio would be much closer to the benchmark (thereby reducing the potential for a large active return), it would have avoided the active losses of the actual portfolio during the period under analysis.
- The **overall risk-return performance of the portfolio would be improved** with the proposed system, although historically the effect would not always be favorable (lower information ratio lower in some periods).

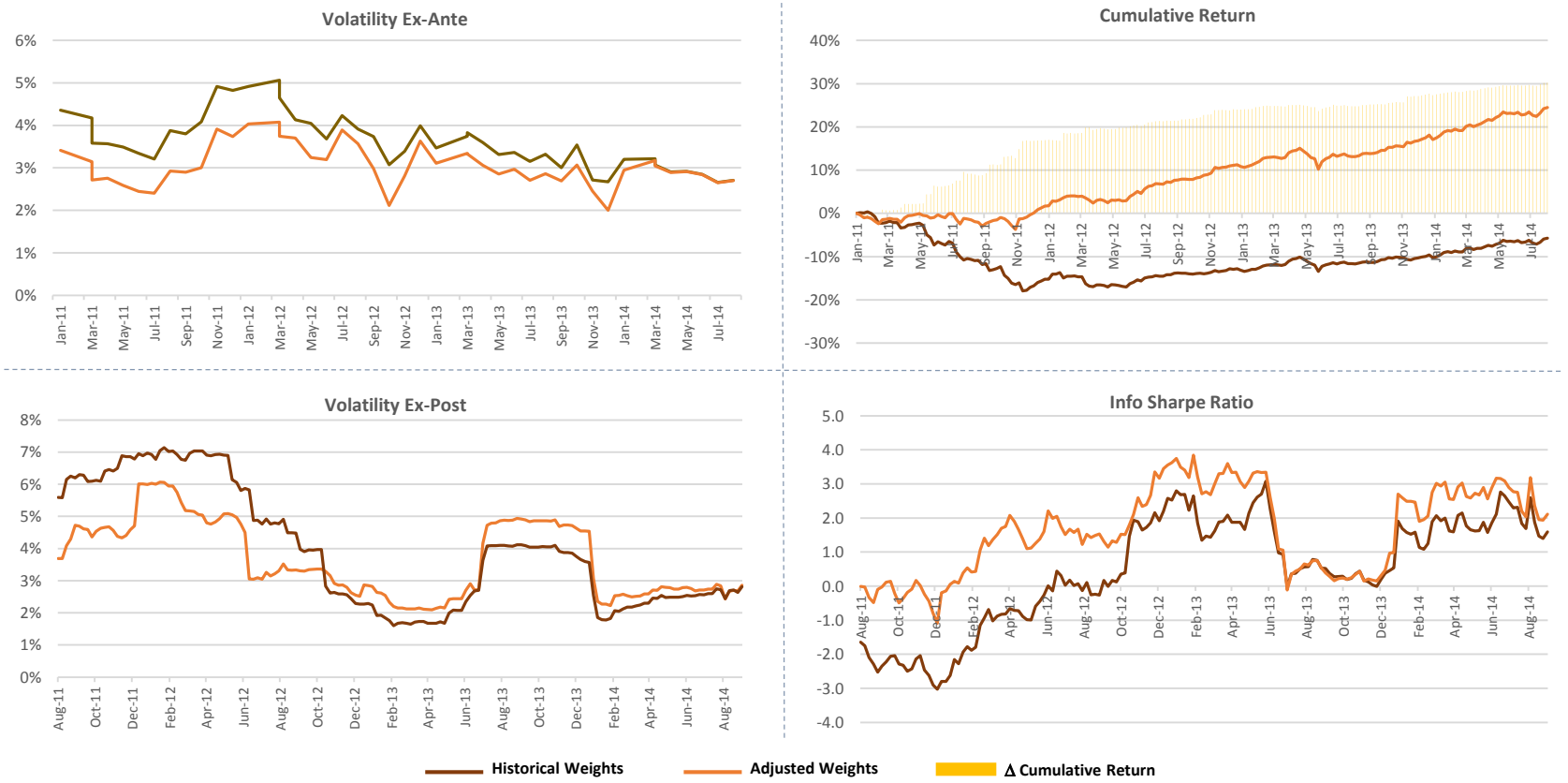
		Historical Weights	Adjusted Weights	
Tracking Error	2011-2014	3.00%	0.46%	✓
	2013-2014	1.81%	0.36%	
Active Return	2011-2014	-1.42%	1.21%	
	2013-2014	1.95%	0.55%	
Information Ratio	2011-2014	-0.475	2.616	✓
	2013-2014	1.077	1.521	

[1]The new portfolio was obtained by adjusting, on each month, either the exposures to Country or Duration factors, depending on which was deviating more from the warning level. Because the two types of factors are usually correlated, in most cases the adjustment of one type of factors was enough as it would also bring the contributions of the other factor below the warning.

