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Value investing across asset classes

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ABSTRACT

The objective of this study is to derive two long-only value risk premium multi-asset strategies, as well as naive investment strategies (equal weighted investment strategy and 60/40 portfolio) which are back tested out-of-sample and evaluated for the period from January 1995 to December 2015. The obtained results exhibit superior excess return for the absolute and relative value strategies compared to the naive investment strategies, and display more effective risk-reward ratios due to better distributed returns. However, the findings emphasise concurrently that the value investing strategies should be applied as a complementary portfolio instrument in the context of dynamic asset allocation due to value phase shifts to mitigate drawdown. Moreover, the overall statistical inference presents that the most influential determinants are interest rate related factors like the inflation rate and macro-economic driven variables, such as the I.S.M. Composite Index and the oil price. The multivariate regression analysis also shows a strong dependency between the value strategy returns, stocks and commodities.

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1. Introduction

This article investigates the robustness of two different value investing strategies that are defined as the absolute value and relative value risk premium strategies in a multi-asset allocation context. Both strategies follow the basic concept of value investing by picking those assets that are undervalued relative to their own history or within the investment universe.

The value effect for stock selection has been studied widely, but relatively low attention has been paid to value investing in the context of a multi-asset allocation combined with absolute and relative risk premium strategies. The contribution of this study is that the different multivariate regression analyses highlight the strong dependence of macro-economic and interest rate sensitive related factors, whereby the largest portfolio weights in both risk premium portfolios are allocated in equities. Thus, the asset allocation and regression analysis indicate strong asset allocation

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ability in a multi-asset context of both value premia strategies, considering that the value strategies increase exposure to risky asset classes during economic stress phases in which the risk premium is highest and investor sentiment is low.

The main goal of this work is to provide an in-depth analysis of the outperformance or underperformance of absolute and relative risk premium strategies in comparison with two naive investment strategies with a performance and risk analysis and also how the absolute and relative value strategy can be disentangled with respect to macro-economic, financial markets and risk specific determinants of different market regimes. Thus, the work examines the usefulness of two simple value risk premium strategies compared to the traditional equal weighted and strategic weighted portfolio (60/40 portfolio) through regime investing from the perspective of a long-term multi-asset investor.

The rest of the article is organised as follows: Section 2 reviews previous work and provides a theoretical framework, Section 3 presents the data and methodology employed, Section 4 presents the results, and Section 5 provides the conclusions.

2. Theoretical framework

The initial foundations of value investing were established by Graham and Dodd (1934) in their book *Security Analysis*. Following this book, Stattman (1980), as well as Rosenberg, Reid, and Lanstein (1985) demonstrated that low price-to-earnings (P/E) ratios generate superior positive returns in the long-term. These studies provide the most frequently discussed explanation for the outperformance of certain stocks (Hammond, Leibowitz, & Siegel, 2001). Fama and French (2012) found consistent risk premia in individual stocks. Fama and French (1996) documented the link between value and expected stock returns, while Gerakos and Linnainmaa (2012) showed the high correlations between past returns and the book value of stocks. Barberis, Shleifer, and Vishny (1998), as well as Hong and Stein (1999), investigated the under-reaction phenomenon and justified capital market inefficiencies with short-term under-reaction of market participants when processing information. Lakonishok, Shleifer, and Vishny (1994) demonstrated similar results based on the cash-flow-to-price ratio. Basu (1977) referred to the P/E ratio anomaly by observing that stocks with low P/E ratios outperform stocks with high P/E ratios. Litzenberger and Ramaswamy (1979) discovered a strong positive relationship between dividend yields (D.Y.) and expected returns of common stocks. Asness, Ilmanen, Israel, and Moskowitz (2015) concluded that value investing is most effective with multiple value variables. They also showed that securities revert to their fundamental fair values (mean-reversion), and that the success of the value premium can even exist in efficient markets.

Numerous studies have used different valuation metrics for stocks. The key figures in this context are D.Y. (Fama & French, 1989; Blitz & Vliet, 2008); P/E ratio and book-to-price ratio (Fama & French, 1992; Fama & French, 1993; Lakonishok et al., 1994). Cochrane (2011) showed that yield describing future returns is a 'pervasive phenomenon' and it has been applied by Leibowitz, Bova, and Kogelman (2014) to a range types of bonds. Fama and French (1998) identified that returns on equity are well forecasted using D.Y. Value effects in a multi-asset context have also been found for commodities, bonds and currencies. For commodities, the value effect was tested by Erb and Harvey (2006) and Richard and Krinsky (1995). Meese and Rogoff (1983), Rogoff (1996) and Cheung, Chinn, and Pascual (2003) confirmed the previous observation for currencies, while Cochrane and Piazzesi (2005), Duffee (2002), Dai and Singleton (2002) as well as Ilmanen (1995) and Altman (1968) did the same for bonds.

In terms of commodities, the roll yield is predominantly used as the valuation metric. However, for bonds, the yield to maturity and traditional financial ratios such as E.B.I.T.D.A. and market value of its equity/total liabilities are the most used valuation measures. The real bond yield is also a possible value measurement. For currencies, valuation is assessed by using the difference between interest rates of the countries, as well as the purchasing power parity (P.P.T.). The deviation from P.P.T. is a possible value measurement as long as prices converge to P.P.T. (Israel & Moskowitz, 2012). Asness, Moskowitz, and Pedersen (2013) showed that there is a significant value premium in different asset classes and a high correlation between different value strategies. However, Zhang (2005) and Cochrane (1996), both proponents of the E.M.H., provided one explanation, which connects assets with low valuation to higher risk and this needs to be compensated with an excess return. Market participants are compensated with an appropriate risk premium, which is usually reflected in times of economic stress (Fama & French, 1992; Zhang, 2005). Campbell, Hilscher, and Szilagyi (2011) and also Novy-Marx (2012) argued that history shows different results, because of the high correlation between the value of a company and the reported profitability, which challenges the distress argument. Behavioural finance theory shows the link between long-term returns and book-to-market value measures, which was documented by Hirshleifer and Subrahmanyam (1998), as well as Hong and Stein (1999), and La Porta (1996).

In summary, according to Fama and French (1992, 1993) value strategies generate superior returns due to the increased underlying risk of value strategies. Lakonishok et al. (1994) and Haugen (1995) have identified that value strategies work because investors make systematic errors in their forecasts or because investors are uncomfortable with holding value stocks.

3. Value risk premia and naive investment strategies derivation

3.1. Sample data and back testing specification

The empirical back test is designed to meet the requirements of a global diversified multi-asset portfolio. Thus, the portfolios consist of an investment universe of eight assets, including equities (M.S.C.I. World; M.S.C.I. Emerging Markets), fixed income securities (U.S. Treasury Bonds), R.E.I.T.s (F.T.S.E. N.A.R.E.I.T.), commodities (Gold; S&P G.S.C.I.) and currencies (J.P.Y./U.S.D.; E.U.R./U.S.D.), which are the most liquid currencies. All data are denominated in U.S. dollars, whereby all indices are net total return indices. The data history ranges from December 1992 to December 2015. The back test period is sufficient as it contains a minimum of two business cycles. Thus, the monthly return time series R_i are computed with a discrete computed rate of return, with P_i; t as the price of asset i at time t, as follows:

$$R_i = \frac{P_{i,\ t}}{P_{i,\ t-1}} - 1 \tag{1}$$

The discrete compound rate of return starts in January 1995 and ends in December 2015. The *z-score* is computed with a starting lag length of 24 months, thus the gathered raw data ranges from December 1992 to acquire an observation back testing period of 20 years. All indices are net total return indices denominated in U.S. dollars. Moreover, the assets are easily tradable. For generating buy or sell signals by detecting whether an asset is undervalued or overvalued, the following value factor metrics are used (also known as value risk premia): earnings yield for equities; D.Y. for real estates; yield to maturity for fixed income instruments; real exchange rate for currencies; rolling yield or treasury yield for commodities.

