USING BOOK-TO-MARKET RATIO, ACCOUNTING STRENGTH, AND MOMENTUM TO CONSTRUCT A VALUE INVESTING STRATEGY: THE CASE OF SPAIN

Carlos Forner Rodríguez*, **
University of Alicante, Dto. Economía Financiera y Contabilidad. Spain
carlos.forner@ua.es

Pablo J. Vázquez Veira**
University of Alicante, Dto. Economía Financiera y Contabilidad. Spain
pablo.vazquez@ua.es

ABSTRACT

The weak value-growth premium of the Spanish stock market highlights the importance of enhancing the accounting-based fundamental strength of the value-growth strategy. This accounting strength is needed to detect potential errors in market expectations that result in mispriced stocks. When we select value-growth stocks whose accounting strength is incongruent with the market expectation reflected by their book-to-market ratio, the value-growth strategy becomes highly profitable. Our results are consistent with the evidence gleaned by Piotroski and So (2012) in the US market and demonstrate that stock markets with a weak value-growth premium are not necessarily free of errors in market expectations. We also demonstrate that the momentum effect allows better timing of this strategy, indicating the best time to buy and sell mispriced stocks. This effect increases profits and reduces the time needed to hold stocks to achieve these profits. Moreover, characteristics of the Spanish fiscal year-end distribution are ideal for avoiding the problems that Kim and Lee (2014) encountered.

Keywords: value-growth stocks, mispricing, rational pricing, momentum, accounting strength, expectational errors, accounting-based fundamental strength

JEL classification: G14, G11, M41

* Contact author. Dpto. Economía Financiera, Contabilidad y Marketing, University of Alicante, 03080 Alicante, SPAIN. Tel.: +34 965 90 36 21.

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1. Introduction

There exists an extensive controversy about whether value-growth effect (value stocks outperforming growth stocks) is the result of risk compensation (rational expectations) or mispricing (derived from expectational errors: systematically pessimistic/optimistic). In this sense, Piotroski and So (2012) present interesting results that give support to the mispricing story. They suggest that if pessimistic (optimistic) expectations exist, they will be concentrated in stocks whose current pricing multiples reflect bad (good) expectations, value (growth) stocks, but their fundamental accounting-based ratios reflect opposed expectations: good (bad). Consistent with their hypothesis, they find that returns to value-growth strategy are concentrated among those firms where expectations reflected in their value-growth classification are incongruent with the expectations reflected in the strength of their accounting-based fundamentals: the "incongruent value-growth strategy".

Behavioural finance theories argue that mispricing is the result of the coexistence of psychological biases and limits to arbitrage. Given that these variables could be affected by cultural and institutional characteristics, some mispricing could be observed in some countries but not in others (see for example Chui, Titman, and Wei, 2000 and 2010, for the momentum effect). Moreover, Daniel and Titman (1999) and Zhang (2006) suggest that any uncertainty (i.e. ambiguity) in the pricing process probably fuels the psychological biases, so investors' behavioural biases will be stronger among those stocks with characteristics that accentuate the ambiguity in their pricing process (hard-to-value stocks). We present out-of-sample evidence from Piotroski and So (2012) in order to check if their results for the US market are market dependent or can be generalised to other markets. We analyse the Spanish stock market because its cultural, institutional, and stock characteristics differ from those of the US market.

Regarding cultural profiles, the Individualism Index of Hofstede (2001) in Spain (51) is markedly lower than that of the United States (91), and the GLOBE institutional collectivism value index of House et al. (2004) is higher in Spain (5.25) than in the United States (4.2). Regarding institutional characteristics, Spain's accounting regime is based on code law and differs significantly from that of the United States, which is based on common law. Moreover, in the Spanish legal system, investors enjoy a lower level of protection (e.g., face higher levels of corruption[1]) than in the United States, and there are fewer limits on insider trading. Regarding stock characteristics, average firm size and book-to-market (BM) in the Spanish market are bigger than in the US market, and return volatility is smaller. Daniel and Titman (1999) and Zhang (2006) suggest that size and BM ratio (return volatility) are negatively (positively) related to uncertainty in the pricing process. Therefore, Spanish stocks are less hard to value, and in consequence less affected by psychological biases. According to these Spanish characteristics we should expect to observe less mispricing than in the US market (see Forner and Sanabria, 2010). Our results confirm this idea and we find little evidence of value-growth premium in the Spanish market (in contrast to the strong evidence found for the US market).[2]

In our opinion this weak value-growth premium offers an ideal context for checking Piotroski and So (2012) results. We hypothesise that in countries with characteristics less favourable to behavioural biases and limits to arbitrage, as is the case of Spain, the fact that a firm has a high accounting value against market price (e.g. BM) is not enough to detect mispricing and is merely an indication that it may be undervalued. To detect whether this high ratio is due to correct poor expectations about the firm or an ‘expectational error’, it is

[1] Based on the Corruption Perception Index (CPI), obtained from Transparency International (www.transparencia.org.es), in 2016 the CPI in Spain (58) is lower than it is in the United States (74).

[2] These results are consistent with those of De Peña, Forner, and Lopez-Espinosa (2010) who observe that HML factor returns are only statistically significant at the 9% level from January 1991 to December 2004.

necessary to thoroughly examine the firm's accounting-based fundamentals. We suggest that the Spanish market shows a weak value-growth premium because in countries with characteristics less favourable to behavioural biases and limits to arbitrage a single value-to-price ratio is not enough to detect mispriced stocks. Some value (growth) stocks correctly reflect bad (good) expectations, and others reflect errors in expectations. If this hypothesis is true, we should observe a strong incongruent value-growth strategy like the US market despite the weak evidence of value-growth premium in the Spanish market.

Therefore, we think that this specific characteristic of the Spanish Stock Market makes this "out of sample" analysis interesting because it can contribute to our understanding of whether incongruent value-growth strategy works even in markets without value-growth effect. In addition, our results could help practitioners to decide whether in stock markets without standard value-growth premium they should rule out value investing philosophy or not. That is, whether standard value-growth strategy omits an important piece of information (fundamental strength) that when included in an incongruent value-growth strategy results in profitable investments even in stock markets with characteristics less favourable to mispricing.

Piotroski (2000) and Piotroski and So (2012) select portfolio formation dates based on firm-specific fiscal year ends, rather than establishing a common portfolio formation date for all firms. Kim and Lee (2014) argue that accumulated returns cannot be replicated in a practical context using this method because portfolio weights cannot be known. These authors also demonstrate that the relationship between fundamental strength and returns is partially driven by choice of formation date. Taking into account the problems argued by Kim and Lee (2014), the Spanish market offers an ideal context to verify Piotroski and So's (2012) results. Fiscal year ends occurred in December in 94% of the cases. Therefore, we can establish a common formation date guaranteeing that the accounting information used for most firms is fresh.

We also analyse the return persistence of incongruent stocks. In their analysis of the momentum anomaly, Jegadeesh and Titman (1993, 2001) suggest that a strategy should stay profitable during the post-holding period if these profits are the reward for some type of risk. Conversely, we should observe a different performance if the profits are due to mispricing. Mispricing caused by overreaction or under-reaction to bad (good) news will normalise once prices reach their fair value. If mispricing is caused by initial under-reactions that ultimately become a posterior overreaction (caused by a disproportionate price adjustment to the initial under-reaction), we should observe some reversion in profits.

We also improve the incongruent value-growth strategy by incorporating Jegadeesh and Titman's (1993) momentum phenomenon. The mispricing hypothesis suggests that incongruent stocks yield abnormal returns because investors finally realise their mistakes and correct their prices. The mispricing hypothesis also suggests that investors suffer from some behavioural biases that make them reluctant to change their expectations. Therefore, price adjustments may take time (momentum). Incongruent stocks with positive or negative short-term returns (momentum) are mispriced, and they have begun to undergo correction. The mispricing hypothesis suggests that we should expect stocks with high BMs and strong fundamentals to yield higher abnormally positive returns among stocks with higher past short-term returns. Stocks with low BMs and weak fundamentals should yield higher abnormal negative returns among stocks with lower past short-term returns.

In the second section, we present the literature review. The third section presents data and methodology. The fourth section includes analyses of returns yielded by portfolios ranked by BM ratio and fundamental strength and by both measures simultaneously. The fifth section includes analyses of the return persistence of incongruent stocks. The sixth section includes analyses of the incongruent strategy augmented by momentum. Finally, we present the conclusions.

2. Literature review

There is extensive evidence that simple value strategies based on earnings-to-price, BM, and cash-flow-to-price ratios have outperformed the market (Basu, 1977; Rosenberg, Reid, and Lanstein, 1985; Chan, Hamao, and Lakonishok, 1991). However, interpreting these superior returns has been more controversial.

Market efficiency supporters argue that value superior returns only represent ‘compensation for common risk’, i.e., value stocks are fundamentally riskier. According to this interpretation, Fama and French (1995) document that BM is related to economic fundamentals. Firms with high (low) book values relative to stock prices are found to have low (high) earnings on assets. Low (high) earnings persist for at least 5 years before and after BM is measured. Fama and French (1995) also find that high-BM firms tend to be persistently distressed, and low-BM firms enjoy sustained profitability (growth stocks). Several studies support this ‘compensation for common risk’ explanation (e.g. Penman, 1996; Liew and Vassalou, 2000; Vassalou and Xing, 2004; Hahn and Lee, 2006; Santos and Veronesi, 2010; and Campbell, Polk, and Vuolteenaho, 2010).

In contrast, behavioural finance theories argue that the value effect is the result of mispricing derived from psychological biases and limits to arbitrage. In this sense, Lakonishok, Shleifer, and Vishny (1994) state that value strategies might produce higher returns because they are contrarian to ‘naive’ strategies. Investors seem to become overly excited about stocks that have performed well in the past (growth stocks)[3] and buy them

[3] According to this interpretation, these stocks are also called ‘glamour stocks’.

up, causing them to become overpriced. Investors also overreact regarding stocks that have performed badly (value stocks) and oversell them, causing them to become underpriced. These findings seem to indicate an ‘expectational error’ or ‘mispricing’ explanation. Several studies find evidence supporting this mispricing explanation: e.g. La Porta (1996), Dechow and Sloan (1997); La Porta, Lakonishock, Shleifer, and Vishny's (1997); Cai (1997); and Gregory, Harris and Michou (2003).

‘Expectational errors’ in the market that cause some stocks to be priced under or over their fundamental or intrinsic value have long been used as part of the value investing philosophy. This philosophy dates back to the publication of the book *Security Analysis* by Graham and Dodd in 1934. In contrast to the value strategy extensively analysed in academic research, value investing practitioners do not focus only on a value-to-price ratio like BM. These practitioners also analyse a broad set of fundamental ratios. The fact that a firm has a high accounting value against market price is merely an indication that it may be undervalued. To detect whether this high ratio is due to correct poor expectations about the firm or an ‘expectational error’, value investors thoroughly examine the firm’s accounting-based fundamentals.