BACKTESTING

BPI Reforma Investimento PPR

ADJUSTMENTS TO CONTRIBUTIONS BY COUNTRY



- While the **ex-ante volatility would be lower** under the proposed adjustments, **the observed volatility would actually increase in 2013** compared to the historical portfolio, particularly in the second half of the year (70 basis points higher on average).
- The **cumulative return would improve substantially** in relation to the historical one – the total return from 2011 to Aug-2014 would increase from -5.7% to 24.5%.
- As a result, the **risk/return performance** of the adjusted portfolio would be **considerably enhanced**.

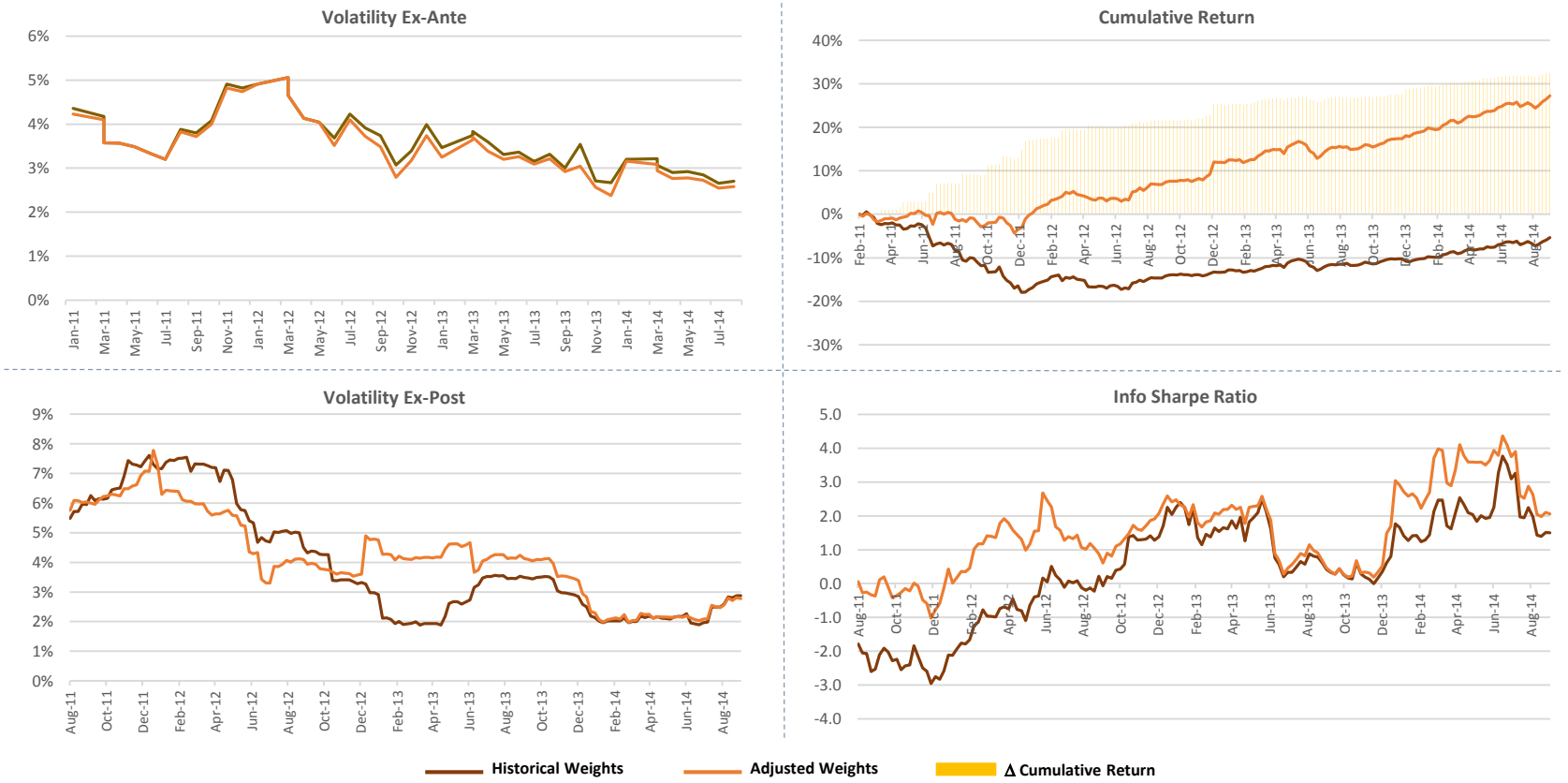
		Historical Weights	Adjusted Weights	
Volatility	2011-2014	4.48%	3.78%	
	2013-2014	3.00%	3.41%	
Total Return	2011-2014	-5.71%	24.51%	✓
	2013-2014	8.60%	12.49%	
Info Sharpe Ratio	2011-2014	-1.276	6.481	✓
	2013-2014	2.865	3.659	