The trading signals detection for currency value risk premia are based on O.E.C.D. fair value real exchange rates. For equities, the earnings yield is the reciprocal value of the P/E ratio. The PE, the D.Y. and yield to maturity are sourced from Bloomberg and DataStream. The positive or negative roll yield for commodities is produced as a result of rolling future positions into new future positions. The O.E.C.D. valuation calculation for currencies uses the real effective exchange rate, which is compounded as follows:

$$REER_i = \sum_{j=1}^{n} \tau_j * RER_j \tag{2}$$

where the real effective exchange rate, *REER*, for country *i* is the sum of trade weighted, τ_j, real exchange rate (*RER*) for the trade partner in country *j*. The exchange rates are in natural logarithms. The real exchange rate (*RER*) for country *j* is an adjustment of nominal bilateral exchange rates (*NER*) with domestic price (*DP*) and foreign prices (*FP*) calculated as follows:

$$RER_j = NER_j * \frac{FP_j}{DP_j} \tag{3}$$

The price earnings ratios, *PE*, of index *i* are defined as the sum of index shares weighted average price earnings ratio, in which *S* is the weight factor for index shares, *P* is the price of the index *i* and 12*M FWD EPS* is the 12-month-forward earnings for the index *i*, calculated as follows:

$$PE_i = \frac{\sum_{i=1}^{n} S_i * P_i}{\sum_{i=1}^{n} S_i * 12M\ \ FWD\ \ EPS_i} \tag{4}$$

where the 12-month forward *EPS (EPS1FD12)* is calculated as follows:

$$EPS1FD12 = \frac{((M * F1) +\ \ ((12-M)*F2))}{2} \tag{5}$$

where *M* is the number of months to the end of the current fiscal year. Note that the current fiscal year will be *FY1* if the date is before *FY1* year end and *FY2* if the date is after *FY1* year end. *F1* is the consensus earnings forecast for the current fiscal year and *F2* is the consensus earnings forecast for the next fiscal year.

The dividend yield, *DY* for index *i* is calculated as the index shares weighted average dividend per share price ratio, in which *S* is the weight factor for index shares, *P* is the price of the index *i* in the denominator and $12M\ DVD/Share$ is the gross dividend per share over the prior *12* months for the index *i*, calculated as follows:[1]

$$DY_i = \frac{\sum_{i=1}^{n} S_i * 12M\ DVD/Share_i}{\sum_{i=1}^{n} S_i * P_i} \tag{6}$$

The commodity roll yield, *CRY* for index *i* is the difference of the calculated *R*, discrete returns of the commodity excess return index *i* and the commodity spot index *i*, defined as:

$$CRY_i = R_{i,excess} - R_{i,spot} \tag{7}$$

Then, the return of the excess return index is the sum of the change in spot price and the roll yield. Gold is a hedge instrument against inflation and the government bond yield is directly affected by changes in interest rates based on changes in inflation. Thus, the U.S. treasury yield is defined as the value factor for gold.

3.2. Value risk premia and naive investment strategies

The most comprehensive measure to quantify, identify and select undervalued assets in the investment universe is the standardisation of value risk premia with the aid of a *z-score*. A large positive (negative) *z-score* indicates that the asset is episodically expensive (cheap). Mathematically, the *z-score* for risk premium *i* is the difference between the current value of the risk premium, X_i, and the mean value of the risk premium, μ_i, divided by the standard deviation of the risk premium, σ_i, as follows:

$$z\text{-}score_i = \frac{X_i - \mu_i}{\sigma_i} \tag{8}$$

All computed *z-score* time-series for the absolute and relative value risk premia strategies are calculated with an extending window, starting with a minimum sample size of 24 months to compound the first sample mean and standard deviation. Additionally, both value risk premium portfolios are rebalanced at the beginning of every month according to the specific strategy signal generation at the end of the previous month, $t-1$.

3.2.1. Absolute value risk premium strategy

The absolute risk premium strategy selects those assets that are historically undervalued within a predetermined range of standardised yield movements. The risk premium *z-score* ranges from 0.0 to 1.5, which identifies those assets that are historically cheap based on the current high risk premium value for asset *i*. For example, for equities, this means concurrently that the current *PE* ratio is relatively low compared to its own history and evaluated with a high earnings yield. If there is no risk premium within the determined *z-score* range, the portfolio is fully invested in the money market, as follows:

$$\mathrm{w_{i,t}} := \begin{cases} \mathrm{w_{i,t}} = 0, \text{ if } \mathrm{Zscore_{i,t-1}} \le 0.0 \\ \mathrm{w_{i,t}} = \frac{1}{N}, \text{ if } 0.0 < \mathrm{Zscore_{i,t-1}} < 1.5 \\ \mathrm{w_{i,t}} = 0, \text{ if } \mathrm{Zscore_{i,t-1}} \ge 1.5 \end{cases} \tag{9}$$

If N, which is the number of assets selected from the investment universe, is zero, the strategy is invested fully in the money market. *N* can be a maximum of eight, which means that the whole investment universe is currently undervalued; where the weight, *w*, for asset *i* at the time *t* is a function of the calculated *z-score* value of the risk premium for asset *i* at time $t-1$ (out-of-sample), denoted as $Zscore_{i,t-1}$. Moreover, the portfolio weights are always equally allocated to the number of selected undervalued assets. The absolute value risk premium strategy portfolio return, $P(R)_{Abs.}$, is calculated as the sum of weighted asset returns of the selected assets.

$$\mathrm{P(R)_{Abs.}} = \sum_{i=1}^{n} \mathrm{w_i R_i} \tag{10}$$

where *w* is the weight for asset *i* and *R* is the return for asset *i*. Since the absolute value risk premium strategy does not take into account the preference of selected assets, the portfolio can be invested in all assets.

3.2.2. Relative value risk premium strategy

The relative risk premium strategy considers the cross-sectional examination of scaled yield movements by investing in the three assets that are most undervalued in comparison to the other assets in the investment universe. Thus, there is the preference to invest in the maximal three assets that are most undervalued in comparison. The weight, *w*, for the selected asset *i* at time *t* is fixed at one third, whereby the signal generation process always takes the three assets with the highest cross *z-score* values, denoted as $CrossZscore_{i_{Rank\ 1-3},t-1}$, without taking into account the overall *z-score* level. This implies that *N* is always equal to three assets, as follows:

$$\mathrm{w_{i,t}} = \begin{cases} \mathrm{w_{i,t}} = 0, \text{ if } \mathrm{CrossZscore_{i,t-1}} \neq \max(\mathrm{CorssZscore_{i_{Rank\ 1-3},t-1}}) \\ \mathrm{w_{i,t}} = \frac{1}{3}, \text{ if } \mathrm{CrossZscore_{i,t-1}} = \max(\mathrm{CrossZscore_{i_{Rank\ 1-3},t-1}}) \end{cases} \tag{11}$$

where the $CrossZscore_{i,t-1}$is the *z-score* cross, the calculated *z-score* of risk premiums at time *t*. The relative value risk premium strategy portfolio return, $P(R)_{Rel.}$, is also calculated as the sum of the weighted asset returns of the selected assets *i*, as follows:

$$\mathrm{P(R)_{Rel.}} = \sum_{i=1}^{n} \mathrm{w_i R_i} \tag{12}$$

where *w* is the weight for asset *i* and *R* is the return for asset *i*.

3.2.3. Naive investment strategies

For comparison reasons, there are two naive investment strategies. The first naive investment strategy is the equal weighted investment strategy, which allocates the weights of asset *i* in the portfolio equally. Since the investment universe includes eight assets, the single *w* is the weight for asset *i* and it is 12.5% over time, as follows:

$$w_i = \frac{1}{8} \tag{13}$$

The equal weighted strategy portfolio return, $P(R)_{Equ.}$ is also calculated as the sum of the weighted asset returns of assets *i*, as follows:

$$P(R)_{Equ.} \; = \; \sum_{i=1}^{8} \frac{1}{8} * R_i \tag{14}$$

where *R* is the return for asset *i*. The strategic weighted strategy portfolio return, $P(R)_{Strat.}$, is also calculated as the sum of the weighted asset returns of assets *i*, as follows:

$$P(R)_{Strat.} \; = \frac{3}{5} * R_{MSCI\ \ World} + \frac{2}{5} * R_{US\ \ Treas.} \tag{15}$$

where $R_{MSCI\ \ World}$ is the return for of M.S.C.I. World and $R_{US\ \ Treas.}$ is the yield for of US Treasury Bonds. The strategic weighted investment strategy has a static strategic allocation of 60 percent in equities (MSCI World) and 40 percent in fixed income securities (U.S. Treasury Bonds).

