Available online at https://www.asjp.cerist.dz/en/PresentationRevue/85

Economic Researcher Review

ISSN: 2335-1748
EISSN: 2588-235X

Volume:7/Issue 12 DEC(2019), PP 67-82

International market tracker funds and portfolio performance

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Received:09/09/2019 Accepted:13/12/2019 Published: 30/12/2019

Abstract:

This study aims to examine the possibility of accreditation exchange traded funds in an international diversification process, by analyzing weekly data of US and major European market trackers, for a period of ten years from 2009 to 2018.

Our findings indicate a strong positive correlation among the domestic US fund and the majority of the European funds. moreover, the US fund was less risky and more efficient in term of performance similarly to the UK fund. For this, the combination of these two funds eventually shows the best blend between risk and return comparing to remaining European funds.

Keywords: *exchange traded funds, international diversification, markets correlation, portfolio theory, funds management.*

Jel Classification Codes**:** E44 ;F21 ;G11 ;G15 ;G23.

Résumé :

Cette étude a pour but d'examiner la possibilité d'accréditation des trackers dans un processus de diversification international, en analysant les données hebdomadaires d'un tracker du marché américain avec les principaux trackers des marchés européens, d'une période qui s'étend entre 2009 à 2018.

Nos résultats indiquent une forte corrélation positive entre le fond du marché domestique américain et la majorité des fonds européens. En plus, le fond américain a été le moins risqué et le plus efficient en termes de performance similairement au fond britannique. Et pour cela, la combinaison de ces deux fonds a montré finalement le meilleur mélange entre risque et revenue par rapport aux autres fonds européens.

Mots clés : *Trackers, international diversification, corrélation des marchés, théorie du portefeuille, Gestion de fonds.*

Codes de classification JEL: *E44 ;F21 ;G11 ;G15 ;G23.*

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1.Introduction

International diversification was and still until this day one of the most important topics in the financial field. Based on the huge utility of this process into investors strategies, many researchers were interested in the global diversity of a portfolio (see, for instance. Lessard's (1973; 1974); Solnik & al. (1996); Goetzmann & al. (2005)) and all of their findings suggest hardly a globaly diversified portfolio.

generally when we deal with global diversification, we are more likely tring to reduce systematic risks related with an economie or a specific market, by combining between multiple markets that have antithetical movement, investors in this case are partially hedged against any shock that can happen in one of them. Because, local diversification are not always a better way to protect investors wealth especially in periods of crisis.

The concept of risk and return was firstly considered in the work of markowitz (1952) which was the seminal work of the majority of portfolio selection and asset performance metrics (see, treynor (1965); sharpe (1966); jensen (1967); Konno & Yamakazi (1991); Sortino & Van der Meer (1991); Young (1998); Rockafellar & Uryasev (2000)). these concepts are generally known as portfolio performance measures, which basically define the degree of risk that the investor is willing to take for a given acceptable return.

Building a diversified portfolio is a complex task that needs to be handled cautiously. and because of that, many investors don't have much experience and skills to achieve this task. for this purpose, many of them use the help of a portfolio manager. This manager pools funds from the public in the form of depository receipt that are listed generally under the name of mutual fund, hedge fund or exchange traded fund.

The first Exchange traded fund was introduced to public back in 1993. And from this day, multiple types of these funds were listed for daily trade in the market floor, and gained much trust and popularity because of their simplicity and diversity. The general purpose of these funds is to allow investors to put their savings in a large proportion of securities among a sectorial index, market index,

or simply a customized strategy index.

The largest fund manager in the world Blackrock introduced to the public in 1996 a bouquet of ETFs that tracks major worldwide markets, and typically allowed US investors to build a global diversified portfolio. For this purpose, we are trying trough this paper to examine the efficiency of these securities in a global strategy by choosing multiple ETFs that tracks major European markets with a US market ETF tracker to reflect the domestic portfolio.

2. portfolio Performance metrics: a general briefing

the literature of finance did give us multiple types of portfolio measures, some of them focused on the portfolio as a unit, while others related the portfolio performance to the market by adding a riskless asset as a minimum acceptable return to calculate the excess return of a risky asset.