*Analysis is performed ceteris paribus, i.e. the potential adjustments required due to the remaining proposed alerts are not considered.

BACKTESTING

BPI Reforma Investimento PPR

ADJUSTMENTS TO CONTRIBUTIONS BY INDUSTRY



- While the adjustments on the contributions of Financials and Consumer Non-Cyclical industries reduce the portfolio's volatility ex-ante, **the effect on the observed risk would again be dubious** – by 2013, the 6-month volatility would have actually increased quite significantly.
- As for the return, the effect is clearly positive: the **cumulative difference in the total return** over 2011 to 2014 would **exceed 30%**.
- Thus, the **risk/return performance** of the adjusted portfolio would also improve, although not so significantly in 2013.

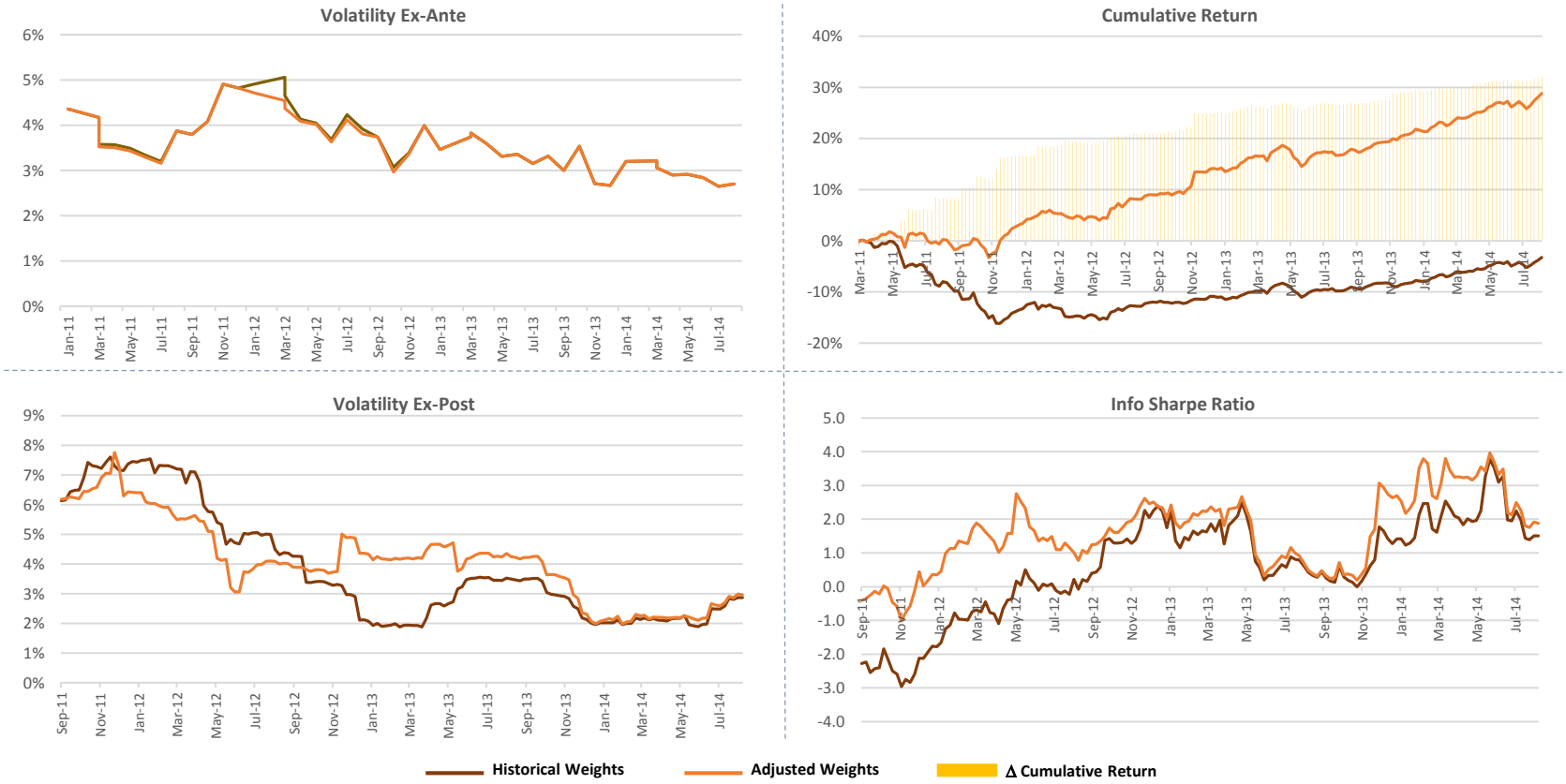
		Historical Weights	Adjusted Weights	
Volatility	2011-2014	4.48%	4.34%	
	2013-2014	2.98%	3.48%	
Total Return	2011-2014	-5.71%	26.64%	✓
	2013-2014	8.80%	13.24%	
Info Sharpe Ratio	2011-2014	-1.276	6.139	✓
	2013-2014	2.948	3.803	

