


“Equity market anomalies in major European economies”

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EQUITY MARKET ANOMALIES IN MAJOR EUROPEAN ECONOMIES

Abstract

This paper investigates five leading equity market anomalies – size, value, momentum, profitability, and asset growth, for four Western European markets, namely, Germany, France, Italy and Spain, from January 2002 to March 2018. The study tests whether these anomalies reverse under different macro-economic uncertainty conditions, and evaluates if strategies based on time diversification can be formed using these equity market anomalies. Market anomalies were tested using four major asset pricing models – the Capital Asset Pricing Model, the Fama-French three-factor model, the Carhart model, and the Fama-French five-factor model. Macro-economic uncertainty was tested using two proxies, namely VIX and default premiums. Time diversified strategies were examined by estimating Sharpe ratios of combined portfolios formed by combining winner univariate portfolios. Value effect in Germany, Size effect in France and Profitability effect in Italy and Spain provide the highest unadjusted returns on long side strategies. No significant reversal of these anomalies was found under different macroeconomic uncertainties. Asset pricing tests show that CAPM works well for Spain and Italy, while Carhart's model explains returns in Germany. The Fama-French five factor model does not seem to be a good descriptor of asset pricing for data. No suitable model for explaining asset returns is identified for France. Finally, it is observed that some of the equity market anomalies seem to be countercyclical and therefore provide time diversification opportunities. The study has implications for academicians, investors, and policy makers by providing insights for developing profitable investment strategies and highlighting the efficacy of alternative models as performance benchmarks.

Keywords

size effect, value effect, momentum effect, multifactor model, CAPM

JEL Classification

C13, C22, G11

INTRODUCTION

The Fama and French Three-Factor Model (FF3) poses a serious challenge to the Capital Asset Pricing Model (CAPM) (Sharpe, 1964). Fama and French (1993) modelled two empirical anomalies viz. Size premium (Banz, 1981) and Value premium (Stattman, 1980), which remain unexplained by CAPM. Simultaneously, Jegadeesh and Titman (1993) observe another pattern in stock returns, wherein the past winners (3 to 12 months) remain winners in the next 3 to 12 months, and called it as Momentum Anomaly. Fama and French (1996) conclude that their three-factor model can explain major equity market anomalies, except price momentum. Carhart (1997) proposed a four-factor model, which, besides the Fama-French factors, incorporates a momentum factor based on the difference in returns between past winners and losers.

Cooper et al. (2008) document another important anomaly in terms of investments, and show that growth in investments is negatively related to returns. Haugen and Baker (1996) show a positive relation between profitability and returns, i.e., stocks of more profitable firms outperform those of less profitable firms on a risk-adjusted basis. Much of the recent literature also shows that profitability anomaly has significant power in cross sectional returns (Novy-Marx, 2013; Fama & French,

2015; Ball et al., 2016). Combining both these anomalies, Fama and French (2015, 2016) recommend a five-factor model (FF5), which is FF3 augmented with profitability and investment (also known as asset growth) factors.

There is abundant prior literature dealing with the five prominent equity market anomalies for global markets. However, similar literature for European countries, especially for Western Europe, is limited. This research gap becomes the motivation for testing market anomalies for West Europe using a variety of multifactor benchmarks. Another rationale for this study is provided by the argument that since the financial integration of Europe, the member countries provide low diversification benefits. Germany, France, Italy, and Spain have been selected as sample countries, since these are large Eurozone economies with developed stock markets. Thus, this study investigates the five major equity market anomalies, namely, size, value, momentum, profitability, and asset growth for four Western European markets viz. Germany, France, Italy, and Spain. It also evaluates the efficacy of prominent asset pricing models in explaining these anomalies. Finally, the study checks if sample anomalies behave differently under macro-economic uncertainty, and examines whether the sample anomalies are countercyclical and whether investors are able to create time diversified strategies.

The contribution of the study to the existing literature is as follows. First, there are few studies available examining asset pricing anomalies, especially profitability and asset growth anomalies, for Western European markets. Next, sample anomalies have been tested using various asset pricing models to see if additional factors play any considerable role in explaining portfolio returns.

One of the major contributions is to evaluate how different market anomalies perform under different macro-economic uncertainty conditions. Copeland and Copeland (2016) explain size anomaly, using U.S. data, and highlight its time varying behavior. In the asset pricing literature, the size effect is a small firm effect, wherein, due to various risks involved (Pandey & Sehgal, 2016), small-cap firms provide superior returns compared to large-cap firms. However, Copeland and Copeland (2016) relate the size effect to the changes in macroeconomic conditions, as proxied by change in VIX. They argue that in periods of positive change in VIX, the small size effect is unfound, and investors should hold large cap stocks, whereas in periods where VIX decreases, size effect persists, and investors should hold small cap stocks. Taking their argument further and performing an out of sample study for the select West European markets, research shows how five equity market anomalies, and the long-short strategies based on these anomalies, perform under different macro-economic uncertainty conditions. Another important contribution of the study is to analyze if sample anomalies are countercyclical in nature for the sample countries, which can provide time diversification benefits.