Piotroski (2000) supports this idea, showing that the mean return earned by a high-BM portfolio based on firms with strong accounting-based fundamentals can increase by at least 7.5% annually. Fundamentally riskier stocks perform worse than healthier stocks, given a set of high-BM firms. High-BM stocks with strong fundamental health are important for selection, rather than all high-BM stocks. Bird and Casavecchia (2007) found similar results for the European Market using a sales-to-price ratio to identify value and growth stocks and a different procedure to measure fundamental strength.

Piotroski and So (2012) extend the work of Piotroski (2000), presenting an alternative testable hypothesis regarding the interpretation of the value premium as compensation for risk or mispricing. They propose that high (low) BM firms are firms with weak (strong) market expectations. That is, high (low) BM firms have low (high) market value relative to their book value because the market has low (high) expectations about their future performance. Lakonishok et al.'s (1994) mispricing argument suggests that investors are overly pessimistic (optimistic) about these stocks. Expectations are systematically lower (higher) than they should be. Thus, investors make systematic ‘expectational errors’ about these extreme BM firms. We can test whether these supposed expectational errors are concentrated among firms with ex ante identifiable expectation errors using historical financial statement-based accounting metrics.

Piotroski and So (2012) classify stocks simultaneously by BM (market expectations) and fundamental strength as reported in the most recent fiscal year’s financial statement. Under rational expectations, investors are unbiased. Therefore, the performance of value (growth) stocks will not depend on the strength of the firm’s fundamentals. Value (growth) stocks with strong fundamentals will not yield different returns than value (growth) stocks with weak fundamentals. In contrast, if investors make expectation errors we would expect that value (growth) stocks, with low (high) market expectations, have pricing expectation errors concentrated in stocks with strong (weak) fundamentals, i.e., incongruent with market expectations. The value-growth strategy that buys value stocks and short-sells growth stocks will only give abnormally positive returns among stocks with BM ratios incongruent with their fundamental strength (the incongruent value-growth strategy). And positive returns will not be found in congruent stocks (congruent value-growth strategy). Supporting the mispricing hypothesis, Piotroski and So (2012) found that value-growth abnormal returns are concentrated in incongruent stocks.[4]

[4] See figure in page 2847 of Piotroski and So (2012) for an illustrative explanation.

3. Data and methodology

3.1 Data

The data were collected using Compustat. Firms with current Primary Global Industry Classification Standard codes equal to 4010, 4020, and 4030 (i.e., financial firms) or with unavailable codes were eliminated. We included 214 non-financial firms quoted on the Spanish capital market from January 1996 to December 2013. When different issues for the same firm existed, we took the primary one. We obtained 28,101 firm-month observations, ranging from 88 to 131 per month. We calculate monthly stock returns from monthly stock closing prices adjusted by seasoned equity offerings and splits, and dividends per share ex-date. Monthly stock market capitalisation is calculated as the number of common shares outstanding at the end of the last fiscal year multiplied by the stock closing price for that month. The BM for each month has been calculated as the book value of a firm's equity at the end of the previous fiscal year (all negative data have been deleted) divided by its market capitalisation. As a proxy for the risk-free return we use monthly data for one-month government bond repo rates collected from the 'Central de Anotaciones de la Deuda Española' historical series, which is published by the Bank of Spain.

[Table 1 near here]

Panel A of Table 1 presents descriptive statistics of these variables. Compared with descriptive statistics shown by Piotroski and So (2012) for the US market, average firm size and BM ratio are bigger, and return volatility is lower in the Spanish market. If firm size and BM ratio (return volatility) are negatively (positively) related to uncertainty in the pricing process (Daniel and Titman, 1999; and Zhang, 2006), Spanish stocks are on average less hard to value than US stocks.

3.2 Measurement of accounting-based fundamental strength: the F_Score

Following Piotroski (2000) and Piotroski and So (2012), we use nine accounting signals that may illustrate firm performance in three crucial areas: profitability, financial health, and operating efficiency. Firm profitability is measured by Return on Assets (ROA), cash flow from operations scaled by total assets (CFO), current year's ROA minus the prior year's ROA (ΔROA), and ACCRUAL = ROA – CFO. Financial health is measured by change in the ratio of total long-term debt to average total assets (ΔLEVER), change in the ratio of current assets to current liabilities (ΔLIQUID), and funds received by the firm when it issues new stocks or sells its own treasury stock scaled by beginning-of-the-year total assets (ΔEQUITY). Operating efficiency is measured by change in the ratio of gross margin to total sales (ΔMARGIN) and change in the ratio of total sales to the beginning-of-the-year total assets (ΔTURN). Panel B of Table 1 presents descriptive statistics of these variables.

Each year, individual signal realisations positively related to fundamental health (ROA, CFO, ΔROA, ΔLIQUID, ΔMARGIN, ΔTURN) are assigned to one if they are positive, zero otherwise. Individual signal realisations negatively related to fundamental health (ACCRUALS, ΔLEVER) are assigned to one if they are less than zero, zero otherwise; ΔEQUITY is assigned to zero if the firm issued common equity, that is if ΔEQUITY>0, one otherwise.[5] The F_score equals the sum of the firm's assignments and it includes only integer numbers between zero and nine. [6]

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[5] See Piotroski (2000) for an explanation of the relation between these variables and fundamental health. See, for example, Dumontier and Raffournier (2002) and Papanastasopoulos (2014) for a review of the relationship between accounting information and capital markets in European countries.

[6] Recent studies use the F-Score as a comprehensive measure of a firm's accounting strength. For example, Chung, Liu, Wang, and Zykaj (2015) find strong evidence that long-term institutions with large shareholdings consistently improve a firm's F-Score and that such activity occurs primarily through the enhancement of a firm's operating efficiency.

Piotroski (2000) and Piotroski and So (2012) use a binary (ones and zeros) assignment because it is simple and easy to implement. Given that it could potentially eliminate important information, Piotroski (2000) checks their results using an alternative methodology where signal realisations are ranked and summed. We also measured F_Score in this way. Each year, individual signal realisations positively related to fundamental health (ROA, CFO, ΔROA, ΔLIQUID, ΔMARGIN, ΔTURN) are independently ranked and linearly assigned between zero and one (zero for the lowest signal and one for the highest). Individual signal realisations negatively related to fundamental health (ACCRUALS, ΔLEVER) are independently ranked and linearly assigned between one and zero (one for the lowest signal and zero for the highest). Given that ΔEQUITY is equal to zero in most cases, we retain the binary assignment for this signal.

The last two rows in Panel B of Table 1 show the descriptive statistics of the two F_Score alternatives: binary and ranking. Both measures range from zero to nine. The binary alternative includes only integer numbers. Panel C shows the number of observations for each integer figure of the binary F_Score. In Piotroski and So (2012) low F_Score, mid F_Score, and high F_Score categories include firm-year observations with binary F_Score less than or equal to three, between four and seven, and greater than or equal to seven, respectively. Their percentage of observations in each category is 17.62%, 60.72%, and 21.66%, respectively. Our binary F_Score distribution is more concentrated in high F_Score figures: 7.39%, 56.74%, and 35.86%, respectively. In our sample, given the low number of observations in the low F_Score category (as defined by Piotroski and So, 2012) there are some years without any figure in this classification. Because of that, we have set F_Score categories using the 30% and 70% percentiles of the ranking F_Score.[7]

3.3 Portfolio formation and return measurement

Piotroski (2000) and Piotroski and So (2012) fix portfolio formation dates several months after the firm-specific fiscal year ends. Kim and Lee (2014) argue that accumulated returns of zero-investment strategies that buy and short-sell portfolios formed at different dates cannot be practically replicated because of the lack of knowledge of portfolio weights. Moreover, these authors demonstrate that the relationship between fundamental strength and returns is partially driven by the choice of formation date.

We follow Kim and Lee's (2014) suggestion by establishing a common formation date for all fiscal years. In our sample, 94% of the fiscal year ends occurred in December. No fiscal year ends occurred in April or May. Therefore, the Spanish market offers an ideal context to verify Piotroski and So's (2012) results and avoid the problems posited by Kim and Lee (2014). We took the first of June as the formation date to ensure that accounting information was available and current for all firms in the sample[8].

On the first of June (i.e., the formation date) of each year t, we select all stocks with market value and BM data available from the month of May, and F_Score data from the previous fiscal year. Next, we construct three equally weighted portfolios using 30% and 70% percentiles for BM (F_Score) determined by the prior May’s BM distribution (the prior fiscal year’s F_Score distribution). Low-BM portfolios (i.e., ‘growth’ or ‘strong expectation’ firms) contain stocks ranked in the bottom 30%. High-BM portfolios (i.e.,

[7] We have also used the binary F_Score categories, but defining low F_Score and mid F_Score categories as figures less than or equal to four, and between five and seven, respectively. These cutoffs allow us to have observations each year in all categories. The results, available upon request, are consistent with those presented in the paper, although they are less significant.

[8] According to the Royal Decree 1362/2007, which developed into Law 24/1988, quoted firms must disclose their financial statements within two months of the fiscal year end.

‘value’ or ‘weak expectation’ firms) contain stocks ranked in the top 30%. Low-F_score portfolios (i.e., ‘weak fundamental’ firms) contain stocks ranked in the bottom 30%. High-F_score portfolios (i.e., ‘strong fundamental’ firms) contain stocks ranked in the top 30%. We construct nine portfolios from the intersections of the above BM and F_Score portfolios. For example, the high-BM × high-F_Score portfolio comprises stocks that belong simultaneously to the high-BM and high-F_Score portfolios.

We analyse buy-and-hold size-adjusted returns 12, 24, and 36 months after the portfolio formation date (holding period). As Lyon et al. (1999) demonstrate, this method is free of rebalancing and new-listing bias and allows us to obtain the actual return an investor would make in excess of the size reference portfolio by investing in the portfolio and holding for the entire period.

We use quintile size reference portfolios constructed annually on the first of June according to the market value for the month of May. We calculate the buy-and-hold return for the size reference portfolio following Lyon et al. (1999) (p.169, equation 2):

$$R_{RP}^{bh}(t,h) = \frac{\sum_{j=1}^{n_{RP,t}} \left[\prod_{z=t}^{t+h-1} (1 + R_{j,z}) \right]}{n_{RP}} \qquad \begin{array}{l} h = 12,\ 24 \text{ and } 36 \text{ months} \\ RP = 1, 2, 3, 4, 5 \text{ size quintile} \end{array} \tag{1}$$

where $R_{RP}^{bh}(t,h)$ is the buy-and-hold return of size reference portfolio RP formed on the first of month *t* over the *h* first months of the holding period, $n_{RP,t}$ is the number of stocks in the size reference portfolio RP in month *t*, and $R_{j,z}$ is the return of stock *j* in the size reference portfolio RP in month *z*.

We assign each stock to the appropriate reference portfolio and we calculate each formation date t the buy-and-hold abnormal return of each stock *i* over the *h* first months of the holding period (Lyon et al. 1999, equation 3):

$$AR_i^{bh}(t,h) = \left(\prod_{z=t}^{t+h-1} (1+R_{i,z}) \right) - R_{RP(i)}^{bh}(t,h) \quad (2)$$

where $R_{RP(i)}^{bh}(t,h)$ is the buy-and-hold return of the size reference portfolio of stock *i* on formation date *t*.

