

FUNDAÇÃO GETÚLIO VARGAS
ESCOLA DE ECONOMIA DE EMPRESAS DE SÃO PAULO

EDOARDO CAMELA

**THE GROWING IMPORTANCE OF THE ETF INDUSTRY - THE PROS AND
CONS OF PASSIVE MANAGEMENT**

**SÃO PAULO
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Campo do Conhecimento:
International Master in Finance

Orientador Prof. Dr. Ricardo Rochman

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RESUMO

O objectivo deste projecto é a comparação entre os prós e contras de gestão passiva e ativa através da realização de um estudo estatístico de várias estratégias através dos Exchange-Traded Funds. Em particular, a análise vai passar pela estratégia mais passiva, ou seja, buy and hold, para um grau diferente de active indexing management, tais como rotações do sector e / ou classe de ativos com base no bottom-up, top-down e indicadores técnicos. A análise mostra que as estratégias ativas, se forem devidamente aplicadas, conseguem obter retornos ajustados ao risco substancialmente superiores quando comparados com uma abordagem passiva, superando as questões de custos de transação e diversificação que normalmente são reivindicadas por uma gestão passiva.

PALAVRAS CHAVE: ETF, gestão de portfolio, rotação de setores, rotação de classes de ativos

ABSTRACT

The aim of this project is the comparison between the pros and cons of passive and active management by conducting a statistical study of several strategies through Exchange-Traded Funds. In particular, the examination will go through the most passive strategy, namely buy & hold, to a different degree of active indexing management such as sector and/or asset class rotations based on bottom-up, top-down and technical indicators. The analysis show that active strategies, if properly implemented, obtain risk-adjusted returns substantially higher than a passive approach, overcoming the issues of transaction costs and diversification which are typically claimed by a passive management.

KEY WORDS: ETF, portfolio management, sector rotation, asset class rotation

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1. Introduction to ETFs

Exchange Traded Funds (ETFs) are baskets of securities that track an index, a bond, a commodity or other pool of assets and are traded, like individual stocks, on a stock exchange. These instruments allow investors to buy a broad basket of securities in a single transaction, investing therefore in the average performance of those shares. As perceivable, ETFs are similar to mutual funds and their large growth in the last years has been reflecting an increasing attraction from investors. Furthermore, parameters such as rolling costs and cash reinvestment issues have reduced the performance of futures contracts, leading investors to shift to ETFs as passive management vehicles.

Put shortly, the main advantages of ETFs are low fees, diversification and trading flexibility. As for the former, passively managed ETFs have usually lower expense ratios than mutual funds - which involve extra costs - but higher than stocks because, although the similar brokerage commission, the latter don't have management fees. Another benefit is the diversification due to their feature of tracking of a group of securities which reduces volatility and enhances returns with respect to individual assets. Eventually, ETFs trade like a stock, meaning that they can be bought and sold throughout the day when the markets are open, whereas mutual funds can only be traded at the end of the day at the NAV (net asset value) price. Other characteristics are that, unlike mutual funds, they can be bought with limit, market, or stop-loss orders, purchased on margin, sold short and traded through the use of derivatives, being therefore an important tool for risk management purposes. Moreover, ETFs provide a much broader investment universe than futures securities, as shown by the current existence of more than 2900 equity ETFs versus 250 equity futures and more than 500 multi region ETFs versus 13 corresponding futures (Deutsche Wealth & Asset Management. 2015).

Nevertheless, there might also be some drawbacks in the use of Exchange-Traded Funds, in particular regarding liquidity and tracking error. As a matter of fact, the more specialized, the higher the probability of large bid-ask spread of an ETF. These illiquid ETFs, which are traded in low volumes, lead to problems when trying to close a position which may not ensure the price desired. Moreover, as mentioned before, ETFs track the performance of the underlying index, but sometimes managers may not succeed in that. This tracking error can be a cost for the investors, which may see its performance deviating from what it was supposed to be. Nevertheless, in these cases, arbitrage opportunities arise and should restore the equilibrium price.

Other types of ETFs, which will not be included in the project analysis, are the leveraged, the inverse and the active managed ones. Leveraged ETFs double or triple the performance of the underlying asset by using derivatives and debt instruments as well as inverse ETFs which replicate the opposite performance of the underlying securities. Actively managed ETFs, as the name says, try to outperform its benchmark rather than to replicate its performance.

2. Passive vs. Active Management

As previously mentioned, ETFs are mostly used for matching a determined index and for this reason they are widely adopted for passive management purposes. Passive strategies don't involve any type of market forecasting and are only aimed at transaction costs reduction and diversification, thereby enhancing returns and reducing volatility (Ferri, 2010) when compared to the single stocks.

This approach is opposed to an active management, used by most mutual funds, where the main goal is the outperformance of the market. Usually, active management supporters claim that passive strategies are not able to minimize risk in the short-term, especially during bear markets, and contrast the main principles of investing. As a matter of fact, passive strategies have some limitations that may significantly disperse value over time, such as long-term investing in indexes which, being mostly market capitalization weighted, increase the weight of best performing stocks and decrease the weight of the least performing ones, going against the investing philosophy of buying low and selling high. Another example is the lack of macro and fundamental analysis, which leads investors to buy a group of stocks without taking into account their valuation and the risk in the economy. Furthermore, it is worth to note that a passive management might be profitable only in case there are active managers that, by making proper valuations, push the securities prices to their fair value. Therefore, if everyone goes passive there would not be equilibrium in the stock market, whose inefficiency will lead active managers to outperform the counterparts. On the other hand, the main criticism to the active management is that on average it underperforms the benchmark after fees (Ferri, 2010). Therefore, active strategies have the opportunity of outperforming the market but higher transaction costs and wrong analysis may result in lower return than the benchmark. On the other side, passive strategies imply low expenses but don't exploit investment opportunities which may potentially outperform the benchmark.

The solution to this debate might be the use of Exchange-Traded Funds as a tool for an active index investing (Schoenfeld, 2004): this approach actively allocates securities on the basis of the portfolio manager's view by taking advantage of passive instruments

which ensure diversification, risk control and transaction costs minimization, leading to a potential outperformance over a passive ETF strategy.

3. Sectors and Asset Classes ETFs

3.1. Data

To investigate the pros and cons of passive and active index approaches, a comparison between buy and hold, rebalancing, bottom-up, top-down, technical and mixed strategies will be undertaken. In particular, the active strategies will be based on sector and asset class rotation. The reason to consider sector ETFs is due to the increasing importance of industry effects, more related to business cycles, over country effects which are diminishing over time as a consequence of larger financial market integration and business globalization, as explained in Phylaktis et al (2002) and Weiss et al (2006).

The reason to consider asset class rotation, in this case between equity and bonds, is related to their different sensibilities to business cycles, which will allow the investor “leveraging” the equity performance during bull markets and limiting drawdowns during crashes (Faber, 2013). For this purpose, nine broad US sectors and two broad asset classes ETFs are considered. These nine sectors, belonging to S&P, are: Consumer Discretionary (XLY US), Consumer Staples (XLP US), Energy (XLE US), Financials (XLF US), Health Care (XLV US), Basic Materials (XLB US), Technology (XLK US), Utilities (XLU US) and Industrials (XLI US) sectors from the SPDR family. The two asset classes are: Equity, represented by the market index S&P 500 (IVV US) and Bonds, referred to the 7-10 years Treasury Bonds (IEF US). The reason for the test to be undertaken on US securities is their long-standing feature, data ranging from around 2003 to 2015, since European sectors ETFs have been established some years later. Moreover, to make the

strategies more realistic, transaction costs of 0.10% per trade are included (EDHEC, 2008 and Zapranis, 1999). In the next paragraph, the sectors' characteristics are analyzed in order to show that their active allocation in a portfolio might outperform a broad market buy and hold strategy.

3.2. Statistics

As illustrated in Figure 1, there is a significant dispersion in the sectors' performance over time which reflects their nature during each phase of the business cycle.

