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EURO STOXX 50 CORPORATE BOND INDEX – THE GATEWAY TO CROSS- ASSET INVESTMENTS INTO EUROZONE BLUE-CHIPS

Dr. Jan-Carl Plagge, Head of Applied Research, STOXX Ltd.

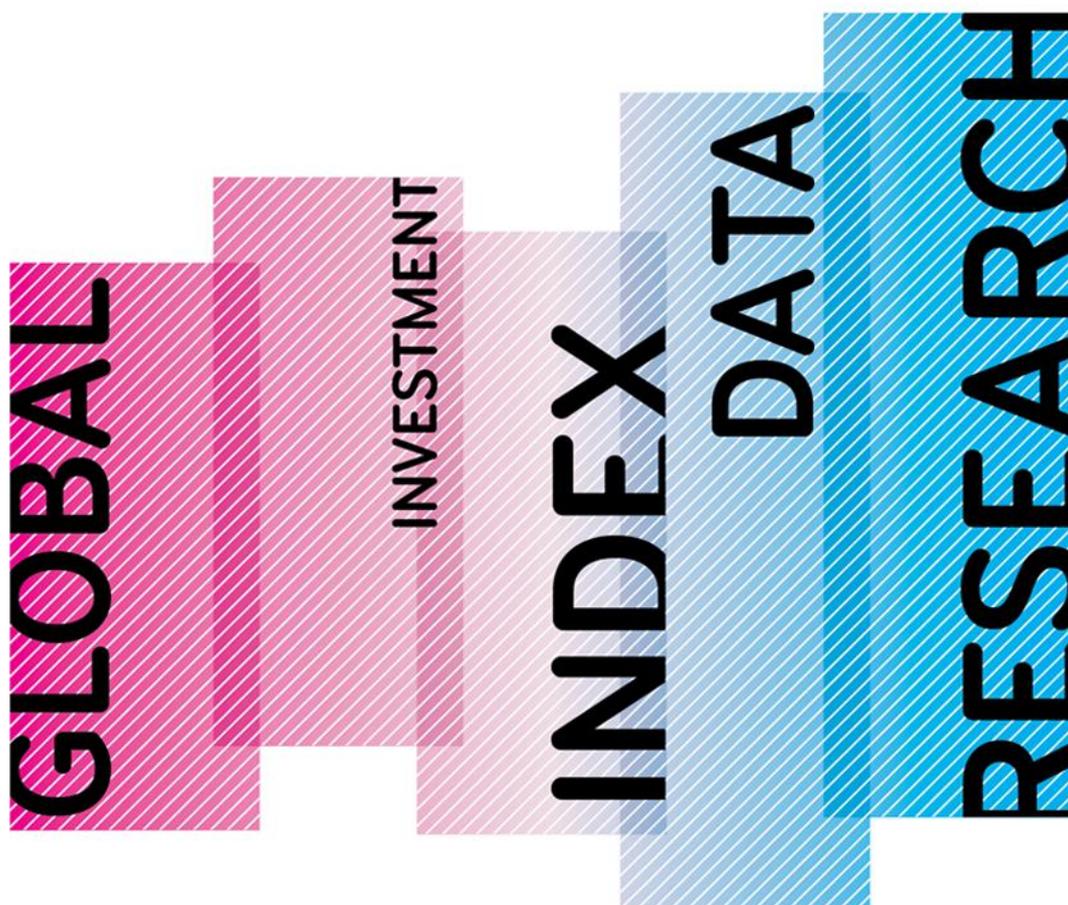


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Abstract

The EURO STOXX 50[®] Corporate Bond index allows market participants to invest into investment grade debt issued by key Eurozone blue-chip companies. The carefully defined index methodology hereby pays special attention to finding the right tradeoff between tradability and diversification across issuers as well as industries.

This paper provides a short introduction into the underlying index methodology before discussing the resulting index characteristics. Special focus lies on risk and return characteristics of the EURO STOXX 50[®] Corporate Bond index on a stand-alone basis as well as in a multi-asset context.

The empirical analysis shows that the index is highly efficient in terms of return generated per unit of risk taken. Measured since the index's base date in Dec 31, 2010, the return-risk ratio is about ten times that of the equity equivalent EURO STOXX 50[®]. The attractive risk-return profile of the EURO STOXX 50 Corporate Bond index as well as low correlations between equity and bonds issued by the underlying companies provides the grounds for cross-asset investments based on the EURO STOXX 50 Corporate Bond index and the EURO STOXX 50 index. Modelling various cross-asset allocations and investment horizons, we find that combinations of both indices offer investors the possibility to construct efficient portfolios according to their individual risk preferences.

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Index Methodology

The universe of the EURO STOXX 50 Corporate Bond index is defined by bonds issued by EURO STOXX 50 member companies, their respective corporate group and subsidiaries of both. All eligible corporate bonds must have a remaining time to maturity of at least 15 months measured from the respective re-balancing date to the maturity date and must have a minimum nominal amount outstanding of 750 million euro.¹ Only euro-denominated fixed and zero coupon bonds are included. A minimum consolidated bond rating of Investment Grade (BBB and higher) is required.

Unlike most of its competitors, the index aims at diversification not only on the issuer but also on the industry level. In that regard, issuers are capped at 20% while the aggregated weight of bonds from one industry is capped to 40%. In order to continuously review these limits and to assure a representative image of the market, the index is reviewed on a quarterly basis.