Finally, we adjust the Lyon et al. (1999) event study procedure to our portfolio analysis. We calculate the time series of average abnormal holding period returns across all firms that enter the portfolio on calendar month *t*:

$$AR_P^{bh}(t,h) = \frac{\sum_{i=1}^{n_P} AR_i^{bh}(t,h)}{n_P}; \quad \begin{array}{c} h = 12,\ 24 \text{ and } 36 \text{ months} \\ t = \text{June } 1997, 1998, \ldots \end{array} \quad (3)$$

where $AR_P^{bh}(t,h)$ is the buy-and-hold return of portfolio P (BM and F_Score portfolios) formed on the first of month t over the *h* first months of the holding period and n_P is the number of stocks that form the portfolio. Values of *h>12* had buy-and-hold size-adjusted return series with autocorrelation problems because they are overlapped. This problem was taken into account when conducting the subsequent statistical tests using Newey-West adjusted t-statistics.[9]

Note that calculating all buy-and-hold size adjusted returns for the last formation dates is not possible. Thus, for the portfolios formed on the last formation date, corresponding with the first of June 2013, we will only be able to calculate the buy-and-hold return of the first 7 months of the holding period. For those formed on the first of June 2012, we will only be able to calculate the buy-and-hold return of the first 19 months. For stocks delisted during the holding period, we replace the delisted stock return with the

[9] Although the buy-and-hold method suggested by Lyon et al. (1999) performs well in random samples of event firms, Lyon et al. (1999) caution about the misspecification of this method in non-random samples where the returns of event firms are positively correlated. Jegadeesh and Karceski (2009) propose autocorrelation-consistent test statistics over the time series of average abnormal holding period returns across all event firms that enter the sample on calendar month t (month t cohort). In our opinion, our equation (3) is equivalent to the 'events firm month t cohort' of Jegadeesh and Karceski (2009).

average return of the stocks remaining in the portfolio. Lyon et al. (1999) observed that similar results are achieved using different alternatives.

4. Empirical results

4.1. BM and F_Score portfolios

Panel A of Table 2 shows the size-adjusted buy-and-hold returns 12, 24 and 36 months after the formation date for BM portfolios and the value-growth strategy. We provide the corresponding standard p-values in brackets. For the 24- and 36-month holding periods, the corresponding Newey-West autocorrelation-consistent p-values are used. The results for the Spanish stock market are weaker than those that Piotroski and So (2012) observed in the US market. The return of Spanish value-growth strategy is 5.5% for the 12-month holding period (only statistically significant at the 10% level) and 15.20% for the 24-month holding period (statistically significant at the 5% level). Piotroski and So (2012) results for the United States are 11.81% and 19.30%, respectively (both statistically significant at the 1% level). For the 36-month holding period we observe significant returns of 28.90% (Piotroski and So, 2012, do not present returns for this holding period). Therefore, as expected given the cultural and institutional characteristics of Spain, we observe less mispricing than in the US market.

[Table 2 near here]

The last four columns of Table 2 show the F_Score, BM, Size, and past 6-month returns of each BM portfolio at the beginning of the holding period. We observe a negative relation between BM portfolios and other characteristics. Value firms are smaller, have less fundamental strength and lower past returns than average. Growth firms are bigger, have greater financial strength and higher past returns than average.

Panel B of Table 2 shows the corresponding results for F_Score portfolios. The difference between high- and low-F_Score portfolio returns was only statistically significant for the 24- and 36-month holding periods: 12.86% and 16.64%. The returns of the High-Low F_Score strategy in the Spanish market are lower than 10.03% annually for a 12-month period observed by Piotroski and So (2012) for the US market. Regarding the portfolio characteristics (last four columns), we observe a positive relation between F_Score portfolios and characteristics of size and past returns, and a negative relation between F_Score portfolios and BM.

4.2. The incongruent value-growth strategy

Table 3 shows the size-adjusted buy-and-hold returns 12 (PANEL A), 24 (PANEL B), and 36 months (PANEL C) after the formation date for the nine portfolios resulting from the BM and F_Score portfolio intersection. The last row of each panel shows abnormal returns for the incongruent and congruent strategies. The incongruent strategy buys the high-BM × high-F_Score portfolio and short-sells the low-BM × low-F_Score portfolio. The congruent strategy buys the high-BM × low-F_Score portfolio and short-sells the low-BM × high-F_Score portfolio.

[Table 3 near here]

High-F_Score value stocks significantly outperform low-F_Score value stocks (12.13%, 28.51%, and 27.89% for 12-, 24- and 36-month holding periods respectively). However, in contrast to Piotroski and So (2012), we do not observe that low-F_Score growth stocks significantly underperformed high-F-Score growth stocks for 12- and 24-

month holding periods. Only for 36-month holding periods do the weak fundamentals growth stocks significantly underperform strong growth stocks (24.70% return difference).

Regarding the incongruent value-growth strategy, although the isolated BM and F_Score strategies in the Spanish market yield weaker abnormal returns than in the US market, a strategy that combines both measures in an incongruent way yields statistically significant returns of 16.02%, 43.88%, and 57.74% for the three holding periods, respectively. These results are similar, in level and significance, to 22.64% and 37.66% for the 12- and 24- month periods, respectively, observed by Piotroski and So (2012) in the US market. Like Piotroski and So (2012), we do not observe abnormal returns with the congruent strategy.

Evidence from the Spanish market further highlights the importance of selecting potentially underpriced value (overpriced growth) stocks by using fundamental health proxies, such as the F_Score. Markets with weaker value-growth effects (even non-existent for 12-month holding periods) do not necessarily indicate the inexistence of mispricing in these stocks, but do indicate that we are not correctly selecting potentially mispriced stocks using incongruent criteria.

Panel D of Table 3 presents the average number of stocks in each portfolio. Because of the negative relation between BM and F_Score, the incongruent portfolios have fewer stocks than other portfolios. The weak fundamental growth portfolio and the strong fundamental value portfolio are formed by six and five stocks on average respectively. Therefore, in narrow stock markets, as in the case of Spain, the incongruent portfolios may not be diversified enough. We have analysed the incongruent strategy using the median to select high and low F_Score and BM stocks, which allows better diversification in incongruent portfolios (21 stocks on average). The returns of the incongruent strategy, although as expected they fell, are still statistically significant (7.23%, 22.29% and 32.88% for 12-, 24-, and 36-month holding periods respectively).

Figure 1 shows 24-month-ahead size-adjusted returns for each formation date from the first of June 1997 to the first of June 2011 for the value-growth, congruent, and incongruent strategies. The incongruent strategy yields positive returns in 14 out of 15 formation dates. The traditional value-growth strategy yielded positive returns in 11 out of 15 dates. The incongruent strategy outperformed the value-growth strategy in 13 of 15 formation dates. The congruent strategy yields negative returns in 7 of 15 formation dates and underperforms the standard value-growth strategy in 9 of the formation dates.

[Figure 1 near here]

As in Piotroski and So (2012), besides the portfolio approach conducted in the preceding analysis, we also estimate the following cross-sectional model:

$$\begin{aligned} R_{\substack{i,[t+1:t+h] \\ h=12,24,and\,36}} = {} & \beta_1 Growth_{i,t} + \beta_2 Growth_{i,t} \cdot LowScore_{i,t} + \beta_3 Growth_{i,t} \cdot MidScore_{i,t} \\ & + \beta_4 Middle_{i,t} + \beta_5 Middle_{i,t} \cdot LowScore_{i,t} + \beta_6 Middle_{i,t} \cdot HighScore_{i,t} \\ & + \beta_7 Value_{i,t} + \beta_8 Value_{i,t} \cdot MidScore_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} \\ & + \beta_{10} SIZE_{i,t} + \beta_{11} MM_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (4)$$

Here, *Growth*, *Middle*, and *Value* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 30%, middle 40% or top 30% of the BM distribution in the prior month (May), respectively. *LowScore*, *MidScore*, and *HighScore* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 30%, middle 40%, or top 30% of the F_Score distribution for the prior fiscal year. *SIZE* is assigned from 1 to 10 according to the size deciles firm *i* belongs to in the month of May. *MM* is assigned from 1 to 10 according to the deciles of the past 6-month-retursn firm *i* belongs to in the month of April (i.e. with 1-month lag). $R_{i,[t+1:t+h],h=12,24,\ and\ 36}$ is the cumulative 12-, 24-, and 36-month-ahead raw return (from June to May of year +1, +2, or +3, respectively). We have a total of 16, 15, and 14 annual cross-sectional regressions, respectively.

Because long-run cumulative annual returns show significant skewness, the standard regression test may be misspecified. Therefore, alternatively we also estimate the cross-sectional model where the dependent variable is $R_{t+j,\ j=1,2,\dots,12}$, that is, raw return in month *t+j*, for *j=1:12* (from June to next-year May), and explanatory variables keep constant during these 12 months and are those obtained in month *t* (May). We have a total of 198 monthly cross-sectional regressions.

Table 4 presents average coefficients, average adjusted R^2s, and Fama-MacBeth Newey-West adjusted t-statistics for this multivariate analysis. The dependent variable, *R*, is multiplied by 100. *Growth*, *Middle*, and *Value* coefficients capture the return corresponding to BM portfolios that are congruent with their F_Score. The interaction terms capture the difference between the returns of BM portfolios incongruent with their F_Score and congruent BM portfolios. The last three rows show the returns for the standard, congruent and incongruent value-growth strategies.

The results are consistent with those observed with the previous portfolio approach. Value stocks with strong fundamentals show significantly higher returns than value stocks with weak fundamentals (Value*HighScore coefficient). Growth stocks with weak fundamentals significantly underperform growth stocks with strong fundamentals (Growth*LowScore coefficient), although only for the longer holding periods. In all the cases incongruent value-growth strategy yields significantly positive returns while congruent value-growth strategy does not.

[Table 4 near here]

4.3. Is the incongruent value-growth strategy concentrated in small stocks?

Loughran (1997) suggests that the value premium is limited to small-cap stocks. We check the robustness of incongruent strategy profits by eliminating small-cap stocks. We eliminate all monthly observations with market capitalisations less than 100 million Euros, which accounts for approximately 25% of the dataset. Panel A of Table 5 shows the size-adjusted buy-and-hold returns for the 12-, 24-, and 36-month holding periods for the standard, congruent and incongruent value-growth strategies. We provide the corresponding autocorrelation-consistent p-values. The results are consistent with the full sample: incongruent value-growth strategy yields significant positive returns in any of the holding periods, while congruent strategy does not. Moreover, the positive abnormal returns of the incongruent strategy are quite similar to those observed for the full sample (e.g. 40.63% for 24-month returns versus 43.88% for the unrestricted sample). Therefore, the incongruent effect is not exclusive to small and illiquid stocks.

