Original Article

A comparison between capitalization-weighted and equally weighted indexes in the European equity market

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ABSTRACT This article aims at comparing two major equity index construction methodologies, the capitalization-weighted and the equally weighted approaches. Focusing on the constituents of the DJ Euro Stoxx index from January 2002 to December 2011, it provides further evidence to add to the established literature on this topic, of the higher risk-adjusted returns achieved by equally weighted portfolios in comparison with cap-weighted indexes. The novelty of our study is that we test these findings on the Euro stock market by using four reweighting frequencies (monthly, quarterly, semiannually and annually) with the aim of identifying that which is most able to maximize the benefits of the contrarian strategy implicit in the equally weighted approach. Moreover, it is demonstrated that the excess returns are not driven solely by a 'size effect' that usually explains the difference in performance of the two methodologies. Finally, we confirm our results by performing a Fama-French (1992) three-factor regression analysis and also by using a portfolio approach based on the market capitalization of the index constituents. To evaluate the implementation of the

EW strategy, from an operational perspective, we estimate the related transaction costs and show that trading costs are not able to affect the main results.
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INTRODUCTION

This article aims at comparing two major equity index construction methodologies, that is, the capitalization-weighted (CW) and the equally weighted (EW) approaches. In general, the equity benchmarks adopted by mutual funds are CW indexes where the components are weighted according to the total market value of their outstanding shares. From a theoretical perspective, the wide use of this approach is based on the evidence that, under a standard interpretation of the Capital Asset Pricing Model (Sharpe, 1964), a CW portfolio (the 'market' portfolio) is automatically Sharpe Ratio maximized.

Operationally, CW portfolios are easy to be implemented because they offer, at the same time, broad diversification and low transaction costs. These operational benefits can be justified by the fact that CW portfolios adjust their constituents' weights automatically as market prices move, resulting in fewer rebalancing trades. As a result, it is not surprising that asset management companies avoid using benchmarks based on a different construction methodology, such as EW indexes for their investment products. The EW approach has been criticized mainly because portfolios created using this methodology are not representative of the aggregate equity market, and because it treats large, mid and small caps regardless of their market liquidity (Arnott *et al*, 2005).

The issue concerning the enhancing of the index construction methodologies is the center of academic debate. Critics of CW indexes point out the fact that basing index constituents' weights on their market capitalization results in the largest securities having the biggest weights in the index, so much so that the contribution of smaller capitalization securities can be minimal. An increasing number of studies have rejected the mean variance efficiency of CW indexes suggesting alternative index weighting methodologies (see Hauger and Baker, 1991; Arnott *et al*, 2005; Clarke *et al*, 2006; Hsu, 2006; Choueifaty and Coignard, 2008; Chow *et al*, 2011). These studies base their critics on the evidence that cap weighting tends to overweight those stocks whose prices are high in relation to their fundamentals and to underweight stocks that have low prices.

In accordance with Bailey (1992), we believe that the efficacy of the benchmark's choice is mainly related to the context of use. It is worth remembering that the choice of the index construction methodology is an increasingly relevant issue because of the fundamental role played by the benchmark in the asset management industry. Benchmarks have become central to portfolio management with an impact on the investment choices, asset allocation, performance measurement and on the evaluation of the fund managers' reward. The role of the benchmark in the industry is even more relevant if we take into consideration the growing role and the impressive amount of assets under management of passive investment vehicles such as Exchange Traded Funds (ETF).

From Perold (2007), we assume that capitalization weighting is associated with a momentum strategy, whereas a rebalancing strategy, including equal weighting, is based on a contrarian strategy. The momentum strategy[1] is based on the empirical evidence that stocks with strong past performance continue to outperform stocks with poor past performance in the subsequent period (Jegadeesh and Titman, 1993). The cap-weighting being a buy-and-hold investment strategy takes advantage of this effect. On the other hand, a contrarian strategy is based on the attempts to profit by going against the trend selling of the stocks that have shown higher returns and buying the underperforming stocks. The EW methodology implicitly follows a contrarian strategy because it mechanically rebalances away from stocks that increase in price. Dash and Loggie (2008) compare the two approaches focusing on the performance of both the S&P500 Index and the S&P500 Equal Weighted Index between 2003 and 2008. They provide empirical evidence of the EW index outperformance as a result of different weighting and rebalancing processes. With further research, Dash and Zeng (2010) show the same results related to an international index, the S&P International 700 which comprises 700 of the largest, most liquid stocks from outside the United States.