2.1 Alternative measures of a risky asset

the first portfolio measure was introduced by Markowitz (1952) under the name of modern portfolio theory. This measure defines the return and the risk of a portfolio as function of its mean expected returns and variance, following this formula:

$$\begin{cases} E = \sum_{i=1}^{N} X_i \mu_i \\ V = \sum_{i=1}^{N} \sum_{j=1}^{N} \sigma_{ij}, x_i, x_j \\ \text{Subject to } \sum_{i=1}^{N} x_i = 1, \\ x_i \geq 0, \quad i = 1, \dots \dots, N \end{cases} \qquad (2.1)$$

Where (x_i) is the weight of asset (i) and (μ_i) is the expected value of its return. Additionally, the covariance (σ_{ij}) between assets (i) and (j) will be in this case a function of the portfolio risk, for a given percentage (x_i, x_j) allocated in assets (i, j).

As an extension of his work, Markowtz (1959) developed his theorem by adding a new criterion to his previous approach called the semi variance. This measure focuses only on downside deviations in the calculation of the portfolio risk:

$$S_b = E[(r-b)^-]^2$$

where $(r-b)^- = \begin{cases} (r\text{-}b) \text{ when } (r\text{-}b) < 0; \end{cases}$

(0) when $(r\text{-}b) \geq 0$. *(2.2)*

Where $(r\text{-}b)^{-}$ represent the negative parts for a given constant (b) and (R) observation. on the opposite, the positive deviations are more likely suitable for investors. thus, it is more appropriate in this case to ignore these positive deviations when measuring risk. Whereas, positive deviations will be useful to define the potential gain of a security.

staying with downside deviations, the value at risk criterion is a widely used metric for the measurement of the highest potential loss of a portfolio, the VAR as it's known in finance literature is a formula that calculates the potential maximum loss (VAR_{α}) for an asset return $F(z)$ in period (x) for a given confidence level ($1\text{-}\alpha$)*: (Sarykalin & al, 2008)

$$VAR_{a}(x) = min\{z|(F_{X}(z) \geq a\} \qquad (2.3)$$

The underlying principle of the VAR suggest an approximation of the maximum loss regarding a level of confidence, without taking in count the potential loss exceeding this threshold level. For this reason, Rockafellar & Uryasev (2000) developed this metric by adding the concept of conditional to the VAR. this concept focuses on the expecting losses exceeding a given error term by calculating the average of these expected losses:

$$CVAR_{a}(x) = \int_{-\infty}^{+\infty} z d\, F_{x}^{a}(z)$$

where:

$$F_{x}^{a}(z) = \begin{cases} (0) & \text{when } z < Var_{a}(x); \\ \frac{F_{x}(z)-a}{1-a} & \text{when } z \geq Var_{a}(x). \end{cases} \qquad (2.4)$$

Always with the downside deviations, the mean absolute deviation introduced by Konno & Yamakazi (1991) was an expension of the semivariance criterion proposed by Markowitz (1959). This metric gives the absolute return deviations from the mean return following this formula:

$$\text{Min } w(x) = E\left[\left|\sum_{j=1}^{N} R_j x_j - E\left[\sum_{j=1}^{N} R_j\, x_j\right]\right|\right]$$

* The most commonly confidence level β used by financial analysts is 95%, i.e. β ϵ [0,1-α [.

$$\text{Subject to } \sum_{j=1}^{N} E[R_j] x_i \geq pM_o$$
$$\sum_{j=1}^{N} M_o$$
$$0 \leq x_j \leq u_j, \quad j = 1, \ldots\ldots, N \qquad (2.5)$$

Where (R_j) is the return of asset (j) and (x_i) is the amount invested in asset (j), (p) represent the minimum rate of return required by an investor, (M_o) is the total amount of fund and (u_j) is the maximum amount that can be invested in asset (j).