*Analysis is performed ceteris paribus, i.e. the potential adjustments required due to the remaining proposed alerts are not considered.

BACKTESTING

BPI Reforma Investimento PPR

ADJUSTMENTS TO CONTRIBUTIONS BY ISSUER



- Although **ex-ante volatility would be slightly lower** with the adjusted weights, **ex-post volatility would again increase in 2013.**
- On the other hand the **cumulative total return would increase considerably** under these adjustments – from the historical -3.25% to 28.82%.
- As a result, the **risk/return performance** of the adjusted portfolio would be **considerably improved**.

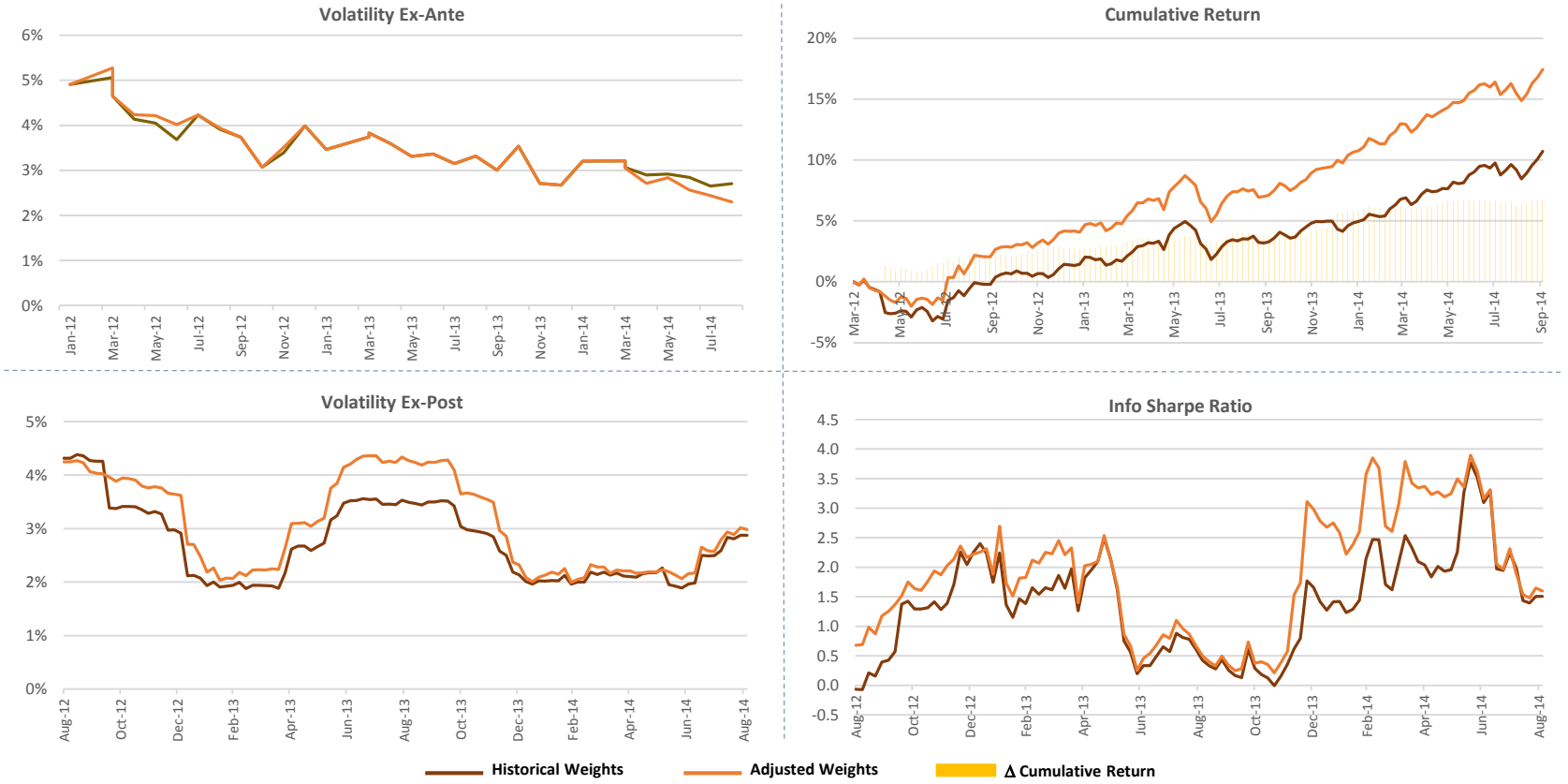
		Historical Weights	Adjusted Weights	
Volatility	2011-2014	4.54%	4.37%	
	2013-2014	2.79%	3.16%	
Total Return	2011-2014	-3.25%	28.82%	✓
	2013-2014	9.15%	13.62%	
Info Sharpe Ratio	2011-2014	-0.715	6.593	✓
	2013-2014	3.273	4.311	

