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Efficiency of the UK Stock Exchange

Vasilios Sogiakas[1]

Abstract

This paper investigates the dynamics of the factors of the *Fama* & *French* (*1993*) model using data from the *UK* financial market. Since financial markets are exposed to exogenous and endogenous structural changes due to the implementation of new regulative guidelines and/or the fluctuation of investors' behavior or the unanticipated financial crises, my analysis is based on an econometric methodology that accounts for structural breaks and regimes shifts. According to the empirical results of the paper, although the functioning of the conventional risk premiums seems to adequately explain the cross-sectionality of share returns, there exists instability on the parameter set, which is associated with the fundamentals of the *UK* economy. Finally, the implications of these results shed much light on the contribution of the recent financial crisis into the informational efficiency of the UK financial market. Thus, although the current liquidity crisis is linked with unanticipated imbalances in the economic environment, it might have been a good opportunity for individual and institutional investors to revise their investing strategies, since the excess returns' risk premia have reached more informative regimes.

JEL Classification numbers: C22, C32, C58, C63, G11
Keywords: Efficient Market Hypothesis, Three Factor model, Regime Shift, Financial Crises

1 Introduction

It has been since *1960's* when *Samuelson* and *Fama* established a theoretical framework according to which the efficient functioning of financial markets is under investigation. Under the *Efficient Market Hypothesis* (*EMH*), the relevant information is immediately publicly available and consequently, is embedded in share prices excluding any systematic arbitrage opportunities. In this direction *Fama* (1970) investigated the EMH through the weak, the semi-strong and the strong forms. The innovative work of *Fama* & *French* (1993) is based on the systematic variability of excess returns (*market portfolio returns on risk free rates*) and on some key factors that represent the size and the valuation fundamentals of listed firms. According to the empirical findings of the extent literature there is a puzzle regarding the validity of the *EMH*, since it's dynamic is country (*sample*) and/or model specific, especially during volatile time periods with essential structural changes. Thus, the investigation of such an economic hypothesis should be incorporated through an econometric framework that would account for structural changes due to market anomalies, financial crises and time varying properties of the financial variables involved.

[1] Adam Smith Business School, University of Glasgow, United Kingdom

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The objective aim of this paper is to examine empirically the informational efficiency of the *London Stock Exchange* (*LSE*) during the period *2000-2010* which is characterized by significant structural changes in financial markets worldwide due to the recent liquidity crisis (*2007-2010*). This paper is motivated by the work of *Lewellen* and *Shanken* (*2002*), who argued that long run market anomalies and individual irrationality are consistent with the notion of informational efficient capital markets, due to the existence of noise traders that possible lead to parameter uncertainty in modeling assets' returns, especially in volatile and gloom time periods. Moreover, Lo (2004, 2005) investigated the EMH and the behavioural finance through the adaptive market hypothesis (*AMH*) and argued that these theories are jointly consistent since there exist structural changes in the financial environment due to the adoption of new evolutionary forces of individual preferences. Hence, the EMH should be examined dynamically (cycles, trends, bubbles, crises, and regulative changes) and not in a static framework. Finally, this paper is motivated by the works of Self and Mathur (2006) who argued that asset prices could not be explained adequately by equilibrium models, since the psychological biases and the trading noise could cause short run deviations from the fundamental prices, and, of *Guidolin* and *Timmermann* (*2008*), who modeled the joint distribution of size and valuation portfolios' returns under regime shifts and argued that there exist predictable short run regime paths on the size and the value effects.

For the purposes of the paper, data from the *UK* financial market are used and by application of advanced econometric methodologies useful results are derived regarding the dynamics of the efficient pricing function of *UK* securities. The empirical results of the analysis shed much light on the validity of the *3*-factor model. In most portfolios, *20* out of *25*, the models' intercepts are insignificant and according to *Merton* (*1973*) this result means that the regressors do effectively explain the cross-sectionality of share's returns. The above argument is strengthened as I examine, instead of the whole time period, sub-periods that are formed around the recent liquidity crisis (*2007-2010*). Moreover, the key macroeconomic factors of *UK* seem to play an important role on the dynamics of the above mentioned explanatory variables (*risk premiums*). More specifically, there exist structural changes on the behavior of stock returns, the timing of which as well as their magnitude is associated with the size and the valuation fundamentals (*value and/or growth*) of the examined firms. Finally, according to the empirical results of a regime shift econometric analysis, it is argued that the post liquidity crises period is characterized by more effectively priced risk premiums.

The rest of the paper is organized as follows, section *2* provides some financial considerations, section *3* briefly discusses the extant literature, section *4* explains the data used and the applied econometric methodology, section *5* discusses the empirical findings and section *6* concludes the paper.

2 Financial Consideration

Fama (*1976*) distinguished the empirical and the (*true*) theoretical distributional forms of asset returns conditional on the observed and the whole information set, respectively, and argued that a financial market is informational efficient, if and only if these distributional forms are equivalent. In the case of informational efficiency, investors are informed about cross sectional and time variation of expected returns while the notion of predictability, refers to possible changes in the relevant risk premium. *Rubinstein* (*2001*) argued that the notion of rational markets should not be investigated on the basis of rational investors but in the sense that prices are set as if all investors are rational (*minimally rational*), since it is sufficient to moderate any abnormal profit opportunity. *Lewellen* and *Shanken* (*2002*), in order to investigate the consistency of predictability with rational behavior or irrational mispricing, introduced the notion of parameter uncertainty, according to which the parameter set of asset pricing models, should not be deterministic but stochastic, in order to account for the fact that investors have imperfect information regarding expected returns. *Timmermann* and *Granger* (*2004*), concluded that it is impossible to find predictable patterns that hold for long periods of time, since the short run trading opportunities are exploited and the new information is accumulated in asset returns in a way that causes non stationarities on financial time series. *Pesaran* (*2010*), argued that possible predictable paths on a financial market are consistent with market efficiency, since the market efficiency hypothesis jointly with the risk neutralily assumption are necessary and sufficient conditions against any predictable strategy. In such financial markets, if investors take into account the available information effectively in the formulation of their expectations, then excess returns for a specific time period should not be predictable using any of the available market informational. However, the rational expectations hypothesis is unlike to hold for long time horizons since market anomalies and high volatility, might motivate market participants to follow new investing strategies with different risk profiles, resulting often to market departures from common rational practices.

3 Literature Review

Since the begin of the previous century, mathematicians have set the basis in order to explain the continuous time series properties of stochastic processes such as share returns. *Bachelier* (*1900*) established the field of financial mathematics and contributed substantially in the investigation of the Brownian Motion and the Weiner stochastic process, since his work is well cited at current well published papers relevant to option pricing, valuation of exotic options, multi-period models and stochastic integration models.

In this framework, many researchers have investigated empirically the formulation of share prices, among them *Cowles* (*1933*), *Working* (*1934*) and *Cowles* and *Jones* (*1937*), and concluded that it is impossible to predict market prices. Then, since the second half of the previous century, that electronic computers were available for time series analysis, researchers focused on the statistical properties of time series data, among them *Roberts* (*1959*), and proposed the *Random Walk Hypothesis*, according to which the serial correlation of subsequent market price changes is insignificant. However, *Osborne* (*1959*), *Working* (*1960*) and *Alexander* (*1961*), investigated the behavior of market data and concluded that under specific circumstances, it is possible to track anomalous paths of assets' returns, and later on *Dimson* (*1979*) was the first who analyzed the market microstructure, since his work provide evidence of short run autocorrelation structures due to thin trading.