Furthermore, the minmax model proposed by Young (1998) is a linear model which minimize the maximum potential loss of a portfolio. The general idea of this model is to exceed a given threshold define by the investor which is generally the minimum required return following this formula:

$$\begin{aligned} &\text{Max } E = \left[\sum_{j=1}^{N} w_j \bar{y}_i\right] \\ &\text{Subject to } \sum_{j=1}^{N} w_j \bar{y}_i \geq H, t = 1, \ldots\ldots, T \\ &\sum_{j=1}^{N} w_j \leq W \\ &w_j \geq 0, j = 1, \ldots\ldots, N \end{aligned} \qquad (2.6)$$

Where ($\bar{y}_j$) is the average return of asset (j) in time period (t), (w_j) represent the weight of the asset (j) in the portfolio, and (H) is the minimum return required by an investor.

2.2 performance indices

The concept of safety first (SF) was firstly Introduced by Roy (1952) and was the seminal work of performance measures discussed lately by (treynor (1965); Sharpe (1966); Sortino & Van der Meer (1991)). The SF ratio defines the performance of an asset as a function of the investor targeted excess return of a portfolio divided by its volatility:

$$SFR = \frac{R_p - R_m}{\sigma_p} \qquad (2.7)$$

Where (R_p) is the expected return of the portfolio, (R_m) is the investor minimum required return and (σ_p) is the standard deviation of the portfolio. More specifically, the Treynor ratio (TR) define the

minimum required return by a riskless interest rate (R_f)* and the portfolio volatility with its beta coefficient (β_p):

$$TR = \frac{R_p - R_f}{\beta_p} \tag{2.8}$$

Not many different from the Treynor ratio, sharpe (1966) kept the return denominator similar to the Treynor ratio, but instead of the beta coeifficient, he used the standard deviation as a measure of the portfolio risk. Whereas, Sortino & Van der Meer (1991) used only dowside deviations of the variance as a measurment of risk and they kept the excess of the minimum acceptable return as a an approximization of the portfolio potential returns similarly with Roy (1952).

the beta coefficient discussed in the treynor ratio is One of the most important risk measures used in the valuation of a security. beta is also the volatility measure of the capital asset pricing model* and mathematically, the covariance between the return of the asset (R_j) and the return of the market (R_m) divided by the market variance (R_m):

$$\beta = \frac{cov(R_j - R_m)}{var(R_m)} \tag{2.9}$$

The capital asset pricing theory was also heilighted in the work of Jensen (1967) by the presentation of the alpha measure which is the most important measure of a fund performace. The jensen's alpha define the ability of a fund manager to overperform the market portfolio gain, i.e. the abbility of a fund to exceed a defined threshold which is generaly defined as the market portfolio, and it is expressed as:

$$a_j = R_i - \left[R_f + \beta_i (R_m - R_f)\right] \tag{2.10}$$

* The riskless interest rate is generally defined by the 10 years government bonds or treasury bills.

* the capital asset pricing theory was firstly discussed by Treynor (1961) and lately introduces by (Sharpe (1964); Lintner (1965); Mossin (1966)) and it was the seminal work of the arbitrage pricing theory introduced by Ross (1976) and expanded by Fama & french (1992).

Where (R_i) is the expected return of the portfolio (i), (R_f) is a risk-free asset return, (β_i) is the beta of the portfolio (i) and $(R_m)$is the market return.

The portfolio theories did provied us multiple types of measurement. therfore, the choise of a specific metric rely on the investor tolerernce of risk and return preference.

3. Data analysis and results

3. 1. General framework

In this section, we are going to analyze a dataset of a selected exchange traded funds that are listed among ishares global diversification strategy and also tracks Morgan Stanley capital international indices. and exclusively, we are focusing our study only on ETFs that tracks major European markets indices (see Table.1). and which were issued before the stating time limit of this study that covers the period from 2009 to 2018 on a weekly basis.

The dataset was collected from investing open database for the weekly adjusted prices of splits for the ETFs prices, and we used the official ishares website to gather qualitative data of the ETFs and the related indices.

Regarding the economic extent of this financial securities, and taking into consideration that they are listed in NYSE arca exchange. we used the SPX index as reference of the domestic US market and we selected the SPDR S&P500 ETF to reflect the local portfolio.

