International Journal of Economics and Financial Issues

ISSN: 2146-4138

available at http: www.econjournals.com

International Journal of Economics and Financial Issues, 2016, 6(3), 1270-1286.

The Impact of the (2011) Devaluation of the Swiss Franc on Eurozone Equity Benchmark Diversification

Daniel Broby[1]*, Raphael Faessler[2], Milenko Josavac[3], Christophe Dehut[4]

[1]Department of Accounting and Finance, Strathclyde University, United Kingdom, [2]Department of Accounting and Finance, Strathclyde University, United Kingdom, [3]Department of Accounting and Finance, Strathclyde University, United Kingdom, [4]Department of Accounting and Finance, Strathclyde University, United Kingdom. *Email: daniel.broby@strath.ac.uk

ABSTRACT

We investigate the diversification benefits of adding Switzerland to a Eurozone equity portfolio, both before and after the removal of Swiss franc peg to the euro. We use a mean-variance portfolio framework to compare the benchmark indices in the Eurozone, including a direct comparison between Switzerland and Germany as substitute market. We investigate the diversification effect both before and during the policy of a minimum exchange rate EURO/CHF. Furthermore, we compare the outcome of the mean-variance portfolio with an equally weighted portfolio composed out of a screened sample of both Swiss value and growth stocks. Our findings suggest that an equally weighted Swiss value portfolio (1/N) will generate the best risk adjusted performance when compared to a market capitalisation weighted index of Eurozone equities. We conclude that Eurozone investors would benefit from diversifying their portfolio with some exposure to the Swiss equity market and in particular Swiss value stocks.

Keywords: Company-specific Political Risk, Swiss Stock Market, Portfolio Diversification, Optimal Portfolios, Currency, Benchmark
JEL Classifications: G28, G14, P16

1. INTRODUCTION

In financial markets macroeconomic shocks have a large impact on asset pricing. During periods of financial uncertainty, international investors seek safe haven currencies in which to deposit savings. Such currencies are considered to be stable and are expected to retain or even increase in value during times of market turbulence. In other words, investors flee to safe haven currencies to limit their exposure to losses. Ranaldo and Söderlind (2010) document that the Swiss franc shares this characteristic. It tends to appreciate against the dollar when the stock market falls. It also appreciates when US bond prices and foreign exchange volatility increase. According to their research the Swiss franc has safe haven status due to its reliability and stability.

Safe haven country status may appear enviable but policymakers face the challenge of dealing with the appreciation. According to (Corsetti et al., 2013) capital flights to safety can destabilise exchange rates. This is because an overvalued exchange rate tends to depress domestic demand and make exports more expensive. This is especially the case for Switzerland because its exports (goods and services) represent over 70% of gross domestic product (GDP) (WB, 2016). According to Patelis (1997) this observation has implications for the stock market. His research linked shifts in monetary policy to the observed predictability in excess stock returns, a similar theme to our own investigation.

Our paper investigates the benefit of diversification into Switzerland from the Eurozone and as such exchange rate policy has to be taken into account. A detailed analysis of the currency movements can be found in Figure 1 in the Appendix. In summary, prior to the 6th of September 2011 the Swiss National Bank (SNB) pursued a consistent policy. It then changed this and set a minimum exchange rate for the euro to the Swiss franc of € 1 = CHF 1.20. In doing so, it left "all doors open" about the time length of the new policy. The SNB prompted depreciation in the value of the Swiss franc and consequently altered the country's price competitiveness in the export market. The change had an immediate effect, with the euro rising from 1.10 francs before the announcement to 1.21 francs just after.

We conducted our analysis on the working hypothesis that a portfolio composed of the Swiss Market Index (SWISSMI) would be positively impacted by the intervention of the SNB in setting this minimum exchange rate for euro. We analysed the Deutscher Aktien Index (DAXINDX) during the same period by way of a control for the currency. We further broke down our results between an equally weighted portfolio of Swiss value and growth stocks.

2. LITERATURE REVIEW

The specific case of Switzerland as a diversification benefitiary in a European context has not been directly addressed by any major study. The bulk of the literature in respect of portflio diversification builds on the work of Markowitz (1952). Country specific countributions have been made furthering the international diversification work of Solnik (1995). We build on (Heston and Rouwenhorst, 1995) observation that additional diversification gains can be obtained when an investor diversifies between countries, rather than industries. In this way, our investigation contributes to the literature.

Switzerland has long had a safe haven status and European portfolio investors do tend to view it in this light. The first to investigate this safe haven phenomenon was (Allen, 1983). He looked into the stability of the short-run money demand function for Switzerland. He investigated the breakdown of the fixed exchange rate system and during the 1974 OPEC crisis. The evidence suggests that Switzerland does indeed have a safe haven status. In a latter investigation (Krugman et al., 1999) analysed "target zones for exchange rates similar to that used by the Swiss authorities during the period of our study. A target zone differs from a fixed currency regime in allowing a range of variation in the exchange rate. In other words, some exchange rate flexibility is allowed, and thus the defense of the exchange rate is only an occasional problem rather than a continuous one. His evidence suggests that expectations that monetary policy will be adjusted has an effect on exchange rate behaviour. We suggest this in turn should impact the way stocks and shares covary.

Claudio and Sornette (2016) built on the safe haven concept and examined Switzerland by using historical data similar to our own, namely a minimum exchange rate peg of 1.20 Swiss francs per euro from September 06, 2011 to January 15, 2015. Their conclusions were largely currency related but again highlight the benefits of diversification on the time varying nature of corrolations. Essentially, they showed that the assumptions of perfect credibility and marginal interventions did hold true. It turns out that it is difficult to capture the subtle non-linear relationships that exist between exchange rates and fundamental value.

According to Lleo and Ziemba (2015), however, there is no impact on the economic growth of Switzerland if the currency is pegged or not. This implies that portfolio diversification into Switzerland would be a sensible strategy in the face of a potential devaluation. This was illustrated by the SWISSMI outperforming the DAXINDX even during the period when the currency was pegged to the Euro. This can be partially be explained by the position of Switzerland in its linkage to the European Union through bilateral agreements. During the crisis, the Swiss economy was stable which attracted additional capital inflow to the country. A workforce shortfall was made up by immigration from Germany due to the agreement on the free movement of persons (the Swiss market is compelling due to its high wage levels). This lead to an increase in domestic demand during the evaluation period, which in turn was reflected in the performance of the portfolio.

Sheehy and Donnelly (1996) document a significant linkage between exchange rates and the market value of large exporters. This supports the observation that exporters tend to rise when currencies are devalued, further justifying our positive observations on Swiss value stocks relative to growth stocks.

3. DATA AND METHOD

We used Bloomberg to obtain data and monthly return data on 15 European portfolios between January 1st 1999 and January 1st 2016. We likewise obtained data on Swiss companies, choosing 50 value stocks and 50 growth stocks out of the Swiss performance indicator, ranked by the lowest and the highest price earnings ratio respectively. The currency cross rate between the CHF and the EURO was also used. Nevertheless, as shown in Tables 1 and 2 of the Appendix, some companies do not have data available for our period of analysis and we adjusted our samples accordingly. We investigated the correlations of the various markets over our sample periods and specifically considered the SWISSMI the DJES50I, using the DAXINDX as a control. These were derived from the co-variance-variance matrix and can be found in Table 3 for the estimation windon 2004-2006 and Table 4 for the evalaution window 2012-2014. The corresponding correlation matrx can be found in Tables 5 and 6.

Both, Switzerland and Germany, are export-oriented and the indices are strongly correlated with each other[1]. Furthermore, Germany is part of the European currency union and therefore not directly affected by the actions of the SNB. This provides us with an appropriate basis for a comparison.

To analyse the impact of the currency surprise on the Swiss stock market, we first select an estimation and evaluation period along the lines of (MacKinlay 1997). The set of the minimum exchange rate (peg) by the SNB on 6th of September 2011 is the event of interest in our research. Following this model, the analysis implies the determination of a period prior to the event. The estimation window for this research is set from 2004 to 2006.

When it came to the creation of the value stocks, we screened the Swiss market for low P/E stocks, selecting the fifty lowest. Similarly, when it came to the creation of the growth stocks, we screened the Swiss market for high P/E stocks, selecting the 50 highest. We ran two scenarios, one with the full data set and one replacing the outlier Belimo Holding with Groupe Minot.

1 The correlation between the SWISSMI and the DAXINDX is 0.762150 (Appendix Table 3).

The estimation window is considered, as illustrated in Figure 1, as the normal (or neutral) period prior to the devaluation. After a turbulent market environment (e.g., the internet bubble bursting or 9/11 terror attacks) in the early 2000s, markets recovered significantly in 2004 and gained in value until 2006. During this period, the indices were upward-sloping and the performances of all three indices were similar for three years. Another relevant aspect is the length of the window. We consider a three years period for both windows which is corresponding with the peg duration.

4. ANALYSIS

We analysed the exchange rate EURO/CHF during the defined periods[2]. This can be found in Table 7 in the Appendix. Not surprisingly, the exchange rate was more volatile during the estimation window with a standard deviation of 1.917%. In contrast, during the evaluation window the exchange rate became less volatile (standard deviation of 1.290%) which was mostly related to the policy actions of the SNB. Particularly during the first year of the evaluation window the exchange rate remained steady. During mid-2013 the exchange rate reached its peak of € 1 = CHF 1.2599 before decreasing continuously to the floor of the minimum exchange rate.

We generated an efficient frontier of a portfolio of the indices of the SWISSMI, DAXINDX and DJES50I for the estimation and the evaluation window as shown in Figure 2.

At first sight, both efficient frontiers have a similar shape. The portfolio in the evaluation window has a better risk-return trade-off at an expected return of 2% and 3%. At an expected return of 4% the efficient frontiers overlap at the same level of risk of 10.4%. At a standard deviation of more than 10.4% the expected return was better at any level of risk during the estimation window. Furthermore, we can visually tell that the gradient is steeper during the estimation window and thus the additional return per unit of extra risk is higher (higher Sharpe ratio). In other words, investors from 2004 to 2006 are achieving generally higher returns - the investment opportunities during the estimation window were slightly better. According to (Lee et al., 2010), investors would prefer a steeper sloping efficient frontier because of a higher expected returns for a certain level of risk.

The following Figure 3 visualises the effect of the constraint "no short selling" on the SWISSMI, DAXINDX and DJES50I and the implementation of a currency hedge on the efficient frontier as shown in Figure 3.