Focusing on the stock market of the Euro area, this article aims to compare the performance of portfolios constructed using the CW and EW approaches over the period between January 2002 and December 2011. Our study examines the indexes of the Euro equity market as the literature on this topic has focused only on the US market.[2] The comparison between CW and EW portfolios in the Euro area is particularly relevant when we consider the importance of passive investment products (such as ETFs) in the fund management industry. These funds simply mirror the underlying equity market indexes that are cap-weighted. We selected for our analysis the Dow Jones EuroStoxx Index (DJ EURO) and the Dow Jones EuroStoxx 50 Index (DJ EURO50) because they are the underlying assets of the largest ETF specialized in the Euro equity market, the IShare funds.[3]

Furthermore, we examined the DJ EURO50, which is a highly concentrated index (representative of the 50 largest stocks in the Euro area) and widely used as benchmark by mutual funds. Among the US equity market indexes, there is not an index showing such characteristics, namely, high concentration of members and market weighted. In this study, we examine the large cap index together with the DJ EURO (whose members are about 300) as they are the mainly used stock market indexes denominated in euro.[4]

In this study, we construct EW portfolios using four reweighting frequencies: monthly, quarterly, semiannually and annually. Widening the existing literature on this topic, we test alternative reweighting frequencies in order to identify the one able to maximize the benefits of the contrarian strategy, which is implicit in the EW methodology. The results reveal a superior performance of the EW portfolios in each reweighting time frame we test and for both the indexes examined. This finding suggests that the contrarian effect derived from the stocks reweighting is stronger than the momentum effect, characterizing CW portfolios. Furthermore, relying on Fama-French (1992) three-factor regression analysis, we examine the extent to which the difference in performance of the two methodologies can be explained by the size and/or the style biases. We then proceed with a further analysis focused on the 'size effect' but based on a portfolio approach. We construct quintile-based portfolios sorting all the index members by market capitalization and calculate the excess returns of the top and the bottom quintiles over the CW indexes. Next, we test the presence of a stock return seasonality and, in particular, of the 'January size effect' (see Schwert, 1983, for a survey).

A frequent criticism of the EW methodology is related to the transaction costs because of the higher portfolio turnover. We then calculate the impact of the indexes reweighting with respect to a passive investment strategy.

The rest of the article is organized as follows. The next section describes the data and the research methodology. The subsequent section presents our main empirical results. The final section comprises some final remarks and concludes the article.

DATA AND METHODOLOGY

To compare the two index construction methodologies, we create EW portfolios using a sample of stocks of the Eurozone. This sample includes all the stocks that have been constituents of the DJEURO index and of the DJEURO50 index during the observation period. In particular, the DJEURO index is composed of a variable number of constituents (approximately 300) and it is weighted by free float market capitalization reviewed quarterly. The DJEURO50 index is a blue chip index and covers the 50 largest components of the broader DJEURO index. As we discuss later in the article, the analysis of this blue chip index overcomes the problem of the well-known 'size effect' that emerges when different portfolios are compared. We focus on the time period from January 2002 to December 2011. The starting date of the observation period coincides with the availability of the index constituents provided by Bloomberg Finance L.P., which is the data set used in this study. We construct EW portfolios with the constituents of the two DJ indexes but by giving equal weights. More in detail, we construct four EW indexes associated with both the market indexes using different reweighting frequencies (monthly, quarterly, semiannually and annually). Each rebalancing day, the weight of each constituent is set to $1/N$ per cent, where N is the number of constituents in the indexes. The index reweighting is made on the first trading day after the end of the observation period in order to avoid illiquidity problems, characterizing the last trading day of the year.

In our analysis, we assess the return and the risk properties of our EW portfolios and of the market indexes. We derive average returns of each portfolio and calculate the excess returns of the EW portfolio with respect to the equivalent market index. To measure performance, we use total returns, which means that returns include dividends and distributions realized over the observation period. Next, we calculate the standard deviation and the Sharpe ratio. The Sharpe ratio reflects the indexes' risk/reward efficiency by adjusting excess returns over the risk-free interest rate by the volatility incurred by the index. As a proxy of the risk-free rate, we use the Euribor rate with maturity at 1, 3, 6 and 12 months in accordance with the time frames of the indexes' reweighting. Next, we calculate the skewness of return distributions and the drawdown to compare the downside risk of each index.

To examine the risk-adjusted return of the EW indexes, we calculate the Jensen's alpha α_{JEN}, by running the regression:

$$R_t^{EW} - Rf_t = \alpha_{JEN} + b(R_t^{CW} - Rf_t) + \varepsilon_t \qquad (1)$$

where R_t^{EW} is the return of the EW portfolio, R_t^{CW} is the return of the CW index and Rf_t is the return on a risk-free asset. α_{JEN} provides an estimate of the risk-adjusted return, assuming that b is an appropriate measure for the systematic risk.