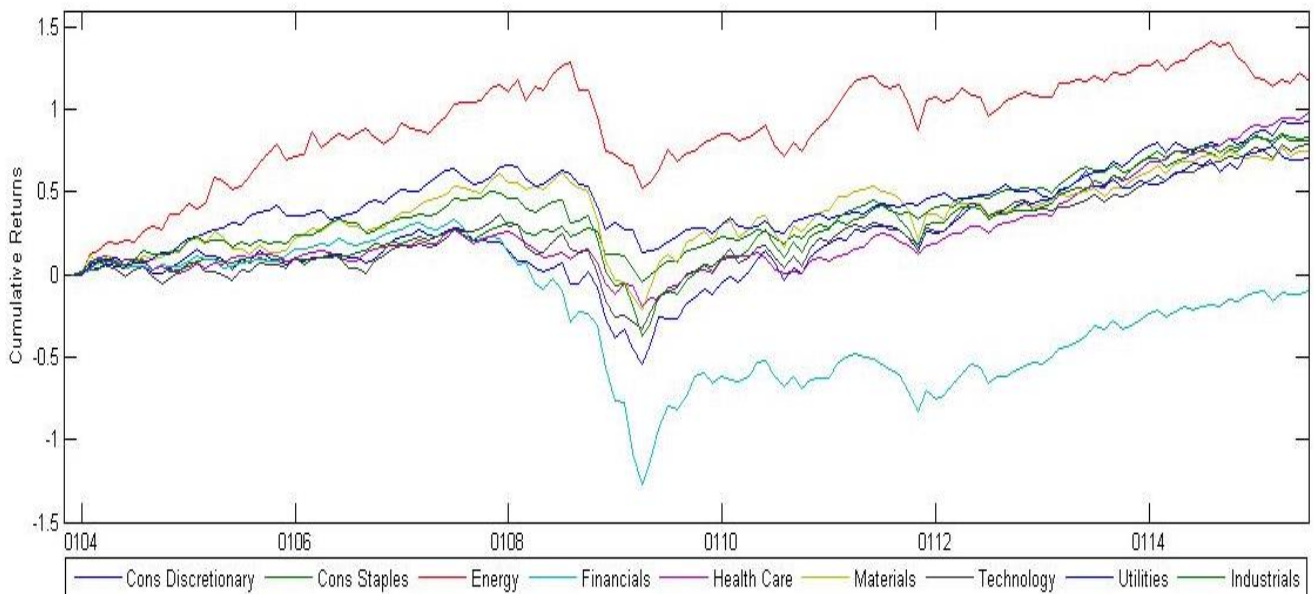


FIGURE 1: SECTORS' CUMULATIVE RETURNS OVER TIME

Giving a closer look at the performance dispersion between sectors, Figure 2 shows the general correlation between each other's total return. It is possible to notice that sectors, such as Utilities and Energy, show low correlation with the others but the general correlations are still positive and high.

	XLY	XLP	XLE	XLF	XLV	XLB	XLK	XLU	XLI
XLY	1								
XLP	0,70	1							
XLE	0,50	0,44	1						
XLF	0,82	0,65	0,44	1					
XLV	0,66	0,73	0,41	0,65	1				
XLB	0,80	0,64	0,73	0,73	0,60	1			
XLK	0,82	0,64	0,59	0,67	0,62	0,80	1		
XLU	0,34	0,55	0,48	0,33	0,50	0,43	0,42	1	
XLI	0,88	0,72	0,62	0,83	0,67	0,86	0,81	0,43	1

FIGURE 2: CORRELATION BETWEEN SECTORS' TOTAL RETURN

For this reason, a better measure of dispersion is the correlation between the excess returns over the market index (IVV US) in order to isolate the performance of the benchmark from the sectors' one. In Figure 3, it is possible to see how the correlations between sectors' excess returns are now very low and mostly negative, indicating a potential diversification effect of a portfolio composed of different sectors.

	XLY	XLP	XLE	XLF	XLV	XLB	XLK	XLU	XLI
XLY	1								
XLP	-0,17	1							
XLE	-0,39	-0,22	1						
XLF	0,24	-0,39	-0,35	1					
XLV	-0,22	0,50	-0,27	-0,28	1				
XLB	0,08	-0,41	0,35	0,02	-0,42	1			
XLK	0,06	-0,25	-0,07	-0,36	-0,27	0,05	1		
XLU	-0,41	0,52	0,12	-0,46	0,39	-0,27	-0,16	1	
XLI	0,26	-0,32	-0,05	0,27	-0,39	0,32	-0,12	-0,37	1

FIGURE 3: CORRELATION BETWEEN SECTORS' EXCESS RETURN

The allocation of a portfolio can't be limited to only equity. Although the low correlation between excess returns, all the sectors are exposed to market crashes with a different degree. To further improve the strategies it is thus necessary diversifying into other asset classes such as bonds, whose performance is uncorrelated to equity (Figure 4).

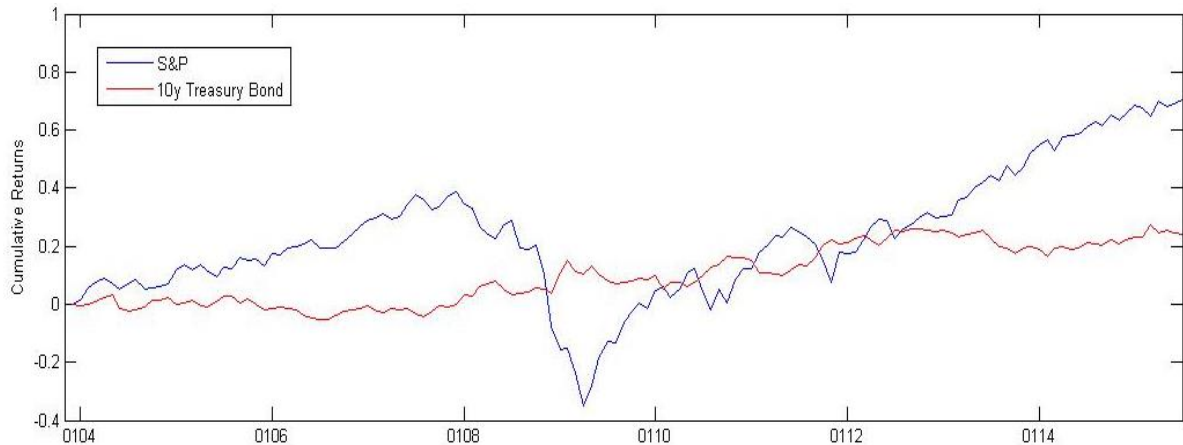


FIGURE 4: S&P 500 AND 7-10 YEARS TREASURY BONDS CUMULATIVE RETURNS

In Figure 5 it is worth to notice that the sectors with highest correlation with the 10 year Treasury Bond are the so called “Defensives”, namely Consumer Staples (XLP), Health Care (XLV) and particularly Utilities (XLU).

	XLY	XLP	XLE	XLF	XLV	XLB	XLK	XLU	XLI
IEF	-0,21	-0,02	-0,31	-0,21	-0,09	-0,27	-0,29	0,14	-0,24

FIGURE 5: CORRELATION BETWEEN SECTORS AND 7-10 YEARS TREASURY BONDS

As a matter of fact, over the years empirical studies have shown that sectors can be classified on the basis of their behavior during different stages of business cycles, where Cyclical and Sensitive (Consumer Discretionary, Technology, Financials, Energy,

Materials and Industrials) tend to perform better during early and late bull markets, and indeed Defensives (Consumer Staples, Health Care and Utilities) during bear markets. This relation can be shown in Figure 1, but also by looking at the time-varying sectors' volatility and beta. In Figure 6, the maximum and minimum twelve-month rolling volatilities of each sector are illustrated, indicating that cyclical sectors are characterized by larger return variations over time with respect to defensive ones which show lower volatility changes.