3.2.4. Performance and risk measurements

The first risk-adjusted measure is Jensen's Alpha (also known as *ex post* alpha) that estimates how much the strategy risk premium forecasting ability contributes to the strategy returns. The formula is as follows:

$$\text{Jensen's Alpha} = R_F + \beta_i E(R_M) - R_F \tag{16}$$

where R_F is the one-period risk free interest rate, $\beta_i E(R_M) - R_F$ is the Capital asset pricing model, β_i is the measure of risk as the systematic measure and $E(R_M)$ is the expected one-period return on the market portfolio that consists of an investment in each asset in the market in proportion to its fraction of the total value of all assets in the market.

The maximum drawdown (M.D.D.) in percentage is calculated to determine which of the strategies suffers the greatest loss. The M.D.D. is computed as follows:

$$MDD_i = Max_{i,t' e(0,T)} \left[Max_{i,t' e(0,T)} \left(\frac{P_{i,t} - P_{i,t'}}{P_{i,t}} \right) \right] \tag{17}$$

where $Max_{i,t' e(0,T)}$ is the largest drop of the price from the running maximum up to time *T*, $P_{i,t}$ is the price of the portfolio *i* at time *t*, when the portfolio is bought, and $P_{i,t'}$ is the price of the portfolio *i* at the time *t'*, when the portfolio is sold. Besides volatility, the second widely adopted risk measure is the Value at Risk (VAR) and the related Conditional Value at Risk (*CVaR*). The historical *VaR* is calculated as follows:

$$\text{Hist. VaR} = \text{N} * \sigma * \sqrt{\text{Days}} * \text{Portfolio Value} \tag{18}$$

with N as the number of standard deviations, which depends on the specified confidence level. Furthermore, σ is the estimated daily standard deviation expressed as a proportion of price or value and $\sqrt{Days}$ is the square root of the number of days used for the *VaR* analysis. The expected shortfall (E.S.), otherwise known as the Conditional Value at Risk *(CVaR),* is as an alternative risk tool to the *VaR* that is more sensitive for fat tail frequency distributions. *ES* is the integral of the *VaR* for a given confidence level:

$$\text{ES}_\alpha \text{ or } \text{CVaR}_\alpha(\text{X}) = \frac{1}{1-\alpha}\int_\alpha^1 \text{VaR}_\gamma(\text{X})\text{d}\gamma \tag{19}$$

with X as a random variable, α as the confidence level (for instance 1%), and $V\alpha R$ as the Value at Risk. One additional important risk measure is the Tracking Error, denoted as *TE,* which is formally the standard deviation of the difference among the portfolio relative to the benchmark. Hence, it is computed as the standard deviation of active returns, as follows:

$$\text{TE} = \sqrt{\frac{\sum_{i=1}^{n}(\text{R}_\text{P} - \text{R}_\text{B})^2}{\text{n}-1}} \tag{20}$$

with R_P as the return from the portfolio and R_B as the return from the benchmark, n is the number of periods. The compound performance and risk measurements are connected to the well-known Sharpe ratio and Information Ratio. The *ex post* Sharpe ratio is as follows:

$$\text{Sharpe ratio} = \frac{\text{R}_\text{P} - \text{R}_\text{F}}{\sigma_\text{P}} \tag{21}$$

with R_P as the portfolio return, R_F as the risk-free rate and σ_P as the standard deviation of the portfolio. Since the Sharpe ratio considers the portfolio volatility in the denominator, the Information ratio is used to quantify the excess return over the specific risk taken to the benchmark. Thus, the *ex post* Tracking Error *(TE)* is in the denominator as follows:

$$\text{Information ratio} = \frac{\text{R}_\text{P} - \text{R}_\text{F}}{\text{TE}} \tag{22}$$

3.3. Determinants of risk premium investment strategies

3.3.1. Binary market stress indicator and independent sample data

The binary market stress indicator is the mean of all z-score calculated indices that displays the market stress, which contains the following components:

1. The M.S.C.I. World Index that illustrates the equity market stress (also including a mean-reversion anchor character).
2. The City Eco Surprise G10 index represents the economic stress expected from market participants in G10 countries. This is an index that measures the degree of surprise in the release of global economic data with a daily frequency for the G10 countries.
3. The T.E.D. Spread is used to summarise the stress in financial markets. It is calculated as the gap between the three-month L.I.B.O.R. and the three-month Treasury bill rate.
4. The default risk with the credit conditions is measured by the credit spread between Baa rated corporate bonds and U.S. Treasury bonds..
5. The V.I.X. index shows the implied risk expected by the S&P 500 market. For all gathered data, the z-score with an extending window is calculated. In phases of market stress, the binary indicator switches from 1 to 0, and vice versa. Thus, an indicator value of one means there is no market stress measured by the mean of the *z-scores* of the underlying components at that time *t*. The observation period ranges from 2001 to the end of 2015.

3.3.2. Estimation models and market regimes

The different estimation models and statistical inference analyses extend the previous robustness investigation to consider the possible impact of macroeconomic and capital market determinants of previous back tested risk premium strategies. One group is formed with macroeconomic factors, the second group with financial market factors and the third one with risk specific factors. The first estimation model with macro-economic factors, $R_{i,macro}$, is as follows:

$$\mathrm{R_{i,macro}} = \alpha_{\mathrm{i}} + \beta_{\mathrm{UTS}} * \mathrm{K_{UTS}} + \beta_{\mathrm{UI}} * \mathrm{K_{UI}} + \beta_{\mathrm{ISM}} * \mathrm{K_{ISM}} + \beta_{\mathrm{CEU}} * \mathrm{K_{CEU}} + \beta_{\mathrm{OPR}} * \mathrm{K_{OPR}} + \beta_{\mathrm{EURI}} * \mathrm{K_{EURI}} + \varepsilon_{\mathrm{i,macro}} \tag{23}$$

Moreover, the second regression model, $R_{i,market}$, contains the financial market factors as independent variables to determine the most significant exogenous variables that explain the risk premium portfolio returns according to the different asset classes, as follows:

$$\mathrm{R_{i,market}} = \alpha_{\mathrm{i}} + \beta_{\mathrm{MSCIW}} * \mathrm{L_{MSCIW}} + \beta_{\mathrm{USB}} * \mathrm{L_{USB}} + \beta_{\mathrm{UI}} * \mathrm{L_{UI}} + \beta_{\mathrm{CGPCI}} * \mathrm{L_{CGPCI}} + \beta_{\mathrm{CEU}} * \mathrm{L_{CEU}} + \beta_{\mathrm{REIT}} * \mathrm{L_{REIT}} + \varepsilon_{\mathrm{i,market}} \tag{24}$$

Subsequently, the third multivariate estimation model incorporates the risk specific factors, $R_{i,risk}$, to examine whether the strategies react sensitively to turbulent markets, as follows:

$$\mathrm{R_{i,risk}} = \alpha_{\mathrm{i}} + \beta_{\mathrm{CESI}} * \mathrm{M_{CESI}} + \beta_{\mathrm{TEDS}} * \mathrm{M_{TEDS}} + \beta_{\mathrm{CBUST}} * \mathrm{M_{CBUST}} + \beta_{\mathrm{VIX}} * \mathrm{M_{VIX}} + \varepsilon_{\mathrm{i,risk}} \tag{25}$$

where R_i is the portfolio return of the value risk premium strategy *i* in time period *t*. The different factors *K* represent the different independent variables. The betas β_i are the factor loadings for strategy i on the factors K and describe the level of movement in strategy i as a result of a unit of movement in the different factors K (slope); α is a constant and is also referred to as the intercept of the regression line; ε_i is the strategy specific factor called the error term.