A further distinguishing feature of the index is its continuous calculation based on evaluated prices as provided by IDC (Interactive Data Corporation), a leading market data provider. The calculation hereby extends from 8:00am and 5:15pm CET.

Bonds within the index are weighted based on their market capitalization. The index is calculated real-time in euro price and total return versions.² Hereby, the calculation methodology of the index is in line with the standards laid down by the "European Federation of Financial Analysts Societies" (EFFAS).³

Index Characteristics

Given the range of selection criteria mentioned above, the EURO STOXX 50 Corporate Bond index currently includes 277 bonds from 33 issuers. In a historical context, the number of bonds and issuers has been rather stable with averages of 300 bonds and 40 issuers since Q1 2011.

Of significant interest for fixed-income investors is, of course, the quality of the bonds selected into the index. With this in mind, the EURO STOXX 50 Corporate Bond index includes only investment grade bonds. Over the course of the index's backtesting, we find that the average bond rating decreased slightly. While the weighted share of A-rated bonds remains quite stable with about 42%, we observe a decline of AAA-rated bonds from 32% in Q1 2011 to 10% in Q1 2006.⁴ Simultaneously, the share of BBB-rated bonds increases from 16% in Q1 2011 to 37% in Q1 2006. AA-rated bonds make up the smallest portion of the portfolio with a historical average of 7% (see Figure 1). The decline in the average rating may partially be explained by the steady decline in interest rates within the Eurozone observed over the past years. Hence, for a given coupon, companies do not need to issue debt with the highest possible standard in order to find an adequate number of investor as market participants are continuously searching for yield.

¹ This threshold with regard to time to maturity allows to keep index turnover at reasonable levels.

² Historical data is available from Dec. 31, 2010. The EURO STOXX 50 Corporate Bond index is reviewed quarterly in March, June, September and December.

³ For a detailed overview, see Brown (2002).

⁴ The bond rating is an aggregation of ratings taken from S&P and Moody's. Please refer to the STOXX Bond Index Guide for a description of the aggregation methodology.

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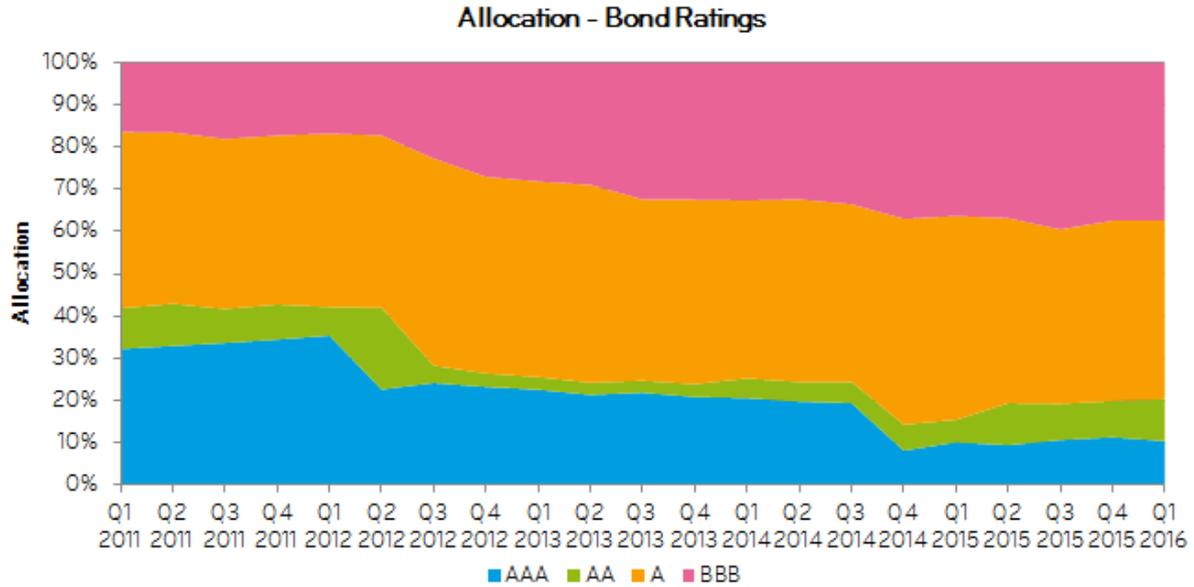


Figure 1: Historical allocation of Bond Ratings. Time period: Q1 2011 to Q1 2016.

Another important characteristic of the index is the average time to maturity as well as the resulting duration. Figure 2 provides the allocation of both dimensions for the current index composition.