Short selling is the sale of a share that is not owned. Typically it is done by borrowing the stock from another party that does own it by paying a stock lending fee. Selling short can extend the efficient frontier beyond the maximum return (e.g., from C* to C or B* to B) however the risk would also greatly increase. The theoretical efficient frontier and is based on the assumption that there are no transaction costs involved short selling. This is clearly not the case. In Switzerland, there are no regulatory provisions on short selling in terms of law. That said, the Swiss Federal Banking Commission (SFBC) and SIX Swiss Exchange imposed certain restrictions on short selling in 2008. In contrast, the German government introduced statutory provisions for the regulation of short selling in 2010.

The portfolios we use are not hedged. Currency hedging would have an impact on the performance of a portfolio. Over our sample period, the potential gain from risk reduction shifts the efficient frontier in a beneficial direction (e.g., from C to C+ or B to B+). The hedged efficient frontier (+) is preferable to an unhedged efficient frontier at any level of expected return. An important feature of currency hedging is the hedge ratio. The optimal hedge ratio is controversial and several studies are devoted to the topic[3]. However, the right exposure to currencies can provide diversification and therefore reduce overall portfolio risk.

4.1. Comparison of Market Capitalisation Weighted Index (MCWI) and 1/N Portfolio

We further broadened our investigation from the behaviour of the market index to reflect the impact of the currency revaluation on exports. This better reflects how a portfolio manager would structure his tactical positions to anticipate chosen as macroeconomic shocks. Hess (2003) argues that the characteristics of specific sectors mean they are affected in different ways by fundamental shocks. As such, we investigated the impact of the devaluation on both growth and value stocks in the Swiss market. We observed that value stocks are more reflective of the exporters than the broad Swiss SMI or the growth stocks.

We compared the performance of the optimal portfolio relative to an equally-weighted portfolio and analyse to see if our results are consistent with (DeMiguel et al., 2009) views on optimal portfolio weight and a naïve strategies[4]. The results can be found in Table 8.

Before going any further into our commentary on this analysis, two preliminary remarks must be made. First, because we constructed our efficient frontier by targeting different returns, we had to choose the one we believe is the most consistent in this comparative analysis[5]. Second, comparing the performance of two different strategies requires their application on an equivalent dataset; we therefore applied the 1/N strategy on our original portfolio composed of Eurozone equities.

The main issue with our approach is that the excess return vector needs to be estimated in respect of the risk-free rate and the variance-covariance matrix. Consequently, the estimation errors associated with those strategies more than offset the benefits from optimised diversification. Intuitively, the probability of estimation

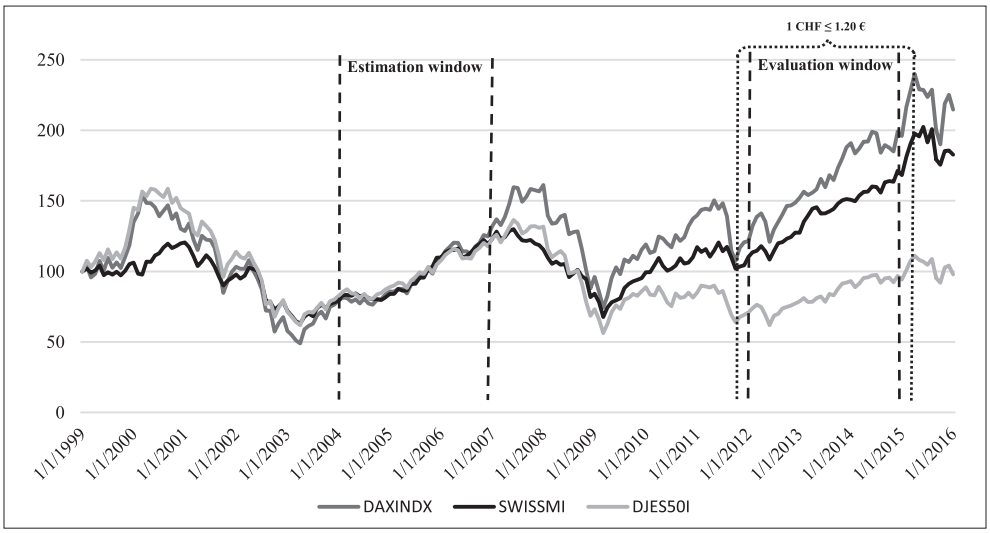
2 The results of our analysis of the exchange rate is provided in the Appendix Figure 1.

3 The most commonly accepted optimal hedge ratio is 50%. 50% of the currency risk should be hedged, while the other 50% is left unhedged. But some studies disagree and recommend full hedging (100%) - e.g., Perold and Schulman (1988).

4 A naïve (or 1/N) strategy involves holding an equal portfolio weight in each of the risky assets.

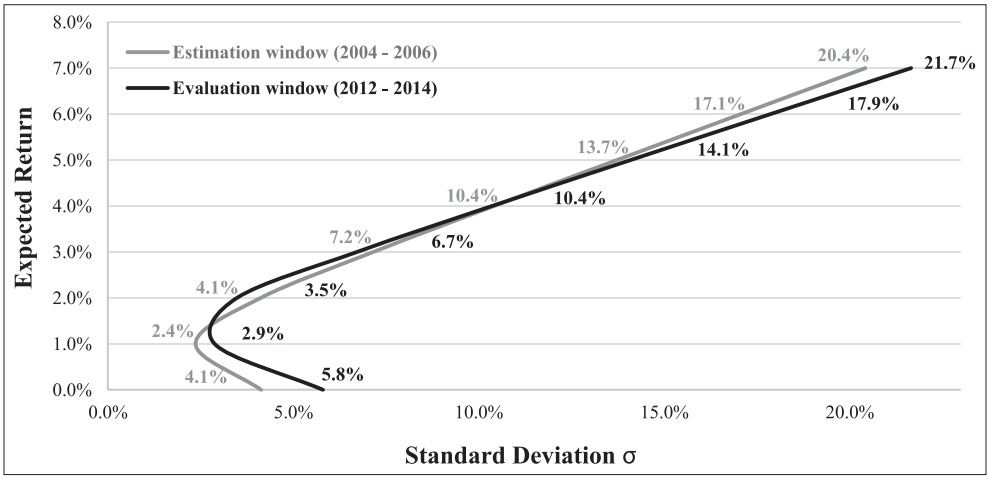
5 The weights used for this return maximises the Sharpe ratio of the mean-variance portfolio.

Figure 1: Comparison of index performance of SWISSMI, DAXINDX and DJES50I 50 from 1999 to 2016



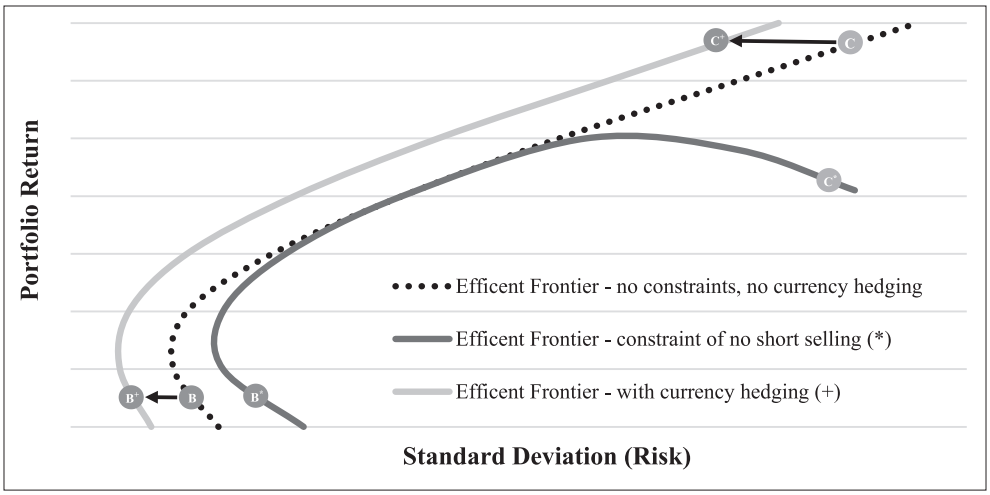
Source: The graph illustrates an indexed comparison of the Deutscher Aktien Index (DAXINDX), the Swiss Market Index (SWISSMI) and the stock index of the Eurozone (DJES50I) from 01.01.1999 to 01.01.2016. The dotted line reflects the period from 11.09.2011 to 16.01.2015 where the exchange rate was pegged at € 1 = CHF 1.20

Figure 2: Efficient frontier combination of the SWISSMI, DAXINDX and DJES50I



Source: The efficient frontier reflects the highest expected return for a defined level of risk (standard deviation)

Figure 3: The unconstrained efficient frontier, the efficient frontier with constraint of no short selling and the efficient frontier with currency hedging



errors is lower when there are less assets in a portfolio. The 1/N strategy has a greater diversification when numerous assets taken into consideration, hence we select the same number of stocks as in the Euro index. We therefore created a 1/N portfolio using the second and third datasets, comprised of fifty Swiss value stocks and fifty growth stocks. In order to better assess the performance of the naïve strategy, we created a MCWI, which allocates weights according to the size of the capitalisation of each company underlying a stock. The results from this are shown in Tables 1 and 2, the first table excluding the outliers and the second with the full sample.

Based on our full sample results, we can see that the 1/N portfolio outperformed the MCWI in each scenario, therefore we refer only to the naïve strategy hereafter. In order to find the better

During the estimation period, the growth stocks portfolio yields higher expected returns than the value portfolio (2.02% vs. 1.84%). The results are shown in Figure 4. Nevertheless, the growth stock portfolio has a lower risk compensation, represented by the lower Sharpe ratio (66.01% vs. 72.12%) and higher CEQ return (1.97% vs. 1.81%) respectively. It needs to be mentioned, that the 1/N portfolio out of growth stocks including the outlier, generates much higher expected returns (7.10% vs. 2.01%) compared to the 1/N portfolio of value stock. Nevertheless, once again, it shows a lower Sharpe ratio (57.15% vs. 72.12%) and a higher CEQ return (6.33% vs. 1.81%).