The analysis of risk and return measures yield insights into how the indexes behave. However, it is also interesting to analyze where the return properties come from. The non-cap-weighted indexes may take on exposures to common risk factors, such as value, momentum and small-cap exposures. As the indexes are broadly diversified across constituent stocks, one may in fact expect that the risk and return properties are largely driven by such factor exposures. This leaves only a small fraction of returns that are completely specific to the method of index design (Amec *et al*, 2011). Therefore, to examine the impact of these risk factors on the difference in performance between EW and CW portfolios, we perform a

Fama-French (1992) three-factor regression analysis:

$$R_t^{EW} - Rf_t = \alpha + b(R_t^{CW} - Rf_t) + s \times SMB_t + h \times HML_t + \varepsilon_t \qquad (2)$$

where R_t^{EW} is the return of the EW portfolio, R_t^{CW} is the return of the CW index, Rf_t is the return on a risk-free asset, *SMB* is the small-cap factor and HML is the value factor. In particular, SMB is a portfolio that has long small cap stocks and short large stocks, whereas HML is a portfolio that has long high book-to-price stocks (value stocks) and short low book-to-price stocks (growth stocks). In our analysis, the small-cap factor is measured by means of the excess return of the S&P small-cap Eurozone total return index and the DJEURO50 total return index, whereas the value factor is measured as the excess return of the S&P Europe EBI Value total index and the S&P Europe EBI Growth total index.

Afterwards, we proceed with a further analysis that focuses on the 'size effect' and is based on a different methodology. Following a portfolio approach, we create quintile-based portfolios, sorting all the index constituents by ascending market capitalization in correspondence of each rebalancing. In particular, we focus on the returns offered by the top and the bottom quintile portfolios. Therefore, we estimate the excess returns over the CW indexes for top and bottom quintiles, as well as the difference.

Next, we test whether the difference in performance between the two portfolios is more prevalent in a certain month in accordance with the evidence of the size-related anomalies of stock returns at the beginning of the year. The January premium for smaller companies is one of the best-known academic market anomalies (see Keim, 1983). As in Keim (1983), for both the indexes analyzed, we test the null hypothesis of equal expected abnormal returns for each month of the year, we use the following regression:

$$R_t^{EW} - R_t^{CW} = \alpha + a_1 D_1 + a_2 D_2 + a_3 D_3 + \cdots + a_{11} D_{11} + \varepsilon_t \qquad (3)$$

where $R_t^{EW} - R_t^{CW}$ is the monthly excess return of the EW portfolio over the CW index for month *t*, and the dummy variables indicate the month of the year in which the excess return is observed (D_1 = January, D_2 = February, and so on). The excess return for December is measured by α, whereas a_1 through a_{11} represent the differences between the excess return for December and the excess return for the other months. Afterwards, we perform a further regression analysis focused only on the DJEURO index to verify whether the stock return seasonality is because of the 'size effect', rather than the index construction methodology. Therefore, adding the small cap factor *SMB* to equation (3), we use the following regression:

$$R_t^{EW} - R_t^{CW} = \alpha + a_1 D_1 + a_2 D_2 + a_3 D_3 + \cdots + a_{11} D_{11} + SMB_t + \varepsilon_t \qquad (4)$$

Therefore, if the SMB factor is significant, then the seasonality is explained by the 'size effect'.

Finally, we estimate the rebalancing costs that must be incurred when an EW strategy is implemented. In particular, we focus on quarterly reweighting of the DJEURO index. In this analysis, we consider two sources of transaction costs. The first arises because of the periodic reweighting of the index constituents to the target weight, characterizing an EW strategy. In this case, the portfolio turnover is generated by the average cross-sectional dispersion of returns of the index's constituents during the observation period:

$$turnover \approx \sum_{t=1}^{M} \frac{\frac{\sum_{i=1}^{N} \left| R_t^i - R_t^{EW} \right|}{N_t}}{M} \qquad (5)$$

Table 1: Average returns of the DJ EuroStoxx (DJEURO) and of the DJ EuroStoxx50 (DJEURO50) indexes and their equally weighted versions

	EW (%)	*CW* (%)	*Difference in average (%)*	*EW (annualized) (%)*	*CW (annualized) (%)*	*Difference in average (%)*	*No. obs.*
Panel A: DJEURO							
Monthly	0.26	−0.04	0.30**	3.12	−0.48	3.60	120
Quarterly	0.81	−0.12	0.93**	3.25	−0.48	3.73	40
Semiannually	1.50	−0.24	1.74**	3.01	−0.48	3.49	20
Annually	3.12	−0.48	3.60*	3.12	−0.48	3.60	10
Panel B: DJEURO50							
Monthly	0.06	−0.15	0.21**	0.69	−1.82	2.51	120
Quarterly	0.27	−0.45	0.73**	1.10	−1.82	2.92	40
Semiannually	0.13	−0.91	1.04***	0.27	−1.82	2.09	20
Annually	0.32	−1.82	2.14**	0.32	−1.82	2.14	10