Descriptive statistics in Table 1 show that size distribution is very skewed (mean size is higher than 75th percentile). The size histogram (not presented because of parsimony) shows that a high percentage of the sample are small firms. Therefore, removing the smallest 25% of firms would not be enough to eliminate all small stocks. We also analyse the subsample of observations with market capitalisations higher than 350 million Euros, which accounts for approximately 50% of the dataset. In this subsample we do not have enough observations to avoid non-empty portfolios in some Mays when 30% and 70% percentiles are used. Therefore, we use the median to identify high and low BM and F_Score portfolios. The results are presented in Panel B. Given that we are using less extreme BM and F_Score portfolios, the returns of the incongruent strategy fall, but they still are statistically significant for the 24- and 36-month holding periods.

[Table 5 near here]

4.4. Bootstrap robustness

We check the robustness of buy-and-hold return results, using a bootstrap analysis to compute p-values. Following Lyon et al. (1999), we apply the bootstrap method to the asymmetry-adjusted t-statistic (Johnson, 1978). We use 10,000 repetitions with replacement and bootstrap samples of the same size as the original sample. Lyon et al. (1999) shows that this bootstrap procedure yields well-specified test statistics in random samples. This test is only valid for independent data. However, an autocorrelation problem is present because the buy-and-hold return series overlap each other for the 24- and 36-month holding periods. Therefore, we apply a moving block bootstrap (Efron and Tibshirani, 1993). The 24-month (36-month) buy-and-hold return series exhibit 2 (3) order autocorrelations. Therefore, the blocks are formed with 2 (3) observations. All p-values are robust to this bootstrap procedure. These results are available upon request.

4.5. Asset pricing models to calendar month returns

In addition to 'buy-and-hold size-adjusted returns', we have analysed returns adjusted by asset pricing models in a 'calendar month returns' approach. Lyon et al. (1999) suggest that these two methods yield well-specified test statistics in random samples, and "*though both ... offer advantages and disadvantages, a pragmatic solution for a researcher who is analysing long-run abnormal returns would be to use both*" (p. 198).

For every calendar month, we calculate the return that an investor would make by investing in the portfolios and holding these positions for h = 12, 24, and 36 months. We calculate this variable as the average return for all stocks within the strategy for that month. For overlapping holding period h = 24 (h = 36), the portfolio is based on stocks invested in over the last *2* (3) formation dates. At the beginning of each formation date, the stocks selected 2 (3) formation dates before are eliminated and replaced by the stocks selected in the new formation date. For example, the low-BM portfolio in calendar month *t* will be based on low-BM portfolios constructed on the first of the previous two (three) Junes. The position held by the low-BM portfolio constructed in month June 2 (3) years before will be eliminated and replaced by new portfolio on the first of the next calendar June. Following this procedure, we obtain a return for each calendar month and portfolio.

The portfolios are equally weighted on the first of June. However, the portfolios lose their initial equal weight in the next months as their stocks draw different returns. To maintain the portfolios throughout the holding period without any readjustments (i.e., buy-and-hold portfolios), we obtain the weight of each stock in each portfolio for each calendar month (see Liu and Strong, 2008, p. 2249, equation 4). We use this weight to compute the portfolio's average return for that calendar month. As in the previous approach, we opt to use buy-and-hold portfolios over rebalanced portfolios to avoid higher transaction costs and rebalancing portfolio biases.

We run the four-factor model of Carhart (1997) on the time series of average calendar monthly raw returns:

$$\begin{Bmatrix} (R_p) = \alpha + \beta_M (R_{M,t} - r_t) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{WML} WML_t + \varepsilon_{p,t}, \\ t = 06/97, 07/97, \ldots, 12/13 \end{Bmatrix} \tag{5}$$

where r_t is the risk-free asset return for calendar month t; $R_{M,t}$ is the value-weighted market portfolio return for month t; SMB_t, HML_t, and WML_t are the size, BM, and momentum factors, respectively; and α is Jensen's alpha, which gauges abnormal return. Alternatively, we also analyse CAPM and Fama and French (1993) three factor alphas.

Griffin (2002) finds that the local versions of factor models work better (in terms of adjusted R^2 and Jensen's alpha) for the stock markets of the United States, Canada, the United Kingdom, and Japan. Moerman (2005) shows that even in the integrated euro area, the domestic Fama and French model outperforms the euro area Fama and French model. Therefore, we calculate the domestic factors for the Spanish market instead of the Europe factors available in Kenneth R. French's data library. We follow the same procedure used by Fama and French (2012) to calculate international factors. Table 6 shows the descriptive statistics of the factors.

[Table 6 near here]

Table 7 shows the results of estimating CAPM, Fama and French (1993) and Carhart (1997) models for the congruent and incongruent value-growth strategies, as well as for a neutral value-growth strategy that take position in value and growth stocks with intermediate F_Score values. There are some differences between the loading factors of the congruent and incongruent value-growth strategies. The congruent value-growth strategy shows significantly positive loading on SMB and HML factors and significantly negative loadings on WML factor, whereas the incongruent value-growth strategy only shows significant positive loadings on HML factor. Consistent with our earlier size-adjusted analysis, the congruent value-growth strategy does not yield positive alphas, and the abnormal returns are exclusive for the incongruent value-growth strategy. However, both Fama and French (1993) and Carhart (1997) models explain incongruent profits more effectively, and the incongruent value-growth strategy only yields statistically significant Carhart alphas for the 24-month holding period.

[Table 7 near here]

5. Persistence of incongruent profits

In their analysis of the momentum anomaly, Jegadeesh and Titman (1993 and 2001) suggest that a strategy should stay profitable during the post-holding period if these profits are the reward for some type of risk. Conversely, we should observe a different performance if the strategy's returns are due to mispricing. Mispricing caused by overreaction or under-reaction to bad (good) news will normalise once prices reach their fair value. If mispricing is caused by initial under-reactions that ultimately become a posterior overreaction (caused by a disproportionate price adjustment to the initial under-reaction), we should observe some reversion in profits.

In this section, we analyse the evolution of the strategies' profitability in the post-holding period. Figure 2 shows the evolution of size-adjusted buy-and-hold returns over the 5-year period after formation[10]. Panel A shows that the high-BM portfolio offers continually higher size-adjusted returns than the low-BM portfolios. This evidence suggests that value firms are riskier than growth firms; thus, they offer higher average returns. Panel B shows that a combined BM and F_Score is effective when selecting underpriced (overpriced) value (growth) stocks. The strong fundamental value firms continue giving higher size-adjusted returns (more than 60% buy-and-hold excess return) than the weak fundamental growth firms until the third year after formation. Differences in returns then cease, and no reversion is observed. These results suggest the correction of a previous overreaction or an under-reaction to new information. Therefore, the behaviour

[10] I.e., the returns are calculated as in equation (2) but with h = 1-,2-,…,60-month holding periods.

detected in the incongruent strategy during the post-holding period is better explained by the 'inefficient market' instead of risk.

[Figure 2 near here]

In our opinion, this post-holding evidence supports the hypothesis that a single fundamental/price ratio (like BM) is not the best way to detect mispriced stocks. A large proportion of the value (growth) stocks could be fairly valued and their returns could be explained by their risk. This is why the standard value-growth strategy also offers positive size-adjusted returns in the post-holding period. The incongruent strategy selects those value and growth stocks that are more probably mispriced. This better selection increases the profitability in the holding period, but these returns stop in the post-holding period once the mispricing has been corrected.

6. Timing the incongruent strategy

Bird and Casavecchia (2007) demonstrate that the momentum proposed by Jegadeesh and Titman (1993) is an effective timing rule when selecting value and growth stocks. We extend Piotroski and So's (2012) research by introducing the price momentum phenomenon.[11] The mispricing hypothesis suggests that incongruent stocks yield abnormal returns because investors finally realise their mistake and make a correction. The results for the Spanish market may be explained by this mispricing hypothesis. However, when do the investors realise their mistake? The mispricing hypothesis suggests that investors are

[11] Forner and Marhuenda (2003) and Muga and Santamaría (2006) find positive evidence for the price momentum phenomenon in the Spanish stock market.

reluctant to change their expectations (e.g., anchoring, overconfidence) and that price adjustments can take some time (momentum). Panel B of Figure 2 shows that investors take an average of 3 years to adjust mispricing.

Selecting incongruent stocks with positive or negative trends in their previous short-term returns (momentum) leads to choosing mispriced stocks that the market has started to correct. The mispricing hypothesis leads us to expect 'high-BM strong fundamental' stocks to yield higher abnormal positive returns among those with higher past short-term returns. We also expect 'low-BM weak fundamental' stocks to yield higher abnormal negative returns among those with lower past short-term returns. As a result, we suggest a 'timing incongruent strategy' that buys 'past winners' high-BM strong fundamentals' and short-sells 'past losers' low-BM weak fundamentals'; and a 'non-timing incongruent strategy' that buys 'past losers' high-BM strong fundamental' and short-sells 'past winners' low-BM weak fundamentals'. The mispricing explanation leads us to expect the following:

(i) The timing incongruent strategy will yield higher returns than the non-timing incongruent strategy.

(ii) The timing incongruent strategy will be profitable during shorter holding periods than the non-timing incongruent strategy

We construct BM and F_Score portfolios using 50% cut-offs for the F_Score to guarantee non-empty portfolios. We construct two equally weighted past-return (PR) portfolios using 50% cut-offs that were determined by cumulative past returns for the prior 6 months and skipping 1 month (i.e., for the formation month t, we use the distribution of cumulative returns of each stock in months t-7 to t-2). The low-PR portfolio (i.e., 'loser' firms) contains stocks ranked in the bottom 50%, and the high-PR portfolio (i.e., 'winner' firms) contains stocks ranked in the top 50%. PR portfolios are rebalanced quarterly (first of June, September, December, and March) to better identify the momentum's initiation.

We construct 12 portfolios from the intersections of the BM, F_Score, and past-return portfolios. For example, the low-BM × low-F_Score × low-past-return portfolio contains stocks that belong simultaneously to the low-BM, low-F_Score, and low-past-return portfolios.

Panel A of Table 8 presents size adjusted buy-and-hold returns for the timing incongruent strategy and the non-timing incongruent strategy. While the timing incongruent strategy yields positive abnormal returns for all holding periods, the non-timing strategy is not profitable for the 12-month holding period: this strategy requires longer holding periods to yield positive abnormal returns. Moreover, the timing incongruent strategy outperforms the non-timing incongruent strategy for all holding periods. The last column presents the average number of stocks that form each portfolio. The loser weak fundamental growth portfolio and the winner strong fundamental value portfolio are formed by six and five stocks on average respectively. Therefore, timing incongruent portfolios may not be diversified enough. We have also analysed the incongruent strategy using the median to select high and low BM stocks, which allows us to better diversify incongruent portfolios. The results are shown in Panel B. The average number of stocks is 10 and the returns of the timing incongruent strategy, although as expected they fall, are still statistically significant and outperform the returns of non-timing incongruent strategy in all holding periods.

[Table 8 near here]

Table 9 presents CAPM, Fama and French and Carhart alphas. In contrast to the results of the standard incongruent strategy (Table 7), the timing incongruent strategy profits are robust to the three asset pricing model adjustments in all the holding periods. Moreover, the alphas of the timing incongruent strategy do not increase with the length of the holding period, so the strategy does not require long holding periods to achieve higher average monthly returns. The non-timing incongruent strategy does not yield significant returns for any of the holding periods.