Furthermore, many economists have utilized mathematical models in order to investigate the factors that are associated with market and firm characteristics and consequently with distributional and time series properties. *Samuelson* (*1965*) and *Fama* (*1965*) were the first economists who established the general framework of efficient capital markets. They argued that the *Random Walk Hypothesis* is consistent with the *Efficient Market Hypothesis* and proceed on investigating asset pricing models.

Thus, many researchers have analyzed empirically the asset pricing and the stock market anomalies for many developed and emerging financial markets concluding in many cases in conflicting results mostly due to model or sample specific issues. *Basu* (*1977*) found an inverse relationship between share returns and the corresponding *P/E* ratio, casting doubt on the validity of the *EMH*, since the mispricing issues that might arise due to this relationship, as well as the consequent abnormal returns could lead to arbitrage opportunities, which are not uniformly allocated among investors' portfolios. *Banz* (*1981*) and *Schwert* (*1983*) investigated the role of the size effect on the cross-sectionality of asset returns and concluded that firms with low capitalization levels outperform those with higher levels of capitalization. *MacDonald* and *Power* (*1993*) investigated the degree of predictability of share returns using data from *UK*. According to a variance ratio statistic their empirical results suggest that the *Random Walk* model does sufficiently explains the behavior of share prices.

Fama and *French* (*1993*) following a self-financing strategy captured the size and the valuation fundamental (*value and/or growth*) effects of firms and introduced the *3*-factor model. According to their previous findings firms with high (*low*) *B/M* value, in other words, firms with low (*high*) stock price relative to book value, tend to have low (*high*) earnings to assets values and this relationship holds for many years. However, the inverse relationship is observed between firm size and the underlying earnings, since small firms can suffer a long earnings depression that bypass big firms. Thus, firm size is associated with a common risk factor which explains the negative relation between capitalization and weighted average returns and *B/M* value is associated with a common risk factor which explains the positive relation between *B/M* and weighted average returns. In this framework, excess returns (*individual firm returns on risk free rates*) are explained by the market risk premium and the size and the valuation (*value and/or growth*) risk premiums. The abovementioned model has been applied to many financial markets and in most cases performs very well. *Carhart* (*1997*) introduced a model which is an extension of the *3*-factor model by the inclusion of the momentum factor which is associated with the performance of firms in terms of past returns.

Liew and *Vassalou* (*2000*) using data from *10* developed countries investigated the *SMB*, *HML* and *WML* risk premiums and their relationship with the macroeconomic characteristics of the underlying economies. According to their empirical results, these factors contain significant information regarding future *GDP* growth rates. Furthermore, these factors except *WML* are state variables that predict future changes in the investment opportunity set in the context of Merton's (1973) ICAPM. *Malin* and *Veeraraghavan* (*2004*) investigated the robustness of the *Fama* and *French 3*-factor model, using data from *UK*, *Germany* and *France*. According to their empirical findings there exist conflicting results regarding the significance of these factors, which is country specific. *Malkiel* (*2005*) examined empirically the performance of professional investment funds and found fund managers do not outperform the corresponding index benchmarks, providing evidence that financial markets are informational efficient.

Lam, *Li* and *So* (*2010*) using data from the *Hong Kong* stock market for a period of *20* years, investigated the *EMH* by application of the *Carhart* (*1997*) four factor model, where the set of regressors of the excess returns consists of the market risk premium, the size risk premium, the valuation risk premium (growth/valued firms) and the momentum factor. According to their empirical findings, the intercepts of the models are insignificant while the explanatory power of the independent variables is well represented on high values of the deterministic coefficient. Furthermore, they tested the robustness of their empirical application by the incorporation of seasonal effects as well as the consideration of the bull and bear market periods and concluded that the four factor model does sufficiently explain the cross-sectionality of the share returns of the Hong Kong Stock Exchange. Karathanassis, Kassimatis and Spyrou (2010), investigated the time variation properties of the risk premiums of the four factor model for thirteen European equity markets. Their empirical findings, cast doubt on the significance of the small-firm premium in contrast to the momentum effect, due to the time varying betas which are associated with the business cycles of the corresponding financial markets.

4 Data and Research Methodology

For the purposes of our analysis data from the *London Stock Exchange* (*LSE*) are used which are derived from *Thomson DataStream*. More specifically the data set consists of share closing prices, firm *Capitalization*, *Book* to *Market* value (*B/M*) and the *3*-month prices of the *Gilt Market*. The dataset is of weekly frequency and covers a range of approximately *10* years, from *30/12/1999* to *26/03/2010*, a period with many structural breaks and one of the most significant financial crisis, the *2007-2010* liquidity crisis. Finally, the dataset is filtered from financial services' firms and from firms whose *B/M* value is negative to end up with *834* firms (*cross sections*) and *532* observations (*time series*).

According to the *3*-factor *Fama* and *French* methodology I construct three regressors (*time series vectors*) and twenty-five dependent variables (*time series vectors*) as shown below:

$$r_{ij,t} - r_{f,t} = a_{ij} + b_{ij}\,(MRP)_t + s_{ij}\,(SMB)_t + h_{ij}\,(HML)_t + e_{ij,t} \tag{1}$$

where, the independent variables of the *RHS* represent the market risk premium (*MRP*), the size risk premium (*SMB*) and the valuation risk premium (*HML*) while the indicator t represents the time dimension and the indicators i, j represent the size and the valuation clusters, respectively.

For the *MRP* we are based on the market portfolio's return, which is the excess value weighted average share return with respect to the capitalization of the examined firms (*revised annually on every June*) over the risk free interest rate (*3-month Gilt Market*):

$$MRP_t = \sum_{q=1}^{n}\left(r_{q,t} \cdot w_{q,t}\right) - r_{f,t} = r_{m,t} - r_{f,t} \tag{2}$$

In order to quantify the *SMB* and the *HML* risk premiums the sample of firms is grouped into six non-overlapping clusters according to the 50^{th} percentile of the size variable and according to the 30^{th} and 70^{th} percentile of the *B/M* variable. More specifically, each year (*June*) firms are clustered into *Small* and *Big* with respect to the median value of their capitalization, while at the same time firms are clustered into *Low*, *Medium* and *High* with respect to their *B/M* 30^{th} and 70^{th} percentiles, as shown below: *S/L*, *S/M*, *S/H*, *B/L*, *B/M* & *B/H*. According to these six non-overlapping clusters I compute weekly value weighted portfolio returns for each of the six portfolios at t, according to firms' capitalization:

$$r_{ml,t} = \sum_{k=1}^{n_{ml}}\left(r_{ml,k,t} \cdot w_{ml,k,t}\right) \tag{3}$$

where m = *Small (S)* or *Big (B)*, l = *Low (L)*, *Medium (M)* or *High (H)*, n_{ml} is the number of firms at ml^{th} cluster, k is the indicator of the ml^{th} cluster's firm and $w_{ml,k,t}$ is the weight of the k^{th} firm on the ml^{th} cluster at t. Finally, the *Fama* and *French* methodology captures the size and valuation risk premiums by the consideration of a self-financing strategy that consists of a long position on small firms and a short one on big as well as of a self-financing strategy that consists of a long position on value firms and a short one on growth, respectively, as shown below:

$$SMB_t = \left(r_{S/L} + r_{S/M} + r_{S/H}\right)/3 - \left(r_{B/L} + r_{B/M} + r_{B/H}\right)/3 \tag{4}$$

$$HML_t = \left(r_{S/H} + r_{B/H}\right)/2 - \left(r_{S/L} + r_{B/L}\right)/2 \tag{5}$$