*,**,***denotes statistical significant at 10 per cent; 5 per cent; 1 per cent level respectively.
The statistics are based on a 10-year data from 02/01/02 to 31/12/11. Panel A reports the performance of the EW and CW indexes. EW indexes are constructed using different reweighting periods: monthly, quarterly, semiannually and annually.

where R_t^i is the return of the stock i in the quarter t, R_t^{EW} is the return of the EW portfolio in the quarter t, N_t is the number of the portfolio constituents in the quarter t and M is the number of quarters examined (which is equal to 36 in our analysis). The second source of transaction costs refers to the loss of the inclusion requirements by the index constituents and the subsequent replacement. This occurs mainly when stocks are replaced because of their small size or in the case of corporate actions (that is, M&A and spin-offs). We calculate this source of turnover as the number of stocks entering and leaving the index, at each rebalancing, multiplied by the stocks target weight. Afterwards, we average the turnover calculated in each quarter.

EMPIRICAL RESULTS

Table 1 shows the comparison between the returns of the CW indexes (DJEURO and DJEURO50) and the equivalent EW version, from January 2002 to December 2011. Panel A reports the performance of the DJEURO index and each of its four EW versions constructed, using the different reweighting frequencies (monthly, quarterly, semiannually and annually). The results highlight that, for each rebalancing time frame, EW portfolios outperform the corresponding CW index, whereas the positive excess returns are statistically significant based on the *t*-test. We observe the same findings in the comparison between the DJEURO50 index and the corresponding EW portfolios, as shown in Panel B. Being that the DJEURO50 is composed of only blue chips, these results prove that the EW methodology provides higher returns with respect to the CW one in addition to any stock's size consideration. Furthermore, both our analyses show that the highest excess returns registered by the EW over the CW indexes are achieved when the indexes are rebalanced on a quarterly basis. In this case, the differences in average annualized returns between EW and the CW indexes are +3.73 per cent and +2.92 per cent for the DJEURO and for the DJEURO50 indexes, respectively. The findings suggest that the most efficient time frame for the EW index rebalancing is 3 months. For this reason, our further analyses focus only on this reweighting frequency.

Figure 1 displays the performance of the DJEURO and the equivalent EW portfolio over the observation period. The cumulative return of the EW portfolio was 38.42 per cent compared with −4.70 per cent of the DJEURO, with a difference equal to 43.12 per cent.

Similarly, Figure 2 shows the performance of the DJEURO50 index and its EW version.

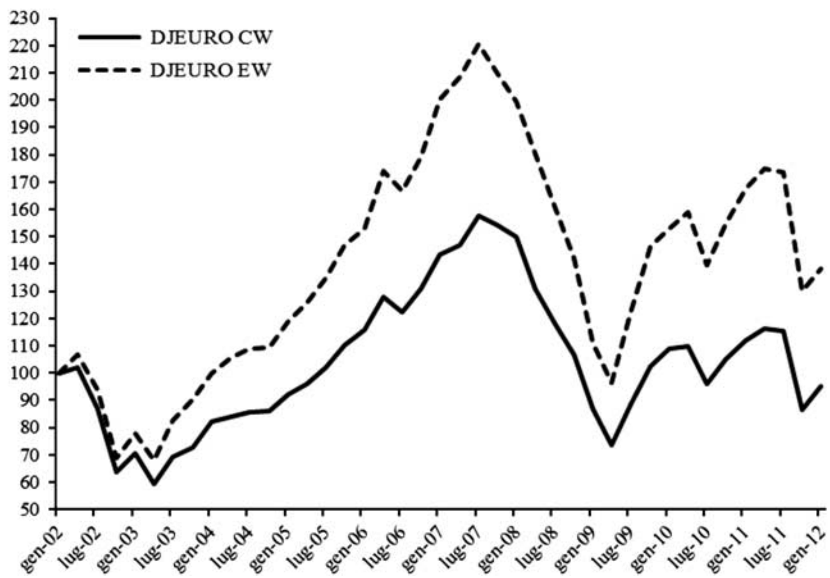

Figure 1: Comparison of the cumulative return of the DJ Euro Stoxx index (DJEURO) and the equivalent equally weighted portfolio rebalanced quarterly.
The graph covers 10 years of data from 02/01/02 to 31/12/11. The data set is provided by Bloomberg Finance L.P.