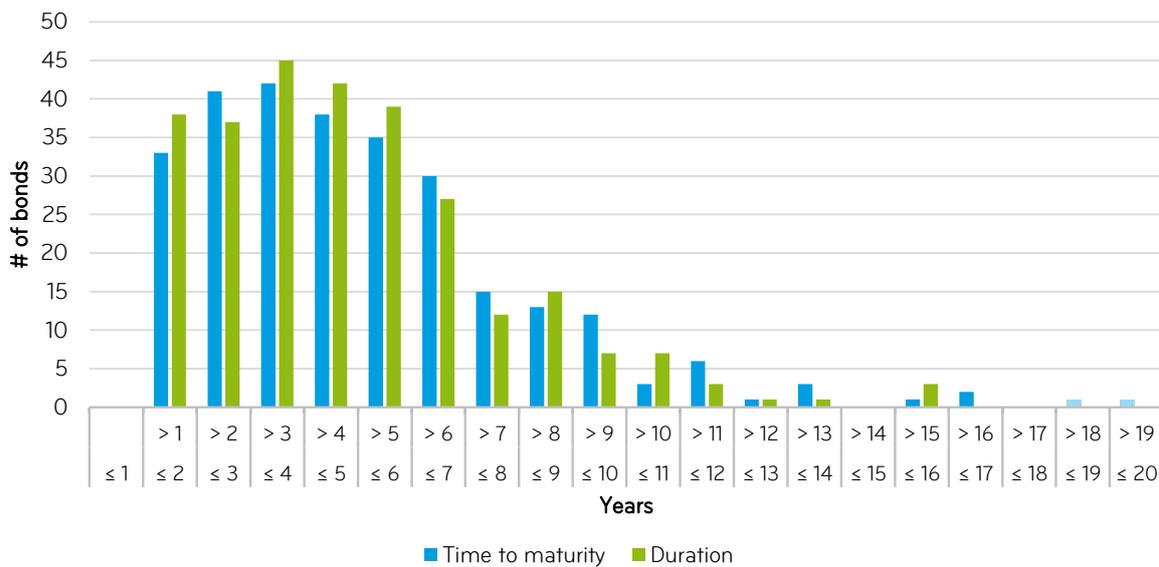


Figure 2: Distribution of the time to maturity as well as duration (in years) of bonds includes in the EURO STOXX 50 Corporate Bond index. Cut-off date: Apr. 15, 2016.

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We find a right-skewed distribution for both, time to maturity as well as duration with peaks at a period of 3 to 4 years. With a capitalization weighted average of 5.03 years, the duration of the index is by about 6 months shorter than the weighted time-to maturity with 5.5 years.⁵

At this point, it is important to briefly discuss the concept of duration. Duration is a measure of time, usually given in years, which tells us the length of the investment horizon at which two opposing effects on bond prices, as they arise from interest rate changes, the “final value change risk” as well as the “market value change risk”, neutralize each other.⁶ In case an investor’s investment horizon is equal to a bond-portfolio’s duration, in our case this would be 5.5 years, he would be immune towards effects of interest rate changes on the future value of the portfolio. In case an investor’s investment horizon is longer (shorter) than the portfolio’s duration, an increase in interest rates would lead to an increase (decrease) in the expected value at the end of the investment period. Thus, if investors with an investment horizon of more than 5.5 years would experience an additional positive return if the currently historically low interest rates are found to increase and vice versa.

Another important characteristic of the index, even though its link to the valuation of bonds is not as imminent as that of the duration, is the industry allocation. As mentioned above, the EURO STOXX 50 Corporate Bond index controls for industry exposures in order to prevent single industries from dominating the index. Due to the tendency of banks to be heavily leveraged, we find the Financials sector to be the most dominant in the EURO STOXX 50 Corporate Bond index. Table 1 provides the historical industry allocation.

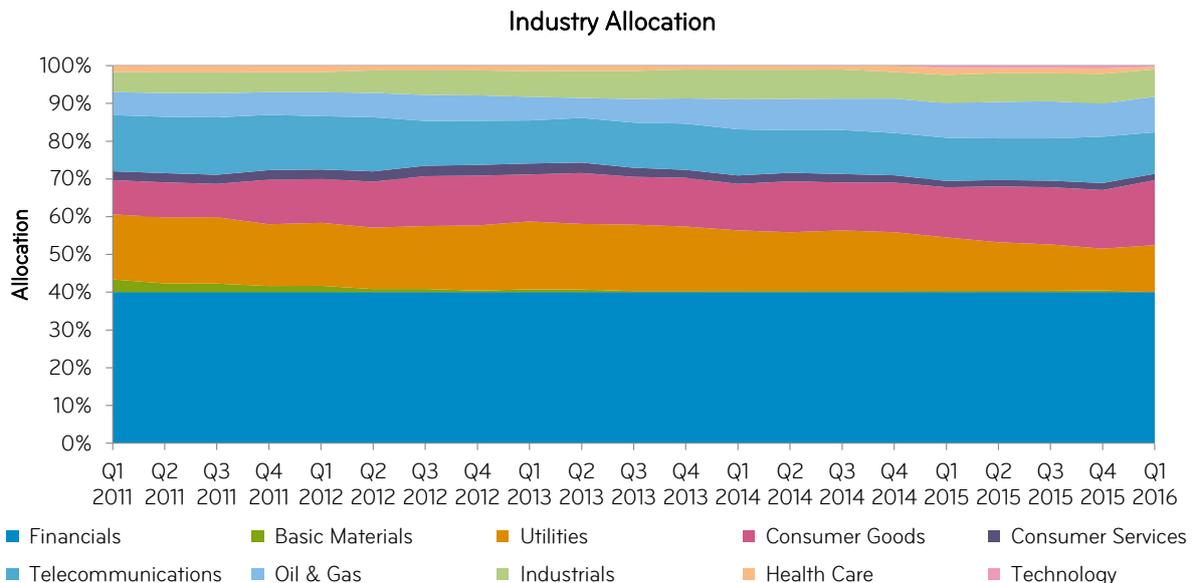


Figure 3: Historical industry allocation of EURO STOXX 50 Corporate Bond index. Time period: Q1 2011 to Q1 2016.