1. LITERATURE REVIEW

This section provides a comparative literature review on the sample anomalies and the efficacy of the asset pricing model in explaining the situation in international equity markets versus European equity markets.

After mid-eighties, the size effect has been found to be either diminished or disappeared for various reasons (Pandey, 2020). However, some work in recent literature has again ignited the debate on the significance of the size effect (Asnee et al., 2018; Leite et al., 2018). Copeland and Copeland

(2016) evaluate size anomaly under macro-uncertainty and suggest size-based profitable trading strategies in such conditions.

Similarly, there are studies that have tested the value effect (Chan & Chen; 1991; Pandey, 2020). Denis and Jarno (2016) authenticate the existence of value anomaly in the Finnish stock market. Klaus and Topi (2019) examine the Nordic capital market and find the value effect among small size companies.

Momentum strategies have been constantly tested for matured and emerging markets

(Rowenhorst, 1998; Novy-Marx (2012, 2015). Alhenawi (2015) finds that momentum absorbs the size effect. Daniel and Moskowitz (2016) and Barroso and Santa-Clara (2015) observe that momentum strategies tend to fail during high volatility periods. Pukthuanthong et al. (2019) find that asset pricing models could not justify momentum anomaly. Zaremba (2018) studies the momentum effect in 40 cross sectional anomalies for 78 countries and finds momentum effect to be present in more than half of such anomalies. Blitz et al. (2018) document the existence of the idiosyncratic momentum effect in non-U.S. countries. Similarly, Linnainmaa and Roberts (2018) support that profitability anomaly subsumes most of the earnings-related anomalies. Elliot et al. (2018) show the presence of the asset growth anomaly across small-cap and large-cap stocks. Cao et al. (2018) document the presence of five asset related anomalies in the Australian market.

In the past decade, several studies have been conducted relating to equity market anomalies for European stock markets. Cakici et al. (2013) find a strong value effect for 18 emerging stock markets (including that of Europe) and strong momentum effect for all but Eastern Europe markets. Zaremba and Czapkiewicz (2017), after investigating 100 anomalies for emerging European markets, find the FF 5-factor model to be superior to all other factor models. Papanastasiopoulos (2017) study the asset growth anomaly for 16 European markets and finds the anomaly to be more pronounced among loss making firms.

Thus, it is found that there is a lot of literature available for international markets, but it is limited for Western European markets. With this background, the study is conducted for selected Western European economies to test performance of five major equity market anomalies; investigate whether sample equity market anomalies can be explained by alternative asset pricing models; evaluate performance of trading strategies, based on these equity market anomalies under different macroeconomic uncertainty conditions; and examine which equity market anomalies are countercyclical in order to develop investment strategies based on time diversification.

2. METHODS

Adjusted month end closing prices are taken from January 2002 to March 2018 for 505 companies from Germany and France, 503 companies from Italy, and 427 companies from Spain. The companies were selected based on market capitalization (Mcap) to match the sample size with S&P 500 Index, which currently comprises 505 companies. Germany and France have the requisite number of companies, however, for Italy and Spain, all the listed companies available have been taken for the sample period as their number is less than 505. Percentage returns have been created from the stock prices to carry out further estimations. To measure market returns, DAX 30, CAC 40, FTSE MIB and IBEX 35 have been taken as benchmark indices for Germany, France, Italy, and Spain, respectively. 91-day US treasury bills are used as risk-free proxies from the global investor's perspective.

Year-end information for market capitalization is used as a proxy for firm size, and price to book value as a proxy for value. Return on equity is used to measure corporate profitability, while a percentage change in total assets is expected to capture asset growth or investment rate of the firms. All year-end corporate attribute values have been obtained from December 2001 to December 2017. Stock price momentum is measured by the average of 6 months/12 months past returns.

Change in Volatility Index (VIX) and default spreads are used as measures of macro-economic uncertainty to classify the study period. VIX data was obtained from January 2002 for Germany and France, for Italy the data is available from January 2010, and for Spain the data is unavailable. Similarly, the default premium rates on bonds are available from January 2002 for Germany and France, for Italy they are available from November 2009, and for Spain from February 2006. The default spreads have been defined as the difference between AAA securities and BBB- for Germany; AAA and BBB+ for France; and AA- and BBB for Italy and Spain. Bloomberg was used to obtain entire data.

The examination begins by checking for the evidence on the existence of five predominant market anomalies for each sample country. For each

country, quintile univariate portfolios on excess returns have been formed based on ranking criteria as Market capitalization as a proxy for size, price to book value as a proxy for value, return on equity as a proxy for profitability, change in total assets as a proxy for asset growth, and two measures i.e., M6 (6 by 6) and M12 (12 by 12) for momentum. For further estimation, only M6 as a proxy for momentum was used, while M12 is used for robustness check.

To create M6, every year since January 2002, the sample stocks are ranked based on the average excess return over the past six months (by skipping the previous month) and form quintile portfolios that are subsequently carried for next six months, that is, from January to June. Portfolios are rebalanced every six months, and the process is repeated till the last semi-annual year of the sample. Finally, a long-short portfolio has been created by subtracting P1 from P5 to form a momentum factor where P5 is a winner portfolio, while P1 is a loser portfolio. M12 has been constructed as same as M6, except that the portfolio formation and holding windows are kept as 12 months.