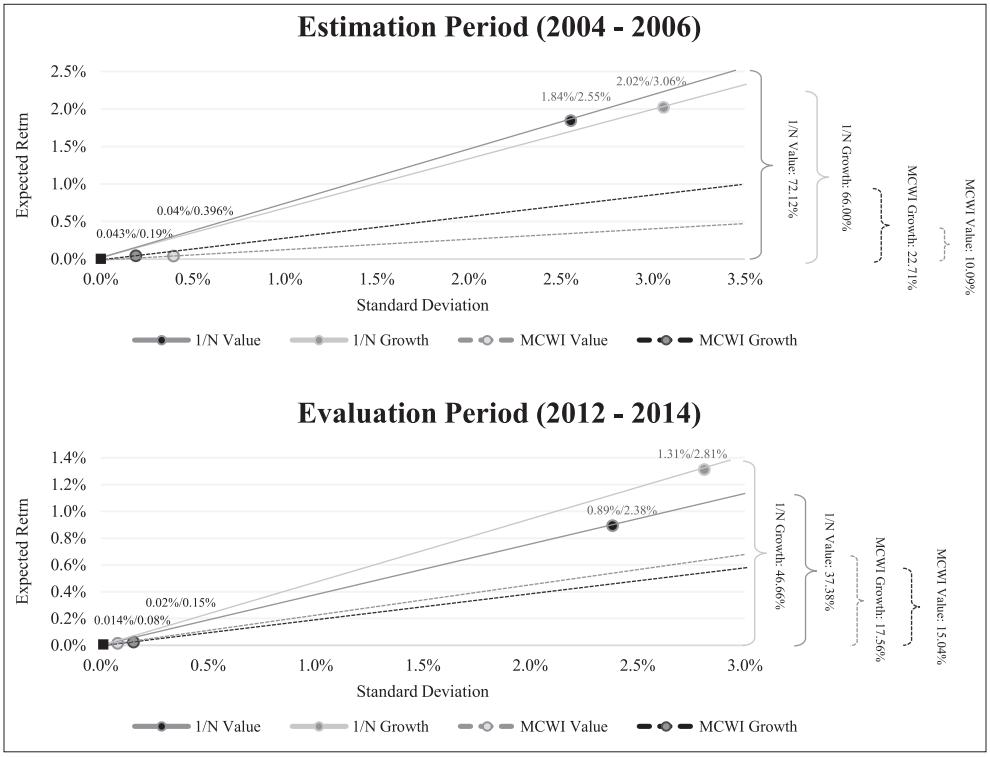
Over the evaluation period, the results are quite similar as mentioned above: The growth stock portfolio provides higher expected returns (1.35% vs. 0.89%) but again, a higher Sharpe Ratio (46.65% vs 37.38%) and a lower CEQ Return (0.86% vs. 1.27%) compared to the value portfolio.

The outperformance of the 1/N portfolio compared to the MCWI could be explained by a systematic flaw characterising MCWI. Per definition, MCWIs will increase the weight to a stock in a company if this stock's price increases, and inversely. The major issue with such a line of reasoning is, that over the short term, stock prices are impacted by emotion. Consequently, this approach will systematically lead to an over-investment in overpriced stocks and under-investment in underpriced stocks. The creation of equally-weighted index allows us to avoid this problem. Indeed, because the naïve strategy does not consider the price factor in its allocation of weights, these over- and under-investment issues will be random and average out over time.

A limitation of our study is that the implementation of portfolio strategies such as these involves transaction costs. Turnover, however, involves a potential efficiency loss, especially with a naïve strategy.

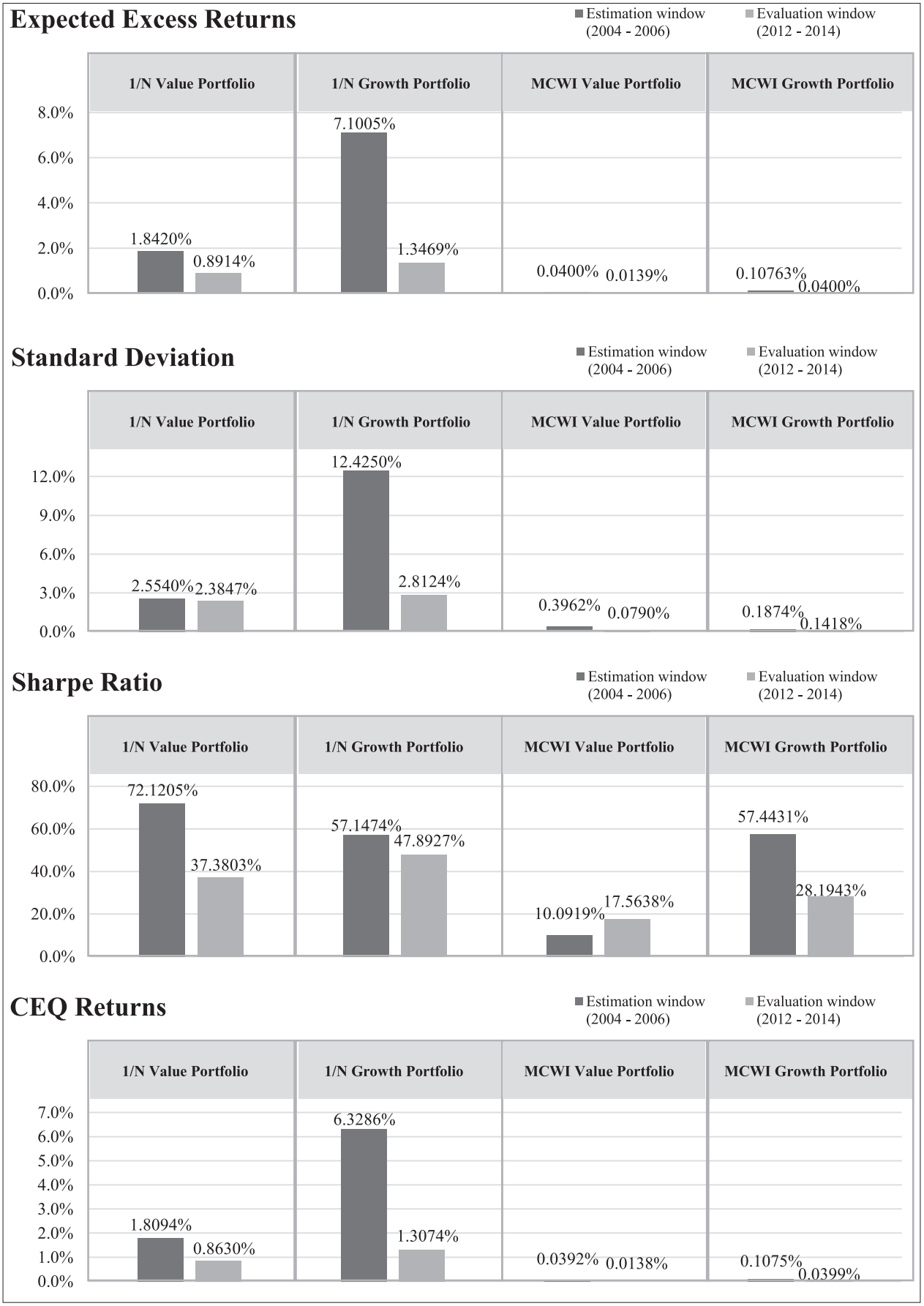
A naïve portfolio such as the one we created will benefit from greater diversification effects when it is composed of a higher number of stocks. In our case, the portfolio is composed of just fifty individual stocks and therefore does not fully benefits from potential diversification effects. In the case of strategies involving complex estimations, the number of stocks considered will increase the possibility of estimation errors, as well as transactions costs.

Figure 4: Visualisation of the Sharpe Ratio for the estimation and evaluation window



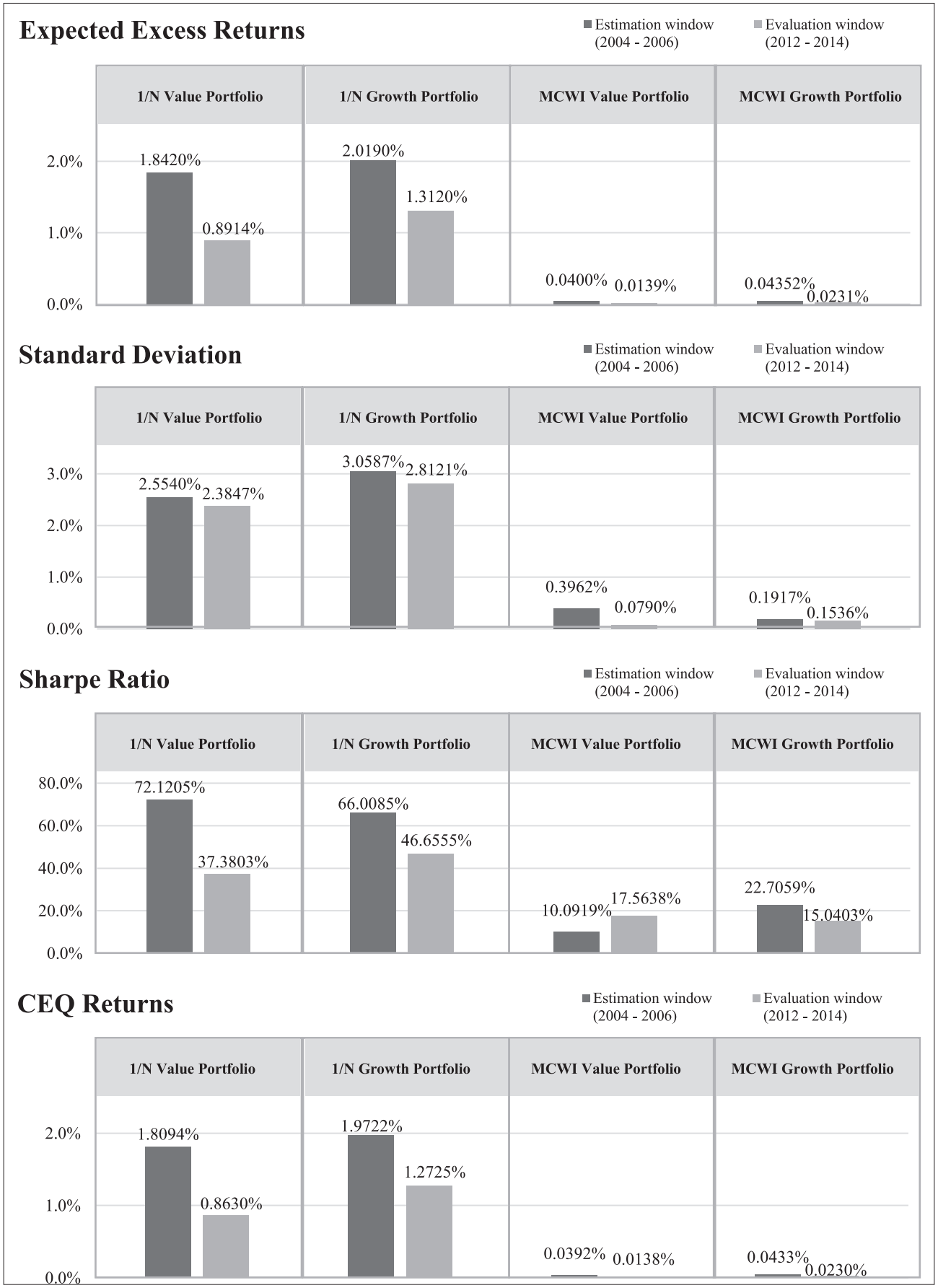
Source: The chart reflects the Sharpe Ratio for the Value and Growth Portfolios during the estimation and evaluation window. The Sharpe Ratio examines the performance of an investment relative to the risk