[Table 9 near here]

The results are consistent with the timing hypothesis. Using past short-term return trends to decide when to buy 'high-BM strong fundamentals' and short-sell 'low-BM weak fundamentals' offers improved timing and allows us to increase abnormal returns and not have to hold stocks for more than 1 year. Consistent with hypothesis (i), timing incongruent returns are higher in magnitude and statistical significance than the non-timing incongruent strategy. Consistent with hypothesis (ii), the timing incongruent strategy is profitable for shorter holding periods, and the abnormal monthly returns do not increase for longer holding periods

Therefore, timing this strategy allows us to take a position in mispriced stocks just when the market is correcting the mistake. This strategy does not include stocks that are going to continue being mispriced and only yield long-term abnormal returns. These results support the mispricing hypothesis and are difficult to explain with the rational pricing hypothesis.

We also check the robustness of the timing incongruent results estimating a cross-sectional model:

$$\begin{aligned} R_{i,[t+1:t+12]} = {} & \beta_1 Growth_{i,t} + \beta_2 Growth_{i,t} \cdot LowScore_{i,t} + \beta_3 Growth_{i,t} \cdot LowScore_{i,t} \cdot LowPR_{i,t} \\ & + \beta_4 Middle_{i,t} \\ & + \beta_7 Value_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} \cdot HighPR_{i,t} \\ & + \beta_{10} SIZE_{i,t} + \beta_{11} MM_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{6}$$

Here, *Growth*, *Middle*, and *Value* are equal to one if at formation date t (first of June) firm i is in the bottom 30%, middle 40% or top 30% of the BM distribution in the prior month (May), respectively. *LowScore* and *HighScore* are equal to one if at formation date t (first of June) firm i is in the bottom 50% or top 50% of the F_Score distribution for the prior fiscal year. *LowPR* and *HighPR* are equal to one if at formation date t (first of June, September, December, and March) firm i is in the bottom 50%, or top 50% of the distribution of past returns for the prior 6 months and with a 1-month skip. *SIZE* is defined as in equation (4). *MM* is assigned from 1 to 10 according to the deciles of the past 6-month-returns with a 1-month skip at formation dates (first of June, September, December, and March). $R_{i,[t+1:t+12]}$ is the cumulative 1-year-ahead raw return at formation dates. We have a total of 63 quarterly cross-sectional regressions. Alternatively, we also estimate the cross-sectional model where the dependent variable is $R_{t+j,\ j=1,2,3}$, that is, raw return in month $t+j$, for $j=1:3$. We have a total of 198 monthly cross-sectional regressions.

Table 10 presents average coefficients, average adjusted R^2s, and Fama-MacBeth Newey-West adjusted t-statistics for this multivariate analysis. The dependent variable, R, is multiplied by 100. *Growth* and *Value* coefficients capture the return corresponding to BM portfolios that are congruent with their F_Score. The single interaction term captures the difference between the returns of loser incongruent BM portfolios and congruent BM portfolios. The double interaction term captures the difference between the returns of winner incongruent BM portfolios (synchronises their positions with past returns) and loser incongruent BM portfolios (does not synchronise their positions with past returns). The last three rows show the returns for the standard, non-timing and timing incongruent value-growth strategies.

The results are quite consistent with those observed with the previous portfolio approach. Incongruent value stocks with high past returns show significantly higher returns than incongruent value stocks with low past returns (Value*HighScore*HighPR coefficient). Incongruent growth stocks with low past returns significantly underperform incongruent growth stocks with high past returns (Growth*LowScore*LowPR coefficient), although this value is only statistically significant when annual returns are analysed. In all the cases the timing incongruent value-growth strategy yields significantly positive returns, while the non-timing incongruent value-growth strategy does not. As expected, when momentum (*MM*) is included in the regression as explanatory variable, the significance of the interaction of incongruent BM portfolios with past returns falls, although it is still statistically significant for incongruent value stocks when monthly returns are used as dependent variable (Panel B)

[Table 10 near here]

7. Conclusions

Value investing is an investment philosophy followed by many practitioners in capital markets. This stock-picking strategy suggests that the market commits systematic expectational errors and that detecting (and buying) undervalued stocks is possible. To find these undervalued stocks, the value investing investor analyses a wide range of accounting ratios that include not only value-to-price ratios (as BM) but also accounting-based fundamental ratios.

Research works investigating value premium or value strategies have focused only on value-to-price ratios such as the BM ratio. However, in line with value investing followed by practitioners, Piotroski (2000) and Piotroski and So (2012) combined BM with accounting-based fundamental ratios to assess the strength of firms' fundamentals. These authors demonstrate that stocks with weak fundamentals perform worse than healthier stocks when given set of high (low) BM firms. Therefore, the incongruent strategy that buys firms with high BMs and strong fundamentals and short-sells firms with low BMs and weak fundamentals yields significantly higher returns than the standard BM strategy.

The Spanish market has cultural, institutional and stock characteristics less favourable to mispricing than the US market and, consequently, shows a weak performance of the standard value-growth strategy. However, we suggest that this does not necessarily mean that there are not expectational errors in value and growth stocks, but that a single value-to-price ratio (as BM) is not sufficient to detect the potentially mispriced stocks. We demonstrate that combining BM with accounting-based fundamental ratios (as the F_Score) in the incongruent way suggested by Piotroski and So (2012) results in a really profitable strategy despite the weak profitability of the standard value-growth strategy in the Spanish market.

In addition, an analysis of the 5 years after the formation date reveals that the standard BM strategy also yields positive returns 4 and 5 years after the formation date. In contrast, the incongruent strategy is more profitable during the first 3 years but then it stops yielding abnormal returns after the third year. This long-run evidence supports the hypothesis that the standard BM strategy includes not only mispriced stocks, but also value (growth) stocks that correctly reflect bad (good) expectations and whose returns are risk based. The incongruent strategy selects those value-growth stocks that are more probably mispriced. This better selection rule results in higher positive returns in the first 3 years and this profitability stops once the mispricing is corrected.

Therefore, our results support the hypothesis that in markets with characteristics less favourable to mispricing the rule of the standard value-growth strategy is not enough. Given that the potential anomaly is not in value and growth stocks but in incongruent value and growth stocks, the standard value-growth strategy that mixes congruent with incongruent BM stocks fails to yield significant positive returns. Fundamental strength must therefore be analysed (for example, with the F_Score) to effectively select mispriced value and growth stocks.

Moreover, the fiscal year-end distribution of the Spanish stock market is highly concentrated in December. This timeframe allows us to analyse the incongruent value-growth strategy in an ideal context and to avoid the formation date problem highlighted by Kim and Lee (2014). We also demonstrate that our results are robust for non-small-cap stocks (Loughran (1997); the value premium is limited to small-cap stocks) and return non-normality (using a bootstrap procedure).

We extend Piotroski and So's (2012) work via Jegadeesh and Titman's (1993) momentum phenomenon. The momentum effect indicates the best time to buy and sell stocks. The introduction of this timing criterion in the incongruent strategy significantly improves the strategy's profits. Moreover, this timing makes achieving these profits in a shorter holding period possible.

Finally, we think our results could be useful for practitioners: the standard value-growth strategy may not be profitable in stock markets with characteristics less favourable to mispricing (as in the case of Spain), but this does not mean that practitioners should rule out value investing. Potential underpriced and overpriced stocks should be selected using not only a fundamental-to-price ratio, but in combination with the fundamental strength signals of the firm. This improved value-growth strategy (incongruent value-growth) can work even in markets where the standard value-growth strategy does not work, as in the case of Spain. Moreover, value investors can further improve their investment strategies by including a momentum criterion in order to decide the best time to buy (sell) potential overpriced (underpriced) stocks: a timing incongruent value-growth strategy.

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Table 1

Descriptive Statistics

Panel A presents descriptive statistics for our sample of 6-month market adjusted returns, stock market capitalization (SIZE), and BM ratio. Panel B presents descriptive statistics for the nine financial signals used to compute F_Score, as well as for the binary F_Score and ranking F_Score. Panel C present the distribution of the binary F_Score.

Variable	**Mean**	**Std.Dev.**	**25th Pctl.**	**Median**	**75th Pctl.**	**% >0**
PANEL A						
6 month market adjusted returns (%)	0.05	0.32	-16.56	-2.65	11.65	
SIZE (millions)	2523.91	7556.42	96.09	357.41	1571.04	
BM	1.15	10.85	0.34	0.58	0.97	
PANEL B						
ROA(%)	4.06	0.13	1.30	4.00	7.20	83.52%
CFO(%)	10.39	0.14	5.10	10.80	15.98	88.66%
IncROA(%)	2.15	1.05	-2.00	0.00	1.30	48.22%
ACCRUAL(%)	-6.33	0.19	-11.58	-7.00	-2.82	15.31%
IncLEVER(%)	0.47	0.10	-3.28	-0.10	3.00	41.26%
IncLIQUID(%)	-1.95	0.81	-15.10	-1.20	12.10	47.34%
IncEQUITY(%)	1.48	0.10	0.00	0.00	0.00	20.28%
IncOPER_MARGIN(%)	4.05	1.60	-2.27	0.01	1.77	50.20%
IncTURN(%)	-2.21	1.92	-8.60	-0.40	5.80	47.57%
Binary F_score	5.81	1.61	5	6	7	
Ranking F_score	4.80	1.18	4.00	4.79	5.56	

PANEL C: Binary F_Score distribution

	0	1	2	3	4	5	6	7	8	9
Binary F_score	12	95	311	1092	2919	4158	4514	4105	2526	695
(no. observations)		F_score∈[0:3] 1510 (7.39%)				F_Score∈[4:6] 11591 (56.74%)			F_Score∈[7:9] 7326 (35.86%)	
			F_score∈[0:4] 4429 (21.68%)				F_Score∈[5:6] 8672 (42.45%)			

Table 2

Size-adjusted buy-and-hold returns to BM and F_Score portfolios

Size-adjusted buy-and-hold returns to portfolios formed by BM ratio (Panel A) or F_Score (Panel B). Low-BM (low-F_Score) portfolio includes the 30% of stocks with the lowest BM ratio (F_Score). Middle-BM (middle-F_Score) portfolio includes the 40% of stocks with non-extreme BM ratio (F_Score). High-BM (high-F_Score) portfolio includes the 30% of stocks with the highest BM ratio (F_Score). Portfolios formed on the first of June. Holding periods of 12, 24, and 36 months. P-values in brackets (adjusted by Newey-West for the overlapped holding periods of 24 and 36 months). The last five columns show the average number of stocks, the average F_score, BM ratio, size (market capitalisation), and past returns for each portfolio.

