Exploring fundamental anomalies: Evidence from the Moroccan stock market

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Abstract:

Fundamental anomalies are explored, for the first time, in the Moroccan stock market. The sample includes non-financial companies from July 2001 to June 2020. We carry out, initially, sorts of returns on anomaly indicators, then, we follow through a regression analysis using a fixed-effect model and the system generalized method of moments methodology. The findings emphasize a significantly positive relationship between returns and the book-to-market ratio and a significantly negative relationship between returns and each of the price-to-earnings and the price-to-cash flow ratios. Regarding the size and the leverage effects, the findings highlight their absence. Finally, we cannot ascertain the existence of a positive or negative price-to-sales effect considering the contradictory results of the tests.

Keywords

Fundamental anomalies; fixed-effect model; dynamic panel model; SGMM methodology; Moroccan stock market.

JEL Classification: G11, G12

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Introduction

The pronounced association between the fundamental characteristics of firms and stock returns is heavily documented in the financial literature. The presence of abnormal returns, unexplained by the CAPM, is closely linked to the specific characteristics of firms. Size, book-to-market ratio (B/M), price-to-cash flow ratio (P/CF), price-to earnings ratio (P/E), price-to-sales ratio (P/S) and debt-to-equity ratio (D/E) are the most extensively adopted and accepted fundamental ratios among researchers, partitioners and investors. The in-depth examination of fundamental anomalies has revealed a crucial impact in investors' decisions to exploit market inefficiencies considering the semi-strong efficiency market hypothesis. Although pioneering works have focused especially on American market, those indicators have been consistently explored across different stock markets. However, by using fundamental ratios, several researchers noticed dissimilarities in explaining the variation in stock returns of emerging markets compared to developed markets as the financial structure and characteristics of each market are also divergent (Akhtar, 2021).

In this perspective, the purpose of our research is to explore the extensively reported fundamental anomalies in the Moroccan stock exchange. The body of research concerning the investigation of the fundamental anomalies in this market is little, if any. As far as we know, our study is the first of its kind trying to answer this question.

The study's sample includes non-financial Moroccan companies over the period from July 2001 to June 2020. Two methodologies are chosen to address the study's question. Initially, we carry out sorts of returns on anomaly indicators. Secondly, we perform a regression

analysis through a fixed-effect model and the system generalized method of moments (SGMM, hereafter) methodology.

Our findings indicate a positively significant relationship between Moroccan stock returns and the B/M ratio and a negatively significant relationship between stock market returns and each of the P/E and P/CF ratios. For their part, the size and the leverage effects seem to be absent as their coefficients are insignificant. However, regarding the P/S effect, it appears to be mixed as, over the studied period, the results of both the univariate and regression analyses are in contradiction.

The subsequent segments of our research are outlined as follows: we begin with a succinct literature review, followed by a description of the study's data and methodology. Ultimately, we summarize and discuss the empirical analysis findings.

Literature review

The literature widely covers the size and the B/M effects. In this paper, our intention is not to provide an exhaustive literature review; instead, we will concentrate on pioneering studies and a handful of research studies conducted in emerging markets. Comparatively, there is a paucity of studies on the P/E, P/CF, P/S, and D/E effects. We will present the studies we have been able to uncover, especially in emerging markets.

The size effect

The size effect is one of the most investigated anomalies in the literature. The Banz's (1981) study is the first to highlight the presence of the size effect on the American market. According to the author, firms with small capitalization show higher returns than those with large capitalization. The pronounced size effect is also documented in subsequent publications of Fama and French (1992,1993).

With respect to emerging markets, Barry et al. (2002) examined the robustness of the size and the B/M effects in 35 emerging markets and noticed that results related to the size effect lack robustness comparing to the significant presence of B/M effect. In disagreement with the Banz's results, Kyriazis and Diacogiannis (2007) concluded that, in Athens stock exchange, the small-firm effect is limited. In other words, when studying, separately, the effect in years, the authors observed its presence in some. However, when considering the entire study period, the difference in returns between small and large stocks is statistically insignificant. Nevertheless, Al-Mwalla (2012) confirmed the persistence of a strong size effect in the Amman stock market. In line with those findings, Akhtar et al. (2017) examined jointly size, value, momentum and liquidity effects in stock returns for the Indian market. They lent significant support to the association between size and stock returns. Similarly, Leite et al. (2018) noted clear evidence of size effect in average stock excess returns of 12 emerging markets including: Brazil, Chile, Mexico, Argentina, India, China, Thailand, Malaysia, Turkey, Poland, Romania, and Russia.