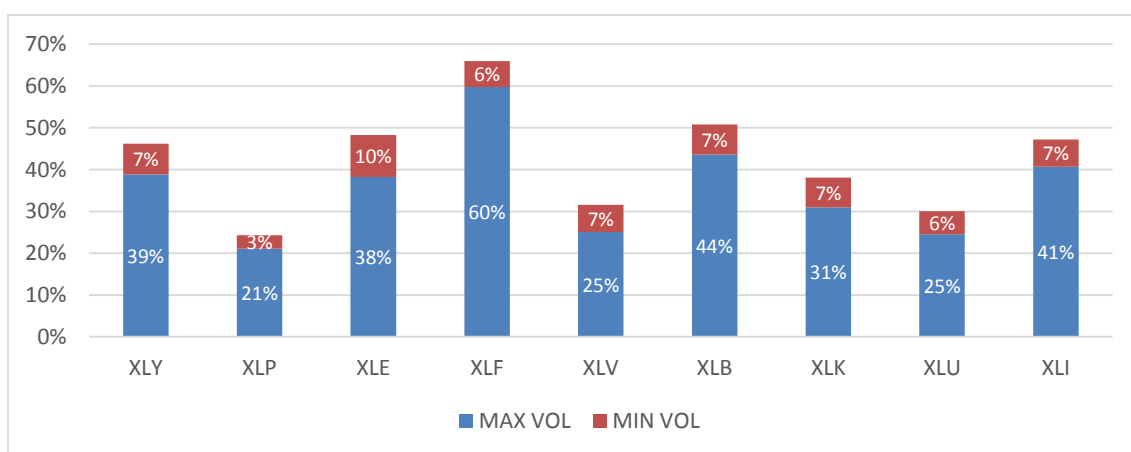


FIGURE 6: MAXIMUM AND MINIMUM 12-MONTH VOLATILITY IN SECTORS OVER TIME

In Figure 7, it is shown the twelve-month rolling beta¹ of the sectors with respect to the market (IVV US). Again, it is possible to notice that cyclical sectors are characterized by above average betas whereas more defensive sectors demonstrate below average betas.

¹ Beta is calculated from the regression: $Return_{Sector} = Alpha + Beta * Return_{Market}$

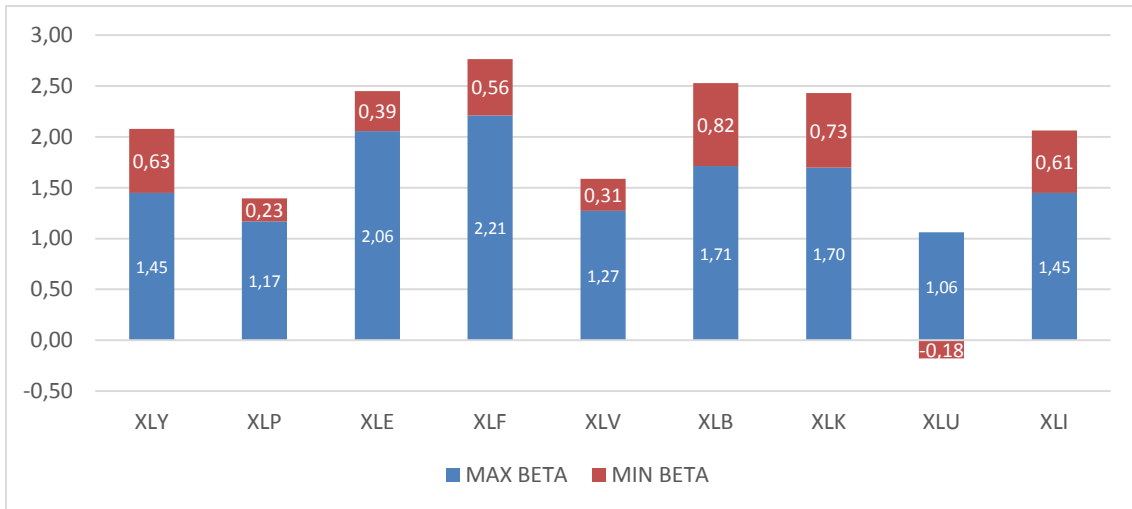


FIGURE 7: MAXIMUM AND MINIMUM 12-MONTH BETA IN SECTORS OVER TIME

	XLY	XLP	XLE	XLF	XLV	XLB	XLK	XLU	XLI
Beta	1,11	0,61	1,09	1,41	0,71	1,28	1,05	0,50	1,20

FIGURE 8: SECTOR'S BETA OVER THE SAMPLE DATES.

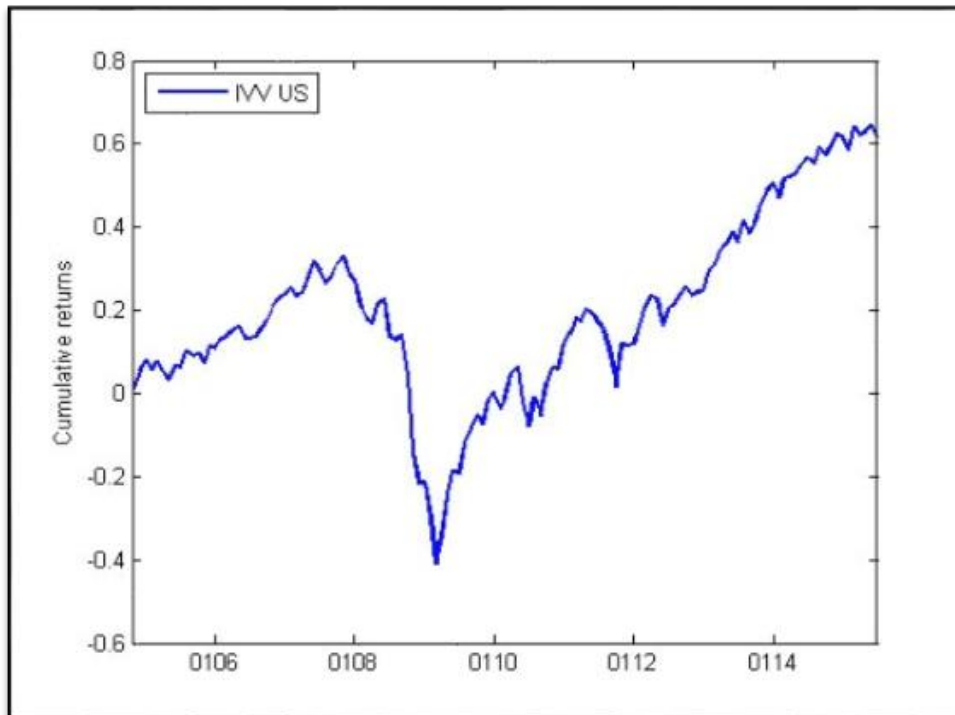
Therefore, on the basis of what has been shown above, sector performance is dispersed making rotational strategies between sectors and bonds attractive and with potential outperformance over a broad market buy and hold.

4. ETF Strategies

4.1. Buy & Hold

Buy and hold is an investment strategy that involves purchasing securities and holding them for the long term in order to get a reasonable performance without being bothered by the short-term volatility. This strategy relies on the Efficient Market Hypothesis (EMH), which is based on the pillars of random walk of asset prices, immediate incorporation of new information into asset prices and no arbitrage opportunities. This strategy, undertaken with the S&P Index ETF (IVV US), will serve as a benchmark for the following ones.

Strategy	Buy & Hold
Securities	S&P ETF (IVV US)
Parameters	n.a.
Description	Long IVV US and hold over time
Run dates	2004-2015



Statistics			
Average Return	5,74%	Skew	-1,03
Standard Deviation	14,56%	Kurtosis	5,65
Info Sharpe	0,39	Max	10,12%
Positive Months	61%	Q3	3,10%
Negative Months	39%	Median	1,24%
		Q1	-1,92%
		Min	-18,19%
		Max Drawdown	74%
		Start DD	65
		Recovery DD	114
		Time recovery	49
		Alpha	0
		Beta	1
		Info Ratio	NaN

FIGURE 9: BUY AND HOLD GRAPH AND STATISTICS

2

Strengths:

² Start DD: starting month max DD. Recovery DD: recovery month max DD.

The buy-and-hold strategy allows minimizing the transaction costs by holding securities for long term horizons thereby trading less frequently than other approaches. The cost minimization will theoretically increase the overall return of the investment portfolio. Moreover, the broad diversification allows the strategy to average the returns of different sectors. By being invested 100% in equity it immediately captures the fast recovery after crisis.

Weaknesses:

The strategy presents an annualized return of 5.74% versus an annualized volatility of 14.56%, resulting in an Info Sharpe³ of 0.39 which is quite lower than the risk-adjusted performance of the approaches that will follow. Moreover, a Buy & Hold strategy can't avoid crashes, such as in 2009, where the maximum drawdown was 74% - driven by a minimum monthly return of -18.19% - which has been recovered after 49 months (more than four years). Therefore, confirming the findings in Ang (2014), an only-equity buy & hold is not optimal for a long-horizon investor: it is a single and static investment decision where the investor selects an initial portfolio allocation without rebalancing through time, leading him to be less exposed to bull and more exposed to bear markets with respect to a more active strategy. Therefore, a determined degree of active index management might overcome the passive approach weaknesses by exploiting potential outperforming opportunities in both bull and bear markets.