*Analysis is performed ceteris paribus, i.e. the potential adjustments required due to the remaining proposed alerts are not considered.

BACKTESTING

BPI Reforma Investimento PPR

ADJUSTMENTS TO CONTRIBUTIONS BY ASSET CLASS



- Our risk monitoring system would suggest a reduction in the amount invested on fixed income securities in 2012 and on equities in 2014, in order to reduce its unusually high contributions to risk. Under these adjustments, the portfolio's overall volatility is expected to decrease in 2014, while in 2012 the effect should be the opposite since the weight of equity is increased. However**, the ex-post volatility turned out to be systematically higher** in all periods (although the difference is not meaningful in 2014 particularly considering that it is still being affected by the rolling window).
- As for the **cumulative return, the adjusted portfolio would again outperform** the historical one – the total return from 2012 to Aug-2014 would be almost 7% higher.
- Hence, the **Info Sharpe ratio** of the adjusted portfolio would be **consistently above the historical** one.

		Historical Weights	Adjusted Weights	
Volatility	2012-2014	3.04%	3.25%	✗
	2013-2014	2.79%	3.33%	✗
Total Return	2012-2014	10.71%	17.43%	✓
	2013-2014	9.14%	12.83%	✓
Info Sharpe Ratio	2012-2014	3.525	5.365	✓
	2013-2014	3.273	3.849	✓

*Analysis is performed ceteris paribus, i.e. the potential adjustments required due to the remaining proposed alerts are not considered.

CONCLUSIONS AND SUGGESTIONS

The recent financial crisis has shown that nowadays, *portfolio management can no longer be dissociated from risk management*. Financial institutions should be aware of the risks they are exposed to and find mechanisms to monitor them, in order to prevent unexpected losses from tail events which history proofs to happen with some regularity.

Nonetheless, risk management does not necessarily hinder the performance of asset managers. In fact, as shown by our analysis, a proper identification of the risk sources may actually be a helpful tool for the management in order to make better informed investment decisions.

In this context, our risk monitoring system aims at **enhancing the cooperation between BPI GA's portfolio managers and the risk team**, by providing a tool that promotes a **joint analysis of the risk factors** inherent to each fund. Taking advantage of the Bloomberg factor decomposition model, this is an intuitive approach to support the management in the measurement of their risk-return trade-off.

PROPOSED RISK MONITORING SYSTEM

- The proposed system is based on the **contributions of risk factors** to the ex-ante volatility and tracking error, thereby providing a comprehensive approach to the main sources of risk, which accounts for the volatilities and correlations of risk factors.
- The **warnings levels** established for each portfolio are intended to be **dynamic** and **breached only occasionally**, so that only atypical deviations are subject to further analysis – this should improve the efficiency and acceptance of the system by everyone involved.
- As shown by our backtesting analysis, the necessary adjustments suggested from the implementation of this system **may actually improve the risk-return performance of BPI's portfolios**.
- The control should be performed on a weekly basis, in order to timely alert the portfolio managers to unusual exposures to risks.