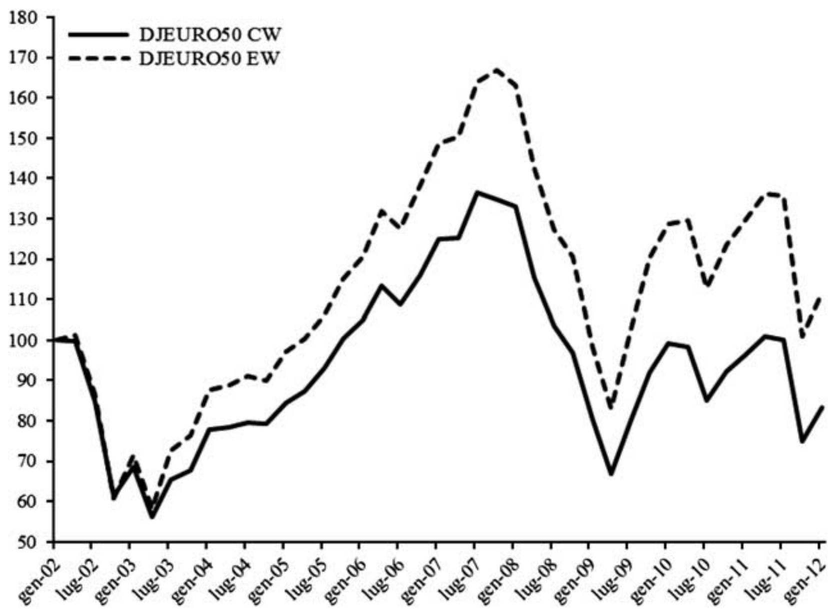

Figure 2: Cumulative return of the DJ Euro Stoxx 50 index (DJEURO50) and the equivalent equally weighted portfolio rebalanced quarterly.
The graph covers 10 years of data from 02/01/02 to 31/12/11. The data set is provided by Bloomberg Finance L.P.

In this case, the cumulative returns of the EW portfolio and of the DJEURO50 index were 11.60 per cent and −16.63 per cent, respectively, showing a difference equal to 28.23 per cent.

Table 2 reports the mean, median, standard deviation and the extreme values of the performance difference between the EW portfolios and the stock market indexes analyzed in this work. In particular, Panel A is

Table 2: Descriptive statistics regarding the difference between the equally weighted portfolios and the capitalization-weighted indexes (EW-CW)

	No.	Mean (%)	Median (%)	SD (%)	Min (%)	Max (%)
Panel A: DJEURO						
Monthly:						
EW-CW > 0	74	1.05	0.89	0.84	0.01	4.45
EW-CW < 0	46	−0.91	−0.61	0.79	−2.99	−0.03
EW-CW in case of positive index returns	67	0.32	0.31	1.07	−1.86	4.45
EW-CW in case of negative index returns	53	0.27	0.40	1.47	−2.99	3.19
Quarterly:						
EW-CW > 0	28	3.21	2.07	5.32	0.12	29.33
EW-CW < 0	12	−2.60	−2.23	2.28	−8.88	−0.07
EW-CW in case of positive index returns	26	1.04	1.55	2.97	−8.88	5.13
EW-CW in case of negative index returns	14	2.26	0.32	8.19	−4.18	29.33
Semiannually:						
EW-CW > 0	16	3.06	2.60	2.43	0.08	7.92
EW-CW < 0	4	−3.51	−4.15	2.50	−5.65	−0.09
EW-CW in case of positive index returns	12	2.35	1.93	2.06	0.08	7.43
EW-CW in case of negative index returns	8	0.84	1.24	5.18	−5.65	7.92
Annually:						
EW-CW > 0	7	6.63	6.67	2.38	2.04	8.82
EW-CW < 0	3	−3.46	−3.60	0.69	−4.07	−2.72
EW-CW in case of positive index returns	7	4.85	6.14	4.32	−3.60	8.79
EW-CW in case of negative index returns	3	0.68	−2.72	7.08	−4.07	8.82
Panel B: DJEURO50						
Monthly:						
EW-CW > 0	67	0.80	0.50	0.93	0.03	4.58
EW-CW < 0	53	−0.54	−0.26	0.76	−3.85	−0.01
EW-CW in case of positive index returns	66	0.52	0.25	1.07	−0.87	4.58
EW-CW in case of negative index returns	54	−0.17	−0.06	0.99	−3.85	2.11
Quarterly:						
EW-CW > 0	28	1.50	1.15	1.56	0.05	7.13
EW-CW < 0	12	−1.07	−0.94	0.85	−3.26	−0.17
EW-CW in case of positive index returns	23	1.12	0.63	1.92	−0.96	7.13
EW-CW in case of negative index returns	17	0.20	0.70	1.58	2.89	2.89
Semiannually						
EW-CW > 0	16	1.56	1.17	1.25	0.23	4.68
EW-CW < 0	4	−1.01	−1.11	0.49	−1.51	−0.33
EW-CW in case of positive index returns	11	0.89	1.03	0.83	−1.04	1.91
EW-CW in case of negative index returns	9	1.23	0.50	2.17	−1.51	4.68
Annually:						
EW-CW > 0	8	2.83	2.74	1.75	0.25	5.28
EW-CW < 0	2	−0.62	−0.62	0.79	−1.18	−0.06
EW-CW in case of positive index returns	6	2.54	2.57	2.22	−0.06	5.28
EW-CW in case of negative index returns	4	1.53	1.69	2.16	−1.18	3.92