To create univariate attribute-based portfolios for each country and for each year in the month of December (t), stocks are have been ranked using sample attributes, for example market capitalization. Further, the ranked securities are separated into five portfolios, and equal-weighted monthly returns are estimated for quintile portfolios for the next twelve months (i.e., from January of year $t+1$ to December of year $t+1$) and are called as unadjusted returns. P1 is the portfolio with the smallest size, and P5 is the portfolio with the largest size. Portfolio rebalancing is done in the month of December every year, and the process is repeated till the final year of the sample period. The same method is applied for portfolios created on PB, profitability and net investments.

Further, to check the performance of market anomalies under different macro-economic uncertainty conditions, the paper analyzes time varying performance of sample portfolios, based on the lines of Copeland and Copeland (2016). However, unlike them, time varying behavior of all attribute-sorted portfolios is analyzed, and the study is not limited only to size-sorted portfolios.

For this purpose, the study classifies every month of time as one showing high (low) macro-economic uncertainty based on whether changes in delta VIX values are positive (negative). For instance, Copeland and Copeland observe that while the small firm effect is prevalent in low macro-economic uncertainty, the big firm effect is observed, for US data, for periods of high macro-economic uncertainty. The study attempts to verify if there are similar patterns in European stock returns. Extending the argument, small size, low PB, high profitability and low net investment stocks should have better performance when there is low macro-economic uncertainty, while the opposite effect should happen where macro-economic uncertainty is high. Hence, portfolio returns are separated for delta VIX positive and delta VIX negative periods, and the average return is re-estimated. Contemporary finance literature shows that default premiums (delta def) tend to expand (contract) during the periods of high (low) macro-economic uncertainty. Therefore, changes in default premiums can also be used as a proxy for measuring macro-economic uncertainty. The periods of positive (negative) delta def may imply high (low) macro-economic uncertainty. Using an alternative measure of macro-economic uncertainty, the study performs a robustness test.

To observe the mean unadjusted portfolio returns, size based, delta VIX positive and delta VIX negative portfolios are constructed. As observed by Copeland and Copeland (2016), the study attempts to find if there is a small size effect in the selected countries when delta VIX decreases and a large cap stock effect when delta VIX increases. This would help portfolio managers to exploit anomalies under economic uncertainty to generate higher returns for their investors. To perform a robustness check on a proxy for macro-economic uncertainty, default premiums have been taken as an additional measure apart from VIX. The same process is repeated for each anomaly and each country using default premiums.

Next, the paper evaluates the extent to which the explanatory power of asset pricing models is in explaining the above anomalies. Alternative asset pricing frameworks were used to meet the dual objectives a) to identify profitable trading strategies and b) to ascertain which factor model is the best

descriptor of cross sectional returns for the selected countries. The study begins with the standard CAPM (Sharpe 1964) and checks its efficacy in explaining unadjusted portfolio returns. Besides, the study applies three multifactor model versions such as the Fama French three-factor model, containing market, size and value as the three factors; the Carhart model, which augments the FF3 model by including a stock momentum factor; and the Fama-French five-factor model (FF5), which augments FF3 with profitability and asset growth factors.

Fama-French size and value factors are constructed through the independent sorted intersection of two size and three value portfolios, as was done in Fama and French (1996). Profitability factor (RMW) was measured as robust minus weak profitability, and an investment factor (CMA) was measured as a conservative minus aggressive investment. Multi-collinearity problem, if any, is resolved before putting these factors in Fama-French models. Newey-West procedure was adopted to estimate regressions to correct for heteroscedasticity and autocorrelation.

Finally, the study examines if country level countercyclical strategies that may have potential for time diversification can be formed. By combining the two univariate hedge portfolios (winner-loser), a country level dual attribute strategy was created and their average returns were taken over time based on attributes with time diversification possibilities. To create the combined portfolios, two filters are employed, namely: a) the study includes only those univariate hedge portfolios that have unadjusted monthly returns of 0.5% and above, so that reasonable time diversified returns can be achieved, and b) portfolios that pass the first filter should be strongly negatively associated. The paper uses the correlation of -0.15 and above as the cut off for selecting two univariate hedge portfolios that need to be combined for this purpose. Next, the Sharpe ratio was estimated for the univariate winner portfolios and winner portfolios of bivariate strategies. The bivariate strategy winner portfolio was the simple average of returns of each univariate winner portfolio, which were combined based on the aforementioned filter rules. The study tests if extra normal returns are provided by bivariate portfolios using alternative asset pricing models as performance benchmarks.