APPENDIX

Annex 1 | *Bloomberg Factor Model – Industry Factors*

The Bloomberg Equity Model uses 24 industry factors, based on the **GICS Industry Group** classification. For the Fixed Income Model, 23 industry factors are defined, according to the **Bloomberg Industry Codes** (BICS) classification.

Equity Model – GICS Industries:

- Energy
- Materials
- Capital Goods
- Commercial & Professional Services
- Transportation
- Automobiles & Components
- Consumer Durables & Apparel
- Consumer Services
- Media
- Retailing
- Food & Staples Retailing
- Food, Beverage & Tobacco
- Household & Personal Products
- Health Care Equipment & Services
- Pharmaceuticals, Biotechnology & Life Sciences
- Banks
- Diversified Financials
- Insurance
- Real Estate
- Software & Services
- Technology Hardware & Equipment
- Semiconductor Equipment
- Telecommunication Services
- Utilities

Fixed Income Model – BICS Industries:

- Basic Materials
- Media
- Telecommunications
- Airlines
- Auto
- Retail
- Consumer Cyclical
- Healthcare
- Pharmaceuticals
- Consumer Non-cyclical
- Industrial
- Aerospace/Defense
- Transportation
- Oil &Gas
- Energy
- Banks
- Insurance
- REITS
- Diversified Financial Services
- Computers
- Technology
- Gas Utilities
- Electric

APPENDIX

Annex 2 | *Bloomberg Equity Model – Style Factors*

Ten major style factors are defined in the Bloomberg Equity Model:

Style Factor	Description	Exposure
Momentum	Allows to distinguish stocks that have risen in the last year from the ones that have fallen	Company's return percentile
Value	Differentiates expensive stocks from cheap stocks (combines fundamental and analyst consensus data)	13% Book to Price + 18% Earnings to Price + 16% Forecast Earnings to Price + 19% Cash Flow to Price + 21% EBITDA/EV
Dividend Yield	Distinguishes between high dividend stocks from those that are not	Dividend yield percentile
Size	Aggregate metric that differentiates large from small companies	28% Market Cap Log + 36% Sales Log + 36% Total Assets Log
Trading Activity	Distinguishes stocks with high turnover from those with low turnover	Percentile of traded shares to outstanding shares
Earning Variability	Analyses the consistency of earnings, cash flows and sales based on historical data	34% Earnings Volatility + 35% Cash Flow Volatility + 31% Sales Volatility
Volatility	Distinguishes between more and less volatile stocks, by measuring volatility through different methods	30% last year Vol + 14% CAPM Beta + 30% CAPM Idiosyncratic Vol + 26% Max price/Min price last year
Profitability	Identifies money makers and money losers through profit margin and similar measures	26% ROE + 28% ROCE + 28% ROA + 18% EBITDA Margin
Leverage	Composite metric of different measures of companies' leverage	34% D/E BV + 33% D/E MV + 33% D/A MV
Growth	Captures distinction between fast and slow growers based on historical and forward looking fundamental data	23% Asset Growth + 26% Sales Growth + 15% Earnings Growth + 16% Forecasted Earnings Growth + 20% Forecasted Sales Growth

APPENDIX

Annex 3 | *Bloomberg Fixed Income Model – Spread Factors*

The Bloomberg Fixed Income Model uses systematic spread factors which are specific to each G6 currency model and subclass of bonds.

Subclass	Spread Factor	Description
Sovereign	▪ Sovereign spread factor	Represents the average sovereign spread change
	▪ Slope factor	Measures the additional spread change for every year of spread duration increase from the median – the factor is positive when spread curve steepens and negative when flattens
	▪ Option adjusted spread factor	Measures the additional spread change for 1% increase in OAS from the median – the factor is positive when low OAS securities tighten relative to high OAS securities
Agency	▪ Agency spread factor	Represents the average spread changes of bonds belonging to a particular group
	▪ Slope factor	Similarly defined as in the sovereign asset class; the only difference is that the medians concern the group that specific bond belongs to, rather than the median of the whole estimation universe
	▪ Option-adjusted spread factor	
Corporate (Investment Grade and High Yield)	▪ Industry specific spread factor	Represents the average proportional changes in spreads of bonds belonging to the same industry. 23 industry groups are considered. based on the Bloomberg Industry Codes (BICS)
	▪ High yield factor	Measures the average incremental proportional changes in spreads of high yield bonds (BB+ and below) – it is positive when HY bonds' spreads widen on average relative to IG bonds
	▪ Seniority factor	Represents the average incremental proportional changes in spreads of bonds in the subordinated class – positive when spreads of subordinated debts widen on average relative to senior debts
	▪ Long duration factor	This factor is positive when spreads of long-duration bonds widen relative to that of short-duration bonds, negative when they tighten
	▪ Short duration factor	This factor is positive when spreads of short-duration bonds tighten, negative when they widen
	▪ Foreign factor	Measures the average incremental proportional changes in spreads for all bonds issued by foreign entities – the factor is positive when spreads of bonds issued by foreign entities widen relative to those issued by domestic entities
Distressed	▪ Distressed level factor	Measures the average excess returns of distressed debts
	▪ Seniority factor	Represents the average incremental excess returns of the distressed debts of the subordinated class
	▪ Price factor	Measures the excess return of premium bonds over the discount bonds
*only in the USD model	▪ Size factor	Measures the excess returns of high-balance bonds over low-balance bonds