This is the procedure of the *Fama* and *French* model, according to which I formulate the size and the valuation risk premiums, that is the *RHS* of equation (*1*). In order to run the model we should quantify the dependent variables of the model, the *LHS* of equation (*1*). Thus, I split the examined firms into twenty five non-overlapping clusters, that is, the product of five capitalization clusters and five *B/M* value clusters. Following this process I end up with twenty five times series vectors, each of which represents the excess return of the value weighted (*time series*) returns of the portfolio consisting of the i^{th} size and j^{th} *B/M* clusters of firms over the *3*-month *Gilt Market* return as follows:

$$r_{ij,t} = \sum_{z=1}^{n_{ij}}\left(r_{ij,z,t} \cdot w_{ij,z,t}\right) - r_{r,t} \tag{6}$$

where *i, j = 1, 2, 3, 4* or *5* and represent the range between the four successive percentiles among the whole sample of firms (*i.e.* 20^{th}, 40^{th}, 60^{th} *and* 80^{th}) of the size and the *B/M* variables, *z* is the indicator of firms belonging to the ij^{th} cluster and *t* is the time dimension.

As it is already mentioned, our analysis is based on the investigation of both deterministic and stochastic structural breaks on the *Fama* and *French 3*-factor model. Thus, the analysis of the whole sample (*10 years*) is followed by the examination of subsequent sub-periods in order to account for deterministic structural breaks with respect to the *2007-2010* liquidity crisis. Furthermore, I apply two methodologies in order to account for stochastic structural breaks, a rolling sample technique, which is a recursive estimation of the associated risk premiums and finally the *Hamilton's* (*1988*) markov switching model, according to which the parameter set is governed by a latent variable which follows a two state markov chain.

The examined sub-periods that are illustrative on the way that the financial crisis has affected the examined financial market refer to the following dates: for the first sub-period, from *07/01/2000* to *07/09/2007*, where the growth rate become *0.005* with a down slope trend and is assumed as the pre crisis period, for the second sub-period, from *07/09/2007* to *05/09/2008*, where the growth rate was negative and reached its overall minimum *-0.009*, and for the third sub-period, from *05/09/2008* to *12/03/2010*, where the growth rate started its up slope trend and is assumed as the post crisis period where financial markets started the recovery process, although its sign did not change until the end of *2009*.

The rolling sample technique which is a recursive modeling process, takes into account the parameter uncertainty and derives the significance of the parameters in a time dimension. For the purposes of the analysis and in order to derive robust results, this analysis is implemented using a fixed sample window of either one or two years, which corresponds to 52 or 104 time series observations (*burning period = 52 or 104 weeks*), respectively, as shown below:

$$z=1:T\text{-}burn \tag{7}$$

$$t^* \in (z : z + burn - 1) \tag{8}$$

$$r_{ij,t^*} - r_{f,t^*} = a_{ij,z+burn} + b_{ij,z+burn}(MRP)_{t^*} + s_{ij,z+burn}(SMB)_{t^*} + h_{ij,z+burn}(HML)_{t^*} + e_{ij,t^*} \tag{9}$$

The rolling sample technique would result to a time series vector for each parameter of the *3*- factor model (*equation 9*).

Moreover, in order to examine for possible endogenous structural changes on the parameter set of Fama and French model, I apply the Hamilton's (1988) model as shown below:

$$r_{ij,t} - r_{f,t} = a_{ij,St} + b_{ij,St}(MRP)_t + s_{ij,St}(SMB)_t + h_{ij,St}(HML)_t + e_{ij,t} \tag{10}$$

where S_t is an unobservable random variable which follows a two-dimensional *Markov Chain* process as follows:

$$\mathrm{P}(S_t = j \mid S_{t-1} = i, \ldots, x_{t-1}, x_{t-1}, \ldots) = \mathrm{P}(S_t = j \mid S_{t-1} = i) \tag{11}$$

according to the transition matrix *P*:

$$P = \begin{bmatrix} p_{11} & p_{21} \\ p_{12} & p_{22} \end{bmatrix} \tag{12}$$

The latent variable S_t governs the whole process and indicates the time paths between the model's regimes. The sampling likelihood (*L*) is given by the following equation:

$$L = \sum_{t=1}^{T} ln[f(y_t / y_{t-1}, y_{t-2}, ..., y_{-3})] \quad (13)$$

the maximization of which, with respect to the parameter set, could be achieved under the linear restriction that columns sum to unity. In the case that our inferences are based on the available information set until *t*, I use the '*filtered probability*', as follows:

$$p(s_t, s_{t-1}, ..., s_{t-q} / y_t, y_{t-1}, ..., y_{-3}) \quad (14)$$

while, in the case that the whole sample is used in making inferences, I apply the '*smoothed probability*', as follows: $p(s_t / y_T, y_{T-1}, ..., y_{-3})$ (15)

5 Empirical Findings

In *Table 1*, the excess returns of the twenty five *Fama* and *French* portfolios are presented, separately for the whole sample and for the three sub-samples, as they are defined on the fourth section '*Data and Research Methodology*'. Thus, it is observed that small and valued firms are superior than big and growth firms, in terms of performance. Furthermore, in the second sub-period, *2007-2008*, although the market is bear, small and valued firms still have positive excess returns. A very interesting result stems from the last sub-period, *2008*-20*1*0, where the effect of small and valued firms on the excess returns has been increased, substantially. Another aspect of the descriptive statistics is the skewness coefficients of the excess returns that are presented on *Table 2*. From the first panel, which refers to the whole sample, it is shown that small firms have positive skewness and big have negative. However, in a more detailed investigation of the skewness coefficients during the subsequent sub-periods, it is shown that during *2000-2007* the skewness coefficient is positive for growth firms only, while, during the second sub-period, *2007-2008*, it is positive only for big valued firms and finally, during the last sub-period, it is positive only for the big growth firms. This result, implies that although it seems that loss averters prefer small firms in contrast to risk averters who prefer big, actually, in the pre-crisis period, growth firms attracted the interest of loss averters, big and value during *2007-2008* and big and growth during the last sub-period, *2008-2010*.

Tables 3, 4, 5, 6, 7, and 8, present the results of the conventional *3*-factor model for the whole time horizon and for the three sub-periods. As shown on *Table 3*, the intercepts of the *3*-factor model (*parameter a*) are either positive or negative indicating that active traders could possible benefit by tracking predictable anomalies in share returns, in the short run. As shown on the other panels of *Table 3*, the intercepts of the models have been increased during the crisis, but a more comprehensive analysis is required in order to examine their significance. According to *Table 4*, there exist significant anomalies in the pre-crisis period, especially for small firms, which are eliminated during and after the financial crisis.

The coefficient *b*, which captures the *MRP* effect, takes values around unity, implying that the twenty five portfolios are either aggressive or defensive. Furthermore, as it is shown on *Table 5,* the size and the valuation variables are inversely related to each other, in the formulation of the relationship of the systematic variability of portfolio's excess returns (*beta*). The values of beta on the minor diagonal of *Table 5* are aggressive while the non-diagonal elements suggest a defensive behavior. In addition to the above-mentioned inverse relationship it is shown that the small growth firms are less defensive than big valued for every sub-period.