In detail, K_{UTS} is the U.S. Treasury yield curve. K_{UI} is the year on year U.S. C.P.I. inflation rate; K_{ISM} is the change in the I.S.M. composite index (I.S.M.), K_{CEU} is the change in the currency rate E.U.R./U.S.D.; K_{OPR} is the change in the oil price and; K_{EURI} is the risk-free yield in form of the money market yield. L_{MSCIW} is the change in the world stock market (MSCI World); L_{USB} is the US bond market (10-year US-Treasury) (USB); L_{UI} is the year over year change rate of the U.S. C.P.I. inflation rate (U.I.); L_{CGPCI} is the change in the gold price (G.P.) which is also used as well as the change in a broad commodities index (S&P G.S.C.I. Index) (C.G.P.C.I.); L_{CEU} is the change in the currency rate E.U.R./U.S.D. (C.E.U.); L_{REIT} is the real estate stocks (R.E.I.T.s Index) are used (R.E.I.T). M_{CESI} is the City Economic Surprise Index G10; M_{TEDS} is the T.E.D. Spread; M_{CBUST} is spread between Baa vs. U.S. Treasuries; M_{VIX} is V.I.X. Index.

The multivariate regression analysis for financial market factors and risk factors are also investigated for different market regimes by multiplying the different independent market variables with the market stress indicator value (binary: 1 or 0) for a stress(-free) market environment. Both conditions can be computed as follows:

$$\mathrm{IV}_{\mathrm{i},\ \mathrm{t,stress-free}} = \mathrm{BMSI}_{\mathrm{t}} *\ \mathrm{IV}_{\mathrm{i},\ \mathrm{t}} \tag{26}$$

and

$$\mathrm{IV}_{\mathrm{i},\ \mathrm{t,stress}} = (1-\mathrm{BMSI}_{\mathrm{t}}) *\ \mathrm{IV}_{\mathrm{i},\ \mathrm{t}} \tag{27}$$

with

$$\mathrm{IV}_{\mathrm{i},\ \mathrm{t}} = \left\{ \begin{matrix} \mathrm{L_{MSCIW}; L_{USB}; L_{UI}; L_{CGPCI}; L_{CEU}; L_{REIT};} \\ \mathrm{M_{CESI}; M_{TEDS}; M_{CBUST}; M_{VIX}} \end{matrix} \right\} \tag{28}$$

where $IV_{i,\ t,stress-free}$ is the independent variable i at time t in a market stress-free condition and $IV_{i,\ t,stress}$ is the independent variable i at time t in a market stress situation. $BMSI_t$ is the binary stress indicator index and $IV_{i,\ t}$ is the independent variable i at time t.

After computation of every independent variable for different market situations, there is an $\mathrm{N} \times \mathrm{M}$ matrix of independent variables, where N represents the number of observations and M is the number of market stress-free independent variables, denoted with plus, and market stress independent variables, denoted with minus. Therefore, every market situation can be investigated independently by regressing the matrix including all independent variables for different regimes towards the risk premium strategy portfolio returns.

The estimation model with market factors with different market regimes, $R_{i,market,\ regime}$, is as follows:

$$R_{i,market,regime} = \alpha_i + \beta_{MSCIW,stress}*L_{MSCIW,stress} + \beta_{USB,stress}*L_{USB,stress} + \beta_{UI,stress}*L_{UI,stress} + \beta_{CGPCI,stress}*L_{CGPCI,stress} + \beta_{CEU,stress}*L_{CEU,stress} + \beta_{REIT,stress}*L_{REIT,stress} + \beta_{MSCIW,\ stress-free}*L_{MSCIW,\ stress-free} + \beta_{USB,\ stress-free}*L_{USB,\ stress-free} + \beta_{UI,\ stress-free}*L_{UI,\ stress-free} + \beta_{CGPCI,\ stress-free}*L_{CGPCI,\ stress-free} + \beta_{CEU,\ stress-free}*L_{CEU,\ stress-free} + \beta_{REIT,\ stress-free}*L_{REIT,\ stress-free} + \varepsilon_{i,market,regime} \tag{29}$$

The estimation model for risk specific factors with different market regimes, $R_{i,risk,regime}$, is as follows:

$$R_{i,risk,regime} = \alpha_i + \beta_{CESI,stress}*M_{CESI,stress} + \beta_{TEDS,stress}*M_{TEDS,stress} + \beta_{CBUST,stress}*M_{CBUST,stress} + \beta_{VIX,stress}*M_{VIX,stress} + \beta_{CESI,\ stress-free}*M_{CESI,\ stress-free} + \beta_{TEDS,\ stress-free}*M_{TEDS,\ stress-free} + \beta_{CBUST,\ stress-free}*M_{CBUST,\ stress-free} + \beta_{VIX,\ stress-free}*M_{VIX,\ stress-free} + \varepsilon_{i,risk,regime} \tag{30}$$

4. Robustness of value risk premium investment strategies

Naive investment strategies (Table 1) show the highest degree of left skewness. Moreover, Figures 1–4 emphasise the strong leptokurtic shape of all return distributions. The absolute value risk premium strategy provides the largest kurtosis. The descriptive statistics clarify that the value risk premium strategy returns are better distributed compared to naive investment strategies, with less fat tails on the left side of the return distributions (Backhaus, Zhakanova, & Fiedler, 2016). In particular, the absolute value risk premium strategy provides evidence of consistent positive returns.

Additionally, Table 2 illustrates that the value risk premium investment strategies outperform all compared strategies over a period of 20 years. These findings are also confirmed by the average annualised total returns of 8.38% and 7.54%, respectively.

Table 1. Descriptive statistics of all strategies.

Descriptive statistic	Rel. Value Risk Premium	Abs. Value Risk Premium	Strategic Weighted	Equal Weighted
Number of observation	252	252	252	252
Minimum	−0.16672	−0.16890	−0.12126	−0.16444
Maximum	0.10115	0.13014	0.05824	0.09320
1. Quartile	−0.01207	−0.00862	−0.00809	−0.01182
3. Quartile	0.03119	0.02556	0.02402	0.01887
Mean	0.00748	0.00664	0.00539	0.00338
Median	0.00971	0.00686	0.00865	0.00463
Standard Error of the mean	0.00242	0.00210	0.00162	0.00174
Variance	0.00148	0.00111	0.00066	0.00077
Standard Deviation	0.03846	0.03335	0.02567	0.02766
Coefficient of Variation	5.14104	5.02532	4.76396	8.17529
Relative Coefficient of Variation	0.32386	0.31657	0.30010	0.51499
Skewness	−0.83472	−0.56345	−0.90267	−0.98211
Excess Kurtosis	2.27398	3.76266	2.18327	5.04655

Source: Authors.

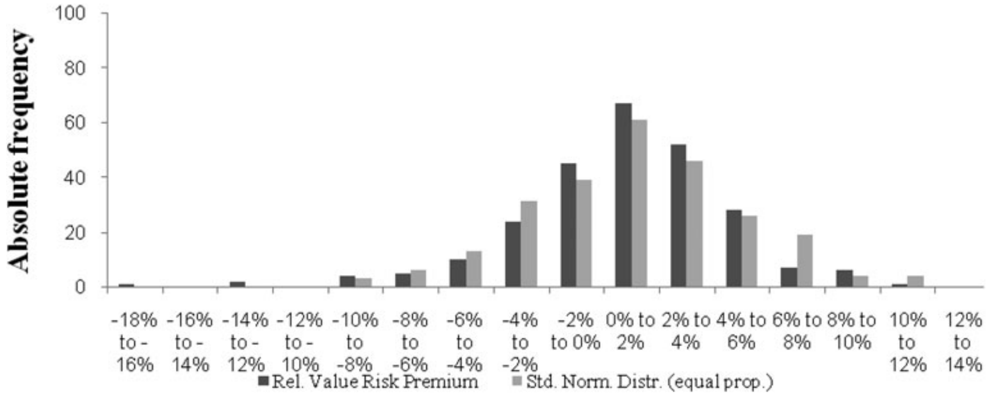

Figure 1. Return distribution of the relative value risk premium strategy. *Source*: Authors.