Table.1. exchange traded funds & related indices

N°	*ticker*	*Fund name*	*index*
01	SPY	SPDR S&P 500 ETF	SP 500
02	EWG	Ishares Msci Germany ETF	Msci Germany
03	EWU	Ishares Msci United Kingdom ETF	Msci UK
04	EWL	Ishares Msci Switzerland ETF	Msci Switzerland
05	EWP	Ishares Msci Spain ETF	Msci Spain
06	EWQ	Ishares Msci France ETF	Msci France
07	EWI	Ishares Msci Italy ETF	Msci Italy

08	EWD	Ishares Msci Sweden ETF	Msci Sweden
09	EWO	Ishares Msci Austria ETF	Msci Austria
10	EWN	Ishares Msci Netherland ETF	Msci Netherland
11	EWK	Ishares Msci Belgium ETF	Msci Belgium

Source: ishares instruments description available on: https://www.ishares.com/us/products/etf-investments#!type=mutualFunds&style=All&view=grouped&subtab. accessed: 23/05/2019.

3.2 correlation analysis of revenues

One of the most important operations that needs to be taking into consideration in a portfolio diversification strategy is the correlation analysis. This process allows investors to minimize their exposure by building a portfolio with assets that are inversely correlated. Therefore, the investor will be partly hedged against volatility especially in the long-run.

The correlation among the US and European funds shows a wide spread of these funds revenues (see Fig.1.). These lines can be seen clearly in the UK and the Italian funds where these funds tend to show less stress to the volatility of the US and the other European instruments.

While in the other markets, the correlation of revenues is more likely to be highly positive and moves in the same direction. But unlikely, any of these funds were negatively correlated to the others.

The lowest correlation level among these funds was recorded between the Italian and the British funds with (0.23%), while in the exception of these funds all the remaining were extremely correlated, especially the French fund which recorded a correlation of (0.94%) with the German and Netherlandish funds respectively.

as a result of the same trend they tend to take in a bullish or a bearish market, the positive correlation between the European funds and the US fund lessen the portfolio efficiency. And because of that, the combination of these funds will be not recommended especially if the local portfolio is more profitable and less risky than the other funds.

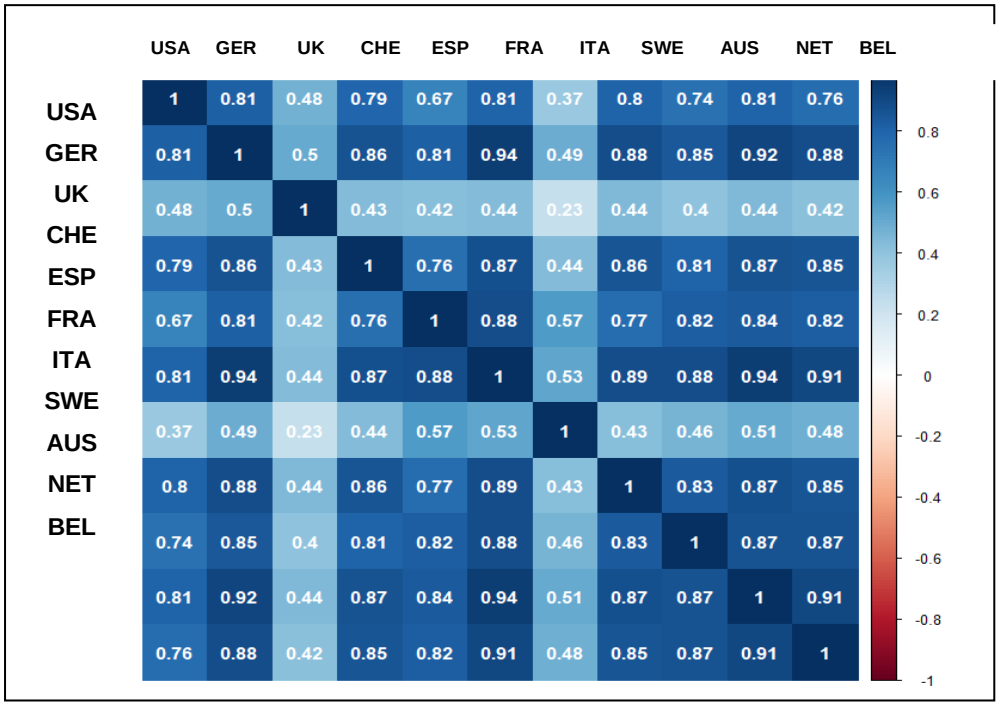
the financial concept of portfolio diversification requires at least two components that move inversely to hedge against volatility and bring a stability to the portfolio. In our case, investing in a portfolio of these ETFs will be useful only in speculating, and the combination will only reduce the impact of a downside market.