3. RESULTS AND DISCUSSION

3.1. Unadjusted returns

The unadjusted returns for univariate portfolios are shown in Table 1, Panel A. The paper reports only corner portfolios (winners/losers) owing to paucity of space. The study finds that the value effect in Germany, the size effect in France, and the profitability effect in Italy and Spain are the strongest among the four countries included in the sample. The momentum effect is found to be strong and consistent among all the sample countries using both measures i.e., M6 and M12. The size effect is found to be strong in Germany and France but negligible in other two countries. It is also observed that, with the exception of Germany, the value effect is modest in France and Italy and weak in Spain. The net investment effect is found to be negligible in all four countries. Annualized values of unadjusted returns on best performing long-short strategies in various countries lie between 10% to 14%. Such returns seem economically significant for matured markets. The findings suggest that different firm characteristics play an important role in portfolio formation for the sample countries. Thus, West European markets do not seem to be a homogeneous asset class.

Mean unadjusted returns on the univariate strategies are estimated separately for the periods of higher and lower uncertainty, which is measured by changes in VIX and default premiums. While positive delta VIX/delta default premiums imply higher economic uncertainty, negative delta VIX/delta default premiums imply lower economic uncertainty. These results are provided in Panels B and C of Table 1. It may be noted that the results of portfolios formed on default premiums are not reported because of paucity of space. They can be made available on request. By analyzing the negative delta VIX period, the study shows that in line with the asset pricing literature, strong size, profitability and momentum effects are observed for France and Italy, while for Germany such effects are negligible. The strong value effect is found for all the three countries. The investment effect is found to be negligible except for Italy where it is significant.

Table 1. Mean unadjusted returns for attribute sorted portfolios

Panel A. Mean returns for the entire period						
Germany						
	Mcap	PB	RoE	T.A	M6	M12
P1	0.016	0.022	0.012	0.011	0.012	0.014
P5	0.008	0.010	0.014	0.012	0.022	0.018
Long-Short Portfolios	0.007	0.012	0.002	-0.001	0.010	0.005
France						
	Mcap	PB	RoE	T.A	M6	M12
P1	0.016	0.015	0.010	0.009	0.010	0.010
P5	0.007	0.010	0.018	0.008	0.017	0.017
Long-Short Portfolios	0.009	0.005	0.008	0.002	0.008	0.008
Italy						
	Mcap	PB	RoE	T.A	M6	M12
P1	0.005	0.006	-0.001	0.006	-0.001	0.000
P5	0.004	0.001	0.010	0.002	0.006	0.005
Long-Short Portfolios	0.001	0.006	0.011	0.004	0.007	0.005
Spain						
	Mcap	PB	RoE	T.A	M6	M12
P1	0.006	0.005	-0.002	0.006	0.001	0.002
P5	0.003	0.002	0.011	0.004	0.009	0.008
Long-Short Portfolios	0.003	0.004	0.012	0.002	0.007	0.006
Panel B. Mean returns for the low economic uncertainty period (when delta VIX is negative)						
Germany						
	MCAP	PB	RoE	T.A	M6	
P1	0.035	0.045	0.038	0.035	0.039	
P5	0.035	0.032	0.038	0.035	0.039	
Long-Short Portfolios	0.000	0.013	0.000	0.000	-0.001	
France						
	Mcap	PB	RoE	T.A	M6	
P1	0.041	0.045	0.035	0.034	0.039	
P5	0.034	0.032	0.041	0.033	0.038	
Long-Short Portfolios	0.007	0.014	0.006	0.001	0.001	
Italy						
	Mcap	PB	RoE	T.A	M6	
P1	0.042	0.043	0.039	0.037	0.037	
P5	0.039	0.035	0.044	0.036	0.027	
Long-Short Portfolios	0.003	0.008	0.006	0.001	-0.010	
Panel C. Mean returns for the high economic uncertainty period (when delta VIX is positive)						
Germany						
	MCAP	PB	RoE	T.A	M6	
P1	-0.010	-0.007	-0.022	-0.024	-0.023	
P5	-0.027	-0.017	-0.017	-0.021	-0.002	
Long-Short Portfolios	-0.017	-0.010	-0.005	0.003	-0.021	
France						
	Mcap	PB	RoE	T.A	M6	
P1	-0.015	-0.032	-0.028	-0.021	-0.027	
P5	-0.026	-0.017	-0.014	-0.023	-0.008	
Long-Short Portfolios	-0.011	0.015	-0.014	-0.002	-0.019	
Italy						
	Mcap	PB	RoE	T.A	M6	
P1	-0.029	-0.038	-0.046	-0.030	-0.042	
P5	-0.036	-0.033	-0.021	-0.040	-0.021	
Long-Short Portfolios	-0.007	0.005	-0.025	-0.011	-0.021	

Notes: This table shows the results for corner portfolios. P1 represents small size, low PB, low profitability, and low investment rate representing past losers, while P5 includes big size, high PB, high profitability, high investment rate representing past winners. Results are also reported for long-short portfolios, including buying winners and selling losers. For size, PB and investment rate of these long-short portfolios is defined as P1-P5, while for profitability and momentum, it is defined as P5-P1.