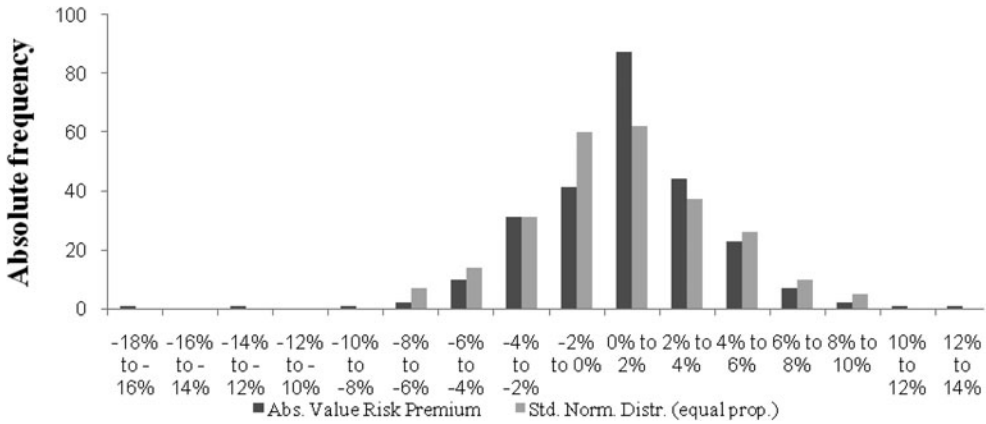

Figure 2. Return distribution of the absolute value risk premium strategy. *Source*: Authors.

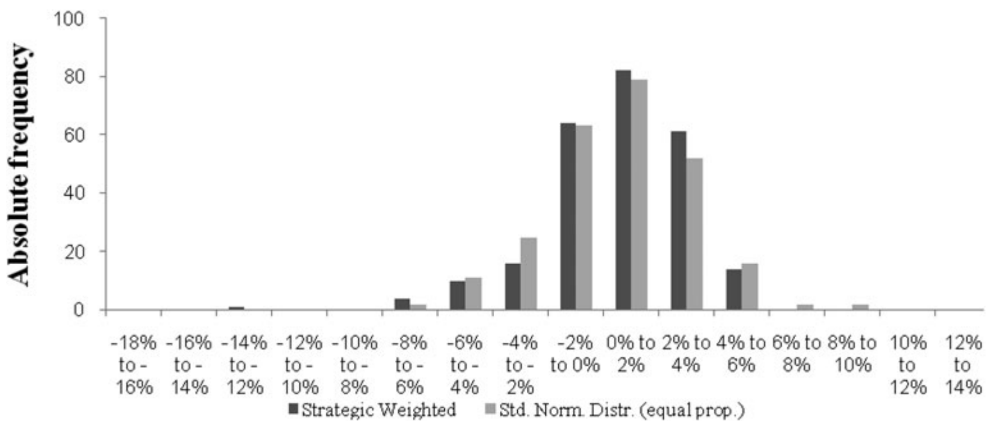

Figure 3. Return distribution of the strategic weighted strategy. *Source*: Authors.

Thus, on an average yearly basis, the relative and absolute value risk premium strategies outperformed the strategic weighted portfolio by 2.02% and 1.23%, and also generated annualised excess returns of 4.56% and 3.75% compared to the equal

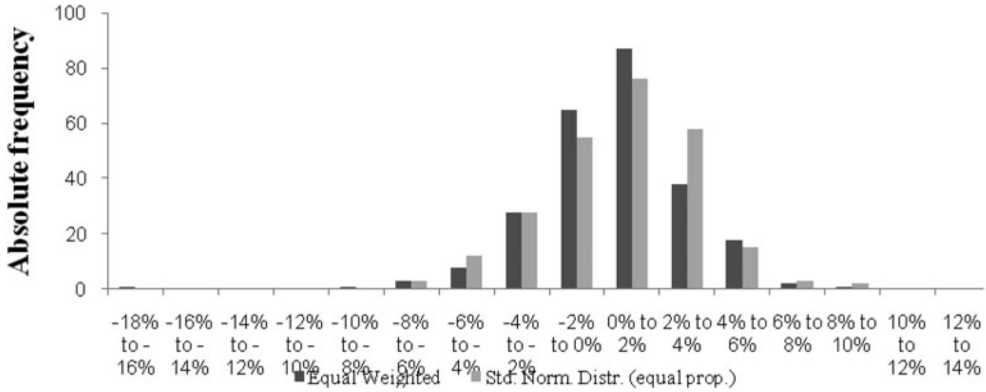

Figure 4. Return distribution of the equal weighted strategy. *Source*: Authors.

Table 2. Performance and risk summary.

Performance	Rel. Value Risk Premium	Abs. Value Risk Premium	Strategic Weighted	Equal Weighted
Jensen Alpha (MSCI World) in %	3.72	4.73	2.37	0.39
Cumulative Returns (from 1995 to 2015) in %	542.25	460.37	356.47	212.48
Hist. Annual Returns in %	8.38	7.54	6.24	3.65
Hist. Annual Excess Returns (Strategic Weighted) in %	2.02	1.23	0	−2.43
Hist. Annual Excess Returns (Equal Weighted) in %	4.56	3.75	2.49	0
Hist. Annual Excess Returns (MSCI World) in %	1.54	0.75	−0.47	−2.89
Risk				
Annualised Volatility in %	13.32	11.55	8.89	9.58
Beta (Strategic Weighted)	1.17	0.75	1	0.85
Beta (Equal Weighted)	1.24	0.94	0.73	1
Beta (MSCI World)	0.69	0.42	0.57	0.48
Hist. Var 99% in %	−11.03	−7.71	−6.9	−6.42
Hist. ES 99% in %	−14.25	−12.52	−8.76	−10.49
Ex post Tracking Error (Strategic Weighted) in %	8.43	9.72	0	6.04
Ex post Tracking Error (Equal Weighted) in %	6.39	7.31	6.04	0
Ex post Tracking Error (MSCI World) in %	9.45	13.11	6.7	9.96
Annualised Volatility/*Ex post* Tracking Error	1.41	0.88	1.33	0.96
Maximal Drawdown in %	39.68	32.15	34.17	35.3
Average Drawdown in %	6.2	5.13	3.78	6.04
Average Drawdown length in months	7	7	6	10
Date of Max. Drawdown	27.02.09	31.10.08	27.02.09	27.02.09
Performance and Risk ratios				
Sharpe Ratio	0.63	0.65	0.70	0.38
Information Ratio	0.17	0.06	−0.07	−0.31

Source: Authors.

weighted portfolio (Backhaus & Isiksal, 2016) and 1.54 and 0.75 compared to the M.S.C.I. World index, which confirms the previous findings of the return distribution.

The largest return of the relative value risk premium strategy could be generated before the financial crisis from year 2006 to 2008 by mainly investing in stocks (M.S.C.I. World and M.S.C.I. Emerging Markets) and gold. The weightings (Figure 5) prove that the preference of undervalued markets is relatively stable over time by mainly investing in stocks and gold. Only when gold was relatively overvalued did the dollar represent a preferred portfolio weight. In particular, during the subprime

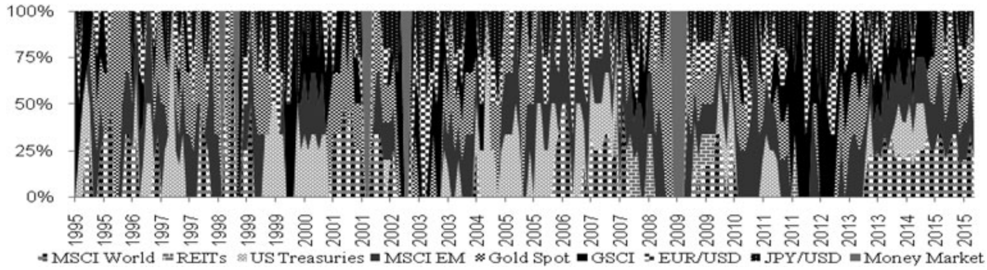

Figure 5. Absolute value risk premia strategy – weightings. *Source*: Authors.

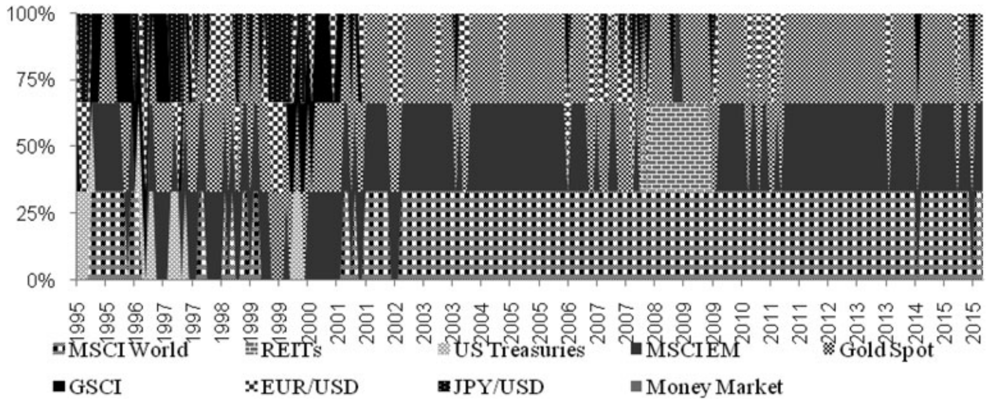

Figure 6. Relative value risk premia strategy – weightings. *Source*: Authors.

crises, the R.E.I.T.s were undervalued and, thus, would have had a major weight in the portfolio.