3.3 Portfolio optimization analysis

3.3.1 Risk analysis

As we witnessed in the previous section, international correlation is highly frequent between the US market and the European markets. Thus, international diversification will be ineffective based on these findings. Meanwhile, risk and return analysis will be highly recommended in this case for choosing the best investment alternative.

Fig.1. Correlation among US & European funds



We aboard the second part of this study by risk analysis (see Table.2.). stating with the variance, we can see that the US fund is evidently less volatile than the others funds with a standard deviation of (2%). While, in the other funds we can witness a high volatility level, especially in the British and the Italian funds with (5.39%) and (5.20%) respectively.

Even with semi variance, the US fund maintain his position of being the less risky investment choice amongst this sample with (1.52%) downside deviation, but following this measure the UK fund is more likely suitable because following the previous results, we can see that the huge volatility percentage is due to positive deviations, what makes it more appreciable in term of return.

Table.2. Funds risks

Funds	***V***	***SV***	***VAR***	***CVAR***	***β***
USA	2.00%	1.52%	3,65%	4.80%	0.99
Germany	3.01%	2.13%	4,88%	7.07%	1.22
UK	5.39%	1.75%	3,94%	5.65%	1.29
Switzerland	2.20%	1.57%	3,54%	5.11%	0.87
Spain	3.70%	2.45%	6,35%	8.10%	1.23
France	3.00%	2.16%	4,98%	7.01%	1.20
Italy	5.20%	2.48%	6,11%	8.16%	0.97
Sweden	3.31%	2.39%	5,45%	7.83%	1.33
Austria	3.27%	2.45%	5,20%	7.74%	1.21
Netherlands	2.80%	1.97%	4,76%	6.32%	1.13
Belgium	2.60%	1.90%	4,46%	6.10%	0.99

Abbrev: SV(V): semi (variance); (C)VAR: (conditional) value at risk; β: beta.

On 95% confidence level, the smallest maximum potential weekly loss among these funds measured by the value at risk was recorded in the Swiss fund with (3.54%), not so far from the US fund which was also low with (3.65%). Meanwhile, the average potential loss among these funds measured by the conditional value at risk differs from (4.8%) recorded in the US fund to (8.16%) for the Italian fund, this result adds more appreciable preference to the

US fund especially for hedging strategies in a bear market or during crisis.

On a market basis, the beta coefficients for both the US and the Belgium funds did approximately match the market trend, while the fund-market covariance for the Swiss and the Italian funds were less volatile. Meanwhile, all the remaining funds were extremely more volatile than the funds sited previously.

Based on all the risk measures available in the portfolio literature, the US fund was without any doubt the less risky fund in the sample study, what makes it the best investment alternative among this sample in the case of international hedging and systematic risk management.

3.3.2 return performance

the US fund was clearly the less risky fund in our sample, but despite this fact, we are trying to find the best possible combination of risk versus return to evaluate the potential performance of each of these funds.

For measuring the funds growth (see Table.3.). we divide the time frame data to a short, mid and long terms. Starting with the short range, all these funds witnessed a decline in value from (-7.7%) recorded in the US fund to (-26.3%) in the Austrian fund. Meanwhile, in the mid-term, an appreciable growth of (37.1%) was noticed in the US fund. for the rest, only the Netherlandish and the Belgian funds were positive, while all the remaining funds kept a negative trend in this term. but and more importantly, the growth of the US fund in the long-term was surprisingly high with a (167%) followed by the British fund (122%). With these results, we can clearly notice that these two funds doubled in value in 10 years, while the rest were performing moderately, excepting the Spanish fund which remain negative.

According to the mean's results, the average weekly returns among these funds wasn't highly spread, a considerable value was recorded in the British fund with (0.26%) followed by the US fund with (0.22%). whilst, using weekly data didn't show any negative return comparing to the absolute term growth, because the lowest performance level was only (0.08%) in the French fund. Thus, all the funds were profitable relying on this measure.