Concerning African markets, Page and Palmer (1991) studied the Johannesburg Stock Exchange and found no size effect in stock returns. In their paper, Acheampong et al. (2014) observed very limited size effect within the manufacturing sector of Ghana stock market. In the same market, Abrokwa and Nkansah (2015) revealed that the relation between stock returns and the size is statistically insignificant. Nevertheless, Boamah et al. (2017), in respect to explore regionality integrated asset pricing on the African stock markets via the Fama and French model (1993), highlighted the presence of the size effect on the pooled African stock markets. In line with Page and Palmer (1991), in the context of testing the validity of the Fama and French three factor model (1993) in explaining stock returns, Abd-Alla and Sobh (2020) concluded the absence of the small firm effect in the Egyptian stock market.

Considering the Moroccan market, while proposing an alternative three factor model to describe the variation returns for the North African emerging markets, Hearn (2011) revealed the existence of the size effect in the Moroccan context but it was the lowest level of significance comparing to Egyptian and Tunisian Markets. Furthermore, Aguenaou et al. (2011) and Alaoui Taïb and Benfeddoul (2023) concluded that the size effect is not pronounced as the value effect was.

The B/M effect

The B/M effect assumes that firms with high B/M ratio tend to have the higher returns than those with low B/M ratio. Stattman's (1980) and Rosenberg's et al. (1985) studies are the original works exploring the relationship between the inverse B/M (Market-to-book) ratio and stock returns in American market. This relationship has been strengthened in the Fama and French papers. Initially, in 1992, while studying NYSE, AMEX and NASADAQ markets, the authors found that companies with a high B/M outperform those with lower ratio and the B/M ratio show a greater explanatory power than the earnings/price ratio. Furthermore, Fama and French (1993) confirmed the B/M effect during a new study period. The positive association between the stock returns and the B/M ratio is strongly documented in several markets apart from US market. More recently, Fama and French (2017), while conducting an international test of their five-factor model, confirmed a strong positive relation between average stock returns and the B/M ratio among North America, Europe and Asian Pacific markets.

Pertaining to emerging markets, the presence of the B/M effect is heavily proven in different studies. Barry et al. (2002) documented the significant presence of B/M effect in 35 emerging markets. In the context of testing the validity of the Fama and French three factor model (1993) and its extensions, the presence of the B/M effect was confirmed in numerous markets including the New Zealand (Nartea, 2009), Amman (Al-Mwalla, 2012), Malaysia (Kheradyar et al., 2011). In accordance with those findings, Cakici et al. (2013) observed strong

evidence for the value effect in all 18 emerging markets studied. In the Indian market, Akhtar et al. (2017) provided a notable significant support to the significance association between stock returns and B/M ratio. The role assigned to the B/M effect over other fundamental anomalies is confirmed by Nivoix and Guo (2018). The authors examined jointly the P/E and B/M effects in Shanghai and Shenzhen markets and found, at the opposite of no P/E effect, a significant B/M effect in the markets. On the other hand, Hsu (2015) and Suyanto and Sibarani (2018) found no B/M effect in Thaiwan and Indonesian stock markets, respectively. For their part, Leite et al. (2018) documented little evidence of high B/M effect.

As far as African markets are concerned, Uwubanwen and Obayagbona (2012) reported, in Nigeria, that only the coefficient of the B/M passed the significance test at the 1 precent level, while all the other coefficients of firm size and price earning (P/E) failed the significance test. Similarly, Bergaoui (2013) found that stocks with high B/M ratio outperformed stock with low ratio in Tunisia. In the study conducted by Boamah et al. (2017) on the African stock markets, they concluded that the B/M effect appeared stronger than the size effect.

Considering the Moroccan market, Aguenaou et al. (2011) and Alaoui Taïb and Benfeddoul (2023) concluded the prominence of the value effect over of size effect.

The P/E effect

P/E effect is the earliest fundamental anomaly documented in the literature. The study of Basu (1977) emphasized that portfolios including lower P/E ratio stocks realized greater returns, as opposed to portfolios with a higher P/E ratio. Since the publication of this pioneering research, a huge body of literature has developed on the P/E effect and confirmed its presence in different stock markets. However, the major concern of researchers was that whether one of size and P/E effects does not dominate the other in average returns, even more, they affirmed that it is not obvious to dissociate the two effects (Ball, 1978; Banz,1981; Reinganum, 1981).