Mean excess returns are reported for total period, as well as separately for low and high economic uncertainty periods. Economic uncertainty is measured by using changes in VIX (Delta VIX). The periods (months) of positive delta VIX and negative delta VIX exhibit high and low economic uncertainty, respectively. The change in default risk premiums (Delta Def) is used as an alternative measure to classify the time period. Positive delta def implies the high macro-economic uncertainty period, while negative delta def implies the low macro-economic uncertainty period.

For positive delta VIX periods, contrary to Copeland et al., the study finds no large firm effect based on Size for the sample countries. However, a reversal in the value effect for France and Italy is found as P5 (High PB) performs better than P1 (low PB) in this analysis. Thus, for value stocks, it is observed that Copeland's argument seems to be working for two of the sample countries, where growth stocks outperform value stocks during the periods of higher uncertainty. More profitable, high past performance and low net investment firms continue to be future winners for positive delta VIX periods negating the argument that profitability, momentum and net investment effects may reverse during the phase of heightened uncertainty.

In sum, unlike Copeland et al. who observe a small (big) firm effect during periods of lower (higher) uncertainty for U.S. data, similar size-based return patterns are not found for West European countries. Interestingly, the paper finds that Copeland's argument is more relevant for the value effect as growth stocks outperform (underperform) value stocks during the periods of high (low) uncertainty in case of France and Italy.

Next, mean unadjusted returns for univariate portfolios are re-estimated separately for negative and positive delta premium periods, where delta premium is used to measure economic uncertainty in an alternative way. Size, value, and profitability effects are as per expectations for the negative delta premium period. The net investment effect also does not pose much problem, except Germany where it is negligible. Further, momentum patterns are observed, except for Italy, which exhibits contrarian effect based on short-term past stock returns.

Finally, the study examines if the asset pricing anomalies reverse under increased macro-economic uncertainty, as observed by Copeland and Copeland (2016). Contrary to the results of Copeland and Copeland, it is found that none of the anomaly provides contrary results, i.e., P1 outperforms P5 for Size, Value and Investment sorted portfolios for all the countries, whereas P5 performed better than P1 for profitability and momentum-based sorting for all the countries.

The results based on two measures of economic uncertainty are not very similar. This may be explained by the fact that the correlations between the two measures of economic uncertainty are low and stand at 0.14 for France, 0.35 for Italy, and 0.38 for Germany. Hence, the choice of a right proxy for measuring economic uncertainty is an important but separate issue for empirical research, which is not the focus of this work. Delta premium, as an additional measure of economic uncertainty, was employed to provide a robustness check of the Copeland argument. However, considering the unsettled debate about measuring economic uncertainty, the Copeland findings for U.S. must be interpreted with caution. In the Western European context, the Copeland argument seems to hold better for the value effect than the size effect, which is not surprising as the former is linked to relative distress, as argued by Chan and Chen (1991), which may significantly vary under different conditions of economic uncertainty.

3.2. Asset pricing tests

This section evaluates if the sample asset pricing models can explain unadjusted returns observed under various anomalies. Asset pricing tests are examined by first using CAPM, and the results are provided in Table 2. The paper shows the results for winners and losers based on each corporate attribute, thus resulting in 10 portfolios for the evaluation. The CAPM is able to explain almost all (9 out of 10) unadjusted returns for Italy and (6 out of 10) portfolios for the total period for Spain. The results are, however, weak for Germany, where CAPM explains only three out of 10 portfolios for the entire period. CAPM fails to explain returns on sample portfolios over the entire period for France. For portfolios based on macro-economic uncertainty, measured by delta VIX and delta pre-

Table 2. CAPM results

Panel A. Germany					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.010	0.016	0.004	0.004	0.005
t	3.359	4.981	1.358	2.061	1.717
P5	0.001	0.005	0.008	0.004	0.016
t	0.918	2.020	3.607	1.926	5.661
Results for Delta VIX Negative Period					
P1	0.000	0.014	0.000	0.013	0.002
t	0.025	2.657	-0.008	2.526	0.537
P5	0.009	0.007	0.012	0.010	0.018
t	1.884	1.888	3.492	1.646	3.949
Results for Delta VIX Positive Period					
P1	0.013	0.019	0.008	-0.001	0.003
t	2.633	3.783	1.537	-0.189	0.609
P5	0.001	0.009	0.010	0.003	0.023
t	0.707	2.380	2.730	0.558	5.039
Panel B. France					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.013	0.012	0.007	0.007	0.006
t	3.632	4.387	2.042	4.026	2.108
P5	0.004	0.007	0.016	0.005	0.015
t	3.636	3.838	5.458	2.422	6.634
Results for Delta VIX Negative Period					
P1	0.019	0.013	0.005	0.008	0.008
t	2.696	2.780	1.116	3.124	1.553
P5	0.005	0.010	0.017	0.004	0.018
t	3.038	3.538	4.720	1.403	4.944
Results for Delta VIX Positive Period					
P1	0.011	0.014	0.001	0.007	0.003
t	2.669	3.355	0.285	2.340	0.824
P5	0.002	0.007	0.012	0.006	0.017
t	1.041	2.372	3.824	1.686	4.804
Panel C. Italy					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.002	0.003	-0.004	0.003	-0.003
t	0.467	0.974	-0.895	1.274	-0.909
P5	0.001	-0.002	0.007	-0.002	0.002
t	0.353	-0.002	2.964	-0.543	1.030
Results for Delta VIX Negative Period					
P1	0.016	0.010	0.001	0.007	0.005
t	1.885	1.318	0.125	1.433	0.527
P5	0.004	0.006	0.016	0.003	0.004
t	1.736	0.946	3.502	0.513	0.757
Results for Delta VIX Positive Period					
P1	0.002	-0.002	-0.010	0.006	-0.014
t	0.245	-0.327	-1.294	1.427	-2.229
P5	0.000	-0.006	0.008	-0.005	0.003
t	-0.066	-0.986	1.438	-1.058	0.475
Panel D. Spain					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.005	0.003	-0.004	0.004	-0.001
t	2.389	1.384	-1.223	1.590	-0.434
P5	0.004	0.000	0.008	0.001	0.007
t	2.213	-0.022	3.417	0.264	2.589