Panel A shows the comparison related to the DJ EuroStoxx index (DJEURO) while Panel B is related to the DJ EuroStoxx50 index (DJEURO50). The statistics are based on a 10-year data from 02/01/02 to 31/12/11. EW indexes are constructed using different reweighting periods: monthly, quarterly, semiannually and annually. The data set is provided by Bloomberg Finance L.P.

related to the DJEURO index. During the sample period, the performance of the market index is positive for 7 out of 10 years. In each rebalancing scheme, the over performance of the EW portfolios is predominant, regardless of the positive or negative performance of the market index. Panel B is related to the DJEURO50 index. It is not surprising that, even in this case, the market performance is positive for 6 out of 10 years. Similarly, the over performance of the EW is dominant for each reweighting

Table 3: Performance statistics of the indexes DJ EuroStoxx (DJEURO) and DJ EuroStoxx50 (DJEURO50) and their equally weighted version based on a quarterly reweighting

	DJEURO (EW) (%)	*DJEURO (CW) (%)*	*DJEURO (EW-CW) (%)*	*DJEURO50 (EW) (%)*	*DJEURO50 (CW) (%)*	*DJEURO50 (EW-CW) (%)*
Average return	3.25	−0.48	3.73	1.10	−1.82	2.92
P-value	—	—	0.017	—	—	0.015
Standard deviation	25.01	23.69	1.32	25.73	23.90	1.83
P-value	—	—	0.737	—	—	0.647
Sharpe ratio	0.014	−0.064	0.078	−0.028	−0.091	0.063
P-value	—	—	2.540	—	—	2.956
Skewness	−0.811	−0.967	—	−0.890	−0.970	—

The statistics are based on 40 observations in the 10-year data from 02/01/02 to 31/12/11. Significance tests are made for each comparison. In particular, the differences in the statistics are tested by the *t*-test for the average returns, the Fisher's test for standard deviations and the Jobson-Korkie test for the Sharpe ratio.

Table 4: Results of the drawdown analysis on the DJ EuroStoxx (DJEURO) and of the DJ EuroStoxx50 (DJEURO50) indexes during two bear market phases within the sample period (02/01/02–31/12/11)

	DJEURO (EW) (%)	*DJEURO (CW) (%)*	*DJEURO (EW-CW) (%)*	*DJEURO50 (EW) (%)*	*DJE + G16URO50 (CW) (%)*	*DJEURO50 (EW-CW) (%)*
01/2002–10/2002	−31.1	−36.4	5.3	−39.2	−38.6	−0.6
07/2007–04/2009	−56.2	−53.4	−2.8	−49.3	−51.0	1.7

The data set is provided by Bloomberg Finance L.P.

frequency, although smaller than the previous case.

Table 3 presents the risk and return profile of the analyzed portfolios over the sample period. The results highlight that EW portfolios show higher standard deviations with respect to the related CW indexes. Calculation of the Sharpe ratios yields values of −0.064 and −0.091 for the DJEURO index and the DJEURO50 index, respectively. On the other hand, the equivalent EW portfolios show higher Sharpe ratios equal to +0.014 and −0.028, respectively. The Sharpe ratio reflects the indexes' risk/reward efficiency by adjusting excess returns over the risk-free rate by the volatility incurred by the index. In this case, the CW indexes display lower excess return/volatility ratios than their EW versions. All indexes show a negative skewness, meaning that the left tail of the returns distribution is more pronounced than the right tail. EW indexes show lower skewness with respect to CW (in particular, if we consider the case of the DJEURO), meaning that EW portfolios can be considered less risky in the case of extreme negative events. This result is explained by the higher diversification of the EW portfolios able to limit their downside risk.

To test the two strategies during negative market phases, we calculate the drawdown of each index. The drawdown is the measure of the decline from a historical peak of the stock price. We focus on the two bear market phases that occurred in our observation period: the first includes the interval between 01/01/02 and 01/10/02; the second includes the interval between 01/07/07 and 01/04/09. The results of the drawdown analysis are shown in Table 4. The figures highlight conflicting results in the two periods examined for the two indexes analyzed, suggesting that the market direction is not an explanatory variable in our comparison.

Table 5 shows the results of the regression analysis performed to calculate the Jensen's alpha. Our finding highlights that EW portfolios have a positive coefficient, significantly different from zero.