Figure 5: Swiss Portfolio (50 Stocks - incl. BELIMO HOLDING-R / excl. GROUPE MINOT-REG)



Source: The results above consist the outlier BELIMO HOLDING-R. Note: Only the Growth Portfolio is affected by the outlier. We compare the 1/N and MCWI portfolios by using the calculated performance indicators

Figure 6: Swiss Portfolio (50 Stocks - excl. BELIMO HOLDING-R / incl. GROUPE MINOT-REG)



Source: In the results above, the outlier BELIMO HOLDING-R is replaced by GROUPE MINOT-REG. Note: The Value Portfolio is not affected by any outlier. We compare the 1/N and MCWI portfolios by using the calculated performance indicators

5. DISCUSSION AND INTERPRETATION

In order to explain and interpret the outcome during the evaluation period when the Swiss franc was pegged to the euro, it is important to take the composition and the overall economic environment into consideration. In order to compare the impact of the peg (CHF to EURO) it is necessary to use the appropriate index of the Eurozone (since the currency peg would equalise Swiss economy with the economic area in the Eurozone). The stock index of the Eurozone represents 50 of the largest companies in the currency union. Table 7 in the Appendix for detailed attribution and Figures 5 and 6 for graphical representation of the results. However, the index does not represent the economic potency over the whole currency union. Nevertheless, the index represents a large number of industries and its economic accent in the Eurozone.

The Swiss Market Index, as shown in Table 1, is a good representation of the composition of the underlying market capitalization. It is made up of the 20 largest and most traded Swiss companies stocks. The main focus is based on pharmaceutical products (36.8%) by two big producers in Switzerland. Furthermore one company (Nestle) represents 21.8% of the overall index. The Swiss banking sector is represented by 11%. The remaining third is split up between different industries (Appendix Table 1). Taking diversification into consideration, the portfolio of the SWISSMI is facing a certain risk concentration due to a limited number of industries represented in the index. However, it needs to be highlighted that Nestle, Novartis and Roche are all headquartered in Switzerland. Despite of the headquarters, the companies only have some of their research and development (R&D) divisions and local sales in Switzerland. Therefore such companies are not very sensitive on the Swiss franc since they are not affected by the impact of increasing personal costs due to a strengthening currency. A fuller breakdown of Swiss growth dynamics is provided by Gmb, Statistica (2016).

The composition of the Deutscher Aktien Index, also illustrated in Table 1, is diversified throughout the German industry representing a portfolio of the 30 major German companies traded at the German stock exchange in Frankfurt. From clothing and banking to pharmaceutical producers and electrical engineers, a lot of industries are represented in the index. Nevertheless there is a major concentration of 16.63% (Appendix Table 1) reflecting the importance of the worldwide second biggest automotive producer Volkswagen. Overall, the DAXINDX represents the German market very well and is more diversified than the SWISSMI.

We chose the ex-post tracking error (TE) as an appropriate measurement to estimate the diversification of each portfolio. The formula is given by:

$$TE=\omega = \sqrt{Var(r_p - r_b)} = \sqrt{E[(r_p - r_b)^2] - (E[r_p - r_b])^2}$$

Where $r_p - r_b$ is the active return, i.e., the difference between the portfolio return and the benchmark return.

The ex-post TE measures of how much the SWISSMI or DAXINDX were deviating from the benchmark (DJES50I) during the evaluation period. The ex-post TE of the SWISSMI returns is 3.14% whereas the TE of the DAXINDX is 2.95% which leads to several interpretations. The deviations of the returns in Switzerland deviate slightly from the returns in Germany. Furthermore, the ex-post TE provides a better indicator regarding portfolio diversification than simple correlation as (Statman, 1987) mentioned. Based on the smaller ex-post TE of the DAXINDX, we can say that this portfolio is more diversified compared to the SWISSMI relative to the benchmark. Additionally, this is reflected in the slightly lower BETA of the SWISSMI of 0.398 compared to 0.473 of the DAXINDX. The SWISSMI is less diversified, not only due to the smaller number of securities but as well to the limited number of industries represented.

We observe that the performance of Switzerland and Germany did slightly diverge during the period of the currency peg. This can be explained by the dependency between the Swiss and German economy. Swiss consumption is mainly driven by German imports, which is the main trading partner in the Eurozone. According to GmbH (2016), capital movements in Switzerland and Germany appear related, which is reflected in the yearly change of the Swiss and German GDP growth. In contrary, based on FSO (2016), the balance of trade in Switzerland during the evaluation period stagnated whereas Germany could expand the export excess during the same time by more than 24%.

6. CONCLUSION

We have compared the performance of a mean-variance portfolio composed of SWISSMI, DAXINDX and DJES50I before (estimation window) and during (evaluation window) the peg of the Swiss franc to the Euro. This comparison is focused on the shape of the efficient frontier during those periods. We find that the efficient frontier during the estimation window is steeper than during the evaluation window. This suggests that the reward for risk (the Sharpe ratio) is higher during the floating-rate policy period. In addition, we observed that, based on the performance indicators such as expected excess returns, Sharpe ratio and CEQ return, the initial portfolio during the peg outperform an equally weighted portfolio composed out of fifty value stocks in Switzerland.

Furthermore we analysed the results of a naïve portfolio against a MCWI-portfolio during the same periods. To go even further, we compared two different stock portfolios - one out of Swiss value stocks and one of Swiss growth stocks. The results consistently showed that the naïve strategy performed better than the market capital weighted portfolio during the estimation as well as the evaluation period. Our findings show more powerful results with a floating rate policy for the Swiss franc. Further research into this area could include a test for the cointegration between the Swiss exchange rate and stock prices.

The value stock portfolio delivered a better Sharpe Ratio than the growth portfolio, whether the outlier is included or not. This result suggests that Eurozone investors would benefit from diversification with some additional exposure to Swiss value

stocks. Our analysis of the performance of an equally weighted value and/or growth index and a MCWI suggest that an equally weighted index (1/N) generated risk adjusted better performance than a MCWI.

REFERENCES

Allen, S. (1983), Did the Swiss demand for money function shift? Journal of Economics and Business, 35(2), 239-244.

Claudio, L., Sornette, D. (2016), Quantitative modelling of the EUR/CHF exchange rate during the target zone regime of September 2011 to January 2015. Journal of International Money and Finance, 63(C), 28-47.

Corsetti, G., Meier, K., Kuester, A., Müller, G. (2013), Sovereign risk, fiscal policy, and macroeconomic stability. The Economic Journal, 123(566), F99-F132.

DeMiguel, V., Garlappi, L., Uppal, R. (2009), Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy? The Review of Financial Studies, 22(5), 1915-1953.

FSO. (2016), Foreign Trade – Indicators, Balance of Trade, Switzerland's Foreign Trade, (1). Swiss Confederation: Federal Statistical Office.

GmbH, Statista. (2016), Germany: Growth Rate of the Real Gross Domestic Product (GDP) From 2010 to 2020.

GmbH, Statista. (2016), Switzerland: Growth Rate of the Real Gross Domestic Product (GDP) From 2005 to 2015.

Hess, M. (2003), Sector specific impacts of macroeconomic fundamentals on the Swiss stock market. Financial markets and portfolio management. Financial Markets and Portfolio Management, 17(2), 234-245.

Heston, S., Rouwenhorst, K.G. (1995), Industry and country effects in international stock returns. The Journal of Portfolio Management, 21(3), 53-58.

Krugman, P., Rogoff, K., Fischer, S., McDonough, W. (1999), Currency crises. In: International Capital Flows. Chicago: University of Chicago Press. p421-466.

Lee, C., Lee, A., Lee, J. (2010), Risk-aversion, Capital asset allocation, and markowitz portfolio-selection model. In: Handbook of Quantitative Finance and Risk Management. New York: Springer Science & Business Media LLC. p69-91.

Lleo, S., Ziemba, W. (2015), The Swiss Black Swan Bad Scenario: Is Switzerland Another Casualty of the Eurozone Crisis? Working Paper.

MacKinlay, A. (1997), Event studies in economics and Finance. Journal of Economic Literature, XXXV, 13-39.

Markowitz, M. (1952), Portfolio selection. The Journal of Finance, 7(1), 77-91.

Patelis, A. (1997), Stock return predictability and the role of monetary policy. The Journal of Finance, 52(5), 1951-1972.

Perold, A.F., Schulman, E.C. (1988), The free lunch in currency hedging: Implications for investment policy and peformance standards. Financial Analysts Journal, 44(3), 45-50.

Ranaldo, A., Söderlind, P. (2010), Safe haven currencies. Review of Finance, 14(3), 385-407.

Sharpe, W. (1964), Capital asset prices: A theory of market equilibrium under conditions of risk. The Journal of Finance, 19(3), 425-442.

Sheehy, E., Donnelly, R. (1996), The share price reaction of U.K. exporters to exchange rate movements: An empirical study. Journal of Inernational Business Studies, 27, 157-165.

Solnik, B. (1995), Why not diversify internationally rather than domestically? Financial Analysts Journal, 51(1), 89-94.

Statman, M. (1987), How many stocks make a diversified portfolio? Journal of Finance and Quantitative Analysis, 22, 353-363.