⁵ Cut-off date: Apr. 15, 2016.

⁶ The „final value change risk“ hereby refers to the risk that interest rates decrease at a future point in time. Hence, coupons can only be reinvested at lower rates which decreases the value of the investment at the end of the investment horizon. The “market value change risk” refers to the future value of the bond. A decrease in interest rates decreases the attractiveness of the “opportunity” to the bond which increases its value. Thus, both risks have an offsetting effect.

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In fact, the Financials sector has been subject to the defined sector cap of 40% throughout the entire historical period observed. The remaining 60% of the index is split among issuers from the remaining nine ICB industries with the issuers from the Consumer Goods and Utilities sectors currently ranking on two and three with weights of 12% and 17% respectively.⁷ In light of crises such as the global financial crisis, controlling for industry exposures makes intuitive sense as it mitigate the index's dependency on single industries in case of industry wide shocks.

Among countries, no domination comparable to that of the Financials sector is observable. France is the most heavily weighted country with about 30%, followed by the Netherlands (21%) and Spain (16%). As displayed in Figure 4, country allocations have, similar to industry allocations, been rather stable over the historical time period observed.

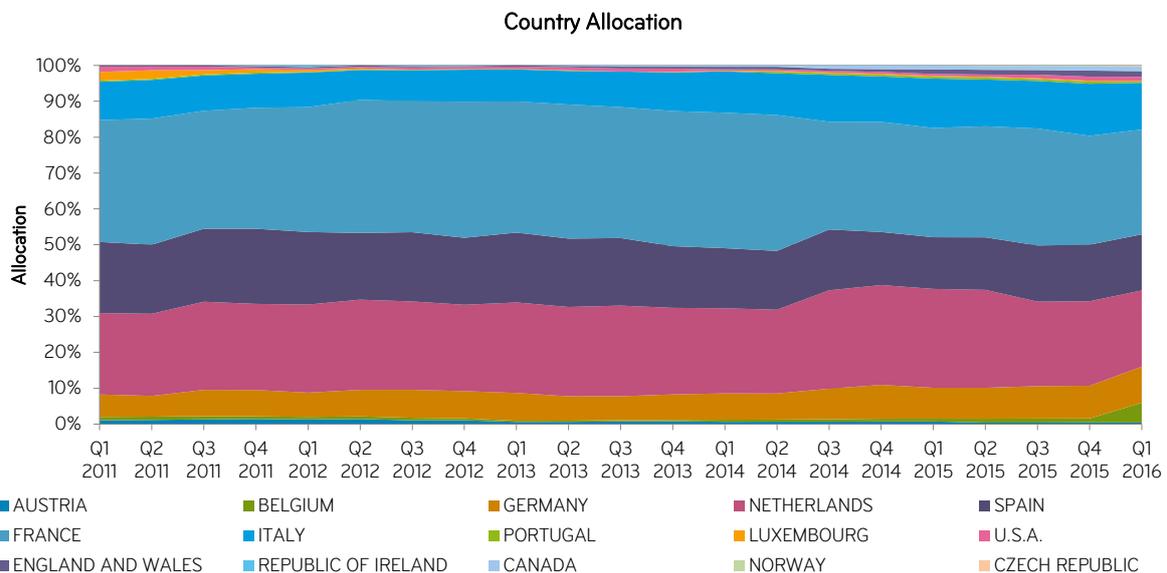


Figure 4: Historical country allocation of EURO STOXX 50 Corporate Bond index. Time period: Q1 2011 to Q1 2016.

Risk and Return Analysis

Stand-alone basis

The EURO STOXX 50 Corporate Bond index provides very compelling risk and return characteristics.⁸ Since its based date in 31 Dec., 2010, the index yielded a total return of 30.5%, achieved with a volatility of 21.8%. This figure is even more impressive when comparing it to the performance of an alternative investment into the "equity side" of the EURO STOXX 50 which would have yielded about the same return with 30.1% but has done so with a total risk which is nine-times higher than that of its bond equivalent. Thus, especially on a risk adjusted basis, the EURO STOXX 50 Corporate Bond index generated results unmatched by the opportunity of an equity investment. This is also captured by its

⁷ Industry allocations are based on cut-off date 31 March, 2016.

⁸ As investors who consider an investment into fixed income typically do so for the harvesting of coupons, the analysis focuses on the Total Return rather than on the price return version of the EURO STOXX 50 Corporate Bond index.

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Sharpe Ratio of 2.3, which is by a factor of 10.6 higher than that of the EURO STOXX 50 index (0.2) measured over the last 5 years (please refer to Table 1 for additional performance measures).

	ESTOXX 50 Corporate Bond Index	ESTOXX 50 Index
Return 1y (ann.)	0.99%	-16.04%
Return 3y (ann.)	4.08%	8.44%
Return 5y (ann.)	5.55%	4.84%
Return Overall	30.38%	32.42%
Volatility 1y (ann.)	1.04%	24.78%
Volatility 3y (ann.)	2.01%	19.80%
Volatility 5y (ann.)	2.38%	21.97%
Volatility Overall	2.40%	21.75%
Sharpe Ratio 1y	1.06	-0.64
Sharpe Ratio 3y	2.03	0.43
Sharpe Ratio 5y	2.28	0.21
Maximum Drawdown	3.29%	32.70%

Table 1: Risk and return characteristics of EURO STOXX 50 Corporate Bond TR index as well as of EURO STOXX 50 GR index measured in EUR. Volatility measures are based on daily logarithmic returns. Base date: Dec. 31, 2010, cut-off date: Mar. 31, 2016.