The size risk premium is captured by the *SMB* coefficient as shown on *Table 6*, for the whole sample period and the subsequent sub-periods. According to the empirical findings in all cases small firms have positive *SMB* coefficients in contrast to big firms whose coefficient is negative. In the period before 2008, the coefficients are algebraically higher than in the whole sample, while during the crisis the values become lower.

The valuation risk premium is captured by the *HML* coefficient as shown on *Table 7*, for the whole sample period and the subsequent sub-periods. According to the empirical findings in all cases value firms have positive *HML* coefficients.

Table 8 consists of the deterministic coefficients of the examined models for the twenty five *Fama* and *French* regressions. A very interesting result is that in the sub-periods following *2007* the deterministic coefficients are increased. This result jointly with the fact that intercepts become insignificant during the crisis, implies that the financial crisis has contributed substantially to the informative pricing of the common risk factors, the risk premiums.

The second step of the analysis consists of the investigation of possible endogenous structural breaks on the parameter set by application of a *rolling sample technique*. As shown in equation (*9*) the rolling sample technique results to a time series vector for each parameter of the *3*-factor model. Thus, the time varying coefficients of the *3*-factor model are illustrated inn *Figures 1, 2, 3* and *4*, where the fixed rolling window consists of *104* observations. The time varying '*a'* coefficients implies a structural change on the model in the time periods between *2004* and *2005* and especially between *2009* and *2010*, for most of the portfolios (*14 out of 25*). According to the time varying '*beta'* coefficients that are illustrated on *Figure 2*, there also, exist structural breaks on the abovementioned time periods for the majority of the portfolios. *Figures 3* and *4* show the time varying '*s*' and '*h'* coefficients where there exist structural changes on the time periods between *2004-2005* and *2008-2010* for most of the *Fama* and *French* portfolios.

In order to examine the robustness of our results, the same technique is followed, setting the rolling sample equal to *52* observations, which corresponds to one trading year. Moreover, we focus on the significance of the intercepts through time, using a 95% confidence interval. As shown on *Figure 5*, there exist significant negative intercepts for short time periods during *2004-2005* and during *2007-2008*, especially for big and valued firms. The negative sign indicates an overestimation of risk premiums that could be tracked by active traders with short positions. Furthermore, another insight from *Figure 5* is the range of the estimated confidence intervals, which is analogous to the standard deviation of the coefficient's estimation. Although the range is narrow at the begin of the liquidity crisis with constant sign, indicating significant intercept values in the short run for most portfolios, in the post crisis period it is increased containing always the zero value, indicating insignificant intercepts. In addition, the increased confidence interval ranges signify a more informative formulation of the risk premiums, in the post crisis period.

Finally, the application of the *Hamilton's* (*1988*) regime shift model, takes into account possible stochastic structural breaks of the *3*-factor specification. *Figure 6* illustrates the time paths of the regimes of the *3*-factor model, according to which there exist structural changes during the periods *2003-2005* and *2007-2010* for many portfolios. In the period *2003-2005*, there exist structural breaks for portfolios whose size is either in the first or the last 20^{th} percentile cluster (*very small or very big*), while for the period *2007-2010*, there exist structural breaks for small and growth firms or for big and value firms. Taking into account the low *GDP* level, the high inflation regime and unemployment level of *UK* during the periods *2003-2005* and 2007-2010 and especially on September of *2008*, as shown on *Figure 6*, we conclude that the macroeconomic environment is associated with the underlying financial market and consequently investors' behavior. Thus, according to these findings, the heterogeneity of assets' returns could be partially explained by well-established models, such as the *Fama* and *French* (*1993*) approach, but furthermore, should be linked to macroeconomic variables that drive the whole economic system and vice versa.

In the case of the *UK* it is found that there exist structural changes on the risk premiums of the *3*-factor model, that are driven by the corresponding macroeconomic variables, such as the growth rate, the inflation and the unemployment rate for the examined period. Overall, the *3*-factor model's regressors, in most cases, do explain sufficiently the cross-sectionality of excess returns. Finally, the investigation of the twenty five portfolios and the associated risk premiums sheds much light on the validity of the *EMH* in *UK*, especially in the post crisis period, where the informational efficiency of the corresponding risk premiums has been improved.

6 Conclusion

As *Malkiel* (*2003*) stated, financial markets might be irrational for short periods of time, since there could be many experts tracking for predictable paths throw time and even more, discover short run riskless arbitrage opportunities. However, these phenomena could not persist over time should the associated stock markets are assumed efficient in the information context. In this paper I investigate the informational efficiency of the *UK* financial market, based on the Fama and French (1993) methodology. Furthermore, I take into account the stochastic properties of possible structural breaks on the examined times series. The time period under investigation is of crucial importance since, it covers the liquidity crisis of *2007-2010*, and as a consequence the interpretation of these results shed much light on the functioning of financial markets.

According to the empirical findings, investors' behavior is changing throw time and the cross-sectionality of asset returns is partially explained by conventional risk premiums, such as market trend, size and valuation fundamentals, in terms of market price and book value. There exist time periods where the abovementioned risk premiums are biased and this is associated with structural breaks in the UK economy. Furthermore, it is shown that since the start of the *2007-2010* financial crisis the returns have been adjusted to a new regime which has increased the information efficiency of the investigated risk premiums. Thus, although the current liquidity crisis is linked with unanticipated imbalances in the financial and the credit system, it might have been a good opportunity for individual and institutional investors to revise their investing strategies, since the excess returns' risk premiums have reached more informative regimes.

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Appendix

Tables

Table 1. Mean excess returns of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

Mean excess returns of the 25 Fama & French's portfolios, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	-0.051	0.045	0.026	0.086	0.107
2	0.031	0.037	0.062	0.104	0.113
3	-0.010	0.043	0.039	0.066	0.072
4	0.032	-0.005	-0.008	0.039	0.045
Big	-0.116	0.011	0.033	0.027	-0.007

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 -07/09/2007

Mean excess returns of the 25 Fama & French's portfolios, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	-0.022	0.058	0.057	0.097	0.085
2	0.043	0.075	0.079	0.123	0.114
3	0.022	0.096	0.069	0.089	0.091
4	0.074	0.021	0.036	0.076	0.076
Big	-0.042	0.072	0.065	0.048	0.021

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

Mean excess returns of the 25 Fama & French's portfolios, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	*-0.244*	*-0.105*	*-0.223*	*-0.125*	*0.032*
2	*-0.111*	*-0.212*	*-0.120*	*-0.165*	*-0.028*
3	*-0.176*	*-0.253*	*-0.146*	*-0.182*	*-0.217*
4	*-0.286*	*-0.207*	*-0.379*	*-0.314*	*-0.217*
Big	*-0.541*	*-0.429*	*-0.239*	*-0.148*	*-0.244*

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/2008 - 12/03/2010

Mean excess returns of the 25 Fama & French's portfolios, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	*-0.066*	*0.078*	*0.029*	*0.161*	*0.234*
2	*0.061*	*0.003*	*0.092*	*0.173*	*0.155*
3	*-0.056*	*-0.027*	*0.009*	*0.104*	*0.134*
4	*0.029*	*0.012*	*0.010*	*0.075*	*0.044*
Big	*-0.221*	*-0.016*	*0.046*	*0.022*	*-0.002*

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 2. Excess returns's skewness of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