³ Info Sharpe = $\frac{r_i}{\sigma_i}$

Before heading to active strategies, a more diversified passive approach might be buying and holding the market index (IVV US) and the Treasury Bonds (IEF US) with an initial allocation of 60/40.

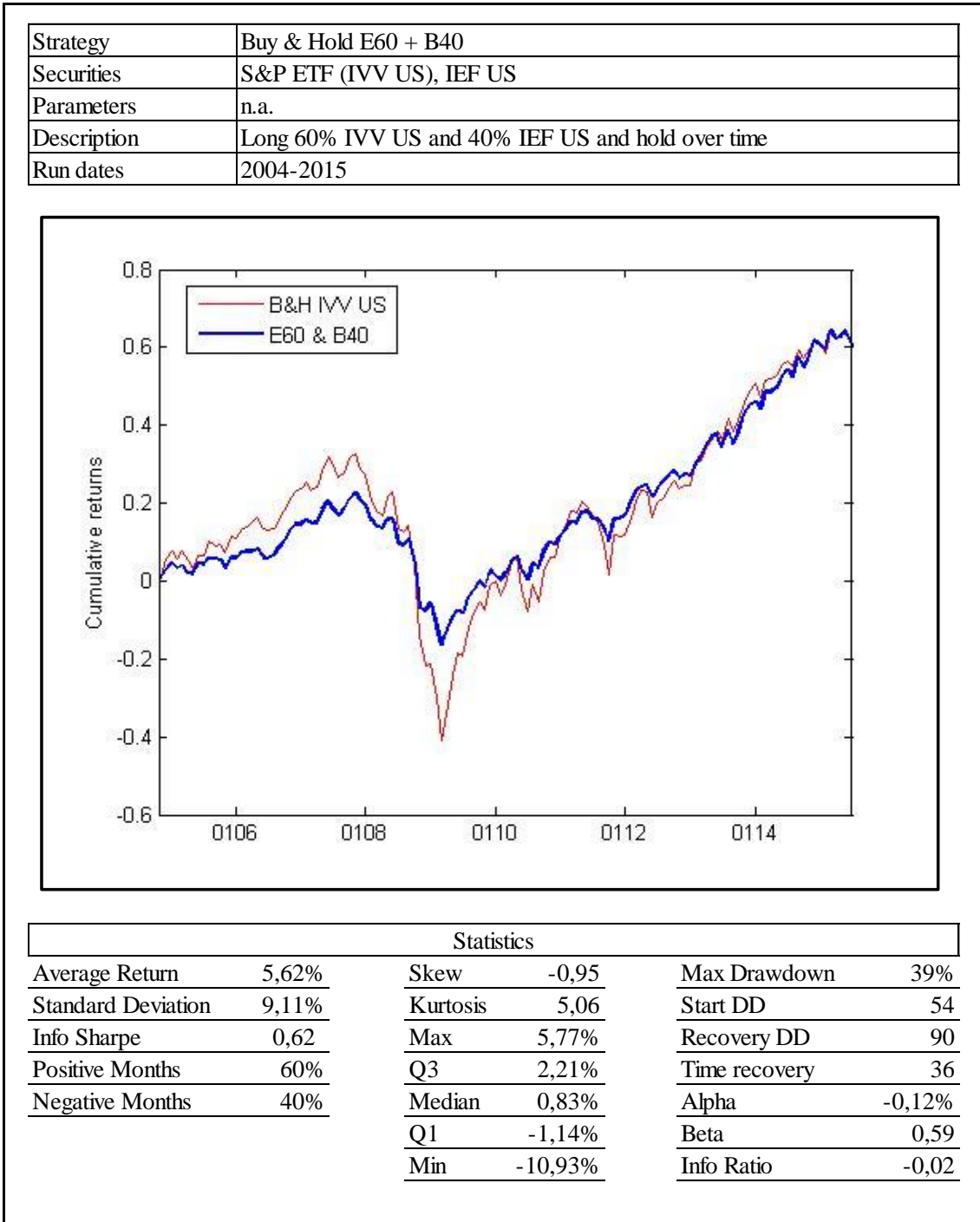


FIGURE 10: EQUITY AND BONDS BUY AND HOLD GRAPH AND STATISTICS

In this case the benefits of holding bonds is clear: it reduces the maximum drawdown to 39%, the time of recovery (36 months) and the overall portfolio volatility. The Info Sharpe is therefore enhanced to 0.62 versus the 0.39 of the full equity long-only. The only remarks are: the strategy takes advantage of the recent bond bull market (which might end in the future and ruin the performance) and the average annual return is only 5.62%.

4.2. Rebalancing

Rebalancing is the process of periodically restoring a predetermined target allocation with the goal of risk minimization rather than return maximization. Supporters of this strategy have demonstrated through empirical studies that the main contributor to a long-horizon investment performance is the asset allocation (Beebower, 1991), thus, considering variation in the portfolio composition over time, the fund needs to be periodically rebalanced back to the original weights. This investment strategy is counter-cyclical and can be explained with the most famous type of rebalancing which involves equity and bonds: when stocks outperform they have a weight higher than originally making their sale optimal, whereas when they underperform they need to be purchased again to restore the target exposure. The reason behind is simple: low-volatile assets such as bonds tend to obtain low returns whereas high-volatile ones, such as equity, tend to obtain higher returns. Consequently, the faster growth of high-volatile assets weight in the portfolio with respect to low-volatile ones will make essential for an investor to undertake a rebalancing strategy rather than a basic diversified portfolio which instead will become less diversified and more risky over time.

Therefore, rebalancing requires buying assets that have underperformed and selling assets that have outperformed, reflecting its contrarian nature. For this reason, it can also be seen

as a type of value investing strategy which involves buying assets that had negative returns but with higher future expected returns, and vice versa.