The graphical representation of the historical performance of the EURO STOXX 50 Corporate Bond index (see Figures 5 and 6) further shows the robustness of its returns over time. While the EURO STOXX 50 index significantly outperformed the EURO STOXX 50 Bonds index in the bull market of 2012 and 2013, it also experienced substantial losses especially in 2011 and in periods during 2015, with a maximum drawdown of about 33%. The EURO STOXX 50 Corporate Bond index, on the other hand, has a maximum drawdown of only 3.3% observed over the entire time period.

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Figure 5: Historical performance of EURO STOXX 50 Corporate Bond TR index and EURO STOXX 50 GR index in EUR. Time period: Dec. 31, 2010 to Mar. 31, 2016.

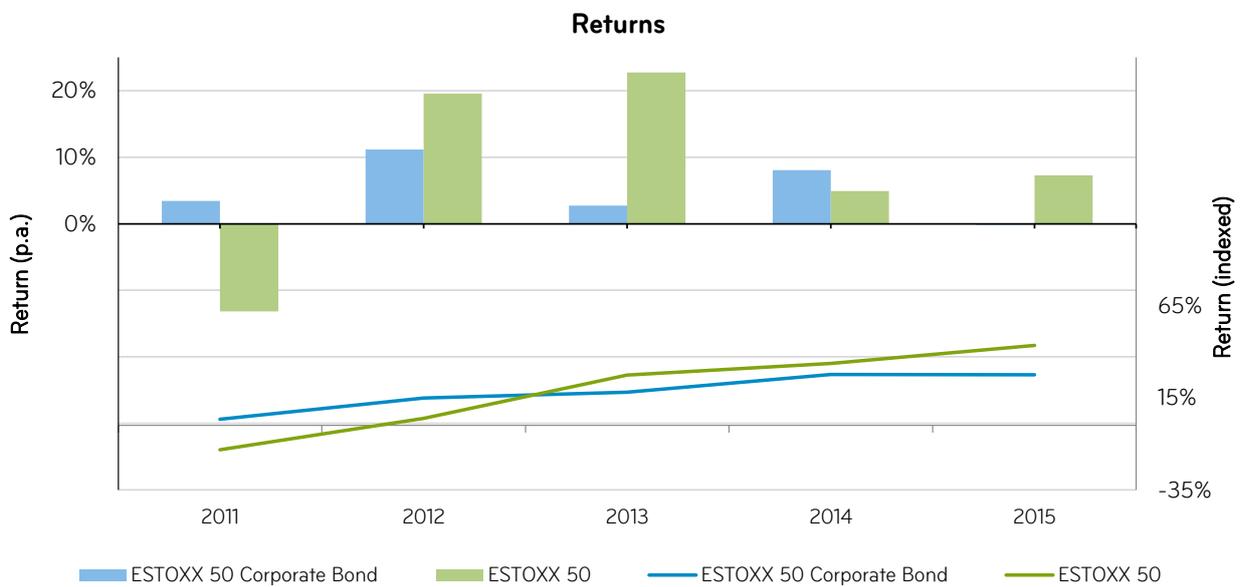


Figure 6: Annual performance of EURO STOXX 50 Corporate Bond TR index and EURO STOXX 50 GR index in EUR. Time period: 2010 to 2015.

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Multi-asset context

With very different risk characteristics, and a correlation between the EURO STOXX 50 Corporate Bond index and the EURO STOXX 50 index of just -0.26 , it makes intuitive sense to look into potential benefits as they may arise from a cross-asset allocation, i.e. from an investment in both indices. Figure 7 provides the position of combinations of both indices in a risk-return context. Hereby, chosen allocations move from the equity to the bond index in ten percentage point increments.⁹