The Jensen's alpha coefficient for all of these funds was

negative in this time period. because of that, none of these funds did overcame the market return, especially when most of these funds recorded a volatility level exciding the market trend with a ($\beta>1$) in

Table.3. Funds performance

Funds	***1 YRS***	***5 YRS***	***10 YRS***	***M***	***α***	***SR***	***TR***
USA	-07.7%	37.1%	167%	0.22%	-7.2-E6%	8.44%	0.16%
Germany	-25%	-17.6%	32.9%	0.1%	-0.163%	1.89%	0.04%
UK	-17.7%	-27.9%	122%	0.26%	-0.022%	3.90%	0.16%
Switzerland	-11.7%	-03%	78.6%	0.14%	-0.049%	4.20%	0.10%
Spain	-19.2%	-30.8%	-29.5%	0.01%	-0.271%	-1.33%	0.03%
France	-17.5%	-04.3%	21.4%	0.08%	-0.180%	1.20%	0.30%
Italy	-21.8%	-21.8%	46.3%	0.19%	-0.025%	2.67%	0.14%
Sweden	-18.8%	-19.6%	56.8%	0.14%	-0.145%	2.93%	0.07%
Austria	-26.3%	-08.1%	13.5%	0.08%	-0.185%	0.97%	0.03%
Netherlands	-18.5%	2.4%	66.4%	0.14%	-0.106%	3.33%	0.08%
Belgium	-23.1%	1.6%	62.5%	0.13%	-0.085%	3.20%	0.08%

Abbrev: YRS: years performance growth; M: mean; α: Jensen's alpha; SR-TR: Sharpe &Treynor ratios

the exception of the US fund whose alpha's coefficient was approximately equal to (≈0).

The fund excess of returns based on the sharp ratio was very highly performing for the US fund with (8.44%) due to its low variance level and clearly the high proportion of returns excessing the risk-free rate. on the other hand, the French fund was more performing on a beta basis with a Treynor ratio of (0.30%).

As we witnessed above, even in term of performance, the US fund kept his position as one of the best investment alternatives whether in term of risk or profitability. Meanwhile, these results will be limited only into a bull market due to the timeframe characteristics.

3.3.3 Funds combination and portfolio efficiency

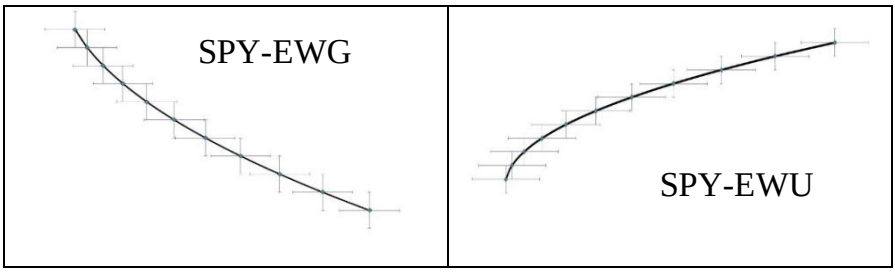
As we saw previously, in a quantitative manner the local US portfolio represented by the SPDR 500 ETF is the less risky and approximately the most lucrative among all of the European market trackers ETFs (see Fig.2.). Consequently, combining these funds will only lessen the portfolio returns and diminish the investor exposure.