	AR (%)			no.			Size	Past return
	12-month	24-month	36-month	stocks	F_Score	BM	(millions)	(%)
PANEL A: BM portfolios								
Low-BM (Growth)	-2.13 (0.24)	-6.85 (0.15)	-14.44 (0.06)	29	5.917	0.242	4595.594	18.274
Middle-BM	0.46 (0.70)	0.51 (0.75)	-0.93 (0.66)	39	5.949	0.606	3029.709	15.036
High_BM (Value)	3.37 (0.12)	8.35 (0.06)	14.46 (0.04)	29	5.605	1.565	1187.640	3.328
Value-Growth	5.50 (0.09)	15.20 (0.05)	28.90 (0.02)					
PANEL B: F_Score portfolios								
Low-F_Score (Weak)	-1.33 (0.37)	-5.58 (0.03)	-10.68 (0.02)	29	3.479	0.92	1764.060	8.45
Middle-F_Score	0.33 (0.82)	-0.44 (0.81)	1.28 (0.59)	39	4.792	0.77	2862.360	12.83
High-F_Score (Strong)	2.80 (0.25)	7.28 (0.10)	5.96 (0.27)	29	6.169	0.666	4244.870	16.156
High-Low	4.13 (0.20)	12.86 (0.02)	16.64 (0.02)					

Table 3
Size adjusted buy-and-hold returns to double sort portfolios on BM and F_Score

Low BM (Low-F_score) portfolio includes the 30% of stocks with the lowest BM ratio (F_score). Middle-BM (Middle F_score) portfolio includes the 40% of stocks with non-extreme BM ratio (F_score). High-BM (High-F_score) portfolio includes the 30% of stocks with the highest BM ratio (F_score). The Incongruent strategy buys the high-BM and high-F_score portfolio and short-sells the low_BM and low-F_score portfolio. The Congruent strategy buys the high-BM and low-F_score portfolio and short-sells the low_BM and high-F_score portfolio. Panels A, B, and C show the size-adjusted buy-and-hold returns for 12-, 24-, and 36-month holding periods. P-values in brackets (adjusted by Newey-West for the overlapped holding periods of 24 and 36 months). Panel D shows the average number of stocks for each portfolio. Panel E shows the average F_score, BM ratio, size (market capitalisation), and past -12 to -2 month returns for each portfolio.

	Low-BM (Growth)	Middle-BM	High_BM (Value)	Value-Growth
PANEL A: 12-month holding period *AR*				
Low-F_Score	-3.59	-1.64	0.30	3.89
	(0.37)	(0.52)	(0.93)	(0.51)
Middle-F_Score	-0.80	-0.05	1.84	2.64
	(0.83)	(0.97)	(0.56)	(0.52)
High-F_Score	-2.69	3.57	12.43	15.12
	(0.39)	(0.22)	(0.04)	(0.04)
High-Low	0.90	5.21	12.13	
	(0.87)	(0.15)	(0.07)	
Incongruent V/G Strategy	16.02	Congruent V/G Strategy	2.99	
	(0.01)		(0.58)	
PANEL B: 24-month holding period *AR*				
Low-F_Score	-14.72	-6.16	0.64	15.37
	(0.05)	(0.11)	(0.88)	(0.13)
Middle-F_Score	-7.89	1.37	3.64	11.53
	(0.06)	(0.68)	(0.64)	(0.24)
High-F_Score	-2.71	4.29	29.16	31.87
	(0.65)	(0.40)	(0.00)	(0.00)
High-Low	12.02	10.45	28.51	
	(0.14)	(0.10)	(0.00)	
Incongruent V/G Strategy	43.88	Congruent V/G Strategy	3.35	
	(0.00)		(0.70)	
PANEL C: 36-month holding period *AR*				
Low-F_Score	-28.29	-11.87	1.56	29.85
	(0.01)	(0.00)	(0.76)	(0.01)
Middle-F_Score	-17.97	3.20	18.45	36.42
	(0.01)	(0.53)	(0.16)	(0.05)
High-F_Score	-3.59	3.12	29.45	33.04
	(0.61)	(0.63)	(0.00)	(0.00)
High-Low	24.70	14.99	27.89	
	(0.02)	(0.05)	(0.00)	
Incongruent V/G Strategy	57.74	Congruent V/G Strategy	5.15	
	(0.00)		(0.62)	
PANEL D: Average no. of stocks				
Low-F_Score	6	10	12	
Middle-F_Score	11	16	11	
High-F_Score	11	12	5	

Table 3 *(Continued)*

PANEL E: F_Score, BM, Size, and past returns characteristics			
Low-F_Score	3.369	3.507	3.496
	0.250	0.616	1.527
	2193.652	2447.408	779.292
	15.440	13.636	-0.004
Middle-F_Score	4.806	4.810	4.743
	0.250	0.606	1.500
	3896.542	3155.029	1515.760
	18.134	14.672	4.511
High-F_Score	6.307	6.131	5.961
	0.233	0.606	1.718
	6184.575	3395.377	2085.594
	18.185	16.778	10.033

Table 4
Multivariate analysis

Average coefficients, average adjusted R^2s, and Fama-MacBeth Newey-West adjusted t-statistics for the following cross-sectional regressions.

$$R_{i,t} = \beta_1 Growth_{i,t} + \beta_2 Growth_{i,t} \cdot LowScore_{i,t} + \beta_3 Growth_{i,t} \cdot MidScore_{i,t} + \beta_4 Middle_{i,t} + \beta_5 Middle_{i,t} \cdot LowScore_{i,t} + \beta_6 Middle_{i,t} \cdot HighScore_{i,t}$$
$$+ \beta_7 Value_{i,t} + \beta_8 Value_{i,t} \cdot MidScore_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} + \beta_{10} SIZE_{i,t} + \beta_{11} MM_{i,t} + \varepsilon_{i,t}$$

Growth, *Middle*, and *Value* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 30%, middle 40%, or top 30% of the BM distribution in prior month (May). *LowScore*, *MidScore*, and *HighScore* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 30%, middle 40%, or top 30% of the F_Score distribution of prior fiscal year. *SIZE* is assigned from 1 to 10 according to the size deciles firm *i* belongs in the month of May. *MM* is assigned from 1 to 10 according to the deciles of the past 6-month returns firm *i* belongs in the month of April (i.e. with one-month lag). In Panels A, B, and C the dependent variable is $R_{i,[t+1:t+h],h=12,24,\ and\ 36}$, i.e. the cumulative 12-, 24- and 36-month-ahead raw return (from June to May of year +1, +2, or +3, respectively). We have a total of 16, 15, and 14 annual cross-sectional regressions, respectively. In Panel D the dependent variable is $R_{t+j,\ j=1,2,...,12}$, i.e. raw return in month $t+j$, for $j=1:12$ (from June to next-year May), and explanatory variables keep constant during this 12 months and are those obtained in month *t* (May). We have a total of 198 monthly cross-sectional regressions.

	PANEL A: 12-month returns				PANEL B: 24-month returns				PANEL C: 36-month returns				PANEL D: Monthly returns			
Growth	9.07	8.61	3.77	-5.65	11.23	14.69	7.17	-2.39	17.65	27.52	18.24	6.40	0.85	0.78	0.60	0.05
	(0.03)	(0.00)	(0.48)	(0.23)	(0.06)	(0.01)	(0.31)	(0.69)	(0.07)	(0.01)	(0.17)	(0.60)	(0.00)	(0.00)	(0.12)	(0.87)
Growth*LowScore		-3.14	-1.78	0.82		-12.20	-13.06	-9.96		-26.93	-27.85	-24.39		-0.35	-0.32	-0.16
		(0.56)	(0.66)	(0.86)		(0.01)	(0.00)	(0.01)		(0.00)	(0.00)	(0.00)		(0.31)	(0.22)	(0.56)
Growth*MidScore		1.62	2.97	4.72		-3.38	-2.63	-1.56		-11.34	-10.37	-9.89		0.26	0.32	0.44
		(0.47)	(0.30)	(0.26)		(0.31)	(0.44)	(0.67)		(0.00)	(0.00)	(0.01)		(0.12)	(0.13)	(0.15)
Middle	10.47	11.53	7.31	-0.82	17.86	20.16	13.32	4.34	30.46	36.26	27.70	15.65	0.78	0.81	0.61	0.15
	(0.05)	(0.08)	(0.38)	(0.91)	(0.11)	(0.09)	(0.30)	(0.70)	(0.06)	(0.04)	(0.15)	(0.38)	(0.03)	(0.06)	(0.30)	(0.77)
Middle*LowScore		-3.42	-2.05	-1.85		-10.24	-9.14	-8.75		-20.31	-18.73	-17.77		-0.20	-0.10	-0.09
		(0.01)	(0.06)	(0.14)		(0.12)	(0.17)	(0.18)		(0.02)	(0.02)	(0.03)		(0.04)	(0.34)	(0.36)
Middle*HighScore		-0.10	1.69	2.34		0.20	1.64	1.84		-0.74	0.71	1.04		0.10	0.20	0.21
		(0.99)	(0.60)	(0.40)		(0.96)	(0.63)	(0.60)		(0.89)	(0.91)	(0.87)		(0.77)	(0.42)	(0.40)
Value	14.33	11.75	8.90	3.19	26.74	18.95	14.22	7.54	50.28	36.96	30.40	21.20	1.04	0.83	0.67	0.33
	(0.08)	(0.13)	(0.35)	(0.71)	(0.12)	(0.28)	(0.44)	(0.66)	(0.04)	(0.09)	(0.18)	(0.32)	(0.04)	(0.11)	(0.28)	(0.55)
Value*MidScore		1.37	1.99	2.48		5.45	6.40	6.64		19.11	20.41	20.19		0.18	0.24	0.24
		(0.57)	(0.38)	(0.25)		(0.20)	(0.10)	(0.09)		(0.03)	(0.05)	(0.05)		(0.27)	(0.13)	(0.09)
Value*HighScore		9.35	10.46	8.20		23.21	23.46	21.25		28.02	28.01	24.88		0.69	0.75	0.64
		(0.04)	(0.03)	(0.10)		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)		(0.02)	(0.02)	(0.04)
Decile(Size)			0.62	0.63			1.13	1.12			1.46	1.31			0.03	0.03
			(0.22)	(0.21)			(0.01)	(0.02)			(0.05)	(0.07)			(0.41)	(0.43)
Decile(MM)				1.34				1.50				2.14				0.08
				(0.00)				(0.00)				(0.00)				(0.00)
Adj.R^2	0.02	0.06	0.09	0.10	0.04	0.07	0.08	0.09	0.03	0.05	0.07	0.07	0.01	0.02	0.04	0.05
V/G Strategy	5.26				15.51				32.63				0.19			
	(0.33)				(0.25)				(0.07)				(0.53)			
Congruent		3.13	5.13	8.84		4.26	7.05	9.93		9.45	12.16	14.80		0.05	0.07	0.28
		(0.58)	(0.26)	(0.08)		(0.77)	(0.57)	(0.43)		(0.56)	(0.35)	(0.27)		(0.90)	(0.78)	(0.35)
Incongruent		15.62	17.37	16.22		39.67	43.57	41.14		64.39	68.01	64.07		1.09	1.15	1.09
		(0.01)	(0.01)	(0.01)		(0.00)	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)		(0.00)	(0.01)	(0.01)

Table 5
Size adjusted buy-and-hold returns to congruent and incongruent value-growth strategies: size subsample

The table presents size-adjusted buy-and-hold returns for 12-, 24-, and 36-month holding periods. P-values in brackets (adjusted by Newey-West for the overlapped holding periods of 24 and 36 months). Last row shows the average number of stocks for each portfolio. The Incongruent strategy buys the high-BM and high-F_score portfolio and short-sells the low_BM and low-F_score portfolio. The Congruent strategy buys the high-BM and low-F_score portfolio and short-sells the low-BM and high-F_score portfolio. Portfolios formed on the first of June. In Panel A, BM and F_Score portfolios are formed with the 30% and 70% percentiles and monthly observations with a market capitalisation less than 100 millions are eliminated (approximately 25% of the smallest firms are removed). In Panel B BM and F_Score portfolios are formed with the 50% percentile and monthly observations with a market capitalisation less than 350 millions are eliminated (approximately the 50% of the smallest firms are removed).