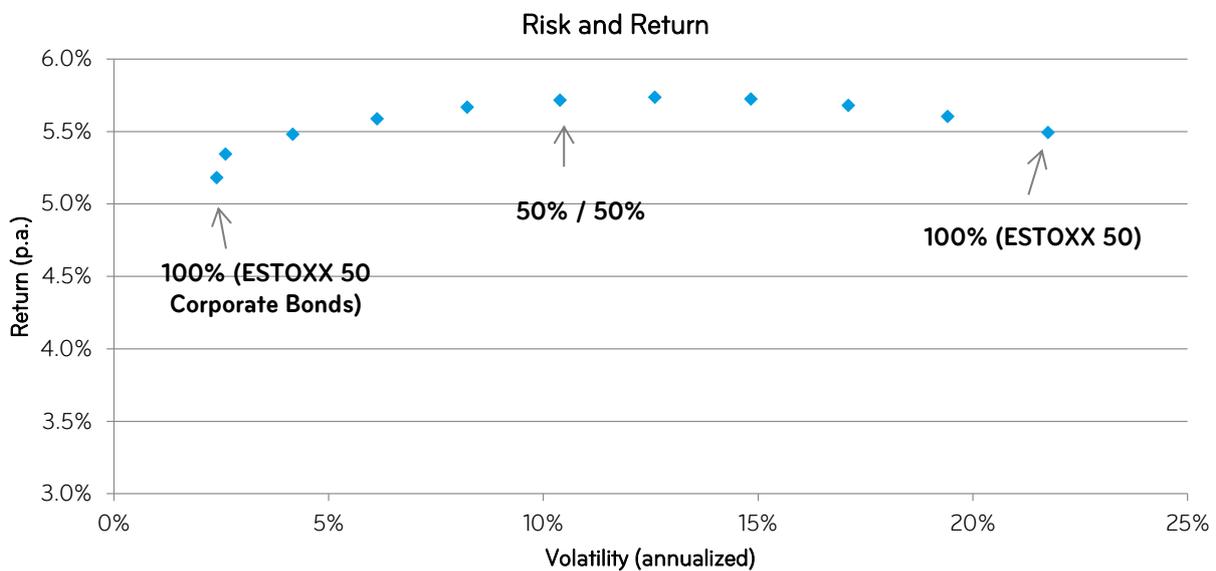


Figure 7: Combinations of EURO STOXX 50 Corporate Bond TR index and EURO STOXX 50 GR index (EUR) in a risk return context. Volatility is calculated based on daily logarithmic returns. Time period: Dec. 31, 2010 to Mar. 31, 2016.

Interestingly, we find that no “universally optimal” combination of both indices can be found. As we have seen above, the EURO STOXX 50 Corporate Bond index as well as the EURO STOXX 50 index yielded roughly the same total return over the entire time period observed. Since the EURO STOXX 50 Bonds index provided this return with a tenth of the EURO STOXX 50’s volatility, a successive substitution of fixed income by equity mainly substitutes high risk by low risk. Thus, an increase in equity seems, at a first glance, less persuasive.

In order to provide a fairer assessment of the benefits and drawbacks of a multi asset investment, we extend the analysis by modelling different investment horizons. Figure 8 provides median return figures of all eleven portfolio combinations (100% bonds / 0% equity to 0% bonds and 100% equity) for investment periods ranging from one year to five years. Hereby, medians are calculated over daily rolling forward looking returns of the corresponding length n with $n=1$ year to $n=5$ years.

⁹ Please note that the frontier is not a linear combination of the performance of the single indices as the allocations are rebalanced on a quarterly basis. The derived portfolios are rebalanced on a quarterly basis, i.e., the weights of the 50% / 50% allocation are reset every three months

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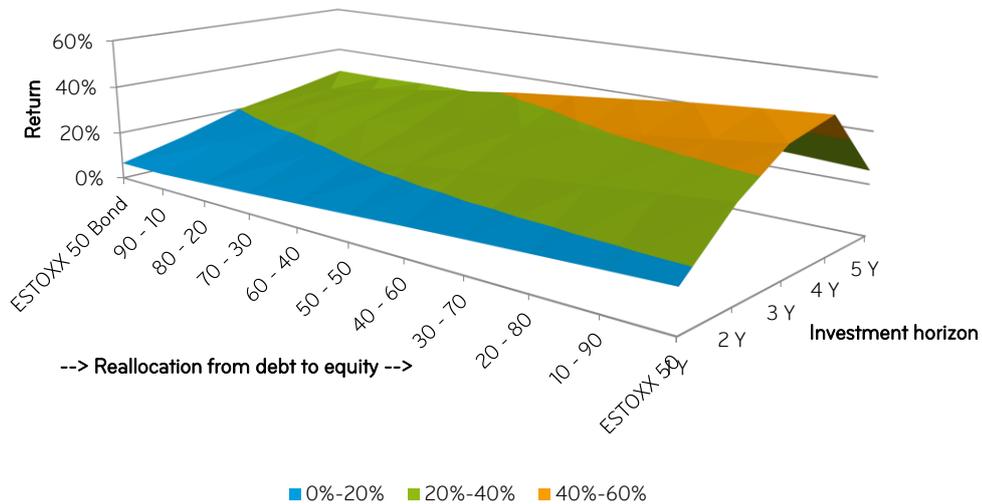


Figure 8: Median total return of combinations of EURO STOXX 50 Corporate Bond TR index in and EURO STOXX 50 GR index for investment horizons ranging from 1 year to 5 years. Returns are measured in EUR. Time period: Dec. 31, 2010 to Mar. 31, 2016.

As we can observe, a successive substitution of debt by equity would have, in median terms, led to an increase in total return. Further, it returns increased with an increase in the investment horizon when moving from $n=1$ year to $n=4$ years. Extending the horizon by another year, however, would have had a negative impact on returns. This observation is caused by the recent decrease in equity prices, i.e., an investor with a five year forward-looking horizon who invested in early 2011, would have suffered from severe losses in late 2015 and early 2016. Hence, he would have been better off, had he disinvested in early 2015 rather than holding on to the investment for another year. The return of an investment in bonds, on the other hand, was almost linear in the length of the investment horizon.

Following the same approach, Figure 9 provides median volatilities of the constructed portfolios, again for investment horizons ranging from $n=1$ year to $n=5$ years.