Note: Excess returns of the sample portfolios are regressed on the excess returns for the market factor. Alpha values are reported for the entire period, and the sub periods are classified by macro-economic uncertainty.

Table 3. Fama-French three-factor model

Panel A. Germany					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.002	0.047	–	0.002	–
t	1.054	5.915	–	0.967	–
P5	0.000	0.032	0.005	–	0.009
t	0.036	7.266	2.350	–	2.900
Results for Delta VIX Negative Period					
P1	–	0.005	–	0.011	–
t	–	1.937	–	2.247	–
P5	–	0.005	0.009	–	0.015
t	–	1.421	3.155	–	3.444
Results for Delta VIX Positive Period					
P1	0.005	0.011	–	–	–
t	1.769	3.075	–	–	–
P5	–	0.007	0.007	–	0.017
t	–	2.128	2.775	–	5.604
Panel B. France					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.006	0.005	0.002	0.005	0.002
t	1.022	3.318	0.479	3.023	0.880
P5	0.004	0.005	0.013	0.002	0.011
t	2.480	4.100	4.142	0.844	4.762
Results for Delta VIX Negative Period					
P1	0.011	0.006	–	0.007	–
t	1.544	2.681	–	3.377	–
P5	0.006	0.006	0.014	–	0.014
t	4.082	4.003	4.030	–	4.314
Results for Delta VIX Positive Period					
P1	0.002	0.005	–	0.005	–
t	0.819	2.152	–	1.990	–
P5	–	0.005	0.008	–	0.011
t	–	1.878	3.388	–	4.039
Panel C. Italy					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5	–	–	0.008	–	–
t	–	–	3.240	–	–
Results for Delta VIX Negative Period					
P5	–	–	0.014	–	–
t	–	–	3.250	–	–
Results for Delta VIX Positive Period					
P1	–	–	–	–	–0.014
t	–	–	–	–	–2.253
Panel D. Spain					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	0.003	–	–	–	–
T	1.404	–	–	–	–
P5	0.000	0.006	–	–	0.004
T	–0.045	2.499	–	–	1.622

Note: Excess returns of the sample portfolios are regressed on the three French factors, namely, excess returns for the market, size and value factors. Alpha values are reported for the entire period, and sub periods are classified by macro-economic uncertainty.

mium, CAPM can explain 24/13 out of 40³ portfolios for Germany/France. Like the trend observed in univariate portfolios, CAPM can explain 37 portfolios for Italy and all portfolios for Spain.

Next, multifactor model effectiveness in explaining returns using FF3, Carhart and FF5 models is examined, and the results are reported in Tables 3, 4 and 5, respectively. The study

Table 4. Carhart model results

Panel A. Germany					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	–	0.004	–0.002	–	–
T	–	1.315	–0.720	–	–
P5	–	0.001	0.011	–	0.005
T	–	0.299	3.607	–	2.069
Results for Delta VIX Negative Period					
P1	–	0.008	–	0.028	–
T	–	2.534	–	3.446	–
P5	–	–	0.014	–	0.002
T	–	–	3.818	–	0.658
Results for Delta VIX Positive Period					
P1	–	–0.001	–	–	–
T	–	–0.271	–	–	–
P5	–	–0.003	0.011	–	–0.005
T	–	–0.385	1.672	–	–0.985
Panel B. France					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	–	0.006	–	0.006	–
T	–	3.852	–	3.204	–
P5	0.005	0.006	0.014	–	0.008
T	4.746	4.630	4.139	–	4.830
Results for Delta VIX Negative Period					
P1	–	0.008	–	0.008	–
T	–	2.316	–	3.877	–
P5	0.007	0.009	0.015	–	0.027
t	5.093	4.368	4.697	–	3.348
Results for Delta VIX Positive Period					
P1	–	0.000	–0.005	0.005	–
t	–	–0.083	–1.530	1.881	–
P5	–	–	0.009	–	0.014
t	–	–	3.482	–	1.470
Panel C. Italy					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5	–	–	0.008	–	–
t	–	–	3.288	–	–
Results for Delta VIX Negative Period					
P5	–	–	0.014	–	–
t	–	–	3.269	–	–
Results for Delta VIX Positive Period					
P1	–	–	–	–	–0.005
t	–	–	–	–	–1.103
Panel D. Spain					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5	–	–	0.005	–	–
t	–	–	2.211	–	–