APPENDIX

Annex 4 | *BPI Ibéria – Proposed Capped Benchmark*

CAPPED BENCHMARK

Under the **UCITS rule**, *no single stock is allowed to have a weight higher than 10% of the portfolio and all stocks with a weight above 5% cannot exceed, in total, 40% of the index*.
Since *BPI Ibéria*'s benchmark is already a weighted average of two indexes, the first rule would almost always be satisfied. However, the second constraint would still be systematically in breach.

Methodology

In order to adjust for this legal constraint, the benchmark is rebalanced monthly, according to the methodology of *Single Stock and Concentration Limit Capping** followed by S&P Indexes:

1) All stocks with a weight higher than 10% are capped at 10%;

2) The excess weight resulting from (1) is redistributed proportionally among all the stocks that remain uncapped;

2.1) If after the redistribution any other stock exceeds 10% in weight, the process is repeated iteratively until the constraint is fulfilled.

3) The weights of all stocks with a weight above 5% are added up; if the sum is below 40%, the adjustment process ends.

4) If the sum exceeds 40%, the stocks with a weight higher than 5% are ordered in a descending way according to their weights. Then, the weights are summed cumulatively. The first stock that makes the sum exceed the 40% limit is capped to the maximum between 5% and the difference between 40% and the cumulative weight of all stocks with weights above the stock in question.

5) All stocks with weights above 5% but lower than the stock capped at (4) are capped to a weight of 5%.

6) The total change in weights from the adjustments in (4) and (5) is redistributed proportionally among all stocks with weights below 5%.

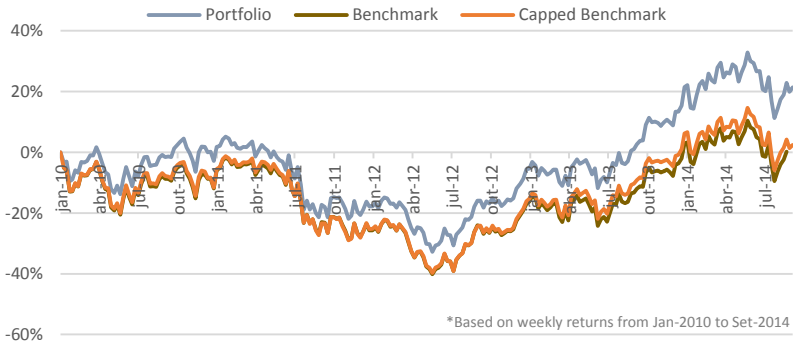
7) If after the redistribution, the constraint of 40% still remains in breach, further iterations are performed until it becomes fulfilled.

*S&P Dow Jones Indices. Index Mathematics – Methodology. (2014). McGraw Hill Financial

Results

Although adjustments are required every month in order to meet the constraints, the capped benchmark does not differ substantially from the official benchmark in terms of risk and return performance:

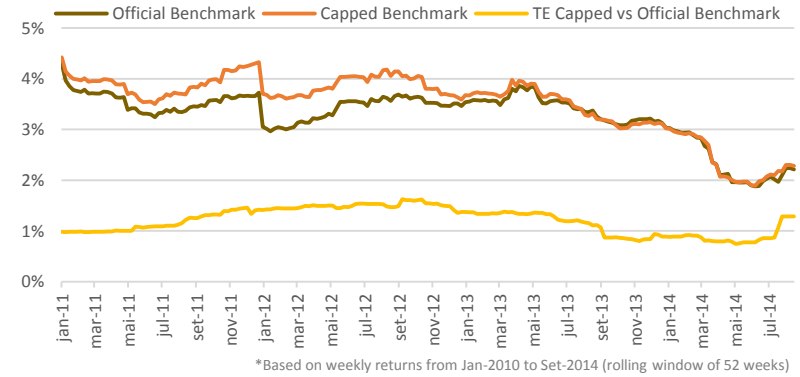
Cumulative Return



*Based on weekly returns from Jan-2010 to Set-2014

The cumulative return of the adjusted benchmark since 2010 is slightly higher than the official benchmark, being therefore closer to the portfolio returns. In fact, the correlation between the portfolio and the benchmark's historical returns is higher for this new benchmark – 97% against 95%.

