Value versus Growth

The sources of return differences**

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Abstract

The paper empirically investigates the relationship between the value effect and firms' real activities. Using the three factor model, the risk adjusted value premium is explained only when both investment inflexibility and business cycle are taken into account. Financial constraint does not directly influence the value effect but indirectly through its influence on firms' investment and disinvestment. Of the two components of the survey based consumer confidence factor, the investor optimism component does not directly drive the value effect. The macro environment prospect component is relevant to the value effect in a similar way that the business cycle factor is.

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Introduction

Managers are classified into value and growth groups as early as in the 1920s by Edgar Lawrence Smith (1925, cited in Ibbotson and Riepe, 1997), who advocates growth investing. The first comprehensive argument in defense of value investing is from Graham and Dodd in 1934 (later edition in 1951), who discourage investors from paying too high for the growth expectation and encourage a “margin of safety” for an investment to be realized as a profit. Value investment is still one of the most popular investment styles these days. Early academic attempts to explain for the return difference between value and growth stocks in the 1960s all fail to adjust returns for risks. With the proliferation of the asset pricing model and behavioural finance literature, since then, subsequent papers study the value premium using different asset pricing models and behavioural factors. Recent theoretical development links the expected stock returns with the real activities of the underlying firm, pioneered by Berk, Green and Naik (1999). Most recently three papers, Zhang (2005), Cooper (2006) and Carlson et al. (2004), developed from Berk et al. (1999), theoretically explain the value effect based on firms’ real activities.

This paper aims at empirically investigating (a) whether the value premium actually exists, and if yes, (b) how it is linked with the real activities at firm level. It tests the following hypotheses. If the investment irreversibility mechanism in Zhang (2005) holds, the value effect would be reduced or eliminated when taking into account the extent to which firms’ investments are irreversible and its interaction with the business cycle. If the operating leverage mechanism in Carlson et al. (2004) holds, the value effect would also be reduced or eliminated when taking into account the difference in the firms’ operating leverage and its interaction with the business cycle. Similarly, if the excess capacity mechanism in Cooper (2006) holds, the value effect would be reduced or eliminated when taking into account the difference in the efficiency of firms in utilising their resources and its interaction with the business cycle.

If the financial constraint status directly affects the value effect with value firms being exposed to greater risk due to higher financial constraint than growth firms along the line of

Livdan et al. (2009) and Gulen et al. (2008), the value effect would be captured when financial constraint is the only firm level information to be taken into account. On the other hand, if the financial constraint status affects the value effect through firms' investment and disinvestment, along the line of Caggese (2007) and Hahn and Lee (2009), the value effect would only be captured when both financial constraint and investment based factors are considered.

Finally, to introduce some element of the relevance of future prospect of the macro environment, this paper tests the relevance of the two components of consumer confidence, i.e. the macro environment prospect component and the investor optimism component, to the value effect. If the former component is relevant to the value effect, the ability to capture the value effect of an asset pricing model conditional on this variable would imitate that of the model when conditioning on the business cycle information.

The paper makes the following main contributions. It provides empirical test to the theoretical models of Zhang (2005), Carlson et al. (2004) and Cooper (2008). To my knowledge, Gulen et al. (2008) is the only paper that tests the first two models and the last one has not been empirically tested. Gulen et al. (2008) find that across the BM deciles real flexibility follow a monotonic pattern; however, after controlling for real flexibility, the value effect is still statistically significant in their sample. Furthermore, Gulen et al. (2008) does not consider the interaction between real flexibility and the macro environment, a critical component in all the models tested. This paper tests all three models, considering different aspects of investment inflexibility and their interaction with the business cycle.

Furthermore, this paper contributes to the literature of the impact of financial constraint on the cross section of stock returns and attempts to differentiates two channels through which financial constraint might affect the value effect, i.e. directly or indirectly through its impact on firms' investment and disinvestment. Finally, this paper attempts to shed further light on the role of investor sentiment to the value effect by differentiating the role of the two components of survey based consumer confidence factor, i.e. the macro environment prospect component and the investor optimism component.