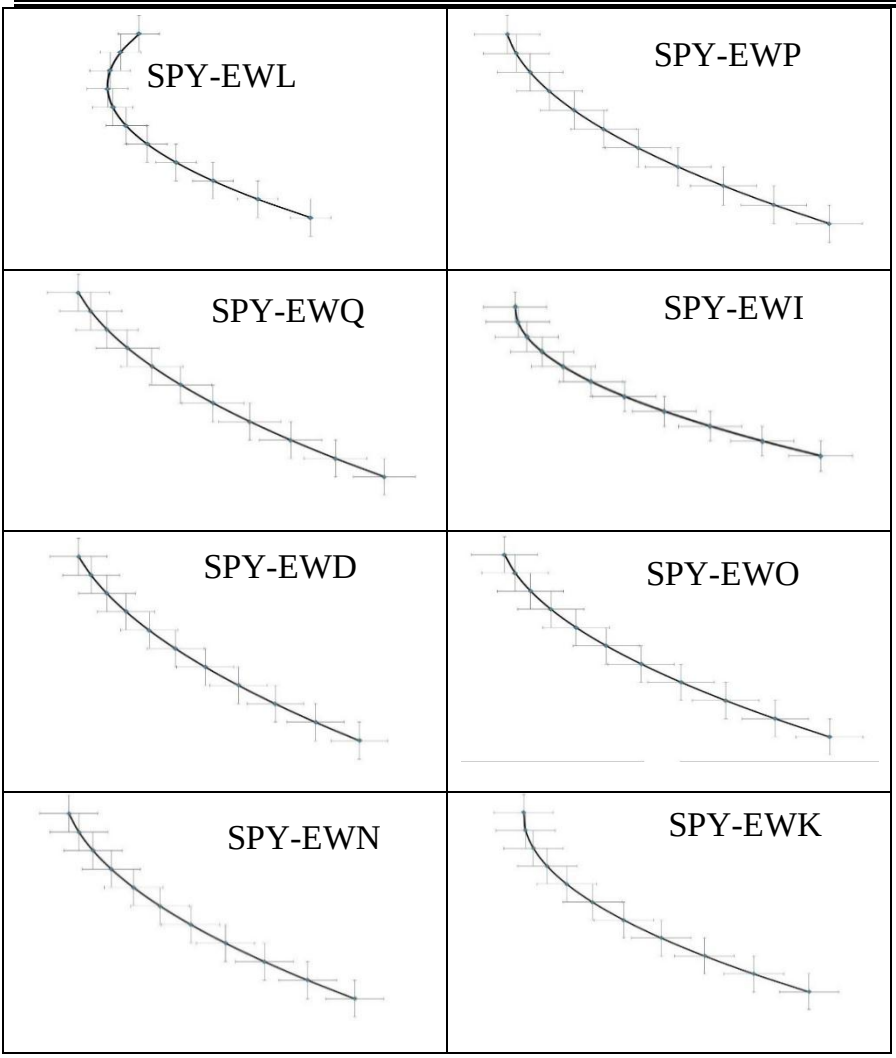
the efficient frontier situated above the global minimum variance portfolio are likely to be the best possible combinations of two components in a portfolio. in our case and due to the high correlation level among these funds, we can clearly see that all of these funds have exactly the same curve in the exception of the US-British and partially the US-Swiss portfolios.

The declining slope among the majority of these combinations suggest the rejection of all these alternatives for being risky and none profitable in the exception of the duel composition of the US-British portfolio (SPY-EWU) which tends to be more outstanding in term of performance. the American fund was a good alternative in a risk-return context in addition to the British fund which was also doing well in term of gain, and due to the lower level of correlation between them the combination was totally efficient. Because, as we mentioned previously, the correlation did acts like a corrector with to portfolio variance, what explain the uprising curve in the chart on the contrary of all the others remaining funds.

The timeframe of this study starts approximately from the subprime crisis, that means the international markets were at the starting of this period at the bottom, and still suffering from the recession. so, there is a good chance that the potential growth will be

Fig.2. efficient frontiers & ETFs combination





higher than normal conditions as we witnessed trough the reverse conditional value at risk. because after the market take-off, the average worst losses recorded during the collapse were approximately regained.

4. Conclusion

Based on the results of this study, it can be concluded that building an international diversified portfolio trough mimicking European markets trends is a complex process, because our results show

clearly that international markets are highly correlated, especially European markets. for this reason, investor who tries to hedge against systematic risk are more than ever suggested to choose a local diversified US equity portfolio.

The US fund shows the best combination of return versus risk among all measurement techniques available in the financial literature, what makes it the less risky instrument and approximately the more profitable too. thus, it is highly recommended for a diversification strategy. although, investors who tend to apply a safety hedge are advised to choose a combination between the US and the British funds.

The results of this study are only limited to US exchange traded funds that track European markets. Thus, further studies in different markets is required to expanding these results to others worldwide markets.

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