As a response to these advances, Basu (1983) again confirmed, in an updated version of his paper, that, even after controlling for size firm, the inverse relationship between the P/E ratio and average stock returns persisted. Similarly, Jaffe et al. (1989) identified, over the studied period, a significant earnings yield effect (the inverse P/E effect) but a significant size effect only in January. While studying, all NYSE, AMEX, and Nasdaq firms, Nathan et al. (2001) observed that the excess returns from trading strategies commonly used P/E ratio is quite low comparing to those based on the P/S ratio.

When it comes to emerging markets, most studies have been directed towards Asian stock markets. Lau et al. (2002) examined the relationship between stock returns and different indicators including the inverse of P/E ratio (E/P) using data from Singapore and Malaysia. Regarding Singapore market, the authors identified no E/P effect. However, the authors confirmed the positive relationship between returns and the E/P ratio in Malaysia and noted that neither the E/P effect encompasses the size effect, nor does the size effect encompass the E/P effect. Contrary to Jaffe et al. (1989), they concluded that the E/P effect is only significant in non-January months. In accordance with Basu (1977, 1983), Kyriazis and Diacogiannis (2007) spotlighted the existence of the P/E anomaly in the Athens Stock Market. In opposition, Aldo Carlo (2014) emphasized the absence of P/E effect in Indonesia Stock Exchange and concurred with Lau et al. (2002) findings in Singapore. However, in Taiwan stock market, Hsu et al. (2015) found that portfolios with high E/P ratio have larger mean returns than those with low ratio. In addition, the authors come to the conclusion that the E/P or dividend-to-price ratios are better than the B/M ratio as a value-growth proxy in Taiwan. The same results are found by Noda et al. (2016) in their study conducted in Brazil stock market. Nevertheless, Cakici et al. (2017) hold a different opinion on the preeminence of the E/P indicator in China. They observed that the E/P ratio produced high differences in both risk-adjusted and raw returns between the top and bottom quintiles, although these differences were not as pronounced as those resulting

from the inverse of P/CF (CF/P) ratio and the B/M ratio. The E/P ratio ranks last in terms of effect robustness. Conversely, Liu et al. (2019) jointed Hsu et al. (2015) and considered that E/P ratio is best indicator capturing the value effect in China. They used the E/P ratio instead of B/M ratio to construct their value factor. From his perspective, Akhtar (2021) investigated the influence of market multiples on stock returns in emerging (ASEAN) markets in comparison with developed (European) markets. He concluded that, in ASEAN markets, P/E indicator affects negatively stock returns. However, Alhashel (2021) agreed with the results of Lau et al. (2002) and Aldo Carlo (2014). No significant relation has been found between the E/P ratio and average returns, whether in the overall GCC market or when examining the Kuwaiti and Saudi markets separately. The author argued that the absence of an E/P effect suggests that current earnings may not provide insights into future firm earnings.

In the context of African markets, Page and Palmer (1991), on the basis of the Fama and MacBeth regression, found that E/P effect is economically and statistically significant in Johannesburg Stock Exchange. The opposite is true while considering the Ghana market. Indeed, Abrokwa and Nkansah (2015) found that the relation between P/E ratio and stock returns is not statistically significant.

The P/CF effect

The fundamental anomaly associated with the P/CF ratio is indicated by the presence of an abnormal high return for stocks with a lower ratio unlike those with a higher ratio. Such pattern in stock returns is highlighted for the first time by Chan et al. (1991) in the Japanese stock market. The authors attempted to test the predictive power of four basic fundamentals (size, B/M ratio, earnings yield and cash flow yield). They concluded that the CF/P ratio have the most significant positive impact on expected returns. Similar results were reported by Lakonishok et al. (1994) in American market. Moreover, the authors revealed that stocks with high CF/P ratio exhibited greater return spreads compared to stocks with high B/M or E/P ratios.

In 1998, Fama and French confirmed the presence of the CF/P effect besides three others (B/M, E/P and Dividend/P) in 12 core markets, consisting of the US, the UK, France, Switzerland, the Netherlands, Germany, Belgium, Hong Kong, Singapore, Australia, Sweden, and Japan.