Note: Excess returns of the sample portfolios are regressed on the three French factors, namely, excess returns for the market, size and value factors and an additional factor, i.e. momentum, as proposed by Carhart. Alpha values are reported for the entire period, and the sub periods are classified on macro-economic uncertainty.

focuses on portfolios that remain unexplained by CAPM. Better explanatory power of multi-factor models is confirmed as FF3 explains 10 out of 22 portfolios unexplained by CAPM for all the sample countries for the entire period. However, 6/4 portfolios remain unexplained for France/Germany at the FF3 level. In case of portfolios based on macro-economic uncertainty, FF3 can explain 7 of the remaining 16 portfolios for Germany, 8 of the remaining 22 portfolios for France, and 1/2 of the remaining 3/2 for Italy and Spain. Thus, for these portfolios as well, FF3 has limited explanatory power in the case of France.

The Carhart model explains almost all the portfolios for the entire period, except 2, for Germany; however, it can explain none of the unexplained portfolios, by previous models, for France. Further, the study finds that the Carhart model can explain most of the portfolios under macro-economic uncertainty for Germany; however, it cannot explain portfolios under decreased macro-economic uncertainty for France.

FF5 has limited explanatory power over the Carhart model in the case of univariate portfolios, as it cannot capture returns of most portfolios that remain unexplained by the Carhart model. Of the

Table 5. Fama-French five-factor model results

Panel A. Germany					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5	–	–	0.002	–	0.009
t	–	–	1.068	–	2.701
Results for Delta VIX Negative Period					
P1	–	0.005	–	0.012	–
t	–	1.483	–	1.906	–
P5	–	–	0.004	–	–
t	–	–	1.235	–	–
Panel B. France					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P1	–	0.007	–	0.005	–
t	–	4.199	–	2.837	–
P5	0.005	0.007	0.011	–	0.015
t	3.872	4.650	2.308	–	4.560
Results for Delta VIX Negative Period					
P1	–	0.009	–	0.006	–
t	–	3.699	–	3.250	–
P5	0.006	0.008	0.007	–	0.013
t	3.908	4.178	2.752	–	3.760
Panel C. Italy					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5			0.005		
t			2.213		
Results for Delta VIX Negative Period					
P5			0.008		
t			2.360		
Panel D. Spain					
Portfolios	Size	Value	Profitability	Investment	Momentum
Total Period Results					
P5	–	–	0.004	–	–
t	–	–	1.716	–	–

Note: Excess returns of the sample portfolios are regressed on the five French factors, namely, excess returns for the market, size, value, profitability and momentum factors. Alpha values are reported for the total period, and the sub periods are classified on macroeconomic uncertainty.

total period portfolios remaining unexplained by the Carhart model, it can only explain 1 for Germany and Spain and none for France and Italy. Similarly, for macro-economic uncertainty-based portfolios, FF5 can explain three remaining portfolios for Germany, only two out of 17 for France and none for Italy. Thus, the study shows that FF5 plays a limited role when it comes to explaining returns for Western European Countries.

In sum, CAPM appears to be a good descriptor of asset pricing for Italy and Spain, while the Carhart model looks to be a more appropriate benchmark for Germany. Interestingly, the popular asset pricing models do not seem to do well for France, implying that one needs to search for new risk factors that can capture the complexity posed by the French market.

In terms of profitable trading strategies, the study shows that the momentum strategy in the case of Germany and profitability in the case of Italy remained unexplained even after passing all the asset pricing tests. All the trading strategies were explained in the case of Spain by various asset

pricing models. It was further found that there was no scope for making trading strategies based on macro-economic uncertainty (as suggested by Copeland and Copeland, 2016) for Germany, Italy, and Spain. France is the only country in which none of sample asset pricing model can explain any winner portfolios based on univariate sorts and most portfolios formed under decreasing macro-economic uncertainty.

3.3. Time diversification strategies

Finally, the study examines if country level countercyclical strategies can be formed to provide the scope for time diversification (see Table 6). Based on country-level filters, of the specified minimum returns for univariate portfolios and negative correlations, bivariate strategies are formed by creating equally weighted bivariate portfolios for each country, and their Sharpe ratios are observed. The study attempts to check if, by combining countercyclical univariate portfolios, one gets the benefit of time diversification using two firm characteristics. The paper finds Value-Momentum for Germany, Size-Profitability, Value-Profitability, Value-

Table 6. Comparison of the performance of univariate and bivariate strategy winners