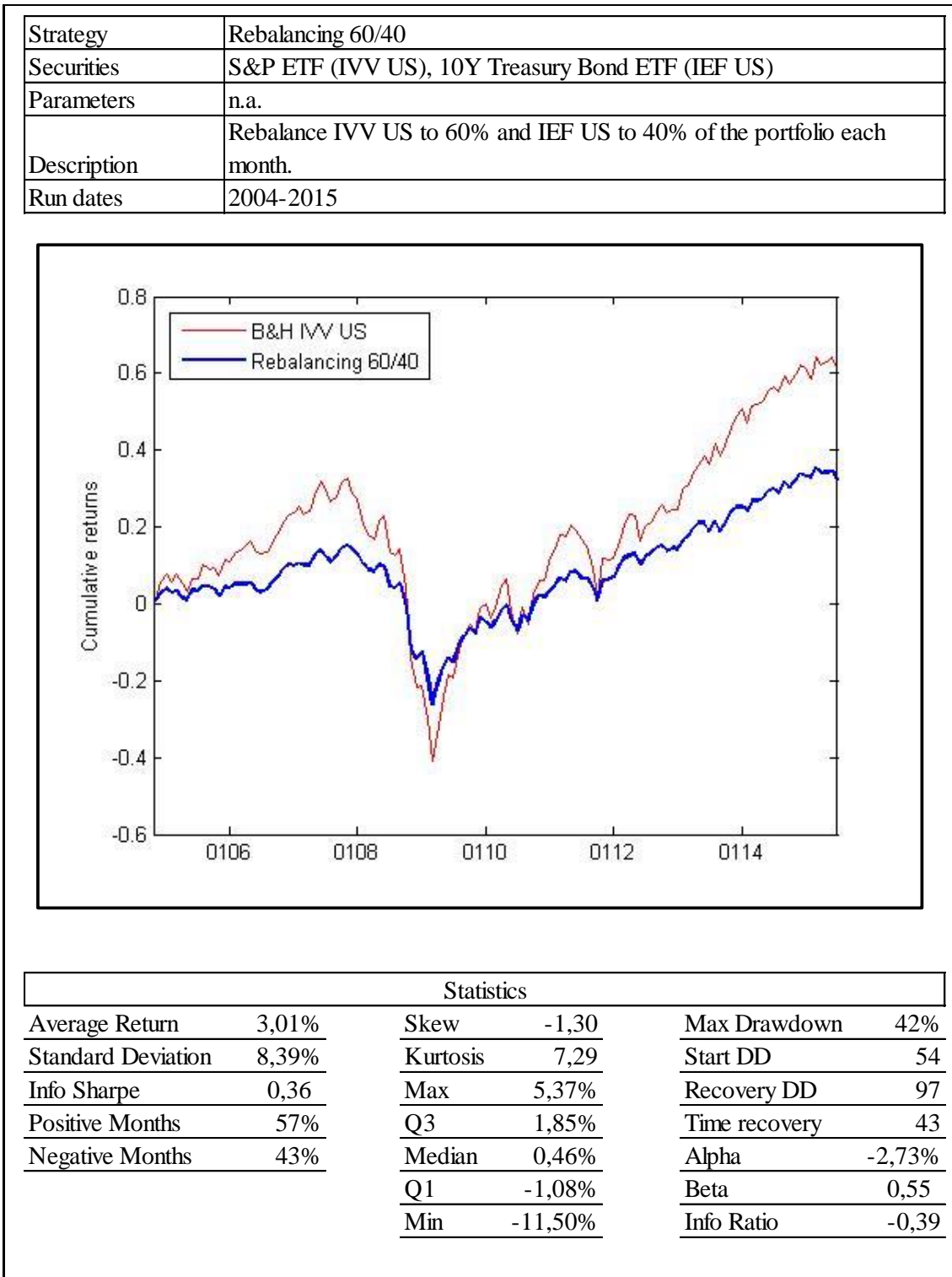


FIGURE 11: REBALANCING 60/40 GRAPH AND STATISTICS

Strengths:

A monthly rebalancing strategy to 60% Equity and 40% Bonds allows to obtain lower volatility (8.39%) but even lower returns (3.01%) resulting in an Info Sharpe of 0.36, therefore underperforming slightly the only-equity buy and hold but by far the equity-bond buy & hold . The strengths of this strategy is the reduction of the minimum monthly return (-11.50%) and of the maximum drawdown (42%), which is completely recovered after 43 months, with respect to the only-equity buy and hold. This is possible due to the investment in bonds, uncorrelated to equity, which decreases the beta to 0.55. As anticipated previously, one of the key facts of this strategy is the enhancement of the diversification benefits: by keeping the asset classes weights close to the original allocation it is possible to reduce volatility and, in case of less frequent rebalancing such as quarterly, to improve long-term returns (not shown).

Weaknesses:

A weakness of the strategy is the transaction costs, depending on the frequency of rebalancing, which may offset the portfolio gains or worsen the losses. In fact, a monthly rebalancing results underperforming due to the high costs, which can be avoided by trading less frequently such as quarterly. In this case, in fact, the Sharpe ratio is enhanced to 0.51 (not shown).

4.3. Technical

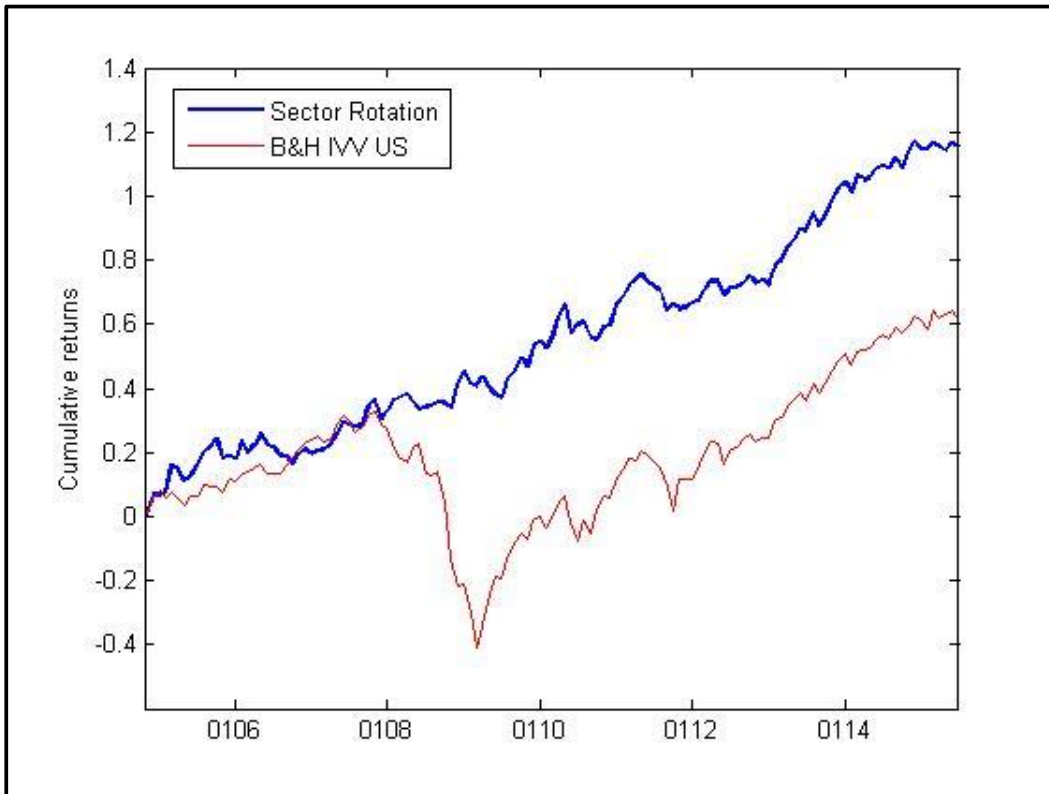
Technical analysis is an approach mainly based on two principles, namely the immediate incorporation of a company's information into its stock price and tendency of

prices to move in trends. Contrarily to bottom-up, the technician doesn't care about the security fundamental information believing that it would be already anticipated by investors who will create a trend. Fundamental information is therefore considered only a distraction. The movement of the price – the price action - is the only powerful factor that is needed to invest: as a matter of fact, they react to a market's movement rather than trying to predict its direction, giving them the ability of not getting emotionally involved with the trades. This is therefore the essence of this approach: markets behave always the same, with uptrends, downtrends and sideways which makes impossible to forecast a changing direction but rather favoring the adaptation to it by following the trend. There have been various studies about the existence of trends and momentum such as herding, anchoring and underreaction, overreaction and disposition effect. The former regards the investors' behavior of following the crowd in case of a price movement, as shown in numerous papers such as Welch et al (1992) and Grinblatt et al (1995). For instance, in case of a sustained increase in a stock price, the majority of investors will start buying it thereby boosting the price further, making it a self-fulfilling strategy. Moreover, investors may anchor their ideas on past data thereby slowly reacting to news in the short-term (Meub and Proeger, 2014), which consequently leads to an overreaction over longer periods as the news are confirmed (Barberis et al, 1998). Lastly, the disposition effect (Statman et al, 1985 and Grinblatt et al, 2005), namely the propensity to keep holding winners and to sell losers too early, causes asset prices to not variate immediately (Frazzini, 2006). The criticisms to this strategy regard their belief of repeatable patterns of prices over time, indicating that past performance can predict the future performance at a determined extent. Empirical studies show that this statement is false, since there is slightly positive but very close to zero correlation between past and future price

movements. Again, the increasing notoriety of this strategy may cause a crowding out thereby decreasing its effectiveness.

The factors that will be used in this strategy are a slight modification of the ones proposed by Faber (2013) and Antonacci (2015): it will be used the ten-month trend following of the benchmark as indication of equity bull and bear markets and the relative sector momentum during the last ten months. The reason for this modification is that looking at the direction of the market index rather than of each single sector allows averaging the overall equity trend. Moreover, Faber and Antonacci's strategies have become public and widely used by investors which end up crowding them out, for this reason a slight variation in the signal identification helps timing sectors and bond's trends in a different way. Once the path is individuated the investment will be done in either the three top ten-month momentum sectors (Faber, 2013) or in the ten-years Treasury Bond.