Figure 6 shows that the portfolio is better diversified than the other value risk premium strategies. The strategy is mainly invested in stocks, such as M.S.C.I. World and M.S.C.I. Emerging Markets, U.S. Treasuries, commodity index, as well as in currencies, such as E.U.R./U.S.D. and partly J.P.Y./U.S.D. The strategy also proves a risk prevention character with a lag by being fully invested in the money market in 2009 and, thus, generating the highest returns in comparison.

The absolute value risk premium strategy could generate superior annual total returns between the years 2002 and 2008, ranging between 15% and 30% per year.

Moreover, in the period from 1997 to 2001, the strategic weighted investment strategy outperformed all other strategies (Figure 7). However, the simulation shows that the diversification effect is not sufficient to avoid losses across all economic cycles.

Nevertheless, both value risk premium strategies also generated a negative alpha for a minimum of seven years. The value risk premium strategy annual returns fluctuated every two to three years with extraordinary returns and mitigated risk behaviour in accordance with the performance of the other benchmarks (Figures 8 and 9).

Moreover, it is clear that the performance of the value risk premium strategies is relatively poor in the years after the crises, with minimum annual returns and partial underperformance compared to the naive investment strategies, which is a primary indication of distorted signal generation in times of expansive monetary policy.

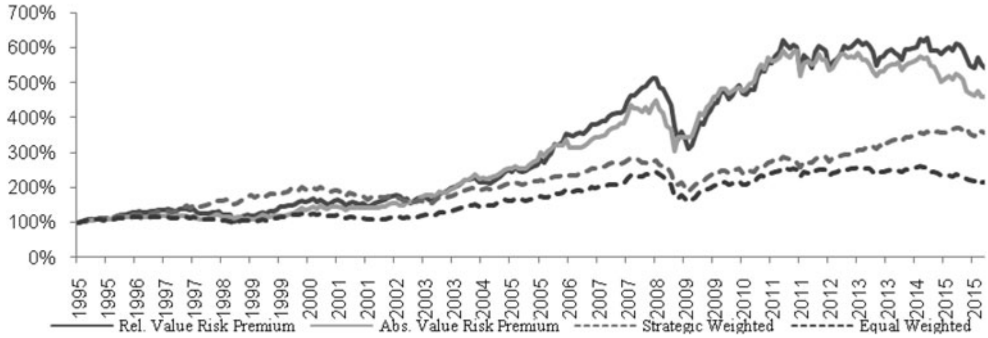

Figure 7. Cumulative returns of all investment strategies. *Source*: Authors.

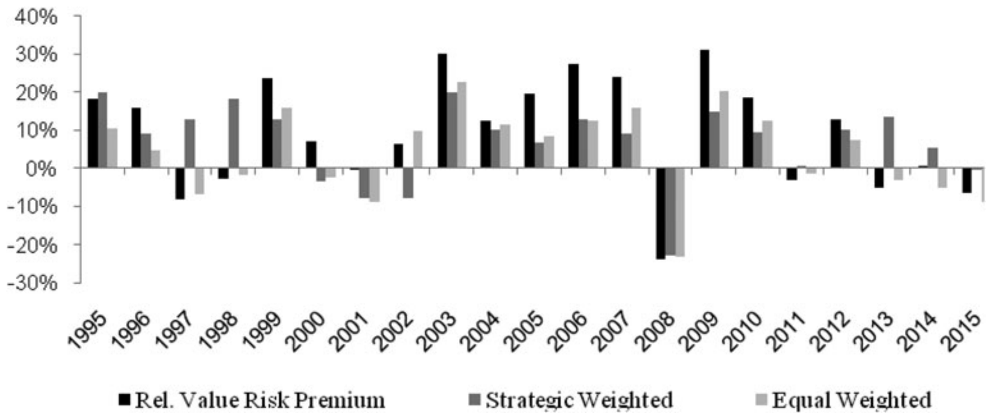

Figure 8. Annual total return of the relative value risk premium and naive investment strategies. *Source*: Authors.

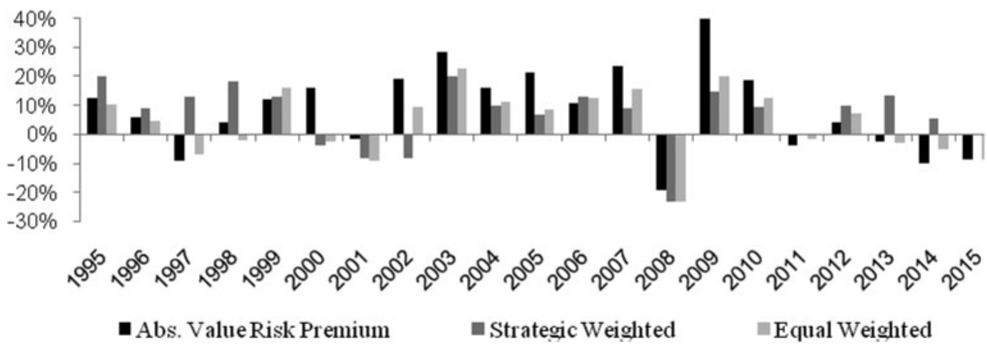

Figure 9. Annual total return of the absolute value risk premium and naive investment strategies. *Source*: Authors.

The last conspicuous key figure is Jensen alpha, with M.S.C.I. World monthly log returns as market returns. Although the relative value risk premium strategy achieves higher returns, the Jensen's alpha for the absolute value risk premium strategy is higher with 4.73% (Table 2). Overall, the value risk premium strategies show extraordinary robust returns over time with a lagging risk mitigation character, whereby

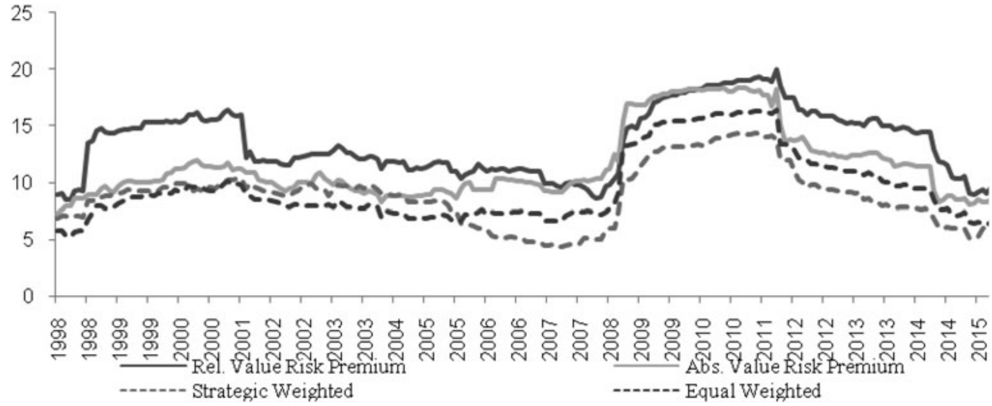

Figure 10. Three years rolling annualised volatility of all strategies. *Source*: Authors.