Consistent with the literature, this paper finds strong evidence of the existence of the value effect in the sample of firms listed in the three main stock exchanges in the U.S. from 1964 to 2006, even when the returns are adjusted for risks using Fama and French model which contains a value factor. The results support the theory in Zhang (2005), Carlson et al. (2004) and weakly support Cooper (2006).

The paper does not find supportive evidence that the financial constraint status of firms directly influence the value effect. The empirical evidence suggests that the financial constraint status of firms affects the value effect indirectly through its influence on firms' investment and disinvestment. This is in line with Caggese (2007) that financial constraint amplifies the impact of investment irreversibility on firms' investment in capital stock. It is also consistent with the finding in Hahn and Lee (2009) that financial constraint affects the relationship between firms' investment and disinvestment and their stock returns.

The paper finds the evidence that the survey based consumer confidence factor is relevant to the value effect in a similar way that the business cycle factor is relevant to it, suggesting that of the two components of the survey based consumer confidence factor used in Lemmon and Portniaguina (2006), it is the macro environment prospect component rather than the investor optimism component that is relevant to the value effect. Given that the consumer confidence factor reflects the consumer's expectation about the prospect of the macro environment whereas the business cycle factor is the historical information about the macro environment, not surprisingly the conditional Fama and French model with the consumer confidence factor captures the value effect better than that with the historical business cycle factor.

Finally, the performance of the value investment strategy among firms with different level of real flexibility is summarised as follows. Subsets of firms with high depreciation charge and high rental expense generate higher value premium than the overall sample. High operating leverage and high financial constraint generate higher value premium than in the remaining firms. However, there is no improvement as compared to the overall sample. Investors might gain more from the value investment strategy or they might save transaction costs if they choose firms in the subsets of high investment irreversibility, high operating leverage or high financial constraint instead of pursuing the strategy in the whole universe of stocks.

Literature review

Value premium and firms' real activities

Recent theoretical development links the expected stock returns with the real activities of the underlying firm. A pioneering study is by Berk, Green and Naik (1999), which proposes a mechanism to link growth option, assets-in-place and expected returns. The model requires that investment opportunities are heterogeneous in risk. Gomes, Kogan and Zhang (2003) relax this restriction by a general equilibrium context. These two papers are the foundation for the development of the three models by Zhang (2005), Cooper (2006) and Carlson et al. (2004).

Zhang (2005) relaxes the assumption in Gomes et al. (2003) that firms have equal growth options, and establish a relationship between firms' current productivity and investment decision. The value premium is explained by the cost reversibility and the countercyclical price of risk. Firstly, firms face higher cost in cutting than in expanding, resulting in asymmetric convex adjustment cost. Value firms are burdened with more unproductive capital stock. As a result of the cost reversibility assumption, in bad state of the business cycle, they will face more difficulty in cutting their capital stock compared to growth firms. On the other hand, in good state, growth stocks will face higher adjustment costs than value stocks. Due to asymmetry of the cost reversibility, expansion is easier than reduction of capital sock. Consequently, value stocks are riskier than growth stocks as the former have less flexibility than the latter in confronting external shocks. Secondly in bad state, the discount rates are higher. As a result, more assets will become redundant, and value firms will face more pressure to disinvest.

Cooper (2006) established a model using excess capacity as a proxy for investment inflexibility. When a firm has experienced adverse shocks, it has idle capital or excess capacity whereas the market value declines, leading to high BM ratio. These firms benefit more from positive shocks and suffer more from negative shocks, or having higher systematic risk. In Zhang (2005) the ease of new investment enjoyed by growth firms in good time brings about the higher flexibility of growth firms in confronting external shocks, hence lower systematic risk. In Cooper (2006), new investments are more costly and hence will partially dampen the positive effect of an economic boom to growth stocks than to value stocks. As a result, growth stocks do not co-vary much with economic booms, or are exposed to lower systematic risk. The common feature in Zhang (2005) and Cooper (2006) is that value firms have more capacity than growth firms, benefit more from positive shocks and suffer more from negative shocks. On the other hand, Carlson et al. (2004) use operating leverage and the changes in demand for firms' products to explain the value premium. When demand for a firm's product decreases, the equity value relative to its capital stock will also decrease. Given that the book value of equity is a proxy for its capital stock, the firm's BM ratio increases. Assuming that the fixed operating costs are proportional to the capital stock, the firm's operating leverage also increase, exposing the firm to higher systematic risk.