Table 6 shows the results of the regression analysis based on the three-factor model of Fama and French (1992), aimed to capture the size bias by means of the SMB factor (small stocks minus large stocks) and the style bias by means of the HML factor (value stocks minus growth stocks). The findings reveal that EW portfolios have a highly significant size bias in the case of the DJEURO, which is composed by roughly 300 stocks. This result confirms previous findings providing strong empirical support that allows to assert that EW indexes tilt toward smaller-cap securities to a statistically significant level (see Velvadapu, 2011). Over the 2002–2011 period, the SMB coefficient is 0.298 for the EW version of the DJEURO. In the case of the DJEURO50, the regression analysis should not reveal any size bias. Actually, we find a negative coefficient of the SMB factor, statistically significant at 10 per cent level. This result indicates that the EW index tilts toward large-cap securities, but this is not a reasonable assertion. Moreover,

Table 5: Summary statistics for the Jensen's alpha

	α	b	No. obs.
DJEURO	1.013**	1.057***	40
t-value	(2.685)	(31.51)	—
DJEURO50	0.867***	1.076***	40
t-value	(3.039)	(42.76)	—

,*denotes statistical significance at 5 per cent and 1 per cent level, respectively.
Tests are conducted on DJ EuroStoxx (DJEURO) and DJ EuroStoxx50 (DJEURO50) indexes. The statistics are based on a 10-year data from 02/01/02 to 31/12/11. The construction of the EW portfolios is based on a quarterly reweighting. Regressions with Newey-West standard errors.

Table 6: Summary statistics for the three-factor model

	α	b	s	h	No. obs.
DJEURO	0.704**	1.053***	0.298***	0.320***	40
t-value	(2.200)	(48.03)	(4.055)	(4.591)	—
DJEURO50	0.715***	1.041***	−0.359***	0.200***	40
t-value	(3.290)	(63.246)	(−6.604)	(4.011)	—

,* denotes statistical significance at 5 per cent and 1 per cent level, respectively.
Tests are conducted on DJ EuroStoxx (DJEURO) and DJ EuroStoxx50 (DJEURO50) indexes. The parameter *s* is related to the size factor SMB, whereas the parameter *h* is related to the style factor HML. The statistics are based on a 10-year data from 02/01/02 to 31/12/11. The construction of the EW portfolios is based on a quarterly reweighting. The data set is provided by Bloomberg Finance L.P. Regressions with Newey-West standard errors.

Table 7: Results of the analysis based on the portfolio approach

	EWmCW	*TOPmCW*	*BTMmCW*	*TOPmBTM*	*No. obs.*
DJEURO	1.02%***	−0.07%	1.62%*	−1.69%	40
t-value	(2.645)	(−0.293)	(1.878)	(−1.595)	—
DJEURO50	0.84%***	−0.36%	1.50%	−1.87%	40
t-value	(2.68)	(−0.592)	(1.386)	(−1.242)	—

*,*** denotes statistical significance at 10 per cent and 1 per cent level, respectively.
Excess returns are calculated over the CW indexes (DJ EuroStoxx and DJ EuroStoxx50) for EW portfolios (EWmCW), for top quintile portfolios (TOPmCW) and for bottom quintile portfolios (BTMmCW). Excess returns are also calculated between top and bottom quintile portfolios (TOPmBTM). The statistics are based on a 10-year data from 02/01/02 to 31/12/11. The construction of the portfolios is based on a quarterly reweighting. The data set is provided by Bloomberg Finance L.P.

Table 8: Results of the analysis month-by-month of the average excess returns of the equally weighted portfolios of the DJ EuroStoxx and DJ EuroStoxx50 over the market-weighted indexes

	January	*February*	*March*	*April*	*May*	*June*	*July*	*August*	*September*	*October*	*November*	*SMB*
Panel A												
DJEURO	0.0152***	0.00685	0.01068**	0.0127**	0.00457	−0.0013	0.00473	0.00429	−0.002	−0.0009	−0.0007	—
t-value	(2.924)	(1.313)	(2.048)	(2.435)	(0.876)	(−0.252)	(0.9073)	(0.823)	(−0.390)	(−0.168)	(−0.143)	—
DJEURO50	0.0012	−0.0026	0.00307	0.0093*	0.00143	−0.0041	0.00226	−0.0015	−0.0053	−0.0027	0.0016	—
t-value	(0.241)	(−0.527)	(0.620)	(1.876)	(0.288)	(−0.826)	(0.455)	(−0.311)	(−1.062)	(−0.553)	(0.325)	—
Panel B												
DJEURO	0.00246	−0.0019	0.00489	0.00654	0.00082	−0.0035	0.0013	0.00036	−0.0035	0.00032	−0.0004	0.3751
t-value	(0.675)	(−0.522)	(1.390)	(1.856)*	(0.235)	(−0.999)	(0.372)	(0.102)	(−1.017)	(0.093)	(−0.121)	(11.631)***