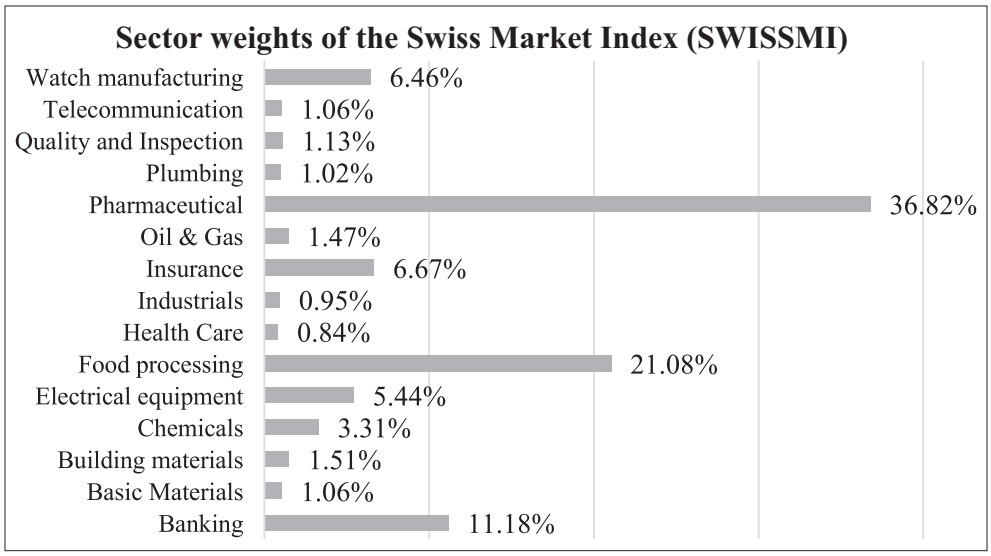
World Bank. (2016), Exports of Goods and Services (% of GDP). Washington, DC: The World Bank Group.

APPENDIX

APPENDIX TABLES

Table 1: Composition of the Swiss market index (SWISSMI) and German market index (DAXINDX)

Company	Weights (%)	Industry
NOVARTIS	19.290	Pharmaceutical
ROCHE GS	17.530	Pharmaceutical
ACTELION	0.840	Health care
NESTLE	21.080	Food processing
RICHEMONT	4.640	Watch manufacturing
SWATCH GROUP	1.820	Watch manufacturing
UBS	6.090	Banking
CS GROUP	4.130	Banking
ZURICH INSURANCE	3.850	Insurance
SWISS RE	2.820	Insurance
JULIUS BAER	0.960	Banking
ABB LTD	5.440	Electrical equipment
HOLCIM	1.510	Building materials
SGS	1.130	Quality and Inspection
GEBERIT	1.020	Plumbing
ADECCO	0.950	Industrials
SYNGENTA	3.310	Chemicals
GIVAUDAN	1.060	Basic materials
TRANSOCEAN	1.470	Oil and gas
SWISSCOM	1.060	Telecommunication
	100.00	



Trading symbol	Company	31.10.2013 (%)	31.10.2014 (%)	Average weights	Industry
LHA	Lufthansa AG VNA.	0.873	0.750	0.81	Aeronautic
BMW	BAY.MOTOREN WERKE AG ST	3.501	3.537	3.52	Automotive industry
DAI	Daimler AG NA	7.731	7.857	7.79	Automotive industry
VOW3	Volkswagen AG VZO	3.371	3.362	3.37	Automotive industry
CON	Continental AG	1.695	2.206	1.95	Automotive Industry
CBK	Commerzbank AG	1.213	1.498	1.36	Banking
DBK	Deutsche bank AG NA	4.878	3.557	4.22	Banking
HEI	Heidelbergcement AG	1.108	0.950	1.03	Building materials
BAS	BASF SE NA	8.949	8.761	8.86	Chemical science
LXS	Lanxess AG	0.545	0.537	0.54	Chemical science
SDF	K+S AG NA	0.480	0.535	0.51	Chemical science
ADS	ADIDAS AG NA	2.269	1.603	1.94	Clothing
BEI	Beiersdorf AG	0.897	0.822	0.86	Consumer goods
HEN3	Henkel AG+CO.KGAA VZO	1.818	1.779	1.80	Consumer goods
SIE	Siemens AG NA	9.974	9.456	9.71	Electrical engineering
ALV	Allianz SE VNA	7.155	7.768	7.46	Insurance
MUV2	Muench rueckvers VNA	3.123	2.945	3.03	Insurance
DPW	Deutsche post AG NA	3.186	3.090	3.14	Logistics
FME	Fresen MED care KGAA ST	1.368	1.451	1.41	Medical technology
FRE	Fresenius SE+CO.KGAA	1.657	1.900	1.78	Medical technology
BAYN	Bayer AG NA	9.814	11.027	10.42	Pharmaceutical
MRK	Merck KGAA	0.999	1.112	1.06	Pharmaceutical
LIN	Linde AG	3.733	3.333	3.53	Plant manufacturing
IFX	Infineon tech. AG NA	1.090	1.248	1.17	Semiconductor
SAP	SAP AG	6.864	6.518	6.69	Software
TKA	Thyssenkrupp AG	0.909	1.184	1.05	Steel
DB1	Deutsche boerse NA	1.390	1.263	1.33	Stock exchange
EOAN	E.ON AG NA	3.488	3.434	3.46	Supplier
RWE	RWE AG ST	1.636	1.869	1.75	Supplier
DTE	DT. Telekom AG NA	4.287	4.652	4.47	Telecommunication
				100.00	