Given development of this branch of investment-related theoretical models, there is a need for empirical studies to match the growth of theoretical studies. It would be interesting to empirically test the explanatory power of firm-level investment decisions through different channels as proposed in Zhang (2005), Cooper (2006) and Carlson et al. (2004) in explaining the value premium. Anderson and Garcia Feijoo (2006) make an attempt in testing the effect of firms' investment decisions (as proxied by different relative measures of capital stock) on stock returns. They find that (1) value firms significantly accelerate capital investment before being classified according to Fama and French's portfolio sorting rules; and (2) the average return of firms that recently accelerate investment is significantly lower. These results, although shed some light on the role of firms' investment decision on stock returns, are too general to be attributable to the empirical evidence of any of the theoretical models that inspired the study. Gulen et al. (2008) use the Markov switching framework and find that the expected value premium exhibits a counter-cyclical behaviour. This evidence is consistent with the mechanisms in Zhang (2005), Cooper (2006) and Carlson et al. (2004). The time-varying pattern reported in Gulen et al. (2008) reinforces the need to take into account the conditioning information in understanding the cross section of stock returns as established in the studies on conditional asset pricing[1].

Hypothesis development

While the theoretical side of the literature suggests several mechanisms that use the real activities at firms' level to explain the value effect, the empirical side is inconclusive. This paper aims to fill in the gap of empirically testing the role of key variables in firms' real environment that are central to several theoretical mechanisms to explain the value effect. Gulen et al. (2008) use the ratio of fixed assets to total assets and the frequency of disinvestment to proxy for the investment irreversibility in Zhang (2005). Following Carlson et al. (2004), the authors use operating leverage as an aspect of real flexibility. Finally, Gulen et al. (2008) argue that financial leverage has a similar role to operating leverage in creating inflexibility in addition to imposing financial constraint to the firm, and should be considered a measure of inflexibility. When individually included in the cross sectional regression of stock returns on flexibility measures, financial leverage and operating leverage are highly statistically significant whereas the fixed asset ratio and the disinvestment proxies are not. The composite flexibility, measured as the average of the four variables, highly statistically significant.

The result of the composite index might be driven by the contribution of the financial and operating leverage rather than the fixed asset ratio and the disinvestment proxy, given the statistical insignificance of the latter two measures. In addition, this evidence therefore lends no direct support to the investment irreversibility mechanism in Zhang (2005). Furthermore, with the coefficient of the BM variable being positive and statistically highly significant in the cross sectional regressions when the composite index is included, Gulen et al. (2008) does not provide conclusive evidence that real flexibility accounts for the value effect, although they are evidently related due to the monotonic pattern of these real flexibility measures across the BM deciles. Finally, in testing the relationship between the real flexibility measures and the cross

[1] Examples include Jagannathan and Wang (1996), Petkova and Zhang (2005), Lettau and Ludvigson (2001).

section of stock returns, Gulen et al. (2008) does not consider the interaction of the macro-environment and the real flexibility factors in both Zhang (2005) and Carlson et al. (2004) to create the value effect.

In Zhang (2005), firms' investment irreversibility of value stocks makes them riskier as they are burdened with investments that are costly to reverse and become less flexible in confronting macroeconomic shocks. This paper hypothesises that if the investment irreversibility mechanism in Zhang (2005) holds, the cross sectional difference in the returns of value and growth stocks should be reduced or eliminated when taking into account the extent to which firms' investments are ***irreversible*** and its interaction with the business cycle.

According to Carlson et al. (2004), operating leverage is the key variable that interacts with changes in the demand for firms' product to create the difference in the value of high vs. low BM firms. Moreover, Gulen et al. (2008) find the relevance of operating leverage to the value effect. This paper therefore hypothesises that if the operating leverage mechanism in Carlson et al. (2004), holds the cross sectional difference in the returns of value and growth stocks should be reduced or eliminated when taking into account the difference in firms' ***operating leverage*** and its interaction with the business cycle.