Strategy	Technical
Securities	10Y Treasury Bond ETF (IEF US), Sector ETFs, S&P ETF (IVV US)
Parameters	Trend Following 10 months IVV US, Sector Momentum 10 months
Description	If IVV US price is above its 10 month Moving Average => long Sectors ETFs with 10 months Price Momentum higher than the quantile 0.65 (i.e. top 3 sectors); Long IEF US otherwise.
Run dates	2004-2015



Statistics			
Average Return	10,76%	Skew	-0,23
Standard Deviation	10,77%	Kurtosis	3,10
Info Sharpe	1,00	Max	8,37%
Positive Months	63%	Q3	3,01%
Negative Months	37%	Median	0,93%
		Q1	-1,19%
		Min	-8,82%
		Max Drawdown	11%
		Start DD	84
		Recovery DD	101
		Time rec	17
		Alpha	5,02%
		Beta	0,35
		Info Ratio	0,37

FIGURE 12: TECHNICAL STRATEGY GRAPH AND STATISTICS

Strengths:

The strategy obtains an annualized return of 10.76% and annualized volatility of 10.77%, resulting therefore in an Info Sharpe of 1 which is substantially higher than the buy & hold. The main strength is the ability to capture the outperforming equity sectors during bull markets and to avoid crashes by switching to bonds during bear markets (ex. 2009). In fact, the maximum drawdown has only been 11% during the 2011-12 crisis and it was recovered after only 17 months. Moreover, the strategy results to move less intensely than the market (Beta=0.35) and to generate an alpha of 0.42%.

Weaknesses:

This method doesn't allow to timing the beginning of a trend and its reversal, which instead would be possible with a discretionary management. Moreover, keeping a window of ten months might be too standardized since it should be fitted to the volatilities of the sectors. On the other side, reducing or augmenting the window size will further increase or reduce transaction costs.

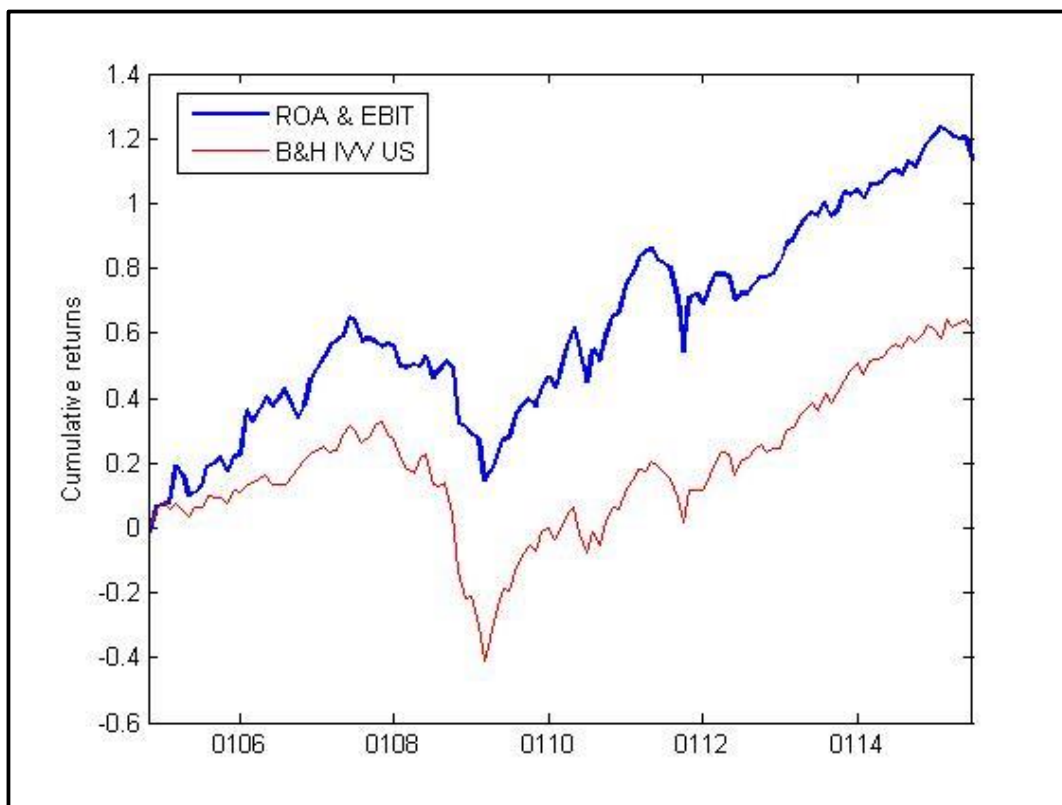
4.4. Bottom-Up

The bottom-up investment approach is focused on the “micro” environment, namely the analysis of securities' fundamentals with the goal of picking the ones with greatest profit potential. The bottom-up styles range from value investing – oriented to the estimation of a company's intrinsic value versus its trading price – to growth investing - concentrated to the speed of earnings and/or revenues growth which might translate into an increase in the stock price. As a matter of fact, these methods are based on the idea that securities picking should be focused on the fundamentals, without considering the

short - term variations in the stock price. Being concentrated on the daily volatility of the trading prices only confuses investors about what an asset is really worth, leading them to undertake a wrong investment. For this reason, bottom-up investors believe that market prices should only be used as a tool of investment timing, informing about whether a bargain opportunity happens.

As for the factors, because of the diversity of sectors, it would be inefficient the use of ratios as a selection tool. Therefore, the analysis will be undertaken by considering the growth of profitability and efficiency measures, where ROA and EBIT together ended up being the most significant. This is also consistent with the findings in Myers et al (2006), where there is evidence of a relationship between earnings momentum and positive abnormal returns, and in Turner et al (2011), where is found out that earnings momentum is a persistent phenomenon and can lead to higher share prices. Return on Asset indicates the ability of a company's asset to generate profits, therefore an increasing ROA should reflect an efficient use of the assets. It is a step behind the ROE, since it doesn't take into account the level of leverage. On the other side, EBIT rather than Net Income is used as earnings indicator in order to eliminate the distortions caused by taxes and interest expenses thereby facilitating the cross-sector comparison. Still consistent with Turner et al (2011), the study is focused on past earnings rather than projected future earnings which are usually overestimated because of optimistic views by analysts and conflict of interests. Hence, an increasing EBIT indicates that the company has been growing in the past and it is likely to continue doing so in the future. In summary, a positive twelve-month change in these two measures indicates a strengthening of the sector, whereas a negative one reflects a deteriorating performance thereby theoretically influencing the market price.

Strategy	Bottom-up
Securities	10y Treasury Bond ETF (IEF US), Sector ETFs
Parameters	12Months Momentum ROA, 12Months Momentum EBIT
Description	Long Sectors with highest ROA 12M Momentum and highest EBIT 12M Momentum (both > quantile 0.65); IEF US otherwise
Run dates	2004-2015



Statistics					
Average Return	10,56%	Skew	-0,60	Max Drawdown	50%
Standard Deviation	17,26%	Kurtosis	5,59	Start DD	54
Info Sharpe	0,61	Max	16,76%	Recovery DD	74
Positive Months	64%	Q3	3,60%	Time recovery	20
Negative Months	36%	Median	1,20%	Alpha	4.82%
		Q1	-1,28%	Beta	0,94
		Min	-17,26%	Info Ratio	0,44

FIGURE 13: BOTTOM-UP STRATEGY GRAPH AND STATISTICS

Strengths:

The strategy obtains an annualized return of 10.56% and annualized volatility of 17.26%, resulting in an Info Sharpe of 0.61 which outperforms the buy & hold. It allows capturing the sectors with the strongest profitability measures which might drive the market prices in bull markets, for example by achieving a maximum monthly return of 16.76%. This is reflected in the ability of capturing the fastest recovering sectors after crisis, which let the drawdown to be offset after only 20 months.

Weaknesses:

A weakness of this investing approach is that it doesn't consider the macro environment: whatever the potential of a determined stock or sector, an economic downturn will consequently affect the whole market thereby leading to potential losses, as shown by the maximum drawdown of 50%, recovered after 20 months, and a very high Beta (0.94). In fact, this type of investing, starting from the bottom, doesn't consider the state of the market, being therefore excessively exposed to equities rather than diversified with other asset classes.