Tracking Error



*Based on weekly returns from Jan-2010 to Set-2014 (rolling window of 52 weeks)

Unexpectedly, the tracking error of the portfolio versus the new adjusted benchmark turns out to be higher than against the original one. This suggests that the management may be deviating intentionally from the lower weighted stocks, which have now a higher weight in the adjusted benchmark.

PROXY BENCHMARK

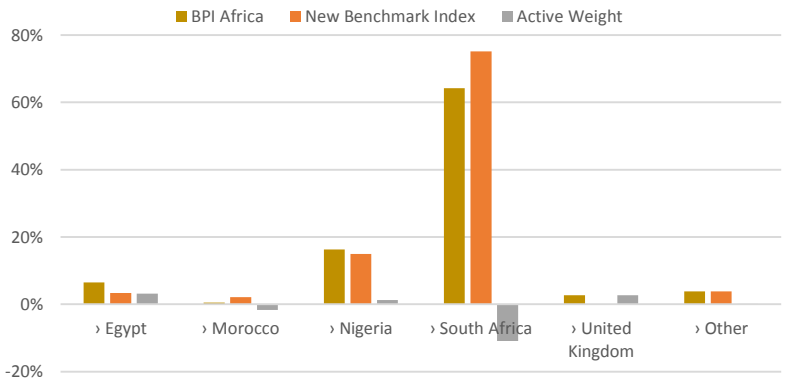
The internal benchmark of *BPI África* is the **S&P Pan Africa Total Return Index** (STEIPADT Index). However, its constituents are not available at BPI GA (requires the payment of a fee).
Thus, based on the indexes and ETFs available on Bloomberg, we suggest a proxy benchmark to be used for the purpose of internal risk control.

Methodology

The proxy is a composite of:

- **S&P Emerging Middle East & Africa** (GAF US), **excluding the stocks from the Middle East market** – these countries are not part of the composition of BPI's portfolio and are therefore removed; the weights of the remaining securities are rebalanced so that this ETF would represent 85% of the benchmark.
- **Nigeria Stock Exchange Index –** because the portfolio has a significant share invested on Nigerian securities (which are not included in the above ETF) a weight of 15% is attributed to this index, in accordance with the country's current share on the portfolio.

Composition by Country – Portfolio vs New Benchmark

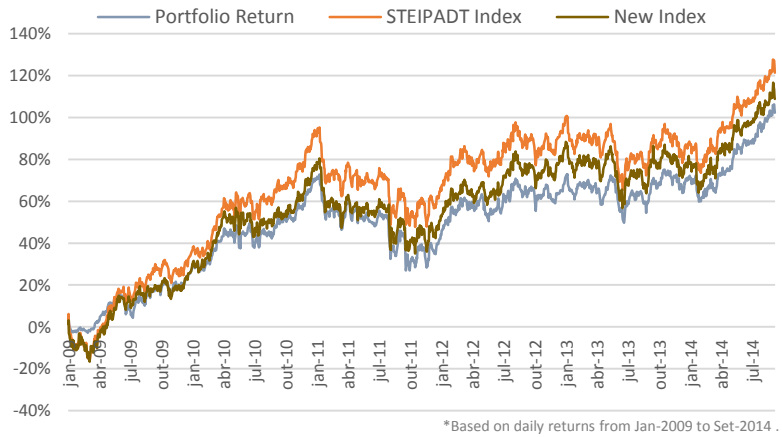


*Average weights by country from Set-2010 to Set-2014 (quarterly data) .

Results

The **new benchmark tracks the S&P Pan Africa Index quite well** – the correlation of historical returns for the two indexes reaches 99.4%.
In fact, the actual portfolio seems to have a performance closer to the new benchmark relatively to the original benchmark (see graph below). This is mostly likely because the underweighting of the portfolio in South African stocks is less pronounced against the new benchmark (as the weight of this country is much higher in the STEIPADT Index).

Cumulative Return



*Based on daily returns from Jan-2009 to Set-2014 .

The correlation between the portfolio and the new benchmark is approximately 0.5% higher than the correlation with the official benchmark (98.71% vs 99.22%).

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