As is the case with the P/E effect in emerging markets, majority of studies concerning P/CF effect have a strong focus on Asian markets. Lau et al. (2002) examined, also, the relation between returns and CF/P ratio in Singapore and Malaysia. Based on the univariate analysis, the portfolio of high CF/P stocks outperforms the portfolio of low CF/P stocks in both countries, but neither is statistically significant. A negatively significant relationship between stock returns and P/CF ratio is reported by Akhtar and Rashid (2015) while examining, in the case of Pakistan stock market, the relationship between market multiples and portfolio returns. Consistently with Chan et al. (1991) and Lakonishok et al. (1994), the preeminence of the CF/P effect is documented, in China, by Cakici et al. (2017) where the largest differences in both risk-adjusted raw and returns between the highest and lowest quintiles are observed when stocks are ranked by their CF/P ratio, followed by the B/M ratio and then the E/P ratio. In their study, Nudrat et al. (2017) confirmed the presence of a positive relation between the CF/P ratio and stock returns in Pakistan, India and China stock markets. Similar pattern is observed by Kakinuma (2020) in Thai market. Furthermore, the author concluded that portfolio sorted on CF/P ratio consistently exhibit the strongest performance in outperforming the market. On the other hand, Akhtar (2021) documented a positive relationship between P/CF ratio and stock returns in Indonesia, Malaysia, Philippines, Singapore and Thailand stock markets.

In relation to African, the only study known to us is the one conducted by Hanauer and Lauterbach (2019). They tried to investigate anomalous returns in 28 emerging markets including three African markets: Egypt, Morocco and South Africa. The authors' conclusion is that the CF/P effect is pervasive, appearing in both equal-weighted and value- weighted portfolio classifications, as well as in cross-sectional regressions.

The P/S effect

The P/S effect is initially documented by Fisher (1984) who suggested that firms with low (high) P/S ratio are more favored (less favored) by investors, creating opportunities for buying (selling). In other words, stocks with lowest P/S ratio generate increased returns. Those findings found their support by Barbee et al.'s (1996) research. The authors concluded that the inverse of P/S ratio (S/P) have a positively significant relation with stock returns. Furthermore, the indicator exhibits more robust associations with stock returns than the B/M and size. In the Korean stock exchange, Mukherji et al. (1997) validated this positive association and found that stocks with a higher S/P indicator have higher returns. For their part, Nathan et al. (2001) highlighted the dominance of the P/S effect in the American market and noted that the excess returns from investment strategies based on this ratio is largely higher comparing to those using P/E ratio. In their study, Barbee et al. (2008) analyzed the relation between four market ratios (P/E, P/CF, P/B and P/S) and American stock returns. The authors found that P/S ratio has the most consistently significant negative relationship with returns comparing to other indicators.

In terms of emerging markets, there is a scarcity of studies dedicated to them. The positive relation between S/P ratio and stock returns is earlier reported by Sheu et al. (1998) in Taiwan stock market. Same results were observed by Rahmani et al. (2006) in Iran stock market but just in one year. While the authors separately examined the S/P effect over the years, they found, on the contrary, a negative relationship, hence an inverse effect, for four consecutive years. On the other hand, Öztürk and Karabulut (2020) confirmed the P/S effect in Istanbul stock market as stocks with the lower P/S ratio led to higher returns for the study's period. Consistently with Rahmani et al.'s (2006) conclusions, Akhtar (2021) found an inverse P/S effect in both ASEAN and European markets. The author noted a positively significant relationship between stock returns and the P/S ratio.

The Debt-to-equity (D/E) effect

Bhandari (1988) studied, for the first time, the relationship between the leverage ratio and the average stock returns in the American market. The findings showed the presence of a significant positive relation between stock returns and D/E ratio. There is an over performance of companies with high D/E ratio. However, Harris and Raviv (1991) found that average returns are negatively associated with the D/E ratio. In line with Bhandari's (1988) conclusions, Barbee et al. (1996) and Mukherji et al. (1997) found that stocks with a higher leverage have higher returns in the American and the Korean stock markets, respectively. Nevertheless, Penman et al. (2007) and George and Hwang (2010) are in agreement with Harris and Raviv (1991) conclusions in the American market. Furthermore, George and Hwang (2010) rejected the hypothesis that this negative relation is due to mispricing (Penman et al., 2007). Same results are documented by Muradoğlu and Sivaprasad (2012) in London stock market.