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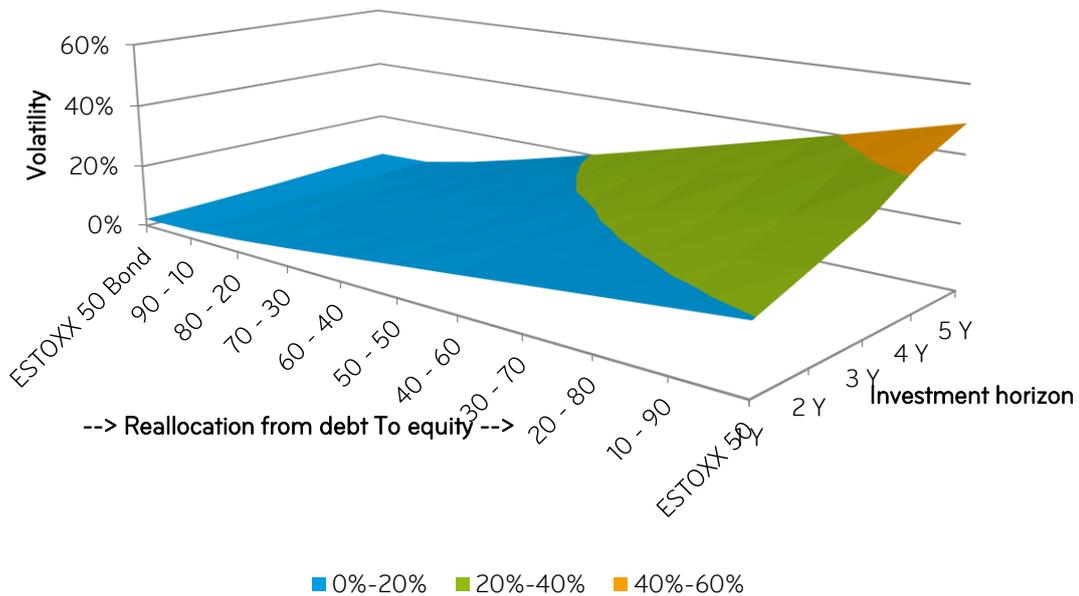


Figure 9: Median volatility of combinations of EURO STOXX 50 Corporate Bond TR index in and EURO STOXX 50 GR index for investment horizons ranging from 1 year to 5 years. Volatility is measured based on daily logarithmic EUR returns. Time period: Dec. 31, 2010 to Mar. 31, 2016.

With the volatility of the EURO STOXX 50 Corporate Bond index being just slightly above zero, the risk of portfolio combinations is found to increase almost linearly in the substitution of debt by equity when allocating more than 10% into equity. Allocating just 10% into equity, however, has barely an effect on median risk-levels of the cross-asset portfolio. Along the time dimension, risk grows by the square root of time when moving from a one year horizon to a 5 year horizon.

The observed increase in expected returns in risk, as it happens when moving from fixed income to equity, is in line with modern portfolio theory. Investors have, in median terms, been rewarded for taking on additional risk. The question now arises whether the compensation has been adequate. In order to investigate this question, we look at ratios of return and risk (see Figure 10).

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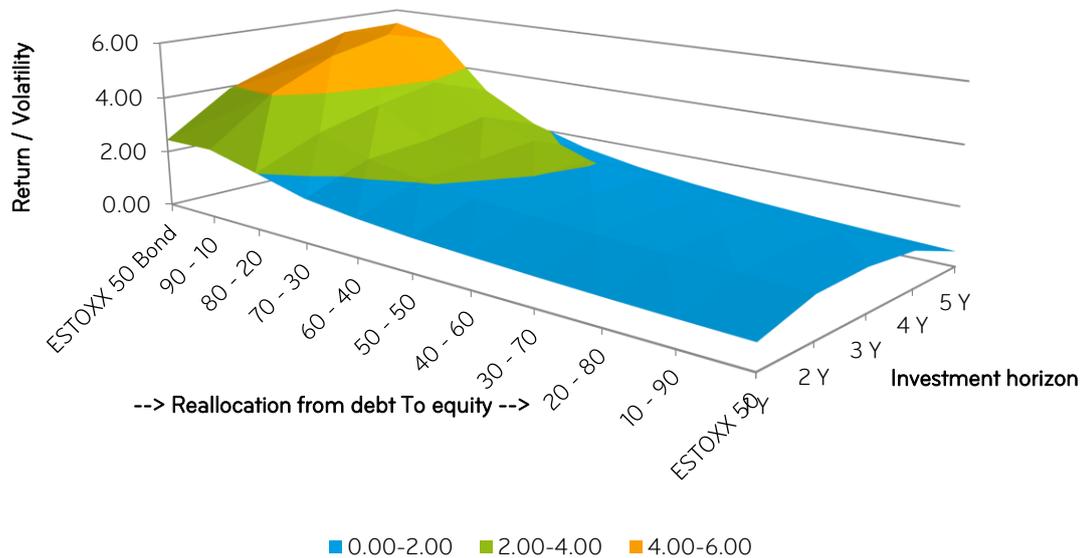


Figure 10: Median return-risk ratio of combinations of EURO STOXX 50 Corporate Bond TR index in and EURO STOXX 50 GR index for investment horizons ranging from 1 year to 5 years. Returns are measured in EUR. Volatility is measured based on daily logarithmic returns. Time period: Dec. 31, 2010 to Mar. 31, 2016.