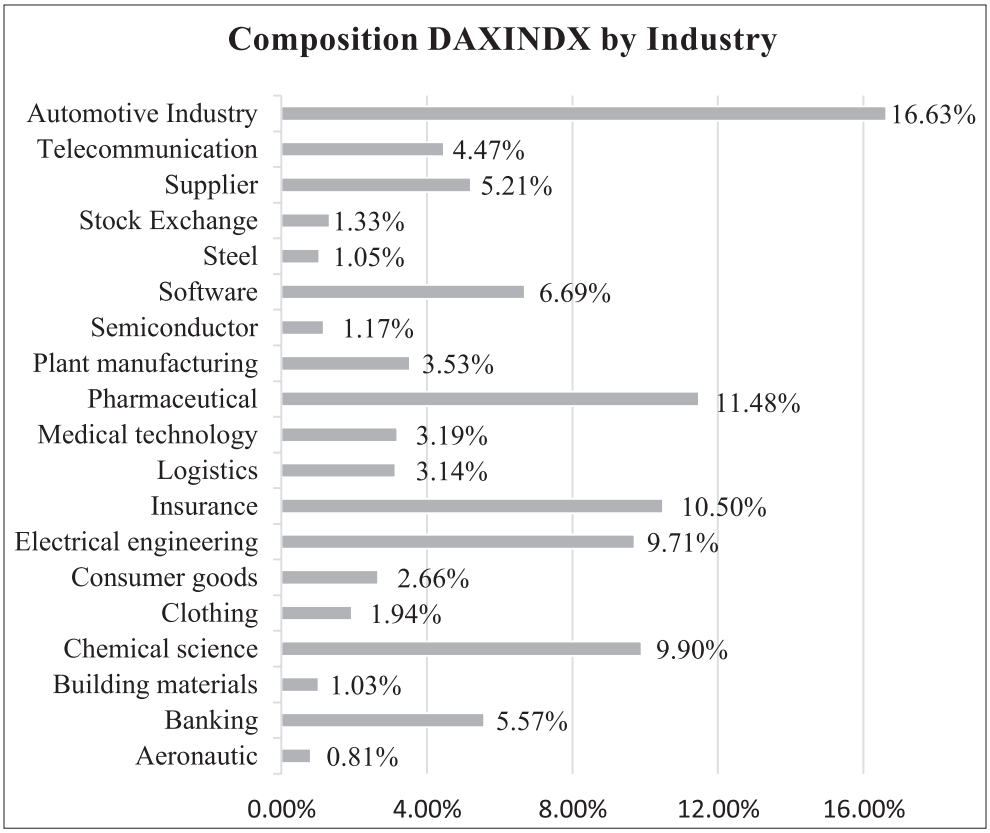


Table 2: Tracking error during estimation and evaluation window

Returns all in euro's	EURO	DAX	Active return	SMI	Active return		EURO	DAX	Active return	SMI	Active return
Code	**DJES50I**	**DAXINDX**	**EURO-DAX**	**SWISSMI**	**EURO-SMI**	**Code**	**DJES50I**	**DAXINDX**	**EURO - DAX**	**SWISSMI**	**EURO - SMI**
01/01/2004	0.031662467	0.036981698	−0.005319231	0.016220212	0.015442255	01/01/2012	0.024065436	0.042915078	−0.018849642	0.054762819	−0.030697383
01/02/2004	0.033216698	0.026489835	0.006726863	0.047649071	−0.014432373	01/02/2012	0.04156321	0.042110867	−0.000547657	0.029582347	0.011980863
01/03/2004	0.022403864	−0.004225932	0.026629796	0.001608667	0.020795197	01/03/2012	0.031028641	0.020200149	0.010828492	0.009320737	0.021707903
01/04/2004	−0.034459848	−0.032481977	−0.001977871	−0.008246668	−0.026213179	01/04/2012	−0.018802749	−0.003725298	−0.015077451	0.028727547	−0.047530296
01/05/2004	−0.004706594	0.020876901	−0.025583494	0.021966332	−0.026672926	01/05/2012	−0.080949424	0.007748243	−0.088697667	−0.030952514	−0.04999691
01/06/2004	−0.033761982	−0.036455536	0.002693554	−0.025352576	−0.008409406	01/06/2012	−0.108910608	−0.088450555	−0.020460053	−0.052937164	−0.055973444
01/07/2004	0.033818992	0.043261759	−0.009442768	0.010918269	0.022900723	01/07/2012	0.102556278	0.074928973	0.027627305	0.055439412	0.047116866
01/08/2004	−0.040115285	−0.043642249	0.003526964	−0.025209288	−0.014905997	01/08/2012	0.017860308	0.029311234	−0.011450926	0.046099415	−0.028239107
01/09/2004	−0.001703809	−0.011741818	0.010038009	−0.01242377	0.010719961	01/09/2012	0.054130782	0.004404835	0.049725947	0.006615656	0.047515126
01/10/2004	0.038056617	0.045406375	−0.007349757	0.003315235	0.034741382	01/10/2012	0.014365863	0.001412269	0.012953595	0.019527989	−0.005162126
01/11/2004	0.013481291	0.004415812	0.009065479	−0.008273464	0.021754755	01/11/2012	0.01392998	0.003976045	0.009953935	0.00961377	0.004316211
01/12/2004	0.027555839	0.042303412	−0.014747573	0.022254996	0.005300843	01/12/2012	0.018959446	−0.011487495	0.030446941	0.02475443	−0.005794984
01/01/2005	0.019313121	0.024890522	−0.005577401	0.031166103	−0.011852983	01/01/2013	0.020531553	0.005747178	0.014784375	−0.000846955	0.021378508
01/02/2005	0.012989259	−0.002697312	0.015686572	−0.000702087	0.013691346	01/02/2013	0.027741694	0.003451432	0.024290262	0.059606453	−0.031864759
01/03/2005	0.022865029	0.023928867	−0.001063838	0.041273745	−0.018408716	01/03/2013	−0.035045039	0.010577709	−0.045622748	0.031698596	−0.066743635
01/04/2005	−0.00564538	−0.002304404	−0.003340976	−0.014316381	0.008671001	01/04/2013	0.002775544	0.030470395	−0.027694851	0.035356185	−0.03258064
01/05/2005	−0.037280947	−0.034783182	−0.002497765	0.002611172	−0.039892119	01/05/2013	0.032881097	0.000297236	0.032583861	0.006544403	0.026336694
01/06/2005	0.058219195	0.069309739	−0.011090544	0.052175563	0.006043632	01/06/2013	0.01318826	0.007321404	0.005866856	−0.031051652	0.044239912
01/07/2005	0.026121978	0.019663285	0.006458693	0.000229707	0.025892271	01/07/2013	−0.046605319	−0.039086264	−0.007519055	0.001367816	−0.047973135
01/08/2005	0.034259483	0.057605808	−0.023346325	0.046328035	−0.012068553	01/08/2013	0.068527656	0.038371946	0.030155709	0.009312538	0.059215117
01/09/2005	−0.011555955	−0.009844138	−0.001711817	0.000803714	−0.012359668	01/09/2013	−0.012378687	0.002987074	−0.015365762	0.01187846	−0.024257147
01/10/2005	0.049641559	0.048196685	0.001444874	0.061342385	−0.011700826	01/10/2013	0.055709181	0.007978176	0.047731005	0.026372954	0.029336228
01/11/2005	−0.040494812	−0.03189197	−0.008602842	0.016322847	−0.056817659	01/11/2013	0.03981107	0.026843006	0.012968064	0.015872942	0.023938128
01/12/2005	0.055514775	0.06754881	−0.012034035	0.05992757	−0.004412795	01/12/2013	0.00818816	0.001524646	0.006663514	0.004966413	0.003221747
01/01/2006	0.028933029	0.03423644	−0.005303411	0.001573513	0.027359516	01/01/2014	0.010270314	0.018649406	−0.008379092	−0.00302081	0.013291125
01/02/2006	0.033827194	0.049497824	−0.01567063	0.033313535	0.000513659	01/02/2014	−0.047774244	−0.037722358	−0.010051886	−0.007501119	−0.040273126
01/03/2006	0.020623557	0.024167192	−0.003543635	0.011567545	0.009056011	01/03/2014	0.029923028	0.041450657	−0.011527629	0.02743152	0.002491508
01/04/2006	0.018897926	0.026482836	−0.007584911	0.000895289	0.018002636	01/04/2014	0.042421753	−0.014755494	0.057177246	0.016348932	0.02607282
01/05/2006	−0.010038252	−0.002353345	−0.007684907	0.009944941	−0.019983193	01/05/2014	0.003860617	0.033519199	−0.029658582	0.001562029	0.002298588
01/06/2006	−0.051176796	−0.051609578	0.000432782	−0.055899668	0.004722872	01/06/2014	0.015245559	0.018613336	−0.003367777	0.023195698	−0.007950138
01/07/2006	0.003991115	0.000893148	0.003097967	0.01024583	−0.006254715	01/07/2014	0.003354181	0.008311045	−0.004956863	−0.003077263	0.006431445
01/08/2006	−0.00611214	−0.020505731	0.01439359	0.023244079	−0.02935622	01/08/2014	−0.058819308	−0.017416197	−0.04140311	−0.024856666	−0.033962642
01/09/2006	0.048334877	0.048783868	−0.000448991	0.02755951	0.020775367	01/09/2014	0.032809718	0.030142836	0.002666881	0.046049438	−0.01323972
01/10/2006	0.018563107	0.020701312	−0.002138205	0.020783777	−0.00222067	01/10/2014	0.006290004	−0.02306167	0.029351674	0.005352325	0.000937679
01/11/2006	0.030826464	0.047593627	−0.016767163	0.024618287	0.006208177	01/11/2014	−0.035929555	−0.015730311	−0.020199244	−0.003570543	−0.032359012
01/12/2006	−0.020701859	−0.008101836	−0.012600023	−0.023906324	0.003204464	01/12/2014	0.047699776	0.010067726	0.03763205	0.046680273	0.001019503
01/01/2007	0.046667024	0.055441618	−0.008774594	0.029970557	0.016696467	01/01/2015	−0.027114184	0.008707077	−0.035821261	−0.01765522	−0.009458964
BETA SWISSMI	**0.633254589**		**Tracking error estimation period (2004-2006)**			**BETA SWISSMI**	**0.398384931**		**Tracking error evaluation period (2012-2014)**		
				DAXINDX (%)	**SWISSMI (%)**					**DAXINDX (%)**	**SWISSMI (%)**
			2004	1.292	1.995			2012		3.3580	3.4298
BETA DAXINDX	1.060535852		2005	0.938	2.171	BETA DAXINDX	0.473550473	2013		2.5703	3.8164
			2006	0.804	1.534			2014		2.7825	1.8625
			TE (2002-2006)	1.043	2.005			TE (2012-2014)		2.948	3.143

Table 3: Covariance-Variance matrix during the estimation window (2004-2006)

	FTSE100	DAXINDX	FRCAC40	SWISSMI	MADRIDI	SWSEALI	HEXINDX	DKKFXIN	OSLOOBX	ISEQUIT	AMSTEOE	NLALSHR	BGBEL20	IBEX35I	PTSHRPRCF	DJES50I
FTSE100	0.000541	0.000424	0.000448	0.000313	0.000443	0.000535	0.000586	0.000499	0.000845	0.000408	0.000509	0.000556	0.000367	0.000445	−0.000049	0.000457
DAXINDX	0.000424	0.001075	0.000822	0.000628	0.000758	0.001066	0.000962	0.000768	0.000910	0.000819	0.000972	0.000914	0.000703	0.000780	0.000138	0.000914
FRCAC40	0.000448	0.000822	0.000739	0.000492	0.000617	0.000909	0.000880	0.000675	0.000863	0.000674	0.000832	0.000799	0.000619	0.000625	0.000078	0.000763
SWISSMI	0.000313	0.000628	0.000492	0.000632	0.000493	0.000588	0.000545	0.000454	0.000387	0.000405	0.000658	0.000593	0.000442	0.000502	0.000133	0.000546
MADRIDI	0.000443	0.000758	0.000617	0.000493	0.000854	0.000819	0.000858	0.000604	0.000728	0.000658	0.000763	0.000756	0.000616	0.000869	0.000127	0.000735
SWSEALI	0.000535	0.001066	0.000909	0.000588	0.000819	0.001419	0.001335	0.000981	0.001254	0.000905	0.001010	0.000983	0.000830	0.000828	0.000086	0.000969
HEXINDX	0.000586	0.000962	0.000880	0.000545	0.000858	0.001335	0.002639	0.001218	0.001605	0.000788	0.001136	0.001051	0.000831	0.000846	0.000197	0.001038
DKKFXIN	0.000499	0.000768	0.000675	0.000454	0.000604	0.000981	0.001218	0.001333	0.001143	0.000613	0.000905	0.000846	0.000694	0.000601	−0.000003	0.000759
OSLOOBX	0.000845	0.000910	0.000863	0.000387	0.000728	0.001254	0.001605	0.001143	0.002645	0.000761	0.000895	0.001038	0.000679	0.000737	0.000051	0.000882
ISEQUIT	0.000408	0.000819	0.000674	0.000405	0.000658	0.000905	0.000788	0.000613	0.000761	0.001081	0.000843	0.000807	0.000597	0.000669	0.000205	0.000757
AMSTEOE	0.000509	0.000972	0.000832	0.000658	0.000763	0.001010	0.001136	0.000905	0.000895	0.000843	0.001173	0.001074	0.000754	0.000769	0.000141	0.000934
NLALSHR	0.000556	0.000914	0.000799	0.000593	0.000756	0.000983	0.001051	0.000846	0.001038	0.000807	0.001074	0.001033	0.000710	0.000764	0.000095	0.000882
BGBEL20	0.000367	0.000703	0.000619	0.000442	0.000616	0.000830	0.000831	0.000694	0.000679	0.000597	0.000754	0.000710	0.000791	0.000631	0.000236	0.000690
IBEX35I	0.000445	0.000780	0.000625	0.000502	0.000869	0.000828	0.000846	0.000601	0.000737	0.000669	0.000769	0.000764	0.000631	0.000897	0.000140	0.000756
PTSHRPRCF	−0.000049	0.000138	0.000078	0.000133	0.000127	0.000086	0.000197	-0.000003	0.000051	0.000205	0.000141	0.000095	0.000236	0.000140	0.000812	0.000116
DJES50I	0.000457	0.000914	0.000763	0.000546	0.000735	0.000969	0.001038	0.000759	0.000882	0.000757	0.000934	0.000882	0.000690	0.000756	0.000116	0.000862

Source: Variance and covariance are illustrated together in a variance-covariance matrix. The variances appear along the diagonal and covariances appear in the off-diagonal elements. The covariance-variance matrix was generated by Microsoft Excel

Table 4: Covariance–variance matrix during the evaluation window (2012-2014)