When discussing emerging markets, several research papers focus primarily on the Asian continent. In line with Bhandari (1988), the positive relationship between D/E ratio and stock returns are documented by many researchers in different developing markets. In Karachi Stock Exchange, Mirza et al. (2016) found that portfolios consisting of firms with high D/E ratio had positive factor loadings, while those with lower D/E ratio had negative factor loadings. Similarly, Setiyono and Amanah (2016) and Ramlah (2021) indicated in their studies conducted in Indonesian stock market that the leverage had a positive influence on stock returns. However, other studies aligned with Penman et al. 's (2007) findings and indicated the negative association between D/E and stock returns. Sugiarto (2011) documented a negative and significant D/E effect in Indonesia stock market which is in opposition to Setiyono and Amanah (2016) and Ramlah (2021). In Istanbul stock market, Koseoglu (2014), Öztürk and Yılmaz (2015) and Öztürk and Karabulut (2020) found that companies having lower leverage ratios tend to achieve stronger performance in comparison to those with higher leverage levels.

In addition to the previously documented contradictory results in developed and emerging markets, some studies indicate the absence of any leverage effect in certain emerging markets. Samarakoon (1998) found that there is no significant relationship between D/E and average returns in Sri Lankan stock market. Similarly, the findings of Rahmani et al. (2006) affirmed the lack of a significant leverage effect in the Tehran market. Corroborating those results, Shabib-ul-Hasan et al. (2015) and Mustafa et al. (2017) found no statistically significant relationship between financial leverage and shareholders return in Karachi Stock Exchanges which is in disagreement with Mirza et al. (2016). In Malaysia, Jakpar et al. (2019) revealed that the D/E ratio did not have any impact on stock returns. Regarding their research, Maiti and Balakrishnan (2020) reached the conclusion that, in the Indian context, there exists an intricate relationship between the D/E ratio and stock returns.

Although, the important place occupied by the leverage effect in the financial literature and the numerous of economic and financial areas to which it is linked, there are very few studies exploring this anomaly in African market. As far as we know, the only study existing is conducted by Acheampong et al. (2014) in Ghana stock market. The authors are in line with the prevailing research that identifies an inverse leverage effect.

Data and methodology

Our study uses unbalanced panel data for non-financial Moroccan companies from July 2001 to June 2020. We compiled data sourced from both the Refinitiv database and the Moroccan stock exchange website. After excluding firms with missing information, the remaining sample totals 50 companies. The number of firms considered in the sample increases from year to year. We opted for an unbalanced panel data sample on account of the small number of stocks traded in the Moroccan stock exchange as well as the availability of data.

According to Fama and French (2008), except for size, we respect the lag of 6 months for variables. The fundamental anomalies which are used in the present paper, for July t to June of t+1, are: size effect, measured by the natural log of market capitalization in June t; B/M effect, measured by the natural log of the ratio of book equity for December t-1 divided by market equity in December of t-1; P/E effect, measured by the ratio of price/earnings for December t-1; P/CF effect, measured by the ratio of price/Cash flows for December t-1; P/S effect, measured by the ratio of price/sales for December t-1; D/E effect, measured by the ratio of Debt-to-equity for December t-1. We consider the stock holding period return (HPR, hereafter) as the return rate that investors achieve through long-term stock ownership. In our study, in consistent with Akhtar (2021), we choose twelve months as a holding period[1]. Table 1 below represents the descriptive statistics of all studied variables.

Table 1: Descriptive statistics of dependent and independent variables

Variables	Mean	Standard deviation	Minimum	Maximum
HPR	0.0625922	0.4401819	-0.9404145	5.631617
Size	5980000000	17500000000	40800000	1.65E+11
B/M	0.6361273	0.4772928	0.0508383	3.159842
P/E	18.67258	29.75355	0	438.5324
P/CF	11.05185	25.25738	0	457.0258
P/S	2.50603	8.840404	0	178.2127
D/E	0.468712	0.6039269	0	4.5

Source: The authors.

As noted by Jaffe et al. (1989), studies applying the ANOVA approach, do not provide point estimates of statistical relations, more in-depth analyzes are needed. Regression analysis is commonly employed to validate findings achieved through the portfolio approach and to capture an intricate relation that cannot be revealed using this approach (Cakici et al., 2017). Therefore, we carry out, in addition to the univariate analysis returns, a regression analysis to measure the intercept and coefficients of fundamental indicators for Moroccan stock returns by

using a fixed-effect model as a preliminary analysis. In accordance with Akhtar (2021), we measure the relationship between fundamental variables and stock HPR with the upcoming formula:

$$\mathbf{HPR} = \boldsymbol{\alpha} + \boldsymbol{\beta_1} * \boldsymbol{Size} + \boldsymbol{\beta_2} * \boldsymbol{B/M} + \boldsymbol{\beta_3} * \boldsymbol{P/E} + \boldsymbol{\beta_4} * \boldsymbol{P/CF} + \boldsymbol{\beta_5} * \boldsymbol{P/S} + \boldsymbol{\beta_6} * \boldsymbol{D/E} + \boldsymbol{\varepsilon} \quad \mathbf{(1)}$$

With,

$\boldsymbol{\alpha}$: is the equation's constant.