Excess returns' skewness of the 25 portfolios, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.145	1.238	0.296	0.080	-0.369
2	-0.125	-0.448	-0.970	-0.596	0.405
3	-1.374	-1.349	-0.573	-2.884	-0.842
4	-2.468	-2.979	-1.913	-1.125	-0.460
Big	-0.943	-1.749	-0.498	-0.371	-0.780

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

Excess returns' skewness of the 25 portfolios, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.283	0.054	-1.832	-4.053	-1.542
2	2.051	-0.556	-2.136	-6.014	-4.723
3	0.435	-0.315	-0.125	-3.306	-0.944
4	-0.008	-1.088	-5.195	-1.286	-0.451
Big	-0.653	0.645	-0.755	-0.715	-1.263

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

Excess returns' skewness of the 25 portfolios, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	-0.211	-0.312	-0.930	-0.446	-0.115
2	-0.382	-0.695	-0.606	-0.541	-0.117
3	-0.102	-0.851	-0.553	0.062	0.479
4	-0.530	-0.472	-0.950	-0.704	0.668
Big	-0.791	-0.904	0.666	1.837	0.064

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/2008 - 12/03/2010

Excess returns' skewness of the 25 portfolios, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	-0.109	-0.427	-0.564	-0.785	-0.753
2	-0.125	0.060	-0.490	-0.877	-0.136
3	0.110	-1.426	-0.413	-0.700	-0.402
4	0.155	-0.078	-1.072	-0.708	-0.336
Big	0.152	0.243	-0.854	-0.357	-0.364

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 3. Intercept values of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

Intercept values of the 25 Fama & French's regressions, 07/01/2000 – 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.051	0.040	-0.017	0.022	-0.070
2	0.021	0.018	0.034	-0.019	0.042
3	-0.014	0.025	0.013	-0.041	0.052
4	0.015	0.021	0.005	-0.007	0.007
Big	-0.016	-0.015	-0.022	-0.007	-0.036

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

Intercept values of the 25 Fama & French's regressions, 07/01/2000 – 07/09/2007

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.050	0.045	-0.007	0.028	-0.097
2	0.014	0.036	0.061	-0.039	0.026
3	-0.004	0.005	0.012	-0.044	0.029
4	0.006	0.013	-0.006	0.016	0.008
Big	-0.031	-0.020	-0.003	0.013	-0.012

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

Intercept values of the 25 Fama & French's regressions, 07/09/2007 – 05/09/2008

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.091	0.025	-0.012	-0.098	0.050
2	0.002	-0.042	0.007	0.110	-0.028
3	-0.088	0.232	0.112	0.016	0.088
4	0.037	0.048	-0.012	-0.102	0.061
Big	0.026	-0.008	-0.099	-0.093	-0.140

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/2008 - 12/03/2010

Intercept values of the 25 Fama & French's regressions, 05/09/2008 – 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.085	0.057	-0.068	0.074	-0.123
2	0.043	0.013	-0.059	0.039	0.080
3	-0.004	0.076	0.033	0.023	0.061
4	0.088	0.068	0.012	-0.003	0.005
Big	-0.086	-0.088	-0.077	-0.056	-0.024

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 4. Confidence Intervals of the intercepts of the 25 portfolios of the F&F model

Panel A: whole sample: 07/01/2000-12/03/2010

95% intercepts' CIs of the 25 Fama & French's regressions, 07/01/2000 – 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.091	0.002	-0.052	-0.022	-0.127
	-0.010	0.077	0.018	0.067	-0.014
2	-0.013	-0.013	-0.004	-0.062	-0.004
	0.054	0.050	0.072	0.024	0.088
3	-0.047	-0.011	-0.025	-0.085	0.011
	0.019	0.061	0.052	0.003	0.094
4	-0.019	-0.013	-0.029	-0.037	-0.033
	0.049	0.056	0.038	0.023	0.046
Big	-0.061	-0.054	-0.055	-0.037	-0.057
	0.028	0.025	0.012	0.023	-0.014

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

95% intercepts' Cis of the 25 Fama & French's regressions, 07/01/2000 – 07/09/2007

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.096	0.003	-0.047	-0.022	-0.157
	-0.004	0.087	0.034	0.077	-0.037
2	-0.024	0.001	0.018	-0.088	-0.023
	0.053	0.071	0.104	0.010	0.075
3	-0.040	-0.032	-0.023	-0.089	-0.015
	0.032	0.042	0.047	0.002	0.074
4	-0.031	-0.023	-0.043	-0.013	-0.031
	0.043	0.049	0.030	0.045	0.047
Big	-0.075	-0.059	-0.038	-0.017	-0.031
	0.013	0.020	0.031	0.043	0.006

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

95% intercepts' CIs of the 25 Fama & French's regressions, 07/09/2007 – 05/09/2008

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.245	-0.084	-0.137	-0.233	-0.137
	0.064	0.133	0.112	0.038	0.237
2	-0.101	-0.163	-0.125	-0.021	-0.173
	0.105	0.079	0.138	0.241	0.117
3	-0.226	0.068	-0.060	-0.120	-0.064
	0.050	0.396	0.283	0.152	0.239
4	-0.082	-0.107	-0.134	-0.228	-0.076
	0.155	0.203	0.111	0.024	0.198
Big	-0.135	-0.174	-0.227	-0.220	-0.255
	0.188	0.157	0.030	0.034	-0.025

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/2008 - 12/03/2010

95% intercepts' CIs of the 25 Fama & French's regressions, 05/09/2008 – 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.197	-0.057	-0.160	-0.065	-0.308
	0.027	0.171	0.024	0.213	0.062
2	-0.052	-0.086	-0.168	-0.076	-0.095
	0.138	0.112	0.050	0.154	0.254
3	-0.100	-0.038	-0.117	-0.118	-0.077
	0.091	0.190	0.184	0.165	0.199
4	-0.004	-0.052	-0.080	-0.125	-0.136
	0.181	0.189	0.104	0.118	0.146
Big	-0.213	-0.232	-0.185	-0.169	-0.102
	0.041	0.055	0.031	0.057	0.054

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 5. Beta coefficients of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

Beta Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.780	0.452	0.634	0.949	1.737
2	0.911	0.807	0.896	1.060	1.384
3	0.918	1.157	1.154	1.220	0.985
4	1.076	1.358	1.058	0.931	0.766
Big	1.427	1.324	1.059	0.598	0.359

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

Beta Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.886	0.323	0.730	0.929	1.844
2	0.894	0.750	0.855	1.079	1.418
3	0.899	1.226	0.985	1.173	1.007
4	1.087	1.358	1.212	0.738	0.681
Big	1.410	1.432	1.058	0.693	0.333

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

Beta Coefficients of the 25 Fama & French's regressions, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.663	0.539	0.727	0.581	2.010
2	0.595	0.895	1.155	0.949	1.223
3	1.052	1.532	1.013	1.270	0.883
4	1.118	1.557	0.886	1.054	0.713
Big	1.447	0.914	1.124	0.652	0.448

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/08 - 12/03/2010

Beta Coefficients of the 25 Fama & French's regressions, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.742	0.609	0.477	0.913	1.824
2	0.980	0.741	0.856	0.955	1.523
3	0.806	0.938	1.246	1.094	1.208
4	0.963	1.267	0.996	1.133	0.732
Big	1.823	1.378	1.087	0.472	0.237

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 6. SMB coefficients of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

SMB Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.140	0.103	0.126	0.136	0.226
2	0.119	0.119	0.110	0.090	0.140
3	0.061	0.071	0.063	0.046	-0.011
4	-0.043	-0.078	-0.099	-0.109	-0.189
Big	-0.212	-0.258	-0.273	-0.185	-0.093