The risk-return ratios display a rather bell curve graphically. When starting to substitute debt by equity, i.e. when moving further away from the EURO STOXX 50 Corporate Bond index into the EURO STOXX 50 index, the return per unit of risk taken decreases significantly up to a 50% / 50% allocation before the slope in the decrease slows down. This decreasing trend is partly due to the fact that when moving from debt to equity, median volatility figures increase with a much higher slope than volatility.

To summarize, the empirical analysis shows that median expected returns have mostly been higher for an investment into equity than debt. However, higher returns come along with higher risk. Given the observation that risk (σ) increases at higher rates than returns (r), the ratio of both, r / σ , decreases in a concave, i.e. bell-shaped manner. However, by investigating return-risk ratios, we cannot derive general conclusions about the portfolios' efficiencies. In an efficiency context, it is merely important to validate that investors are compensated for taking on additional risk.

When plotting the derived index combinations in a two-dimensional risk-return context, we find that, with the exception of holding periods of five years, the prediction of modern portfolio theory holds: taking on additional risk when substituting the EURO STOXX 50 Corporate Bonds index by the EURO STOXX 50 index is rewarded by additional return. Hence, any combination of the indices can be regarded as efficient. Which combination to choose is then subject to investors' individual risk preferences.

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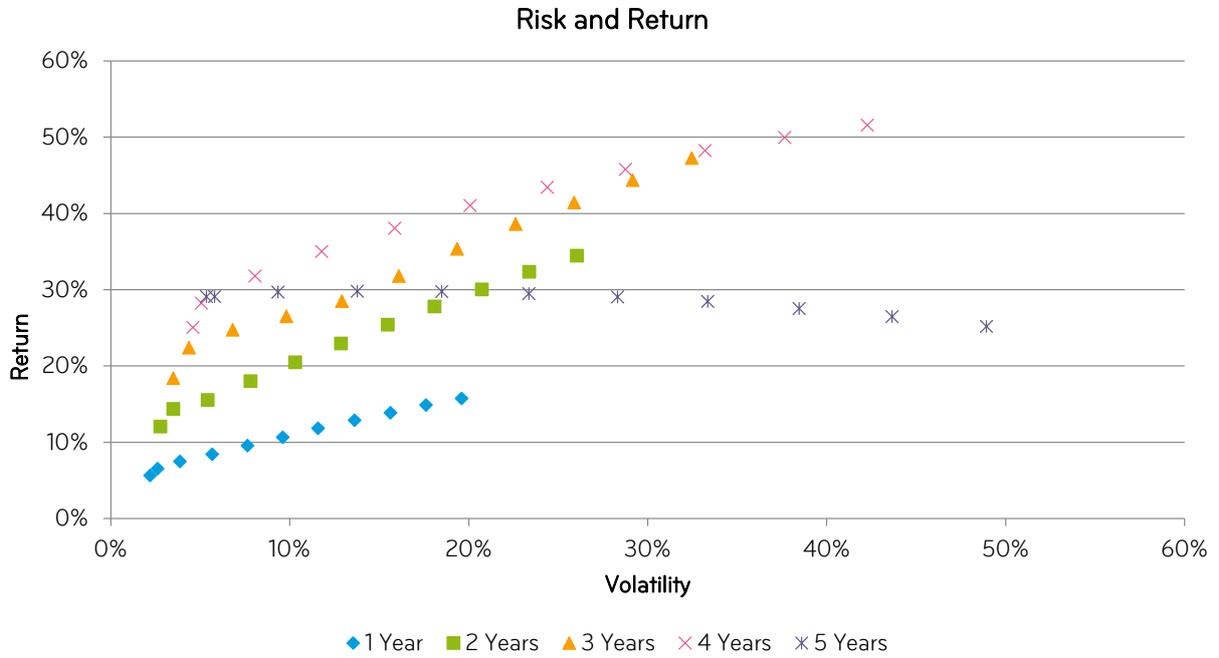


Figure 11: Combinations of EURO STOXX 50 Corporate Bond TR index and EURO STOXX 50 GR index (EUR) in a risk return context. Combinations are calculated based on median returns for time horizons ranging from 1 year to 5 years. Time period: Dec. 31, 2010 to Mar. 31, 2016

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Summary

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The empirical analysis shows that the index is highly efficient in terms of return generated per unit of risk taken. Measured since the index's base date in Dec 31, 2010, the return-risk ratio is about ten times that of the equity equivalent EURO STOXX 50. The attractive risk-return profile of the EURO STOXX 50 Corporate Bond index provides the grounds for cross-asset investments based on the EURO STOXX 50 Corporate Bond index and the EURO STOXX 50 index. Modelling various cross-asset allocations and investment horizons, we find that combinations of both indices offer investors the possibility to construct efficient portfolios according to their individual risk preferences.

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References

Brown, P.J. (2002). Constructing and Calculating Bond Indices – A Guide to the EFFAS European Bond Commission Standardized Rules. 2nd Edition.

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CONTACTS

Selnaustrasse 30
CH-8021 Zurich
P +41 (0)58 399 5300
stoxx@stoxx.com
www.stoxx.com

Frankfurt: +49 (0)69 211 13243
London: +44 (0)20 7862 7680
New York: +1 212 669 6426
Sydney: +61 2 9089 8844
Tokyo: +81 3 4578 6688

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