$\boldsymbol{\beta_1}, \boldsymbol{\beta_2}, \boldsymbol{\beta_3}, \boldsymbol{\beta_4}, \boldsymbol{\beta_5}, \boldsymbol{\beta_6}$: are the coefficients of the six fundamental variables (Size, B/M, P/E, P/CF, P/S and D/E., respectively)

$\boldsymbol{\varepsilon}$: is the equation's error term.

Then, we adopt the Blundell and Bond (1998) SGMM methodology[2] for dynamic panels, as it is well-established, in the literature, that substantial challenges can emerge when applying the ordinary least square (OLS) to estimate equations in this context. Furthermore, this methodology can easily deal with unbalanced panel data. To address issues arising from the proliferation of instruments, we employed "xtabond2" Stata command, as introduced by Roodman (2009).

Results and Discussion

The univariate analysis returns

Table 2 presents average monthly returns for the four groups of stocks sorted by the six fundamental variables. In the process of portfolio construction, firms are independently assessed using the six ratios at the end of June each year and are, subsequently, categorized into one of the four groups. Group1 includes stocks with the lowest indicator values whereas group 4 consists of those with the highest indicator value.

Table 2: Average returns for portfolios of all stocks sorted into quartiles based on the six indicators: Size, B/M, P/E, P/CF, P/S and D/E.

Panel A: sorted on Size					
Portfolios	1	2	3	4	4-1
Return	0.2242134	0.1677736	0.1782629	0.0816968	-0.1425166
t-statistic	2.2134	2.274	3.108	1.7497	-1.7198
Panel B: sorted on B/M					
Portfolios	1	2	3	4	4-1
Return	0.0682626	0.094163	0.1788917	0.194562	0.1262994
t-statistic	1.5311	1.4879	2.3418	2.8309	**2.1563**
Panel C: sorted on P/E					
Portfolios	1	2	3	4	4-1
Return	0.2225311	0.1025149	0.1034408	-0.0088698	-0.2314009
t-statistic	2.8844	1.6362	1.8859	-0.1512	**-3.1547**
Panel D: sorted on P/CF					
Portfolios	1	2	3	4	4-1
Return	0.1957438	0.1608165	0.1511691	0.0124064	-0.1833374
t-statistic	3.8261	2.5079	2.2114	0.1994	**-2.7143**
Panel E: sorted on P/S					
Portfolios	1	2	3	4	4-1
Return	0.2637241	0.1469445	0.0142451	0.0908763	-0.1728478
t-statistic	4.1509	2.2112	0.2209	1.8571	**-3.6873**
Panel F: sorted on D/E					
Portfolios	1	2	3	4	4-1
Return	0.0935564	0.1149621	0.1264424	0.0263361	-0.0672203
t-statistic	2.0737	2.2376	2.4501	0.4016	-1.2946

Source: The authors.

From panel A, small stocks achieve higher returns than large stocks with a negative difference of 14.25 per cent per month between the top and the bottom quartiles. This result confirms the negative association between stock returns and size. However, the value is not statistically significant. Our findings are consistent with those reported by Kyriazis and Diacogiannis (2007), Abrokwa and Nkansah (2015) and Abd-Alla and Sobh (2020).

From portfolios sorted on B/M, results show that high B/M stocks outperform substantially low B/M stocks with a difference of 12,63 per cent per month between the two extreme groups. The positive relationship between returns and B/M ratio is confirmed as the difference in returns is statistically significant. Persistently, Aguenaou et al. (2011) and Alaoui Taïb and Benfeddoul (2023) reported that the B/M effect is the most pronounced in the Moroccan stock market.

In panel C, low P/E firms earn a premium of 23.14 per cent over firms with high P/E ratio which emphasize the negative association between this indicator and stock return. In addition, the difference between the two extreme portfolios returns is statistically significant.