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

SMB Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.191	0.154	0.147	0.109	0.206
2	0.139	0.098	0.132	0.041	0.131
3	0.022	0.033	0.039	-0.046	0.018
4	-0.086	-0.133	-0.142	-0.115	-0.093
Big	-0.142	-0.251	-0.204	-0.168	-0.079

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

SMB Coefficients of the 25 Fama & French's regressions, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.105	0.099	0.112	0.106	0.321
2	0.086	0.090	0.168	0.137	0.083
3	0.078	0.094	0.052	0.138	-0.030
4	-0.102	-0.041	-0.097	-0.101	-0.212
Big	-0.210	-0.189	-0.302	-0.228	-0.158

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/08 - 12/03/2010

SMB Coefficients of the 25 Fama & French's regressions, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	*Low*	*2*	*3*	*4*	*High*
Small	0.110	0.092	0.091	0.146	0.247
2	0.118	0.129	0.075	0.090	0.190
3	0.067	0.063	0.086	0.060	0.017
4	-0.016	-0.059	-0.078	-0.079	-0.262
Big	-0.186	-0.276	-0.307	-0.206	-0.110

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 7. HML coefficients of the 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

HML Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.040	-0.002	-0.085	-0.055	0.263
2	-0.120	-0.108	-0.032	-0.006	0.233
3	-0.128	-0.082	-0.016	-0.020	0.289
4	-0.136	-0.103	-0.017	0.053	0.267
Big	-0.143	-0.126	0.026	0.062	0.026

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

HML Coefficients of the 25 Fama & French's regressions, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.044	-0.016	-0.086	-0.077	0.321
2	-0.140	-0.116	-0.030	-0.011	0.248
3	-0.122	-0.068	-0.046	-0.015	0.304
4	-0.140	-0.085	0.005	0.049	0.219
Big	-0.117	-0.121	0.017	0.063	0.007

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

HML Coefficients of the 25 Fama & French's regressions, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.045	-0.027	-0.057	0.023	0.053
2	-0.088	-0.088	-0.104	0.084	0.172
3	-0.187	-0.004	0.060	0.078	0.215
4	-0.047	-0.136	0.048	0.054	0.227
Big	-0.302	-0.135	-0.010	0.116	0.101

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/08 - 12/03/2010

HML Coefficients of the 25 Fama & French's regressions, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	-0.079	-0.058	-0.071	0.044	0.111
2	-0.099	-0.042	-0.054	0.092	0.170
3	-0.065	-0.020	0.078	0.097	0.159
4	-0.048	-0.059	-0.031	0.008	0.327
Big	-0.398	-0.172	-0.036	0.056	0.090

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Table 8. Deterministic Coefficients of the regressions of 25 Fama and French portfolios

Panel A: whole sample: 07/01/2000-12/03/2010

Deterministic Coef of the 25 Fama & French's regressions, 07/01/2000 - 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	0.437	0.280	0.395	0.475	0.783
2	0.588	0.551	0.534	0.577	0.781
3	0.636	0.690	0.674	0.647	0.767
4	0.768	0.834	0.793	0.798	0.770
Big	0.839	0.872	0.875	0.769	0.669

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel B: sub-period: 07/01/2000 - 07/09/2007

Deterministic Coef of the 25 Fama & French's regressions, 07/01/2000 - 07/09/2007

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	0.411	0.237	0.368	0.365	0.757
2	0.504	0.471	0.396	0.447	0.731
3	0.587	0.657	0.570	0.572	0.722
4	0.735	0.802	0.743	0.653	0.600
Big	0.757	0.844	0.764	0.674	0.563

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel C: sub-period: 07/09/2007 - 05/09/2008

Deterministic Coef of the 25 Fama & French's regressions, 07/09/2007 - 05/09/2008

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	0.445	0.534	0.595	0.472	0.839
2	0.597	0.697	0.766	0.706	0.758
3	0.735	0.784	0.595	0.786	0.652
4	0.865	0.852	0.791	0.826	0.799
Big	0.900	0.803	0.920	0.829	0.737

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Panel D: sub-period: 05/09/08 - 12/03/2010

Deterministic Coef of the 25 Fama & French's regressions, 05/09/2008 - 12/03/2010

	VALUE/GROWTH				
SIZE	***Low***	***2***	***3***	***4***	***High***
Small	0.604	0.510	0.451	0.723	0.859
2	0.799	0.700	0.734	0.833	0.850
3	0.755	0.782	0.823	0.819	0.876
4	0.880	0.897	0.915	0.890	0.907
Big	0.951	0.931	0.955	0.860	0.799

SIZE: the 20th, 40th, 60th & 80th capitalization quantiles
VALUE/GROWTH: the 20th, 40th, 60th & 80th B/M quantiles

Figures

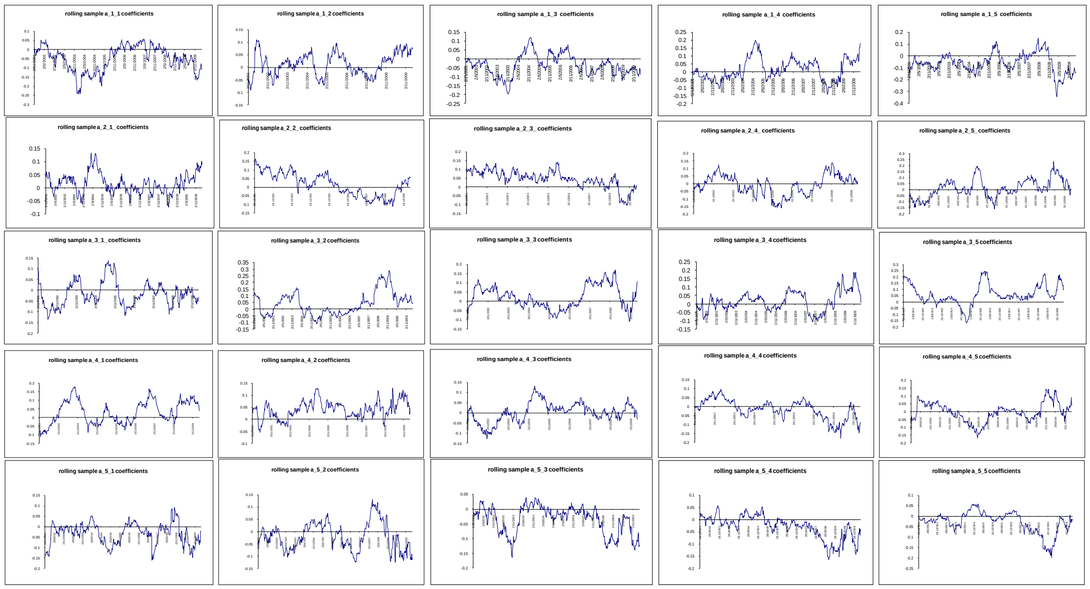

Figure 1. Rolling Sample intercept values of the 25 F&F portfolios (fixed sample window = 104 weeks)