Finally, Cooper (2006) suggests the role of excess capacity to the existence of the value effect. The relevance of excess capacity or efficiency to the value effect has not been tested empirically. This paper hypothesises that if the excess capacity mechanism in Cooper (2006) holds, the cross sectional difference in the returns of value and growth stocks should be reduced or eliminated when taking into account the difference in firms' ***capacity utilisation*** and its interaction with the business cycle.

The impact of real flexibility on firms' investment and disinvestment can be influenced by the firm's financial constraint status. According to Caggese (2007), the effect of investment irreversibility on investment of capital stock is reinforced by the financial constraint[2]. Hahn and

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[2] At the beginning of a downturn, firms might want to downside their fixed assets but are prevented from doing so due to the irreversibility constraint. As the downturn continues revenue becomes worsen. Some firms may also have binding financing constraint and are forced to reduce their investment in working

Lee (2009) report evidence that suggests that the cross sectional difference in firms' investment behaviour arise from financial constraints. Furthermore, Livdan et al. (2009) use simulation of data and find that firms with financial constraints are riskier as they are prevented from making investment and smoothing the dividend streams in confronting aggregate shocks. Gulen et al. (2008) include financial leverage as a proxy for financial constraint and reports that firms with higher BM have higher financial leverage.

Along the line of Livdan et al. (2009) and Gulen et al. (2008), financial constraints play a direct role to the existence of the value effect, i.e. value firms are subject to higher financial constraints and earn higher returns to compensate for investor exposure to higher level of risk. This paper hypothesises that if this argument holds, we could expect that the value premium is captured when ***financial constraint*** is taken into account whether or not firms' investment inflexibility is taken into account.

Alternatively financial constraints affect the stock returns through firms' investment and disinvestment according to Caggese (2007) and Hahn and Lee (2009). Central to the mechanisms that give rise to the value effect tested in this paper is how capital stock changes given the changes in the macro-environment. Therefore the alternative hypothesis is that if the capital stock is affected by the financial constraint status of firms, the value premium should be captured when the firm level information includes ***both financial constraints and investment based factors***, i.e. investment irreversibility or operating leverage.

Finally, to introduce some element of the relevance of future prospect of the macro environment, this paper considers the role of survey based consumer confidence alternative to the role of the business cycle. According to Lemmon and Portniaguina (2006), consumer expectations extracted from consumer confidence surveys predict business cycle peaks and troughs well. Furthermore, this measure also contains information about investor optimism,

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capital. When the downturn ends, firms are more cautious about increasing their fixed capital. Consequently, during downturns, firms that face investment irreversibility and / or financial constraint would have fixed investment at an inefficiently high level and working capital at an inefficiently low level. During upturns, fixed investment might be inefficiently low.

according to Fisher and Statman (2002, cited in Lemmon and Portniaguina (2006)). Other studies on market based investor sentiment[3] find that the evidence of the linkage between the investor sentiment and the value effect is not clear and conclusive.

Ho and Hung (2009) find that when survey based investor sentiment is used as the conditioning variable, the common asset pricing models often but not always capture the value effect. In Ho and Hung (2009), however, the two components of the survey based investor sentiment, i.e. the macro environment prospect and the investor sentiment, are not separated. This paper hypothesises that if the macro environment prospect component is relevant to the value effect, the ability to capture the value effect of an asset pricing model when the survey based ***consumer confidence*** is used as the conditioning variable will imitates that of the model when the ***business cycle*** information is used as the conditioning variable.

Measurement of key variables

To test the role of investment irreversibility to the value effect as modeled in Zhang (2005), investment irreversibility needs to be proxied for. To measure the extent to which firms' assets are irreversible, I follow the industrial economic literature. Kessides (1990) recommended a proxy for industry level sunk costs, consisting of three components – the portion of capital which can be rented (negatively correlated with the level of irreversibility), the extent to which fixed assets have depreciated (negatively correlated), and the intensity of the second-hand market for the capital employed (negatively correlated). Farinas and Ruano (2005) modified the industry-level measure in Kessides (1990) to three separate firm-level measures: a dummy of 1 for firms renting at least part of their capital and 0 otherwise, the ratio of depreciation charged during the year / total fixed assets, and the ratio of proceeds of fixed asset sale / total fixed assets.