Related to the portfolios ranked on P/CF in panel D, the negative relationship between stock returns and this ratio is validated as low P/CF companies surpass those with high ratio, registering a statistically significant difference of 18.33 per cent per month.

Inconsistent with Cakici et al. (2017), P/E effect holds the top position since the largest differences in returns between the highest and lowest quartiles is observed when stocks are ranked by their P/E ratio, followed by the P/CF ratio and then the B/M ratio.

Similarly, the results on panel E reveal the significantly negative relation between P/S indicator and the stock returns. In accordance with Öztürk and Karabulut (2020), firms with low P/S ratio have greater returns than those with high ratio. In addition, the spread in returns

between the top and the bottom quartiles presents a statistically significant value of 17.28 per cent per month.

Lastly, the difference in abnormal returns between the two extreme groups for the D/E variable is surprising. Its value shows a negative unexpected sign implying an inverse association between the leverage ratio and stock returns. Furthermore, this value is statistically insignificant. Those findings are in harmony with those reported on the Karachi stock market (Shabib-ul-Hasan et al., 2015; Mustafa et al., 2017).

Regression results

Fixed-effect panel regression

The results in table 3 are based on a fixed-effect panel regression analysis of stocks HPR as dependent variable with robust standard errors[3].As Fama and French (2008) reported, the regression analysis has the power to identify the return effects of anomalies. By performing fixed-effect panel regression, we focus particularly on the slope of fundamental variables for stock returns. According to Akhtar (2021), we take into consideration the business cycle issues by including year fixed effects in the model.

Table 3: Results of fixed-effects model

	Coefficient	t-statistic	Number of Groups	50
Size	-0.0631316	-1.25	Observations	675
B/M	0.1396874	**2.93**	F-statistics	**10.84**
P/E	-0.0016378	**-3.38**	Significance F	0
P/CF	-0.0005373	**-1.86**	R-square	0.2875
P/S	0.0050827	**3.62**	Year Fixed Effect	yes
D/E	-0.0010547	-0.02	Number of Groups	50
α	1.245256	1.25		

Source: The authors.

Above all, we noticed that the F-statistic is significant. This result highlights the stability and the reliability of our model.

Relatively to the size effect, the slope of the size variable has the expected negative sign implying that small stocks outperform large stocks. However, the value is statistically insignificant. The absence of small-effect is, also, documented in different emerging markets as Athens (Kyriazis & Diacogiannis, 2007), Ghana (Acheampong et al., 2014; Abrokwa & Nkansah, 2015) and Egyptian markets (Abd-Alla & Sobh, 2020).

As expected, the B/M ratio shows a significantly positive relationship to stock returns implying that stocks with high B/M have greater returns than those with low B/M ratio. As several researchers point out, the dominance of the B/M effect over the size effect is evident in emerging markets (Fama and French, 2012; Barry et al., 2002; Eraslan, 2013). Our findings are in line with those reported in Alaoui Taïb and Benfeddoul's (2023) study in the Moroccan market.

Related to the P/E ratio, its coefficient indicates the significantly negative relationship to stock returns. Firms with low P/E over-perform firms with high P/E which is consistent with the literature. Liu et al. (2019) concluded that E/P effect is economically and statistically significant and it is the best indicator capturing the value effect in China.

The P/CF variable has the expected negative sign and it is significant at 10 per cent. These findings suggest that firms with low P/CF ratio typically show the greater returns. Parallel results have been reported by Akhtar and Rashid (2015), who documented a negatively significant relation between P/CF ratio and stock returns in the Pakistan stock market.

Regarding the P/S ratio, the results are surprising. The coefficient of the P/S ratio is significant with an unexpected positive sign assuming that stocks with high P/S ratio outperform those with low ratio. This finding is in conformity with that observed in the Akhtar's

(2021) study. In Iran stock market, while Rahmani et al. (2006) separately examined the S/P effect over the years, they found, also, a negative relationship, hence an inverse effect, for four consecutive years. As Konijn et al. (2011) noted in their study, dissimilarities in the relation between stock returns and fundamentals through different markets, may be influenced by the institutional and regional features of those stock markets.

The coefficient of debt variable shows an unexpected negative sign which in contradiction with the D/E effect as Bhandari (1988) presented. Our results are in harmony with Harris and Raviv (1991) and Penman et al. (2007) conclusions. However, in our case, the value of the coefficient is still statistically insignificant.