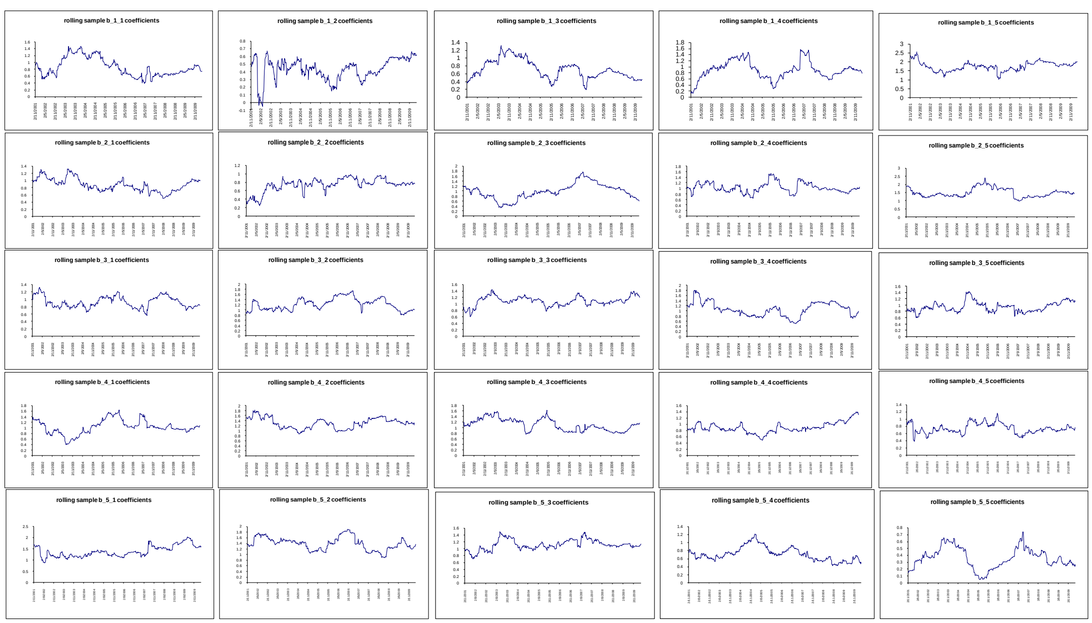

Figure 2. Rolling Sample betas of the 25 F&F portfolios (fixed sample window = 104 weeks)

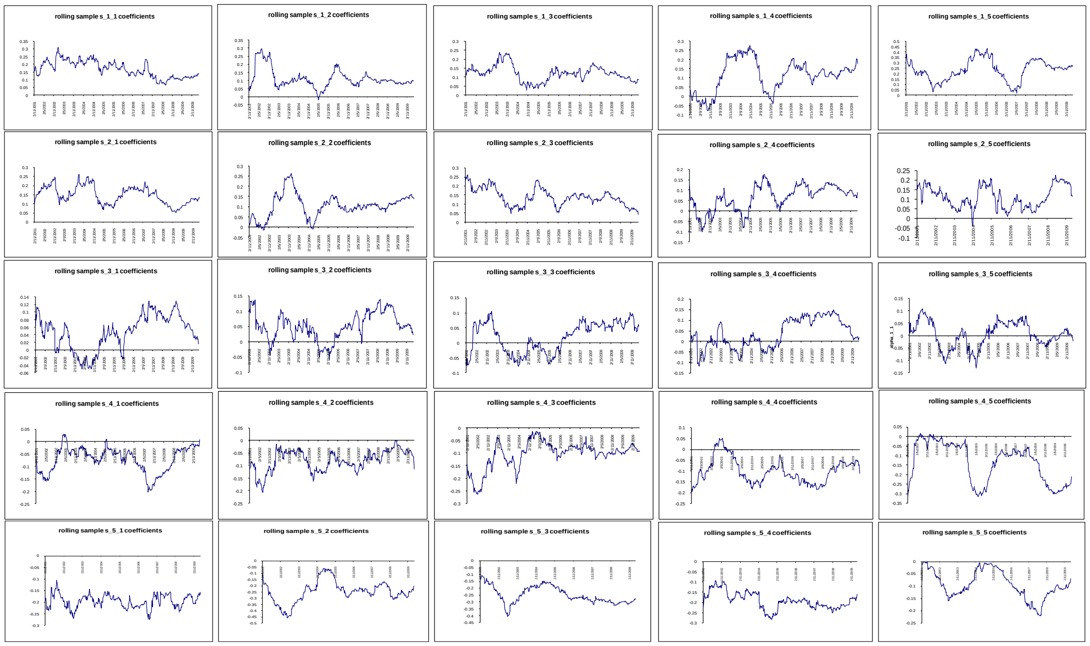

Figure 3. Rolling Sample SMB coefficients of the 25 F&F portfolios (fixed sample window = 104 weeks)

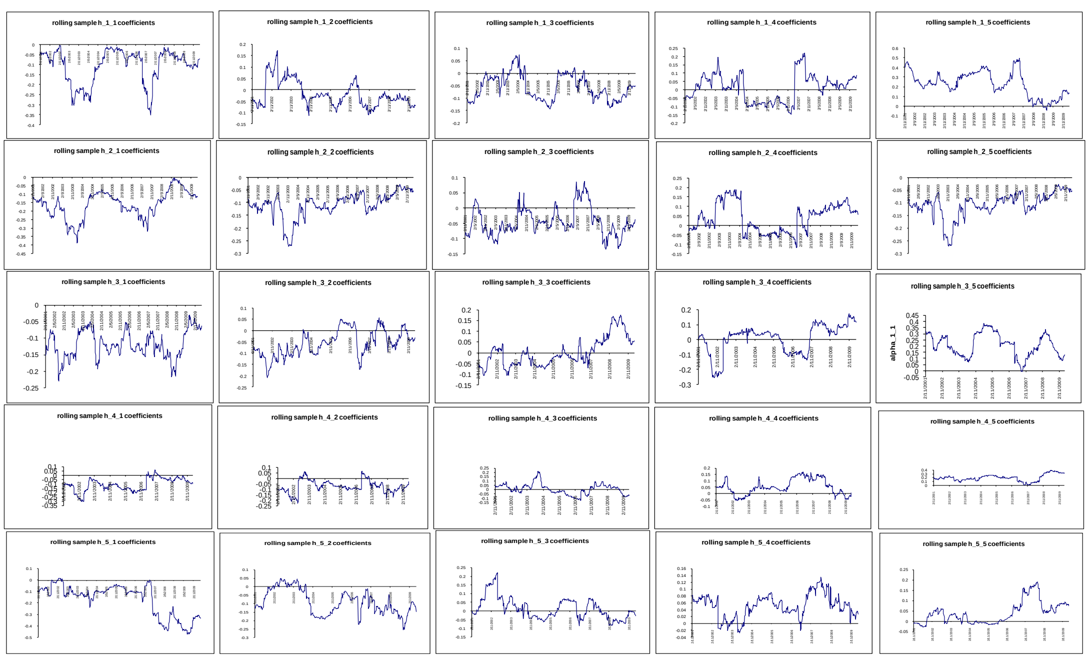

Figure 4. Rolling Sample HML coefficients of the 25 F&F portfolios (104 weeks)