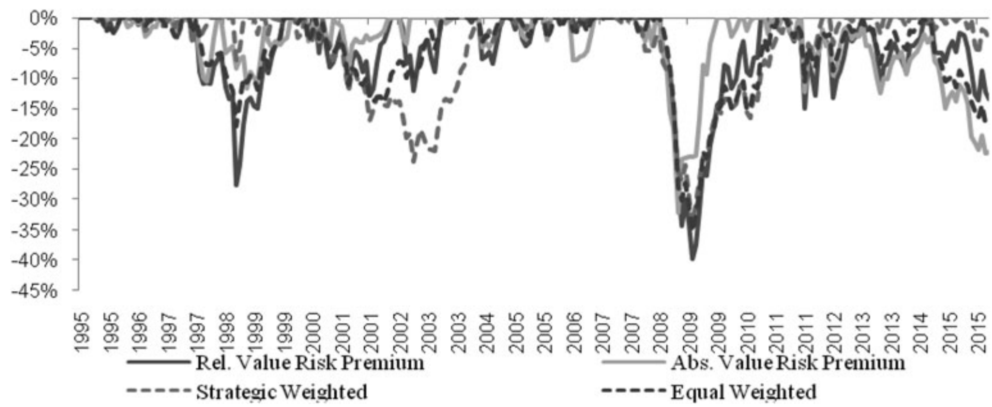

Figure 11. Drawdown in percentage over time. *Source*: Authors.

both strategies highlight the importance of dynamic asset allocation due to superior selection quality. Volatility steadily increases (Figure 10) after the financial crisis in 2008 and reaches its peak in the middle of 2011. Later, the volatility decreases to a level in the range between 5% to 12% in 2015 for all strategies. Moreover, the relative value risk premium strategy has a higher volatility compared to the absolute value risk premium strategy and naive investment strategies (Table 2). Moreover, the rolling volatility of the equal weighted strategy is higher than the strategic weighted, which again highlights that the investor will not be compensated for equal allocation.

In different periods (Figure 11), the value premium strategies perform better, which emphasises the better quality selection of assets. These findings are confirmed by the average drawdown that is similar to the naive investment strategies, which again emphasises the slight risk mitigation character (Table 2). Furthermore, by examining the Tracking Error, it is clear that the allocation and thus the specific risk compared to the measured benchmark is widening across the strategies.

Combining the performance and risk measurements, the quality effects of selecting the value risk premium exposure in the multi-asset context generate better risk-adjusted returns, measured by the information ratios of 0.17 and 0.06, as

Figure 12. Market stress indicator. *Source*: Authors.

well as the negative values for both naive investment strategies. However, the Sharpe ratios provide evidence that the strategic weighted portfolio provides a slightly better risk-return trade off compared to the value risk premium strategies due to the proportionally lower volatility. The strong divergence of the Value-at-Risk (V.a.R.) and E.S. at 99% confidence among the strategies supports the previous findings (Table 1). Thus, by applying the value risk premium strategies, the investor will be fairly compensated with robust risk-adjusted returns for accepting to take more risk over time due to selection quality and slight risk prevention characteristics. Moreover, the findings emphasise that value investing strategies should be applied as a complementary portfolio instrument in the context of dynamic asset allocation.

4.1. Binary market stress indicator results

The Binary Market Stress Indicator (Figure 12) illustrates the market stress indicator. In particular, the longest stress duration is displayed from mid-2008 until mid-2009. Moreover, there are frequent periods in the more recent years, where the indictor switches in a stress environment; for example, this can be observed mid-2010, from mid-2011 until 2012, at the end of 2014 and the end of 2015. It is obvious that the market regime after the financial crisis was characterised by increasing market stress due to the banking crises, oil turmoil, the decrease in global economic growth and higher volatility among global financial markets.

4.2. Estimation model results and its implications

The goodness of fit of both macro-economic estimation models is 41% and 48%, respectively, indicating that 41% of the absolute value risk premium strategy return variability is explained by macro-economic factors, which are significant at a confidence level of 95%. Thus, the significant p-values are U.S. Inflation rate, I.S.M. Composite Index, the currency factor (E.U.R./U.S.D.), as well as the change in oil price. Hence, the absolute value risk premium strategy has the U.S. Inflation rate

Table 3. Multivariate regression summary for macro-economic determinants vs absolute risk premium strategy.

Multivariate Regression Summary	Intercept	Yield Curve 10Y-3M	US Infl. Rate	ISM Comp. PMI	EUR/ USD	Euribor 3M	Oil Price Change
Factor loading	1.6260	−0.1808	−0.5314	0.2853	0.4052	0.2806	0.1267
Standard Error	0.7608	0.2354	0.2114	0.1427	0.0845	0.2090	0.0280
t-statistic	2.14	−0.77	−2.51	2.00	4.80	1.34	4.53
p-value	**3.42**%	44.37%	**1.30**%	**4.74**%	**0.00**%	18.15%	**0.00**%
R^2	0.41						

Multivariate regression summary for macro-economic determinants vs. relative risk premium strategy.

Multivariate Regression Summary	Intercept	Yield Curve 10Y-3M	US Inflation Rate	ISM Composite PMI	EUR/ USD	Euribor 3M	Oil Price Change
Factor loading	2.0134	−0.3980	−0.0477	0.3713	0.6810	−0.1592	0.0860
Standard Error	0.7757	0.2400	0.2155	0.1455	0.0861	0.2131	0.0285
t-statistic	2.60	−1.66	−0.22	2.55	7.91	−0.75	3.02
p-value	**1.04**%	9.94%	82.53%	**1.17**%	**0.00**%	45.62%	**0.30**%
R^2	0.48						

Note: Values in bold indicate that p-values are lower than 5% and therefore variables are strongly significant.
Source: Authors.

significant with a negative sign in the factor loading. Thus, these factors indicate that positive economic growth leads to positive returns, whereby a high inflation reflects an overheating economy, meaning that a reaction from the central bank involving hiking interest rates is expected. The multivariate macroeconomic factor regression analysis demonstrates a very high and significant beta at 0.4 and at 0.6 for the currency factor. Moreover, the inference shows that if the I.S.M. Composite Index increases, the return of both value risk premium strategies also increases. Additionally, the statistical outcome proves that if the dollar depreciates against the euro, the return of the strategy rises, as observed in the financial crisis of 2008. Moreover, if the oil price increases, the value of both value risk premium strategy returns also increase due to the significant factor loadings (Table 3).

The multivariate financial market factor regression analysis demonstrates the highest R^2 of 72% for the absolute value risk premium strategy (without market regime computation) and simultaneously a high dependency between the strategy return and the significant mix of asset classes, including stocks and commodities. Thus, the inference illustrates that the strategy return increases if stocks and commodities prices grow. Moreover, gold is the most significant (lowest p-values) positive factor loading, which confirms the macro-economic regression analysis. The relative value risk premium multivariate regression analysis with financial market factor has the highest R^2 of 98%, with the determinants of stocks, bonds, gold and furthermore, for regime investigations E.U.R./U.S.D. currency pair and R.E.I.T.s. The findings show that Bonds, E.U.R/U.S.D. and R.E.I.T.s are negatively characterised determinants of the strategy. When the absolute value risk premium strategy returns increase, the value of the returns for these determinants decreases taking into account the market condition for the last two determinants (Tables 4 and 5).

The goodness of fit for the risk factor regressed estimation model are at the lowest level by comparing with all estimation models at 31% and 38%, including significant factors such as credit spreads, the V.I.X. Index and the Citi Eco Surprise Index.

Table 4. Multivariate regression summary for financial market determinants vs. absolute risk premium strategy.

Multivariate Regression Summary	Intercept	Market Factor	Bond Factor	Commodity Factor	Gold Factor	EUR/USD Factor	Reits Factor
Factor loading	0.1019	0.4216	0.0980	0.0790	0.3373	−0.0495	−0.0025
Standard Error	0.1862	0.0921	0.1542	0.0309	0.0382	0.0774	0.0608
T-statistic	0.55	4.58	0.64	2.56	8.82	−0.64	−0.04
p-value	58.49%	**0.00**%	52.58%	**1.16**%	**0.00**%	52.33%	96.75%
R^2	0.68						

Multivariate regression summary for financial market determinants vs. relative risk premium strategy.

Multivariate Regression Summary	Intercept	Market Factor	Bond Factor	Commodity Factor	Gold Factor	EUR/USD Factor	Reits Factor
Factor loading	0.2644	0.4078	−0.2045	0.0208	0.3116	0.0832	0.1727
Standard Error	0.1240	0.0614	0.1027	0.0206	0.0255	0.0516	0.0405
T-statistic	2.13	6.64	−1.99	1.01	12.23	1.61	4.27
p-value	**3.47**%	**0.00**%	**4.84**%	31.41%	**0.00**%	10.88%	**0.00**%
R^2	0.88						

Note: Values in bold indicate that p-values are lower than 5% and therefore variables are strongly significant.
Source: Authors.