Results of dynamic panel model

The findings of the SGMM estimation model of Moroccan stock returns are shown in table 4. The equation in the SGMM estimation is considering the lagged HPR as an endogenous variable. Thereby, our basic model is estimated using equation 1 where the lagged HPR is an additional term. According to the literature, the general findings are deemed robust under the conditions that no second order autocorrelation is detected in the residuals and the employed instruments are valid.

Table 4: Results of dynamic panel model

	Coefficient	t-statistic	Number of Groups	50
HPR_{t-1}	0.044465	1.15	Observations	625
Size	-0.0080222	-0.44	Hansen test	0.179
B/M	0.111321	**2.65**	AR(2)	0.112
P/E	-0.0010027	**-2.66**	F-statistics	**8.75**
P/CF	-0.0008805	**-3.09**	Significance F	0
P/S	0.0014932	**1.94**		
D/E	0.0241534	0.4		
α	0.3040797	0.82		

Source: The authors.

Table 4 indicates a notable absence of second order autocorrelation as the p-value of AR (2) is high, 0,112. In addition, the Hansen test of over-identifying restriction has high p-value (0,179) indicating that null Hypothesis of "the validity of the instruments" cannot be rejected. In addition, regarding the significance of the F-statistics, our dynamic panel model is reliable and stable.

Overall, results of Table 2 confirm those presented in the previous section concerning fixed-effect regression. The slope of the size variable still insignificant. Additionally, the findings of the dynamic model support the presence the B/M effect with a significantly positive coefficient. Concerning the P/E, it is still pronounced as the coefficient still shows the significantly negative expected sign. The P/CF variable still has the expected negative sign and it turns out to be significant at 5 per cent. As argued earlier in the fixed-effect regression, the inverse P/S effect is still marked with the significantly positive sign of the slope. According to the D/E effect, the sign of the coefficient becomes positive, however, its value is still statistically insignificant.

As Cakici et al. (2017) argued, regression analysis is frequently used to corroborate the portfolio analysis. However, in our study, the results are conflicting when it comes to the P/S effect. As previously shown in sorts within P/S ratio, the statistically significant negative relationship between the top and bottom quartiles is evident. Inversely, when considering the outcomes of both the fixed-effect panel regression and the SGMM estimation model, the coefficient of P/S variable shows a statistically significant positive sign. In light of this, those findings are inconclusive regarding the existence of the P/S effect in the Moroccan market.

Conclusion

This research brings forth new substantiation regarding the existence of fundamental anomalies in stock markets, especially in an emerging market. Little, if any, has interest about this question in the Moroccan context. To fill this gap, in our study, we examine and explore fundamental anomalies in the Moroccan stock exchange over the period from July 2001 to June 2020 using the univariate sorts analysis, then, a regression analysis through fixed-effect and SGMM estimation models. Our sample includes 50 non-financial Moroccan companies.

In the robustness testing, we found a significantly positive relationship between Moroccan stock returns and the B/M ratio, which confirmed the Alaoui Taïb and Benfeddoul (2023) conclusions. In addition, results show a negatively significant relation between stock market returns and each of the P/CF and P/E ratios. Regarding the size and the leverage effects, the findings highlight their absence in the Moroccan stock market as their coefficients are both insignificant. Nevertheless, we cannot pronounce on the existence of a positive or negative price-to-sales effect, over the studied period, since the results of both the univariate and regression analyses are in contradiction.

In summing up, our results confirm the fact that there are differences about the impact of the fundamental characteristics in stock returns from developed and emerging markets. In accordance with Akhtar's (2021) argument, divergences in the accounting standards and economic environments may influence the comprehension and the accordance of existence fundamental anomalies in stock markets.

Our findings carry a twofold implication: firstly, from a managerial perspective, investors and portfolio managers may consider the significant fundamentals to shape their investment strategies or asset allocation within the Moroccan stock market. Secondly, from an academic perspective, these results could guide future researchers towards modeling the relationship returns-risk in the Moroccan stock market, using such as the CAPM or Fama and French models, with an incorporation of the most pertinent indicators.

Declaration of Conflicting Interests

The Authors declare that there is no conflict of interest.

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Notes

[1] Many are studies prioritizing to use a long-short strategy (Lakonishok et al., 1994; Bird & Casavecchia, 2007; Akhtar, 2021). However, the period of holding is not specified.

[2] SGMM methodology is based on Arellano and Bond (1991) which is an efficient approach to handle endogeneity and heterogeneity issues.

[3] We use the White estimate of variance errors to adjust the model for heteroskedasticity.

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