4.5. Top-Down

Top-Down strategy is an investment approach that is based on the analysis of the big picture: through a detailed examination of market forces, a top-down manager tries to understand cycles and trends which indicate the overall position of the economy and consequently make the most appropriate trades. Therefore, after having analyzed the macro factors the investor will identify the main themes and focus in individual securities. One of the main beliefs of this strategy is the idea that picking the winner sector would

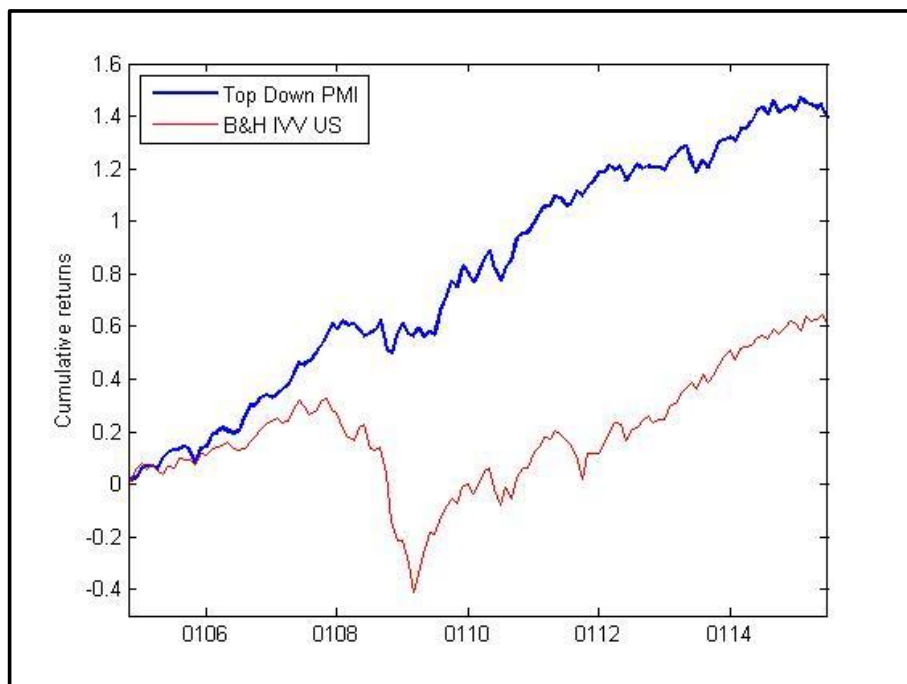
lead to picking the winner stocks, rather than departing from the companies' fundamentals analysis, method that require a relatively high degree of market inefficiency. Moreover, a top-down strategy allows the investor to be flexible in both bull and bear markets by shifting its portfolio allocation based on the general macro view. Another point in top-down favor is the high degree of freedom: rather than focusing on only equity, like a bottom-up manager would do, the global view investor will be able to rotate between different asset classes and capturing their relative strength, improving thus the tactical allocation of the portfolio. A criticism to the top-down investing is the degree of riskiness: interpreting the macro environment is a hard task, therefore in case the manager's forecast is incorrect, the portfolio performance will be negatively impacted.

The strategy will be built on the PMI index, an indicator of the health of the manufacturing sector, which is composed of five different factors namely manufacturing output, inventory levels, new orders, supplier deliveries and the employment level. This index influences the financial markets for several reasons such as being the first broad indicator released each month and covering the cyclically sensitive manufacturing sector. Moreover, it has been found out a very high correlation between PMI and US GDP. On the basis of Harris et al (2004), the PMI is very accurate in the representation of the current business cycle, leading the GDP at least one quarter ahead. In particular, the production factor has been shown to be tightly correlated with personal income growth as well, which affects both economy and financial markets. Therefore, a study of the PMI position might be relevant for the allocation to determined industries (Crescenzi, 2009), which can be divided into Cyclical (Financials, Consumer Discretionary, Technology and Industrials), Sensitive (Energy, Materials, Technology and Industrials), Defensive (Utilities, Health Care, and Consumer Staples), rotating with bonds. To notice that Technology and

Industrials have been include in both early and late bull phases given their sensitivity to both periods (Fidelity Investments, 2015 and Emsbo-Mattingly, 2014). In general, the manufacturing sector is considered in expansion when the PMI is higher than 50 (i.e. more firms are expanding activity than contracting activity), whereas when it is below 50 indicates a contraction. In this project the assessment of the business cycle will be done by looking not only at the PMI level – i.e. above or below 50 points – but also at its direction – i.e. above or below its moving average. In the latter, a moving average of six months is used given the restrained PMI’s volatility in order to better timing the trend variation. Accordingly to the PMI’s position and direction the economy is considered to be divided in four stages:

- 1) When the PMI is higher than 50 and below its six-month moving average the economy is considered strong but starting to deteriorate, phase that is here specified as “early bear”. During this stage, long Defensives
- 2) When the PMI is lower than 50 and below its six-month moving average the economy is considered weak and in recession, phase that is here specified as “late bear”. During this stage, long ten-years Treasury Bonds ETF (IEF US)
- 3) When the PMI is lower than 50 and above its six-month moving average the economy is considered weak but in recovery, phase that is here specified as “early bull”. During this stage, long Cyclicals
- 4) When the PMI is higher than 50 and above its six-month moving average the economy is considered strong and in expansion, phase that is here specified as “late bull”. During this stage, long Sensitives

Strategy	Top-Down
Securities	IEF US, Sectors
Parameters	PMI, PMI 6Month Moving Average (Purchasing Managers' Index)
Description	<p>Economic state based on PMI level (above or below 50) and direction (above or below MA).</p> <p>Four economic stages:</p> <p>1) PMI>50 and PMI<MA(PMI) -> strong economy + deterioration (early bear) => Long Defensives (Utilities, Health Care, Cons Staples)</p> <p>2) PMI<50 and PMI<MA(PMI) -> weak economy + recession (late bear) => Long IEF US</p> <p>3) PMI<50 and PMI>MA(PMI) -> weak economy + recovery (early bull) => Long Cyclical (Financials, Cons Discretionary, Tech, Industrials)</p> <p>4) PMI>50 and PMI>MA(PMI) -> strong economy + expansion (late bull) => Long Sensitives (Energy, Materials, Tech, Industrials)</p>
Run dates	2004-2015



Statistics					
Average Return	12,94%	Skew	-0,47	Max Drawdown	13%
Standard Deviation	11,46%	Kurtosis	3,89	Start DD	50
Info Sharpe	1,13	Max	9,00%	Recovery DD	59
Positive Months	67%	Q3	3,65%	Time rec	9
Negative Months	33%	Median	1,18%	Alpha	7,20%
		Q1	-1,26%	Beta	0,39
		Min	-11,31%	Info Ratio	0,52

FIGURE 14: TOP-DOWN STRATEGY GRAPH AND STATISTICS

Strengths:

The strategy obtains an annualized return of 12.94% and an annualized volatility of 11.46%, resulting in an Info Sharpe of 1.13, the top outperforming approach of this project. By switching from Cyclical to Sensitive to Defensive sectors to bonds on the basis of the PMI level and direction it allows capturing most of the market trends. The maximum drawdown is thus only 13% and it is recovered after only 9 months, reflecting the general ability of this strategy to be less intensely correlated with the market (Beta=0.39) and to capture an alpha of 0.60%.

Weaknesses:

Sometimes the macro fundamentals may not be reflected in the market prices which are mostly moved by investors' irrationality. This explains the inability of this strategy to ride the financial sector bubble before 2008 as other strategies do, but it allows predicting and avoiding the following market crash.

4.6. Mixed Model

The mixed model tries to combine two different approaches – bottom-up and technical, tested previously– in order to further improve the portfolio performance. The top-down is excluded on purpose since it allocates the portfolio to predetermined sectors in their potential outperforming phase, practice that would be in contrast with the fundamentals and technical findings. In this case, the chosen factors are the twelve-month rate of change in ROA and EBIT, as fundamentals, and the ten-month market moving

average and sectors' price momentum, as technicals, with the goal of exploiting the benefits of both approaches.