Panel A presents the results of the regression analysis focused on the stock return seasonality for both the indexes. Panel B presents the results of the regression analysis performed to verify the January size effect. The statistics are based on a 10-year data from 02/01/02 to 31/12/11. The data set is provided by Bloomberg Finance L.P.
*,**,***denotes statistical significance at 10 per cent; 5 per cent; 1 per cent level respectively.

focusing on the style factor, we find that both the indexes exhibit a value tilt over the 10-year period: the HML coefficients are 0.320 and 0.216 for the EW version of the DJEURO and the DJEURO50 indexes, respectively. This result confirms the findings of Arnott *et al* (2005) demonstrating that CW indexes tilt toward growth securities.

Table 7 presents the results of our further analysis, based on a portfolio approach, aimed to verify if the stock's size is able to explain the over performance of the EW portfolios. Our results confirm highly significant excess returns over the CW indexes of the equivalent EW portfolios based on a quarterly reweighting frequency: +1.02 per cent and +0.84 per cent for the DJEURO and the DJEURO50, respectively. On the other hand, the TOP and BOTTOM quintile-based portfolios do not exhibit statistically significant excess returns over the CW indexes. In addition, the comparison between the BOTTOM and TOP portfolios do not provide significant results. The findings offer additional evidence to the fact that the stock's size is not able to fully explain the excess returns of the EW portfolios over the equivalent CW indexes.

Table 8 shows the results of the analysis designed to examine whether the excess returns of the EW portfolios present a seasonality (Panel A) and whether the stock return anomaly is explained by the 'size effect' (Panel B). Not surprisingly, we find that highly significant excess returns occur in January, but only for the DJEURO. According to the prevalent literature on this issue, we provide evidence of the 'January size effect' being both a positive and highly significant coefficient of the SMB factor (Panel B).

From an operational point of view, the excess return showed by the EW portfolios must be analyzed in the light of the higher transaction costs associated with the EW strategy. Focusing on the DJEURO index reweighted quarterly, we estimate two sources of trading costs: the turnover related to the periodic index constituents reweighting and the turnover associated with the index stocks replacement. The first is, on average, equal to 10.51 per cent, whereas the second is equal to 5.04 per cent on a quarterly basis. This statistic is in line with those of Dash and Zeng (2010), who argue that generally the US equity indexes have a turnover in the 15-30 per cent range. Relying on the S&P500 index, during the 5-year period, ending in 2009, the average turnover of the equivalent EW index (also rebalanced quarterly) was 28.1 per cent. In the case of the DJEURO index, if we assume negotiation fees of 10 bps[5] for stock trading, the average transaction costs are limited to nearly 6 bps per year.

CONCLUSIONS

This article compares two alternative index design methodologies, that is, the equally weighted and the cap-weighted. It focuses on the Euro equity market rather than the more frequently studied US equity market. Our research provides further evidence to the established literature on this topic of the benefits of equal weighting over the market weighting methodology. We highlight the fact that the highest excess return among those observed is associated with the quarterly rebalancing of the EW portfolios.

Our findings demonstrate that the 'January size effect' is not the only explanatory variable of the difference in performance obtained using the two approaches. The benefit that results from reweighting the portfolio into equal weights can rather be attributed to the fact that EW portfolios implicitly follow a contrarian investment strategy, because they mechanically rebalance away from stocks that increase in price. According to this strategy, overvalued stocks are sold at each rebalancing, preventing the continued growth of their weight during financial bubbles. These findings are extremely important if we consider that, usually, the benchmarks used in the asset management industry are based on cap-weighting. Moreover, EW indexes permit a higher diversification of the portfolio by investing a higher proportion of the portfolio in mid- or small-cap stocks. Finally, we calculate the amount of transaction costs related to the EW portfolios examined in our analyses.

NOTES

1. See Swinkels (2004) for a survey on momentum investing.
2. European data are also used by Hemminki and Puttonen (2008) in their study on the benefits of fundamental indexation.
3. According to the statistics provided by Blackrock, in 2011, the market share of the IShares products in Europe, within the category of ETFs, was 70 per cent. Moreover, in December 2011, the assets under management by the IShares in Europe were €105.9 billion.
4. The DJ EuroStoxx and the DJ EuroStoxx 50 are composed only of stocks denominated in euro. This restriction allows a comparison of the two index construction methodologies without having to consider the trend of the exchange rates (primarily the EUR/GBP).
5. A negotiation fee equal to 10 bps for stock trading is relatively high for institutional investors. Our conservative assumption allows considering the possible additional transaction costs arising from the bid-ask spread characterizing smaller cap stocks.

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