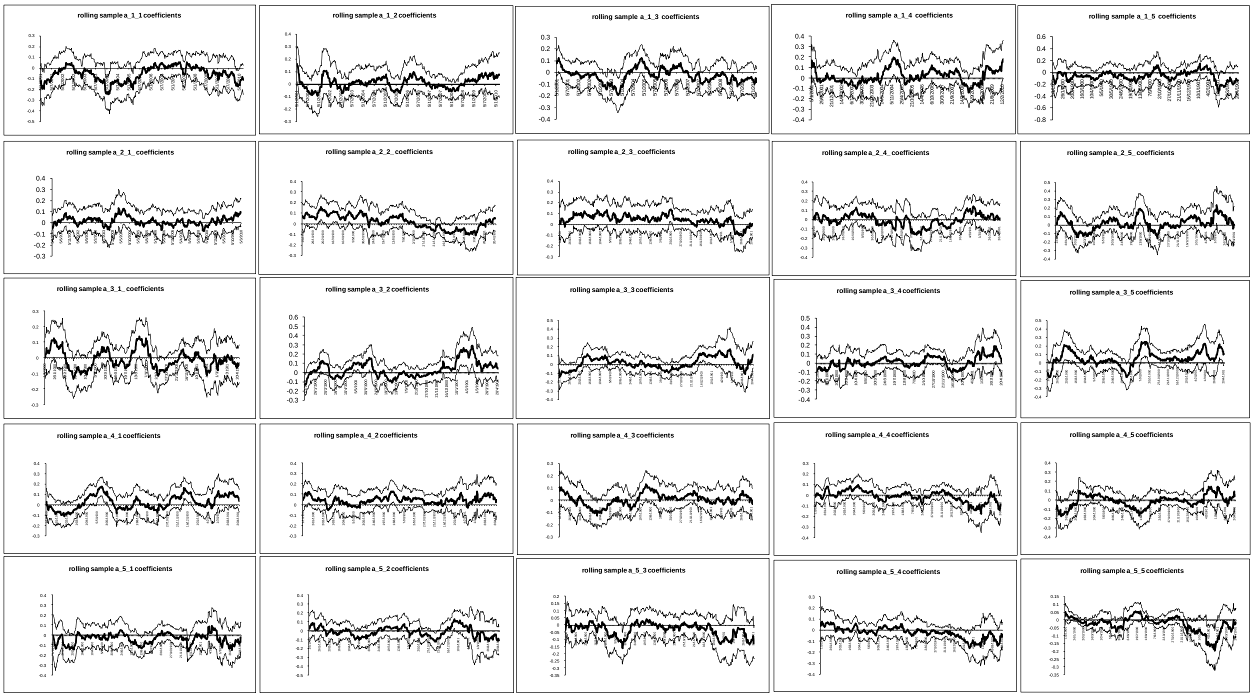

Figure 5. Rolling Sample intercept values and the 95% CIs of the 25 F&F portfolios (fixed sample window = 52 weeks)

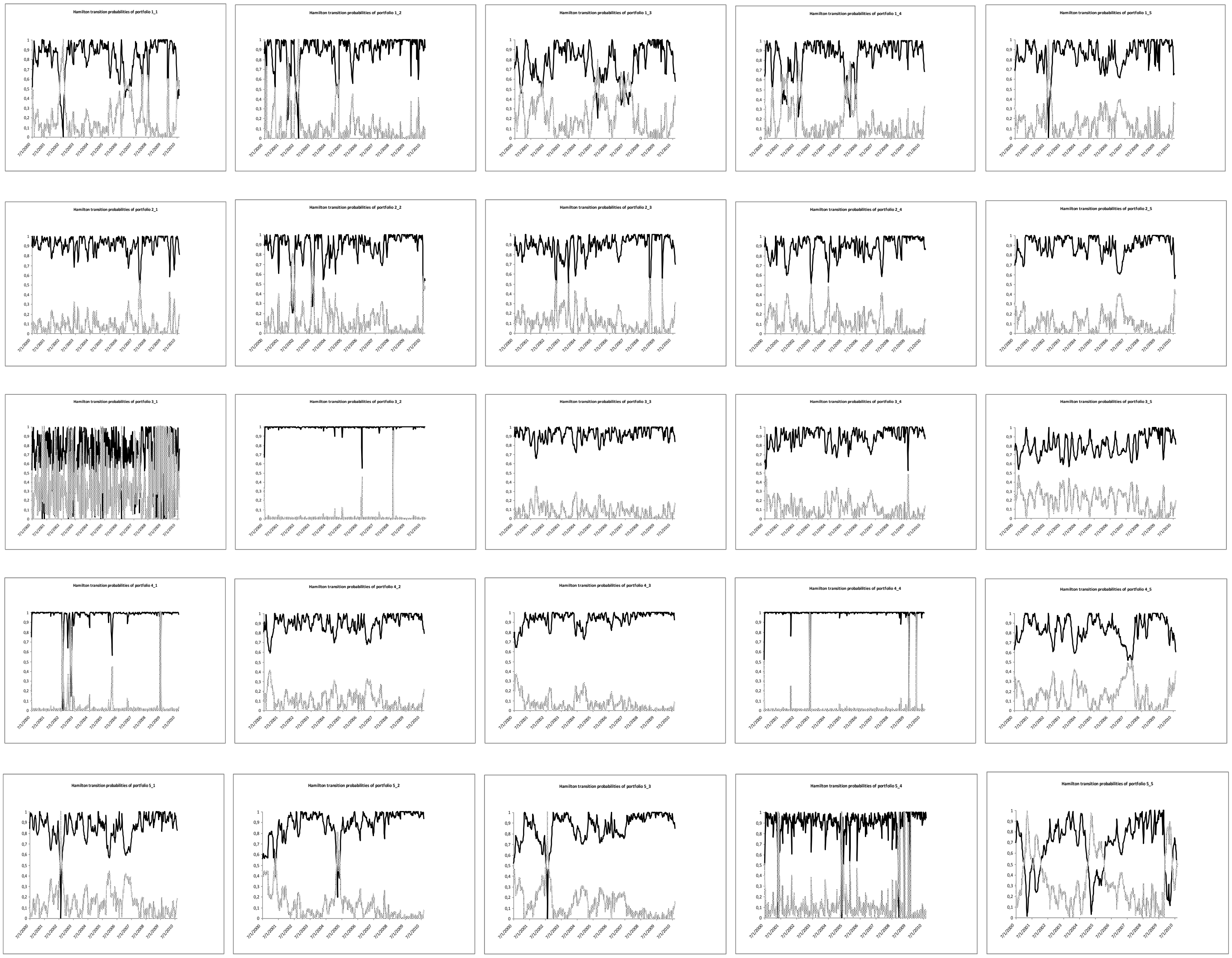

Figure 6. Time Varying transition probabilities of the 25 Fama and French regressions

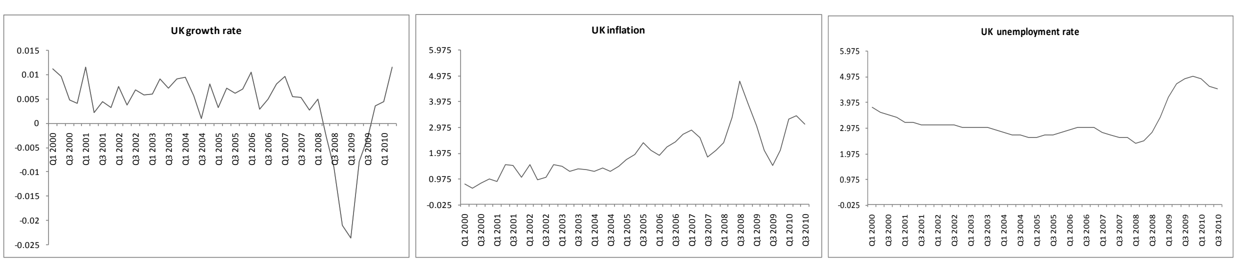

Figure 7. UK growth rate, inflation and uneployment between 2000-2010