Table 5. Multivariate regression summary for financial market determinants vs absolute risk premium strategy for different market regimes.

Multivariate Regression Summary Part 1.	Intercept	Market Factor +	Bond Factor +	Commodity Factor +	Gold Factor +	EUR/USD Factor +	REITs Factor +
Factor loading	0.0692	0.3236	0.0574	0.1522	0.1926	0.0145	0.1196
Standard Error	0.1960	0.1095	0.1982	0.0406	0.0504	0.1010	0.0813
t-statistic	0.35	2.96	0.29	3.75	3.83	0.14	1.47
p-value	72.44%	0.36%	77.25%	0.03%	0.02%	88.63%	14.37%
R^2j	0.73						

Multivariate Regression Summary Part 2.	Market Factor	Bond Factor	Commodity Factor	Gold Factor	EUR/USD Factor	REITs Factor
Factor loading	0.7642	0.0840	−0.0266	0.5241	−0.1849	−0.1591
Standard Error	0.1533	0.2091	0.0461	0.0557	0.1060	0.0940
t-statistic	4.99	0.40	−0.58	9.41	−1.74	−1.69
p-value	0.00%	68.84%	56.55%	0.00%	8.34%	9.28%
R^2						

Multivariate regression summary for financial market determinants vs. relative risk premium strategy for different market regimes.

Multivariate Regression Summary Part 1.	Intercept	Market Factor +	Bond Factor +	Commodity Factor +	Gold Factor +	EUR/USD Factor +	REITs Factor +
Factor loading	0.1555	0.5502	−0.0792	0.0436	0.3877	0.0038	0.0837
Standard Error	0.1264	0.0706	0.1279	0.0262	0.0325	0.0651	0.0525
t-statistic	1.23	7.79	−0.62	1.66	11.93	0.06	1.60
p-value	22.09%	0.00%	53.67%	9.84%	0.00%	95.40%	11.28%
R^2	0.90						

Multivariate Regression Summary Part 2.	Market Factor	Bond Factor	Commodity Factor	Gold Factor	EUR/USD Factor	REITs Factor
Factor loading	0.0836	−0.2937	0.0245	0.1915	0.1972	0.3617
Standard Error	0.0989	0.1349	0.0298	0.0359	0.0684	0.0606
t-statistic	0.85	−2.18	0.82	5.33	2.88	5.96
p-value	39.92%	3.11%	41.18%	0.00%	0.46%	0.00%
R^2						

Note: Values in bold indicate that p-values are lower than 5% and therefore variables are strongly significant.
Source: Authors.

Table 6. Multivariate regression summary of risk determinants vs absolute risk premia strategy.

Multivariate Regression Summary	Intercept	Citi Eco Surprise G10	T.E.D. Spread	Credit Spread	V.I.X. Index
Factor loading	0.2777	0.0123	0.0064	−0.0326	−0.3262
Standard Error	0.3810	0.0091	0.0064	0.0135	0.0632
t-statistic	0.73	1.36	1.00	−2.41	−5.16
p-value	46.72%	17.62%	31.86%	**1.70**%	**0.00**%
R^2	0.31				

Multivariate regression summary of risk determinants vs. relative risk premia strategy.

Multivariate Regression Summary	Intercept	Citi Eco Surprise G10	TED Spread	Credit Spread	VIX Index
Factor loading	0.7808	0.0286	−0.0012	−0.0175	−0.4218
Standard Error	0.3875	0.0092	0.0065	0.0137	0.0643
t-statistic	2.02	3.10	−0.18	−1.27	−6.56
p-value	**4.57**%	**0.23**%	85.62%	20.53%	**0.00**%
R^2	0.38				

Note: Values in bold indicate that p-values are lower than 5% and therefore variables are strongly significant.
Source: Authors.

Table 7. Multivariate regression summary of risk determinants vs absolute risk premium strategy for different market regimes.

Multivariate Regression Summary Part 1.	Intercept	Citi Eco Surprise G10 +	T.E.D. Spread +	Credit Spread +	V.I.X. Index +
Factor loading	0.0780	0.0169	0.0169	−0.0008	−0.3224
Standard Error	0.5865	0.0123	0.0216	0.0216	0.1011
t-statistic	0.13	1.38	0.78	−0.04	−3.19
p-value	89.44%	16.99%	43.58%	96.98%	**0.18**%
R^2	0.32				
Multivariate Regression Summary Part 2.	Citi Eco Surprise G10	TED Spread	Credit Spread	VIX Index	
Factor loading	0.0087	0.0094	−0.0519	−0.2870	
Standard Error	0.0152	0.0071	0.0179	0.0840	
t-statistic	0.57	1.33	−2.90	−3.42	
p-value	57.10%	18.66%	**0.42**%	**0.08**%	
R^2					

Multivariate regression summary of risk determinants vs. relative risk premium strategy for different market regimes.

Multivariate Regression Summary Part 1.	Intercept	Citi Eco Surprise G10 +	T.E.D. Spread +	Credit Spread +	V.I.X. Index +
Factor loading	0.2545	0.0171	0.0270	−0.0102	−0.4121
Standard Error	0.5975	0.0125	0.0220	0.0220	0.1030
t-statistic	0.43	1.37	1.23	−0.46	−4.00
p-value	67.08%	17.27%	22.08%	64.31%	**0.01**%
R^2	0.40				
Multivariate Regression Summary Part 2.	Citi Eco Surprise G10	T.E.D. Spread	Credit Spread	V.I.X. Index	
Factor loading	0.0405	0.0044	−0.0252	−0.4075	
Standard Error	0.0155	0.0072	0.0182	0.0856	
t-statistic	2.61	0.60	−1.38	−4.76	
p-value	**1.01**%	54.73%	16.84%	**0.00**%	
R^2					

Note: Values in bold indicate that p-values are lower than 5% and therefore variables are strongly significant.
Source: Authors.

Therefore, for both strategies, the most significant risk factor is the V.I.X. Index, which indicates that the value of the strategy returns increases when the V.I.X. Index level decreases. The credit spread is only significant in negative market conditions with a negative factor loading. Thus, if the credit conditions deteriorate in a stressed market environment, the absolute value risk premium strategy return increases, which emphasise the strong correlation between stock markets and the value risk premia strategies (Tables 6 and 7).

Overall, the different multivariate regression analysis (with and without different market regimes) emphasise, besides the strong correlation to stocks, the strong dependence of macro-economic and interest rate sensitive related factors: dollar, credit spreads, bonds, commodities (including gold) or the Citi Eco Surprise Index.

5. Conclusion

In this article, two different variations of multi-asset value risk premium investment strategies, such as the absolute and relative value risk premium investment strategy, are initially compared to the naive investment strategies by constructing portfolios. All strategies were back tested from January 1995 to December 2015.

The findings emphasise the quality effects of selecting the value risk premium exposure in the multi-asset context that generates better risk-adjusted returns measured by Information ratio, with 0.17 for the relative value risk premium strategy and 0.06 for the absolute value risk premium strategy compared to negative values for both naive investment strategies. However, the Sharpe ratios provide evidence that the strategic weighted portfolio provides a better risk-return trade off compared to the value risk premium strategies.

The findings of different multivariate regression analyses highlight the strong dependence of macro-economic and interest rate sensitive related factors, whereby the largest portfolio weights in both risk premium portfolios are allocated in equities. Therefore, the asset allocation and regression analysis indicate the strong asset allocation ability in a multi-asset context of both strategies, considering that the strategies increase exposure to risky asset classes during economic stress phases in which the risk premium is highest and investor sentiment is low.

Thus, the findings emphasise that by applying the value risk premium strategies, it is clear that investors will be fairly compensated with robust risk-adjusted returns for accepting to take more risk over time due to selection quality and slight downside prevention character, whereby the relative risk premium strategy provides a better diversification over time. Nevertheless, the findings emphasise that the value investing strategies should be applied as a complementary portfolio instrument in the context of dynamic asset allocation due to value phase shifts for optimal portfolio construction and mitigates drawdown.

Note

1. Gross and net dividend amounts are assumed to be the same when only one is reported.

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