Panel A. Germany									
	Mcap	PB	RoE	T.A.	Momentum	Combined			
Winner Portfolio	P1	P1	P5	P5	P5	PB-Momentum			
Sharp Ratio	0.243	0.308	0.224	0.164	0.353	0.550			
Panel B. France									
	Mcap	PB	RoE	T.A.	Momentum	Combined			
Winner Portfolio	P1	P1	P5	P1	P5	Size-Profitability	PB-RoE	PB-Momentum	Size-Momentum
Sharp Ratio	0.220	0.218	0.295	0.158	0.309	0.408	0.462	0.395	0.413
Panel C. Spain									
	Mcap	PB	RoE	T.A.	Momentum	Combined			
Winner Portfolio	P1	P1	P5	P1	P5	RoE-Momentum			
Sharp Ratio	0.165	0.107	0.184	0.106	0.163	0.274			
Panel D. Italy									
	Mcap	PB	RoE	T.A.	Momentum	Combined			
Winner Portfolio	P1	P1	P5	P1	P5	PB-RoE			
Sharp Ratio	0.066	0.085	0.158	0.091	0.104	0.197			

Note: This table presents the results of winner portfolios of total period univariate portfolios, as well as of the combined portfolios based on the time diversification strategy. The mean excess returns, standard deviations and their Sharpe ratios are also presented.

Table 7. Asset pricing tests for bivariate strategies

Asset pricing Model	Germany	France				Italy	Spain
	PB-MOMENTUM	PB-PROFITABILITY	SIZE-MOMENTUM	SIZE-PROFITABILITY	PB-MOMENTUM	PB-PROFITABILITY	RoE-Momentum
CAPM (α)	0.014	0.014	0.014	0.015	0.013	0.007	0.004
T	4.431	4.983	4.642	4.573	5.033	2.459	1.364
FF3 (α)	0.008	0.009	0.009	0.010	0.008	0.007	–
T	3.249	4.467	4.195	3.925	4.905	2.754	
Carhart (α)	0.006	0.010	0.010	0.012	0.007	0.007	–
T	2.773	4.713	3.085	4.162	4.469	2.831	
FF5 (α)	0.007	0.009	0.011	0.010	0.009	0.005	–
T	2.952	3.293	4.027	3.045	5.250	2.098	

Note: In this table, the portfolios formed on bivariate strategies are regressed for each of the sample country on CAPM, the Fama and French three-factor model, the Carhart model, and the Fama-French five-factor model to ascertain if they provide significant risk-adjusted returns. alpha values of portfolios formed on bivariate strategies are also given.

Momentum and Size-Momentum for France, Value-Profitability for Italy, and Profitability-Momentum for Spain as the significant dual attribute strategies as per selection criteria for the sample countries. Based on Sharpe ratios, it can be seen that bivariate strategies provide much higher risk-adjusted returns compared to univariate strategies for all four countries.

Finally, the study evaluates if bivariate strategies provide significant alphas based on four asset pricing

models mentioned in the previous sub-section (Table 7). It is found that except the Profitability-momentum strategy for Spain, asset pricing models were not able to explain any bivariate strategies for other three countries. Thus, bivariate strategies that reap the benefit of time diversification have the potential to provide extra-normal returns for Germany, France and Italy. Using these strategies, global fund managers can generate annualized risk-adjusted returns (alpha) of 5% to 12% that are substantially high, given the mature nature of these markets.

CONCLUSION

The study breaks the myth that mature markets have low return potential and thus fund managers have limited opportunities to generate extra-normal returns in these markets. Further, the paper refutes the popular belief that these European markets represent a homogeneous asset class, as different anomalies seem to work for different countries in the sample. Copeland's argument about the reversal effect of size anomaly for the U.S. market, as extended by the study, on other four prominent anomalies is not true for European countries. Thus, it is suggested that the reversal argument should be interpreted with caution for markets outside the U.S. Finally, the study confirms that time diversification strategies can be economically relevant for these countries and portfolio managers can exploit them to create extra-normal returns.

The study has significant implications for portfolio managers, market regulators, and academia. Using data for over 16 years, it shows that portfolio managers can create univariate and time diversified bivariate strategies for these markets and generate positive alphas for their portfolios. From the market regulators' perspective, market efficiencies of various degrees have been exhibited for Western European markets, as demonstrated by success or failures of alternative risk models across these countries. For academic community, the results provide evidence that different anomalies work in different countries and alternative asset pricing frameworks seem to be relevant for different economic settings. The French market in particular seems to be an asset pricing puzzle that requires further attention through detailed examination of its microstructure and behavioral aspects.

Notes

1. Various risks: Pandey and Sehgal (2016) examine various risks inherent in small cap companies that result in higher returns provided by three companies. The important risk factors analyzed were the market factor adjusted for non-synchronous trading bias, size and value factors, liquidity factor, momentum factor and premium factor.
2. VIX: It is the implied volatility calculated by using a weighted average of different strike prices for options on relevant stock indices. It is derived by selecting a wide range of out-of-the money call and put options from two expiration months bracketing the nearest 30-day period.
3. 40 portfolios: In addition to 10 univariate portfolios based on five attributes for each country, the portfolios have been segregated, based on macro-economic uncertainty proxies, i.e., VIX and Default Premium, separately for positive and negative delta VIX, and delta Def positive and negative, making 40 additional portfolios to evaluate their performance under macro-economic uncertainty, as argued by Copeland and Copeland (2016).

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