	FTSE100	DAXINDX	FRCAC40	SWISSMI	MADRIDI	SWSEALI	HEXINDX	DKKFXIN	OSLOOBX	ISEQUIT	AMSTEOE	NLALSHR	BGBEL20	IBEX35I	PTSHRPRCF	DJES50I
FTSE100	0.000778	0.000776	0.000769	0.000428	0.000859	0.000833	0.000781	0.000634	0.001094	0.000547	0.000725	0.000722	0.000687	0.000865	0.000012	0.000815
DAXINDX	0.000776	0.001580	0.001311	0.000633	0.001551	0.001235	0.001426	0.000923	0.001309	0.000758	0.001113	0.001041	0.001136	0.001552	0.000049	0.001470
FRCAC40	0.000769	0.001311	0.001449	0.000667	0.001782	0.001142	0.001296	0.000940	0.001389	0.000678	0.001188	0.001096	0.001204	0.001772	0.000212	0.001537
SWISSMI	0.000428	0.000633	0.000667	0.000638	0.000737	0.000762	0.000701	0.000558	0.000704	0.000501	0.000602	0.000577	0.000639	0.000747	0.000036	0.000686
MADRIDI	0.000859	0.001551	0.001782	0.000737	0.003383	0.001210	0.001810	0.001016	0.001697	0.000669	0.001435	0.001344	0.001557	0.003386	0.000349	0.002117
SWSEALI	0.000833	0.001235	0.001142	0.000762	0.001210	0.001651	0.001348	0.001145	0.001316	0.000904	0.001037	0.001014	0.001088	0.001217	0.000155	0.001185
HEXINDX	0.000781	0.001426	0.001296	0.000701	0.001810	0.001348	0.001761	0.001012	0.001393	0.000827	0.001040	0.000996	0.001193	0.001810	0.000166	0.001467
DKKFXIN	0.000634	0.000923	0.000940	0.000558	0.001016	0.001145	0.001012	0.001472	0.001384	0.000737	0.000788	0.000780	0.000836	0.000998	−0.000052	0.000986
OSLOOBX	0.001094	0.001309	0.001389	0.000704	0.001697	0.001316	0.001393	0.001384	0.002318	0.000824	0.001191	0.001167	0.001187	0.001686	0.000301	0.001509
ISEQUIT	0.000547	0.000758	0.000678	0.000501	0.000669	0.000904	0.000827	0.000737	0.000824	0.001056	0.000562	0.000594	0.000701	0.000674	0.000240	0.000671
AMSTEOE	0.000725	0.001113	0.001188	0.000602	0.001435	0.001037	0.001040	0.000788	0.001191	0.000562	0.001268	0.001140	0.001029	0.001435	0.000007	0.001312
NLALSHR	0.000722	0.001041	0.001096	0.000577	0.001344	0.001014	0.000996	0.000780	0.001167	0.000594	0.001140	0.001058	0.000962	0.001344	−0.000010	0.001202
BGBEL20	0.000687	0.001136	0.001204	0.000639	0.001557	0.001088	0.001193	0.000836	0.001187	0.000701	0.001029	0.000962	0.001208	0.001550	0.000250	0.001300
IBEX35I	0.000865	0.001552	0.001772	0.000747	0.003386	0.001217	0.001810	0.000998	0.001686	0.000674	0.001435	0.001344	0.001550	0.003395	0.000331	0.002112
PTSHRPRCF	0.000012	0.000049	0.000212	0.000036	0.000349	0.000155	0.000166	−0.000052	0.000301	0.000240	0.000007	−0.000010	0.000250	0.000331	0.002279	0.000164
DJES50I	0.000815	0.001470	0.001537	0.000686	0.002117	0.001185	0.001467	0.000986	0.001509	0.000671	0.001312	0.001202	0.001300	0.002112	0.000164	0.001721

Variance and covariance are illustrated together in a variance-covariance matrix. The variances appear along the diagonal and covariances appear in the off-diagonal elements. The covariance-variance matrix was generated by Microsoft Excel

Table 5: Correlation matrix during the estimation window (2004-2006)

	FTSE100	DAXINDX	FRCAC40	SWISSMI	MADRIDI	SWSEALI	HEXINDX	DKKFXIN	OSLOOBX	ISEQUIT	AMSTEOE	NLALSHR	BGBEL20	IBEX35I	PTSHRPRCF	DJES50I
FTSE100	1	0.555872	0.709734	0.535920	0.652551	0.610749	0.490646	0.587965	0.707044	0.533795	0.638881	0.744295	0.560636	0.639793	−0.073968	0.669999
DAXINDX	0.555872	1	0.922959	0.762150	0.791581	0.862874	0.571133	0.641990	0.539961	0.760215	0.866099	0.867333	0.762115	0.794610	0.147231	0.949607
FRCAC40	0.709734	0.922959	1	0.720935	0.777411	0.887651	0.630320	0.680446	0.617641	0.754015	0.894096	0.915183	0.809570	0.767691	0.100579	0.956842
SWISSMI	0.535920	0.762150	0.720935	1	0.671798	0.621321	0.422199	0.494972	0.299506	0.490303	0.764332	0.734127	0.625732	0.667565	0.185714	0.739730
MADRIDI	0.652551	0.791581	0.777411	0.671798	1	0.743699	0.571411	0.565703	0.484267	0.684934	0.762170	0.805198	0.748916	0.993500	0.152086	0.856485
SWSEALI	0.610749	0.862874	0.887651	0.621321	0.743699	1	0.689749	0.713301	0.647408	0.730448	0.782725	0.811641	0.783059	0.734325	0.080124	0.876305
HEXINDX	0.490646	0.571133	0.630320	0.422199	0.571411	0.689749	1	0.649516	0.607536	0.466528	0.645469	0.636589	0.574738	0.550211	0.134451	0.688073
DKKFXIN	0.587965	0.641990	0.680446	0.494972	0.565703	0.713301	0.649516	1	0.608790	0.510926	0.723855	0.721280	0.675323	0.549608	−0.002629	0.708350
OSLOOBX	0.707044	0.539961	0.617641	0.299506	0.484267	0.647408	0.607536	0.608790	1	0.449978	0.508111	0.628205	0.469489	0.478568	0.034791	0.583940
ISEQUIT	0.533795	0.760215	0.754015	0.490303	0.684934	0.730448	0.466528	0.510926	0.449978	1	0.749293	0.763821	0.645531	0.679195	0.218673	0.784162
AMSTEOE	0.638881	0.866099	0.894096	0.764332	0.762170	0.782725	0.645469	0.723855	0.508111	0.749293	1	0.976168	0.783042	0.749503	0.144392	0.929039
NLALSHR	0.744295	0.867333	0.915183	0.734127	0.805198	0.811641	0.636589	0.721280	0.628205	0.763821	0.976168	1	0.785966	0.794056	0.103820'	0.934962
BGBEL20	0.560636	0.762115	0.809570	0.625732	0.748916	0.783059	0.574738	0.675323	0.469489	0.645531	0.783042	0.785966	1	0.749531	0.294618	0.835701
IBEX35I	0.639793	0.794610	0.767691	0.667565	0.993500	0.734325	0.550211	0.549608	0.478568	0.679195	0.749503	0.794056	0.749531	1	0.164631	0.860496
PTSHRPRCF	−0.073968	0.147231	0.100579	0.185714	0.152086	0.080124	0.134451	−0.002629	0.034791	0.218673	0.144392	0.103820	0.294618	0.164631	1	0.139141
DJES50I	0.669999	0.949607	0.956842	0.739730	0.856485	0.876305	0.688073	0.708350	0.583940	0.784162	0.929039	0.934962	0.835701	0.860496	0.139141	1

The correlation matrix displays the relationship between the returns. The diagonal of a correlation matrix is the relationship of the return with itself, which always equals 1. We employed the solver in excel to calculate the correlation matrix. The input range are the returns of the indices

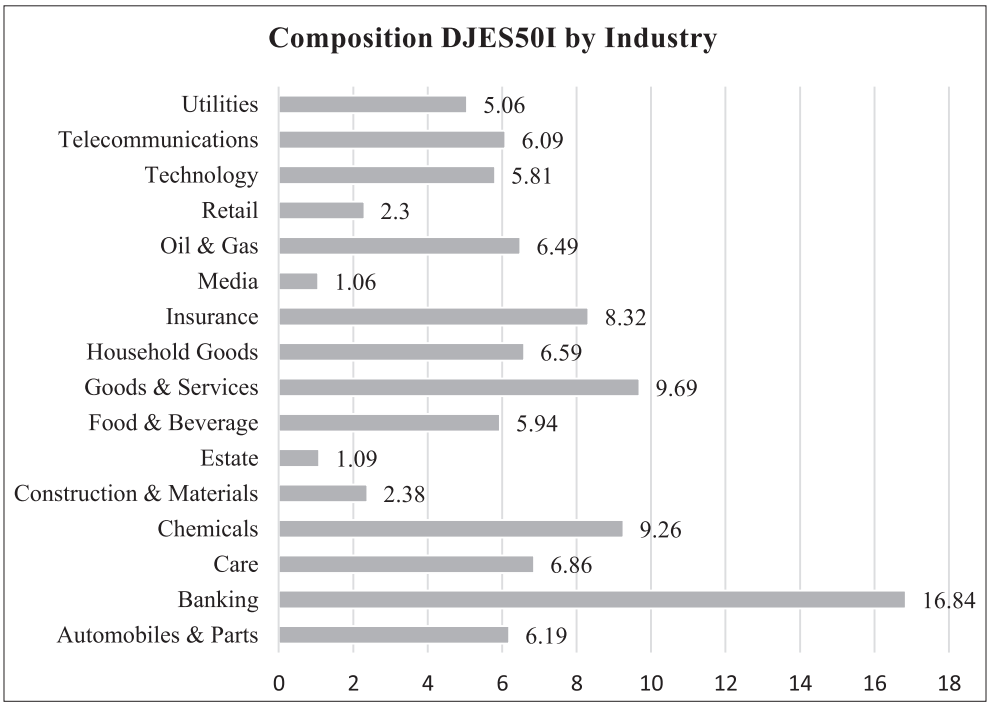
Table 6: Correlation matrix during the evaluation window (2012-2014)