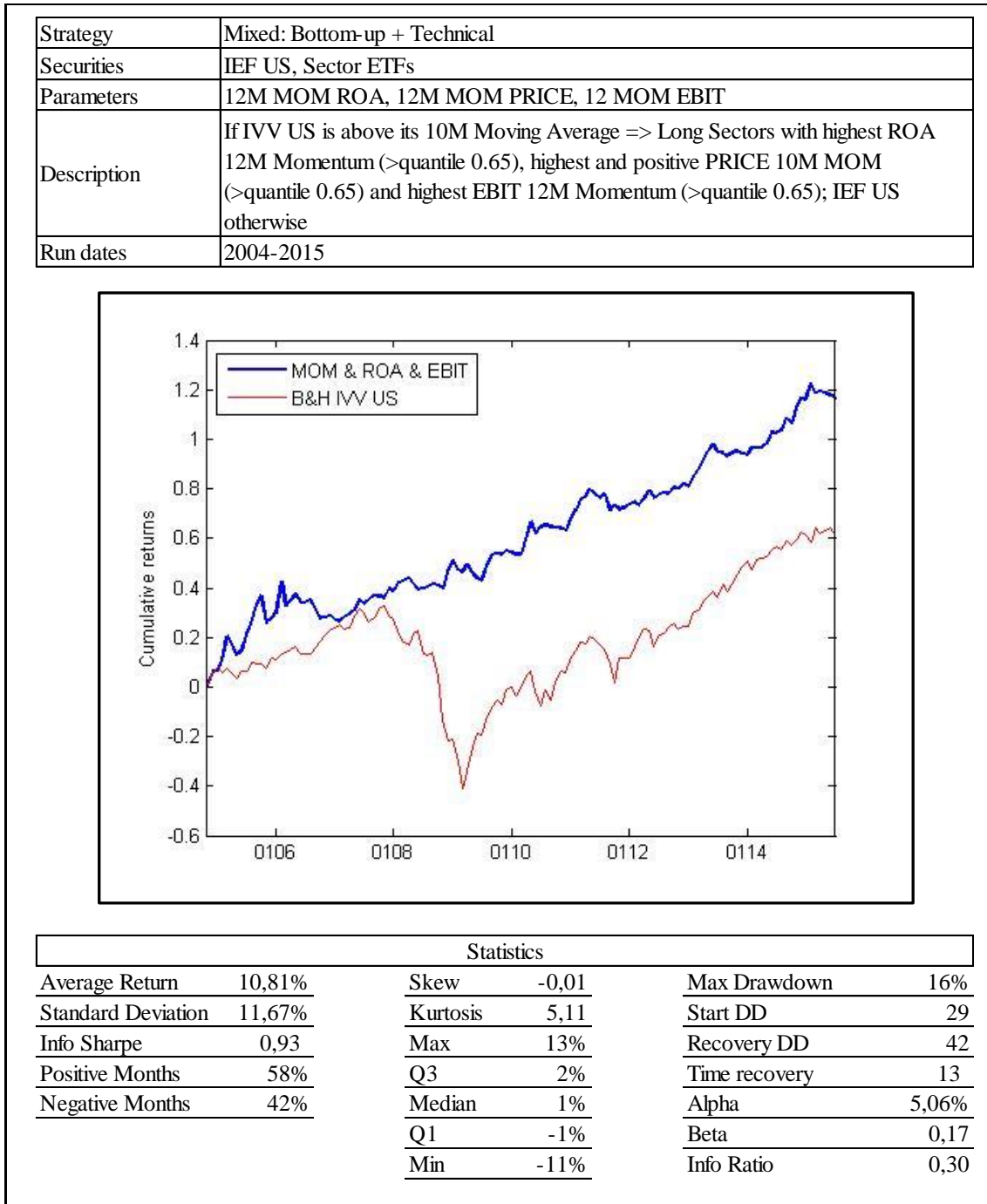


FIGURE 15: MIXED STRATEGY GRAPH AND STATISTICS

Strengths:

The strategy allows to exploit both prices and fundamental momentum in the sectors. In this way, it tries to improve the only-technical strategy by investing in sectors with increasing profitability and efficiency and it tries to improve the only-bottom-up strategy by looking at variations in price trends. The portfolio shifts from the sectors with strong fundamentals and momentum during equity bull markets to bonds during equity bear markets, achieving an annualized return of 10.81% (which is higher than the annualized return in both technical and bottom-up strategy) and volatility of 11.67% (which unfortunately is higher than the technical, even if quite lower than the bottom-up) resulting in an Info Sharpe of 0.93. The strategy thus outperforms the buy and hold, confirmed by a (daily) alpha of 0.42%, also from a the losses' point of view: the maximum drawdown is in fact only 16% - strangely not corresponding to neither the crisis in 2008 nor in 2012 – and it is recovered in 13 months. The strength of the strategy can also be considered the relative market neutrality, reflected in a beta of only 0.17, due to the high number of periods invested in bonds.

Weaknesses:

The volatility is still high due to the fundamental factors' signals, even if smoothed by the price momentum indicator, making this strategy underperforming the only-technical one from the Info Sharpe point of view. The information ratio is only 0.09 compared to the other strategies, meaning that the active returns are low for the risk taken. Moreover, the strategy obtains 42% of negative months, which is even higher than the buy and hold approach. Although the good Sharpe, the strategy might be not well working because of the excessive filters for the equity signals which increases the number of periods invested

in bonds. In case bonds become less profitable over time there will be a probable underperformance of this strategy.

	B&H	Rebalancing	Technical	Bottom-up	Top-down	Mixed
Average Returns	5,74%	3,01%	10,76%	10,56%	12,94%	10,81%
Standard Deviation	14,56%	8,39%	10,77%	17,26%	11,46%	11,67%
Info Sharpe	0,39	0,36	1,00	0,61	1,13	0,93
Max DD	74%	42%	11%	50%	13%	16%
Months Recovery DD	49	43	17	20	9	13

FIGURE 16: SUMMARY STRATEGIES' STATISTICS

5. Conclusion

In the last years the use of ETFs has been increasingly growing due to their advantages over mutual funds and futures as a tool for passive management. In particular, the project has the goal of showing that ETFs might be used as powerful instruments for an active management approach, focusing on sector and asset class rotation, rather than for a passive one. The active strategies undertaken are monthly rebalancing to 60% equity and 40% bonds, technical, bottom-up, top-down and mixed model. The analysis show that by combining sector and asset class rotation it is possible to capture the strongest sectors during an equity bull market and to substantially reduce losses by investing in bonds during equity bear markets, making thus more efficient the use of ETFs for active management rather than passive management purposes. In particular, it has been shown that a strategy based on technical signals – ten-month price momentum and ten-month trend following applied to the benchmark and sectors – allows capturing the strongest sectors over time and moving to bonds in case of deteriorating performances, resulting in an Info Sharpe of 1 which more than double the Info Sharpe of the benchmark buy and hold (=0.39). The bottom-up strategy, by focusing on fundamentals, is oriented to capture

the sectors with highest profitability and efficiency growth by looking at the rate of change in their respective Return On Assets and EBIT. With this method it is possible to achieve an Info Sharpe of 0.61, which again outperform a passive only-equity buy and hold strategy, but the feature of focusing on fundamentals rather than prices and macroeconomic state doesn't allow the investor timing the bear markets and switching to bonds. The top-down strategy, undertaken by looking at the PMI level and direction, is revealed to be very efficient: in fact, it allows capturing the different phases of the business cycle and the related outperforming sectors and asset classes, achieving an Info Sharpe of 1.13. The only risk of this strategy might be the future distortion of the sector's performance during a determined moment of the cycle due to changes in endogenous factors (ex: sectors' regulations and technology) and in exogenous factors (supply/demand). The mixed model, which excludes the top-down indicator (based on predetermined sector choice), combines fundamental factors (ROA and EBIT) with technical factors (trend following price momentum) in order to outperform the benchmark. The strategy obtains an Info Sharpe of 0.93 by increasing the returns for the level of volatility and an alpha of 0.42%. It is important to say that the goal of this paper is not showing which type of active approach is the most efficient, since the choice and the combination between factors is unlimited leading to large variations in the performance, but it is rather demonstrating that the use of ETFs in active strategies, if properly implemented, is greatly more profitable and less risky than in passive management. This statement can be done not only from the Sharpe's point of view but by looking at the drawdowns: as shown in *Figure 16: Summary strategies' statistics*, a passive buy and hold strategy obtains a maximum drawdown of 74% which is recovered after 49 months (more than four years) whereas active strategies allow to significantly

reduce the drawdowns and their time of recovery (ex. Max DD of 13% and recovered after only 9 months for the top-down approach). Therefore, in the light of what the analysis has shown, the theoretical “pros” of a passive management such as diversification and absence of transaction costs are substantially overcome by the “pros” of an active management.

To further investigate the potential outperformance of active over passive ETFs strategies it is suggested to extend the research to analyze the effectiveness of the strategies in different time periods – bull, bear and sideways – and to use super-sector ETFs in order to additionally exploit the differences within each broad sector.

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