PANEL A: 30% and 70% BM and F_Score percentiles, and capitalisations higher than 100 millions			
	Value-Growth	Congruent	Incongruent
12 month	7.49	2.57	23.97
	(0.06)	(0.57)	(0.01)
24 months	18.61	7.41	40.63
	(0.05)	(0.51)	(0.00)
36 months	30.02	11.13	44.88
	(0.02)	(0.41)	(0.00)
Number of stocks	Growth: 23 Value: 23	High-F_Score growth: 9 Low-F_Score value: 10	Low-F_Score growth: 5 High-F_Score value: 4
PANEL B: 50% BM and F_Score percentiles, and capitalizations higher than 350 millions			
12 month	3.67	4.19	3.01
	(0.23)	(0.31)	(0.39)
24 months	10.35	9.99	11.14
	(0.14)	(0.26)	(0.03)
36 months	17.57	13.10	24.30
	(0.08)	(0.25)	(0.00)
Number of stocks	Growth 28 Value: 27	High-F_Score growth: 15 Low-F_Score value: 16	Low-F_Score growth: 12 High-F_Score value: 11

Table 6
Descriptive statistics of the Fama and French (1993) factors

Mean and Std dev are the mean and standard deviation of the return, respectively, and t-mean is the ratio of mean to its standard error.

	SMB	HML	WML
Mean (%)	-0.29	0.80	0.63
Std Dev	3.79	4.51	5.29
t-mean	-1.08	2.49	1.66
Correlation			
SMB	1	-0.08	0.02
HML		1	0.03
WML			1

Table 7

CAPM, Fama and French, and Carhart alphas

CAPM, Fama and French (1993) and Carhart (1997) alphas to the congruent (incongruent) value-growth strategy that buys the high-BM and low-F_Score (high-F_score) portfolio and short-sells the low_BM and high-F_Score (low-F_score) portfolio. Neutral value-growth strategy is constructed with middle-F_Score stocks. Low BM (Low-F_score) porfolio includes 30% of stocks with the lowest BM ratio (F_Score). High-BM (High-F_score) portfolio includes 30% of stocks with the highest BM ratio (F_Score). Middle-F_Score portfolio includes 40% of stocks that are not included in the extreme high and low F-Score portfolios. Portfolios formed on the first of June. Holding periods of 12, 24 and 36 months in Panels A, B, and C, respectively. P-values in brackets.

	Congruent			Neutral			Incongruent		
	CAPM	Fama French	Carhart	CAPM	Fama French	Carhart	CAPM	Fama French	Carhart
PANEL A: 12-month holding period									
Alpha (%)	-0.09	-0.27	-0.03	0.31	-0.04	-0.02	1.16	0.82	0.98
	(0.81)	(0.46)	(0.94)	(0.52)	(0.94)	(0.97)	(0.07)	(0.20)	(0.13)
Market Beta	0.14	0.23	0.14	-0.22	-0.11	-0.12	-0.16	-0.09	-0.15
	(0.04)	(0.00)	(0.04)	(0.01)	(0.19)	(0.19)	(0.17)	(0.44)	(0.22)
SMB Beta		0.39	0.38		0.37	0.37		0.12	0.11
		(0.00)	(0.00)		(0.00)	(0.00)		(0.48)	(0.52)
HML Beta		0.30	0.29		0.48	0.48		0.42	0.42
		(0.00)	(0.00)		(0.00)	(0.00)		(0.00)	(0.00)
WML Beta			-0.30			-0.02			-0.20
			(0.00)			(0.83)			(0.11)
R-adjusted	0.02	0.13	0.20	0.03	0.15	0.14	0.00	0.04	0.05
PANEL B: 24-month holding period									
Alpha (%)	-0.03	-0.22	-0.07	0.37	0.04	0.03	1.46	1.17	1.29
	(0.93)	(0.46)	(0.82)	(0.40)	(0.92)	(0.94)	(0.02)	(0.06)	(0.04)
Market Beta	0.11	0.20	0.14	-0.26	-0.18	-0.18	-0.14	-0.10	-0.14
	(0.06)	(0.00)	(0.01)	(0.00)	(0.02)	(0.03)	(0.23)	(0.39)	(0.25)
SMB Beta		0.39	0.38		0.23	0.23		-0.03	-0.04
		(0.00)	(0.00)		(0.04)	(0.04)		(0.86)	(0.83)
HML Beta		0.31	0.31		0.43	0.43		0.32	0.31
		(0.00)	(0.00)		(0.00)	(0.00)		(0.02)	(0.03)
WML Beta			-0.18			0.01			-0.14
			(0.00)			(0.90)			(0.25)
R-adjusted	0.01	0.19	0.23	0.05	0.14	0.14	0.00	0.02	0.02
PANEL C: 36-month holding period									
Alpha (%)	0.07	-0.15	-0.03	0.74	0.46	0.40	1.19	0.95	1.03
	(0.83)	(0.57)	(0.91)	(0.06)	(0.22)	(0.29)	(0.05)	(0.12)	(0.09)
Market Beta	0.05	0.14	0.09	-0.23	-0.15	-0.13	-0.14	-0.12	-0.15
	(0.33)	(0.01)	(0.07)	(0.00)	(0.03)	(0.07)	(0.21)	(0.29)	(0.21)
SMB Beta		0.36	0.35		0.25	0.25		-0.11	-0.12
		(0.00)	(0.00)		(0.01)	(0.01)		(0.47)	(0.46)
HML Beta		0.34	0.33		0.38	0.38		0.24	0.24
		(0.00)	(0.00)		(0.00)	(0.00)		(0.07)	(0.08)
WML Beta			-0.15			0.07			-0.10
			(0.00)			(0.33)			(0.40)
R-adjusted	0.00	0.20	0.23	0.05	0.15	0.15	0.00	0.01	0.01

Table 8
Size-adjusted buy-and-hold returns to triple sort portfolios on BM, F_Score, and momentum

The table presents size-adjusted buy-and-hold returns for 12-, 24-, and 36-month holding periods, as well as the average number of stocks for each portfolio. In Panel A (Panel B) low BM portfolio includes 30% (50%) of stocks with the lowest BM ratio, and high-BM portfolio includes 30% (50%) of stocks with the highest BM ratio. Loser (Low-F_score) porfolio includes the 50% of stocks with the lowest past returns (F_score). Winner (High-F_score) portfolio includes 50% of stocks with the highest past returns (F_score). Portfolios formed on the first of June, September, December, and March. The non-timing incongruent strategy buys the loser high-F_score value portfolio and short-sells the winner low-F_score growth portfolio. The timing incongruent strategy buys the winner high-F_score value portfolio and short-sells the loser low-F_score growth portfolio.

PANEL A: 30% and 70% percentiles for BM

	12 months	24 months	36 months	Mean no. of stocks
Timming incongruent strategy	23.48 (0.00)	47.74 (0.00)	64.49 (0.00)	Loser low-F_Score growth: 6 Winner high-F_Score value: 5
Non-timing incongruent strategy	4.17 (0.31)	19.52 (0.01)	33.03 (0.00)	Winner low-F_Score growth: 5 Loser high-F_Score value: 5

PANEL B: 50% percentile for BM

	12 months	24 months	36 months	Min., mean and max. no. stocks
Timming incongruent strategy	13.97 (0.00)	25.68 (0.00)	34.34 (0.00)	Loser low-F_Score growth: 10 Winner high-F_Score value: 10
Non-timing incongruent strategy	1.82 (0.31)	11.43 (0.01)	20.00 (0.00)	Winner low-F_Score growth: 10 Loser high-F_Score value: 9

Table 9

CAPM, Fama and French and Carhart alphas to timing incongruent strategy

CAPM, Fama and French, and Carhart alphas. The non-timing incongruent strategy buys the loser high-F_score value portfolio and short-sells the winner low-F_score growth portfolio. The timing incongruent strategy buys the winner high-F_score value portfolio and short-sells the loser low-F_score growth portfolio. Low BM portfolio includes 30% of stocks with the lowest BM ratio. High-BM portfolio includes 30% of stocks with the highest BM ratio. Loser (Low-F_score) portfolio includes 50% of stocks with the lowest past returns (F_score). Winner (High-F_Score) portfolio includes 50% of stocks with the highest past returns (F_score). Portfolios formed on the first of June, September, December, and March. Holding periods of 12, 24, and 36 months in Panels A, B, and C, respectively. P-values in brackets.

PANEL A: 12-month holding period						
	Non-Timing incongruent strategy			Timing incongruent strategy		
	CAPM	Fama French	Carhart	CAPM	Fama French	Carhart
Alpha (%)	0.13	-0.09	0.32	1.72	1.40	1.17
	(0.82)	(0.88)	(0.56)	(0.00)	(0.00)	(0.01)
Market	-0.16	-0.10	-0.24	-0.23	-0.16	-0.08
	(0.12)	(0.37)	(0.02)	(0.01)	(0.05)	(0.33)
SMB		0.22	0.20		0.10	0.12
		(0.14)	(0.17)		(0.38)	(0.31)
HML		0.30	0.29		0.39	0.40
		(0.02)	(0.02)		(0.00)	(0.00)
WML			-0.50			0.28
			(0.00)			(0.00)
R-adjusted	0.01	0.03	0.13	0.03	0.10	0.14
PANEL B: 24-month holding period						
Alpha (%)	0.53	0.25	0.51	1.60	1.36	1.13
	(0.33)	(0.65)	(0.34)	(0.00)	(0.00)	(0.01)
Market	-0.11	-0.05	-0.14	-0.16	-0.12	-0.03
	(0.28)	(0.61)	(0.16)	(0.04)	(0.13)	(0.66)
SMB		0.10	0.09		0.05	0.06
		(0.47)	(0.53)		(0.64)	(0.54)
HML		0.34	0.33		0.28	0.29
		(0.00)	(0.00)		(0.00)	(0.00)
WML			-0.32			0.28
			(0.00)			(0.00)
R-adjusted	0.00	0.03	0.08	0.02	0.05	0.11
PANEL C: 36-month holding period						
Alpha (%)	0.56	0.31	0.46	1.31	1.11	0.90
	(0.28)	(0.55)	(0.38)	(0.00)	(0.01)	(0.02)
Market	-0.11	-0.06	-0.11	-0.16	-0.13	-0.05
	(0.23)	(0.51)	(0.25)	(0.03)	(0.09)	(0.50)
SMB		0.09	0.08		0.04	0.05
		(0.51)	(0.55)		(0.72)	(0.63)
HML		0.30	0.30		0.24	0.24
		(0.01)	(0.01)		(0.01)	(0.01)
WML			-0.18			0.26
			(0.08)			(0.00)
R-adjusted	0.00	0.03	0.04	0.02	0.04	0.10