	FTSE100	DAXINDX	FRCAC40	SWISSMI	MADRIDI	SWSEALI	HEXINDX	DKKFXIN	OSLOOBX	ISEQUIT	AMSTEOE	NLALSHR	BGBEL20	IBEX35I	PTSHRPRCF	DJES50I
FTSE100	1	0.699660	0.724416	0.607196	0.529593	0.735220	0.666995	0.592119	0.814972	0.603057	0.730371	0.795550	0.709083	0.532214	0.009157	0.704405
DAXINDX	0.699660	1	0.866665	0.629959	0.670905	0.764401	0.854610	0.604957	0.683916	0.586826	0.786545	0.805214	0.822641	0.669851	0.025710	0.891475
FRCAC40	0.724416	0.866665	1	0.693862	0.805116	0.738520	0.811351	0.643993	0.758135	0.548238	0.876477	0.885666	0.910392	0.798931	0.116841	0.973276
SWISSMI	0.607196	0.629959	0.693862	1	0.501711	0.742624	0.661285	0.575848	0.579058	0.610176	0.669565	0.701854	0.728319	0.507847	0.029495	0.654330
MADRIDI	0.529593	0.670905	0.805116	0.501711	1	0.512220	0.741634	0.455290	0.605936	0.353979	0.692805	0.710508	0.770279	0.999031	0.125630	0.877271
SWSEALI	0.735220	0.764401	0.738520	0.742624	0.512220	1	0.790738	0.734592	0.672881	0.684495	0.716531	0.767492	0.770775	0.514204	0.080086	0.702905
HEXINDX	0.666995	0.854610	0.811351	0.661285	0.741634	0.790738	1	0.628255	0.689357	0.605959	0.695955	0.729530	0.817853	0.740405	0.082961	0.842519
DKKFXIN	0.592119	0.604957	0.643993	0.575848	0.455290	0.734592	0.628255	1	0.749238	0.591052	0.576510	0.624835	0.627238	0.446370	−0.028609	0.619511
OSLOOBX	0.814972	0.683916	0.758135	0.579058	0.605936	0.672881	0.689357	0.749238	1	0.526533	0.694854	0.745495	0.709468	0.601035	0.130822	0.755634
ISEQUIT	0.603057	0.586826	0.548238	0.610176	0.353979	0.684495	0.605959	0.591052	0.526533	1	0.485919	0.562372	0.620313	0.355760	0.154362	0.497678
AMSTEOE	0.730371	0.786545	0.876477	0.669565	0.692805	0.716531	0.695955	0.576510	0.694854	0.485919	1	0.984637	0.831249	0.691519	0.004021	0.887807
NLALSHR	0.795550	0.805214	0.885666	0.701854	0.710508	0.767492	0.729530	0.624835	0.745495	0.562372	0.984637	1	0.850953	0.709339	−0.006589	0.891165
BGBEL20	0.709083	0.822641	0.910392	0.728319	0.770279	0.770775	0.817853	0.627238	0.709468	0.620313	0.831249	0.850953	1	0.765454	0.150693	0.901571
IBEX35I	0.532214	0.669851	0.798931	0.507847	0.999031	0.514204	0.740405	0.446370	0.601035	0.355760	0.691519	0.709339	0.765454	1	0.119159	0.873829
PTSHRPRCF	0.009157	0.025710	0.116841	0.029495	0.125630	0.080086	0.082961	−0.028609	0.130822	0.154362	0.004021	−0.006589	0.150693	0.119159	1	0.082774
DJES50I	0.704405	0.891475	0.973276	0.654330	0.877271	0.702905	0.842519	0.619511	0.755634	0.497678	0.887807	0.891165	0.901571	0.873829	0.082774	1

The correlation matrix displays the relationship between the returns. The diagonal of a correlation matrix is the relationship of the return with itself, which always equals 1. We employed the solver in excel to calculate the correlation matrix. The input range are the returns of the indices

Table 7: Composition of the DJES50I by industry and country

Company	Weights	Industry	Country	Average weights
Total	4.79	Oil and gas	FR	4.79
Bayer	4.52	Chemicals	DE	4.52
Sanofi	4.44	Care	FR	4.44
Anheuser-busch inbev	4.16	Food and beverage	BE	4.16
Daimler	3.64	Automobiles and parts	DE	3.64
Allianz	3.49	Insurance	DE	3.49
SAP	3.30	Technology	DE	3.30
Siemens	3.26	Goods and services	DE	3.26
Bco santander	3.18	Banking	ES	3.18
Basf	3.04	Chemicals	DE	3.04
Unilever NV	2.91	Household goods	NL	2.91
Bnp paribas	2.81	Banking	FR	2.81
AXA	2.47	Insurance	FR	2.47
Deutsche telekom	2.47	Telecommunications	DE	2.47
ING GRP	2.26	Banking	NL	2.26
Telefonica	2.14	Telecommunications	ES	2.14
Bco bilbao vizcaya arg.	2.10	Banking	ES	2.10
Intesa Sanpaolo	2.09	Banking	IT	2.09
Lvmh Moet Hennessy	1.86	Household goods	FR	1.86
L'oreal	1.82	Household goods	FR	1.82
Danone	1.78	Food and beverage	FR	1.78
Iberdrola	1.75	Utilities	ES	1.75
Airbus group SE	1.74	Goods and services	FR	1.74
ENI	1.70	Oil and gas	IT	1.70
Air liquide	1.70	Chemicals	FR	1.70
GRP societe generale	1.63	Banking	FR	1.63
Industria de diseno Textil SA	1.60	Retail	ES	1.60
Orange	1.48	Telecommunications	FR	1.48
BMW	1.46	Automobiles and Parts	DE	1.46
Schneider electric	1.45	Goods and services	FR	1.45
VINCI	1.44	Construction and materials	FR	1.44
Unicredit	1.44	Banking	IT	1.44
ASML HLDG	1.41	Technology	NL	1.41
Deutsche bank	1.33	Banking	DE	1.33
ENEL	1.29	Utilities	IT	1.29
Muenchener rueck	1.29	Insurance	DE	1.29
Fresenius	1.25	Care	DE	1.25
ENGIE Utilities	1.23	Utilities	FR	1.23
Essilor international	1.17	Care	FR	1.17
Deutsche post	1.16	Goods and services	DE	1.16
Volkswagen Pref	1.12	Automobiles and parts	DE	1.12
NOKIA	1.10	Technology	FI	1.10
Unibail-rodamco	1.09	Estate	FR	1.09
Assicurazioni generali	1.07	Insurance	IT	1.07
Vivendi	1.06	Media	FR	1.06
Philips	1.06	Goods and services	NL	1.06
Safran	1.02	Goods and services	FR	1.02
Saint gobain	0.94	Construction and materials	FR	0.94
EON	0.79	Utilities	DE	0.79
Carrefour	0.70	Retail	FR	0.70
	100.00			100.00


Composition DJES50I by Industry
Utilities 5.06
Telecommunications 6.09
Technology 5.81
Retail 2.3
Oil & Gas 6.49
Media 1.06
Insurance 8.32
Household Goods 6.59
Goods & Services 9.69
Food & Beverage 5.94
Estate 1.09
Construction & Materials 2.38
Chemicals 9.26
Care 6.86
Banking 16.84
Automobiles & Parts 6.19
0 2 4 6 8 10 12 14 16 18

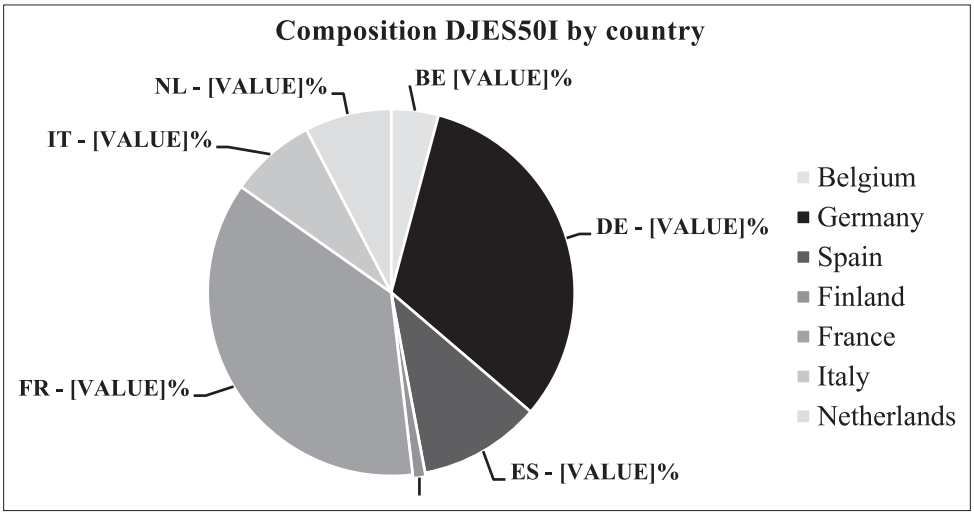

Composition DJES50I by country
NL - [VALUE]%
BE [VALUE]%
IT - [VALUE]%
DE - [VALUE]%
FR - [VALUE]%
ES - [VALUE]%
Belgium
Germany
Spain
Finland
France
Italy
Netherlands

Table 8: Performance indicators of the 1/N and MCWI portfolios based on Swiss Growth Stock and Value Stock compared to the EURO Benchmark

Full sample	Swiss portfolio (50 Stocks–incl. BELIMO HOLDING-R/excl. GROUPE MINOT-REG)							
	Estimation window (2004-2006) %				Evaluation window (2012-2014) %			
Portfolios	1/N value	1/N growth	MCWI value	MCWI growth	1/N Value	1/N growth	MCWI value	MCWI growth
Expected excess returns	1.8420	7.1005	0.0400	0.10763	0.8914	1.3469	0.0139	0.0400
Standard deviation	2.5540	12.4250	0.3962	0.1874	2.3847	2.8124	0.0790	0.1418
Sharpe ratio	72.1205	57.1474	10.0919	57.4431	37.3803	47.8927	17.5638	28.1943
CEQ returns	1.8094	6.3286	0.0392	0.1075	0.8630	1.3074	0.0138	0.0399
Sample excluding outliers	**Swiss portfolio* (50 Stocks-excl. BELIMO HOLDING-R/incl. GROUPE MINOT-REG)**							
	Estimation window (2004-2006) %				Evaluation window (2012-2014) %			
Portfolios	1/N value	1/N growth	MCWI value	MCWI growth	1/N value	1/N growth	MCWI value	MCWI growth
Expected excess returns	1.8420	2.0190	0.0400	0.04352	0.8914	1.3120	0.0139	0.0231
Standard deviation	2.5540	3.0587	0.3962	0.1917	2.3847	2.8121	0.0790	0.1536
Sharpe ratio	72.1205	66.0085	10.0919	22.7059	37.3803	46.6555	17.5638	15.0403
CEQ returns	1.8094	1.9722	0.0392	0.0433	0.8630	1.2725	0.0138	0.0230
Euro sample comparison	**Euro Stoxx 50**							
	Estimation window (2004-2006)				Evaluation window (2012-2014) (%)			
Portfolios	DJES50I				DJES50I			
Expected excess returns	0.9397				0.8307			
Standard deviation	2.3391				4.2061			
Sharpe ratio	40.1720				19.7500			
CEQ returns	0.9123				0.7422			

APPENDIX FIGURES

Figure 1: Descriptive summary of the exchange rate EURO/CHF during estimation and evaluation window

Average (EUR/CHF)	Average (EURO/CHF)	Standard deviation	Min and Max	Maximum	Date	Minimum	Date
Estimation window 2004-2006	1.55492	1.917%	Estimation window 2004-2006	1.6069	29/12/2006	1.5085	21/06/2004
Evaluation window 2012-2014	1.21697	1.290%	Evaluation window 2012-2014	1.2599	22/05/2013	1.2008	06/06/2012
Covariance	**Estimation window 2004 to 2006**	**Evaluation window 2012 to 2014**	**Correlation**	**Estimation window 2004-2006**		**Evaluation window 2012-2014**	
Estimation window 2004-2006	0.000367350	−0.00002841	Estimation window 2004 to 2006	1		−0.11425	
Evaluation window 2012-2014	−0.00002841	0.00016646	Evaluation window 2012 to 2014	−0.11425		1