Table 10

Multivariate analysis

Average coefficients, average adjusted R^2s, and Fama-MacBeth Newey-West adjusted t-statistics for the following cross-sectional regressions.

$$\begin{aligned} R_{i,[t+1:t+12]} = {} & \beta_1 Growth_{i,t} + \beta_2 Growth_{i,t} \cdot LowScore_{i,t} + \beta_3 Growth_{i,t} \cdot LowScore_{i,t} \cdot LowPR_{i,t} \\ & + \beta_4 Middle_{i,t} \\ & + \beta_7 Value_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} + \beta_9 Value_{i,t} \cdot HighScore_{i,t} \cdot HighPR_{i,t} \\ & + \beta_{10} SIZE_{i,t} + \beta_{11} MM_{i,t} + \varepsilon_{i,t} \end{aligned}$$

Growth, *Middle*, and *Value* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 30%, middle 40% or top 30% of the BM distribution in prior month (May). *LowScore* and *HighScore* are equal to one if at formation date *t* (first of June) firm *i* is in the bottom 50% or top 50% of the F_Score distribution of prior fiscal year. *LowPR* and *HighPR* are equal to one if at formation date *t* (first of June, September, December, and March) firm *i* is in the bottom 50% or top 50% of the distribution of past returns for the prior 6 months and with 1-month skip. *SIZE* is assigned from 1 to 10 according to the size deciles firm *i* belongs in the month of May. *MM* is assigned from 1 to 10 according to the deciles of the past 6-month returns with 1-month skip at formation dates (first of June, September, December, and March). In panel A, the dependent variable is $R_{i,[t+1:t+12]}$, the cumulative 1-year-ahead raw return at formation dates. We have a total of 63 quarterly cross-sectional regressions. In panel B, the dependent variable is $R_{t+j,\ j=1,2,3}$, i.e. raw return in month $t+j$, for $j=1:3$. We have a total of 198 monthly cross-sectional regressions.

	PANEL A: Annual returns				PANEL B: Monthly returns			
Growth	8.95	10.21	6.71	2.37	0.85	0.75	0.54	0.12
	(0.00)	(0.00)	(0.14)	(0.66)	(0.00)	(0.00)	(0.17)	(0.79)
Growth*LowScore		1.74	1.74	-0.11		0.46	0.50	0.37
		(0.39)	(0.38)	(0.97)		(0.36)	(0.31)	(0.48)
Growth*LowScore*LowPR		-9.75	-8.72	-3.90		-0.50	-0.46	-0.07
		(0.00)	(0.00)	(0.30)		(0.23)	(0.27)	(0.88)
Middle	9.28	9.28	6.68	2.87	0.77	0.77	0.61	0.17
	(0.04)	(0.04)	(0.28)	(0.68)	(0.03)	(0.03)	(0.26)	(0.77)
Value	12.51	9.55	7.37	4.38	1.04	0.79	0.65	0.40
	(0.08)	(0.14)	(0.35)	(0.59)	(0.04)	(0.08)	(0.27)	(0.50)
Value*HighScore		4.12	5.00	6.22		-0.07	0.00	0.05
		(0.00)	(0.00)	(0.00)		(0.69)	(0.99)	(0.80)
Value*HighScore*HighPR		11.77	11.19	6.91		1.39	1.36	0.94
		(0.01)	(0.00)	(0.09)		(0.00)	(0.00)	(0.01)
Decile(Size)			0.49	0.38			0.03	0.03
			(0.18)	(0.28)			(0.38)	(0.34)
Decile(MM)				0.79				0.07
				(0.00)				(0.00)
Adj.R^2	0.03	0.05	0.07	0.09	0.01	0.02	0.04	0.06
V/G Strategy	3.56				0.19			
	(0.53)				(0.53)			
Congruent		-0.66	0.66	2.01		0.04	0.11	0.29
		(0.90)	(0.87)	(0.55)		(0.89)	(0.61)	(0.14)
Incongruent Non-timing		1.73	3.91	8.34		-0.49	-0.39	-0.04
		(0.73)	(0.38)	(0.06)		(0.12)	(0.15)	(0.90)
Incongruent Timing		23.25	23.82	19.15		1.40	1.43	0.97
		(0.00)	(0.00)	(0.01)		(0.00)	(0.00)	(0.02)

Figure 1

Buy-and-hold size-adjusted return for 24 months after the formation date

Buy-and-hold size-adjusted returns for 24-month holding periods for each one of the formation dates. Portfolios formed on the first of June. The V/G strategy buys the value portfolio and short-sells the growth portfolio. The Incongruent strategy buys the High-BM and High-F_score portfolio and short-sells the Low_BM and Low-F_score portfolio. The Congruent strategy buys the High-BM and Low-F_score portfolio and short-sells the Low_BM and High-F_score portfolio. Low BM (Low-F_score) portfolio includes 30% of stocks with the lowest BM ratio (F_score). High-BM (High-F_score) portfolio includes 30% of stocks with the highest BM ratio (F_score).

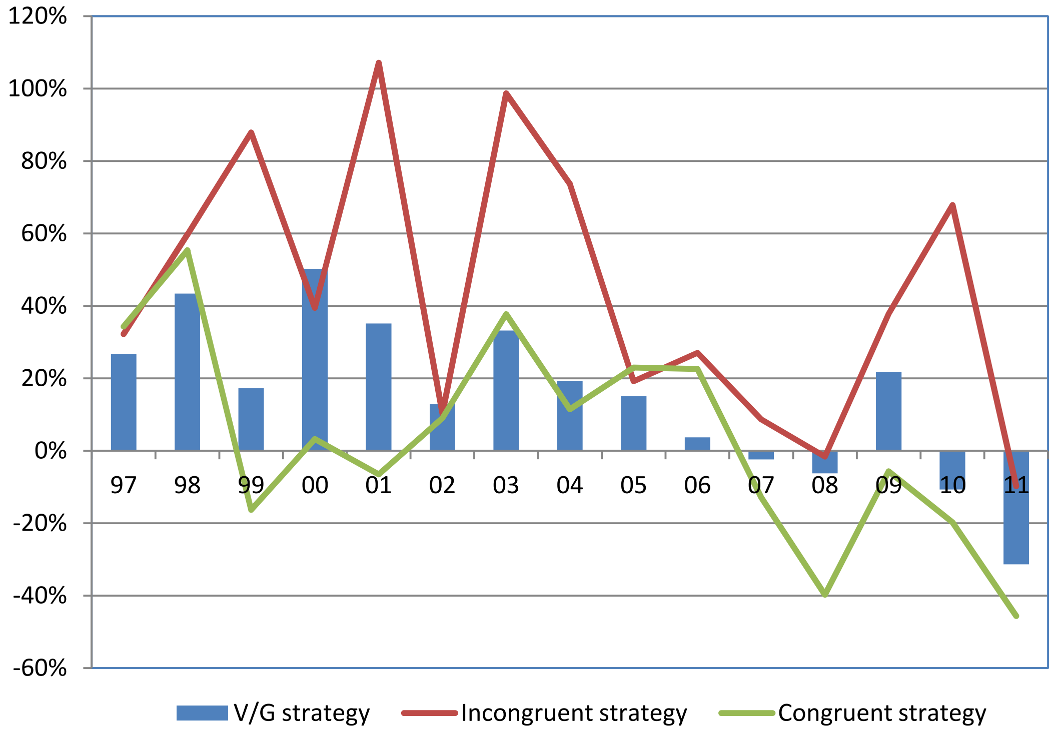
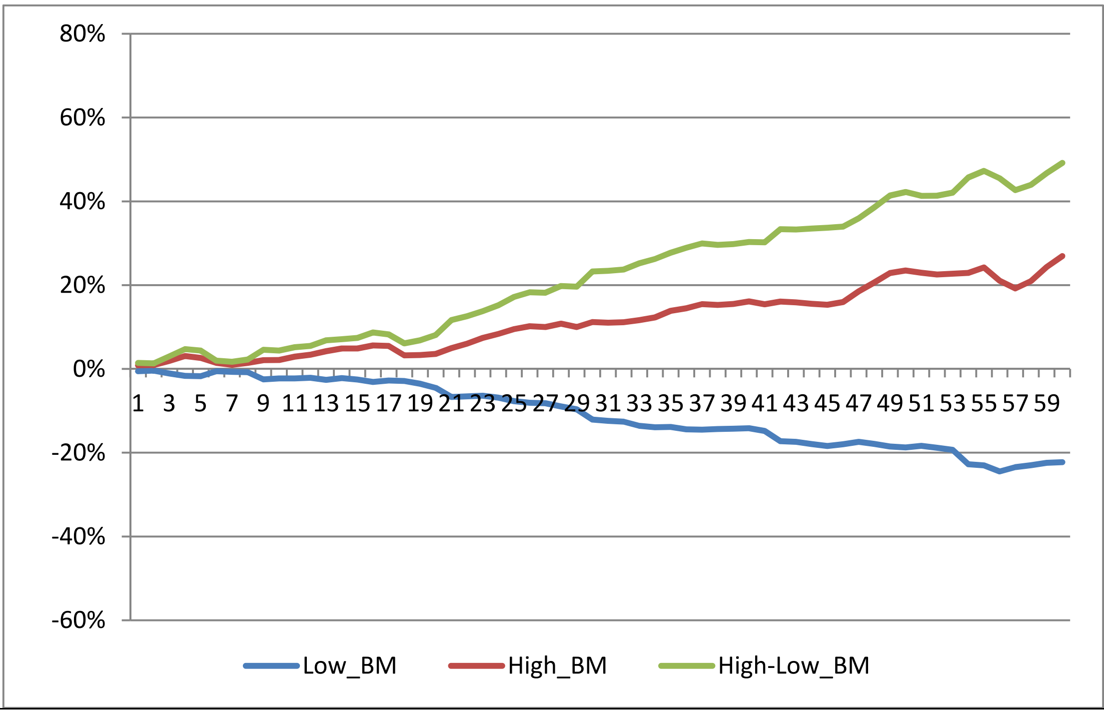


Figure 2

Buy-and-hold size-adjusted return for 60 months after the formation date

Size-adjusted buy-and-hold returns for each one of the 60 months after formation date. Portfolios formed on the first of June. The high-low_BM strategy buys the value portfolio and short-sells the growth portfolio. The Incongruent strategy buys the high-BM and high-F_score portfolio and short-sells the low_BM and low-F_score portfolio. Low-BM (Low-F_score) porfolio includes 30% of stocks with the lowest BM ratio (F_score). High-BM (High-F_score) porfolio includes 30% of stocks with the highest BM ratio (F_score).

PANEL A: BM portfolios



PANEL B: Incongruent strategy