To avoid the effect of fully depreciated assets being included in the firm's balance sheet, I replace the denominator of total fixed assets in Farinas and Ruano (2005) with

[3] Baker and Wurgler (2006), Kumar and Lee (2005). However, evidence from these studies suggests that that value and growth firms react differently to investor sentiment.

beginning of the year net fixed assets. To increase the precision in measuring the cross sectional difference in the fixed asset rental activities among firms, I use the rental expense scaled by the modified denominator instead of the dummy variables in Farinas and Ruano (2005). Finally, using one year's proceeds of fixed asset sale significantly reduce the sample size whereas arguably the underlying economic force that it measure, i.e. the intensity of the second hand market for the assets employed by a firm, would not dramatically change from one year to the next. Hence I modify the numerator of this measure in Farinas and Ruano (2005) to be the sum of the proceeds of fixed asset sale in the last three years.

The final measurements of three aspects of investment irreversibility are depreciation charge during the year, rental expense, and sum of the proceeds from fixed asset sale in the last three years, all scaled by beginning of the year net fixed assets. The higher the depreciation charge ratio, the more quickly the asset are depreciated, the more easily the firm can replace it with new assets. The more assets are rented, the more easily the firm can replace them with new assets at the end of the rental contract, normally no longer than their useful life. Finally, the more active the second hand market is, the more easily the firm can replace an asset by selling it into the second hand market to buy a new one. Therefore, arguably, all three variables are positively correlated with firms' flexibility and negatively correlated with investment irreversibility.

The fixed asset ratio used in Gulen et al. (2008) does not directly describe the extent to which a firm's assets are irreversible. Firms may have very high percentage of fixed assets in their balance sheet but this mere fact does not make the assets highly irreversible if their fixed assets, for example, are quickly depreciated. It might explain why the fixed asset ratio is statistically weakest and insignificant among the proxies for real flexibility employed in Gulen et al. (2008).

The other measurement of irreversibility at firm level in Gulen et al. (2008) is the dummy that takes the value of 1 if the firm disinvests for at least one year during the last three years. Gulen et al. (2008) attributes this measure to the frequency of disinvestment and argues that the more frequently the firm needs to disinvest, the more prone it is to irreversibility. My measurement of the asset sale proceeds ratio captures not only the frequency of disinvestment but also the magnitude of the sale proceeds. In the same manner as Gulen et al. (2008)'s argument, we could also expect that firms with high asset sale proceeds ratio disinvest more often, and consequently face the irreversibility problem more frequently, hence the lower flexibility. Similarly, the higher the depreciation charge and the rent ratios, the more frequently the firm faces the irreversibility problem and the lower the flexibility. Therefore, the three measures of investment irreversibility chosen in this paper could be negatively correlated with firms' flexibility. Which type of relationship holds for each measure is an empirical question.

To measure the operating leverage, this paper follows Gulen et al. (2008) to use the ratio of percentage changes in operating profit before tax to percentage changes in sales. To avoid the negative value of operating leverage in case operating profits and sales move in opposite directions in a year, we also follow Gulen et al. (2008) and take the three year moving average of the ratio. If the three year moving average is negative, I replace it with a missing value.

To proxy for the capacity utilisation, I measure the efficiency of each firm using Data Envelopment Analysis (DEA)[4]. I choose the following optimisation setting for each firm in 49 industries classified by Fama and French: Given the level of output, i.e. the inflation adjusted sales, the DEA technique is used to measure the optimum input levels, i.e. fixed capital in the form of depreciation expense, and human capital, in the form of inflation adjusted salary related expense. The depreciation expense is not adjusted for inflation as it reflects the historical costs at the time the fixed capital is acquired. The result of the DEA analysis is an efficiency level from 0 to 1 for each firm each year by comparing among firms in the same industry. When the DEA analysis fails to give any efficiency level for a firm, i.e. when the optimisation fails, I assume that the corresponding efficiency is zero.

To test the role of financial constraint, I use net payout ratio. Almeida and Campello (2007) use payout ratio together with credit ratings of bonds and commercial papers and total

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[4] I use the SAS code to perform DEA analysis by Emrouznejad (2005).

assets to proxy for financial constraint. According to Hahn and Lee (2009), these criteria reflect the financial constraint in terms of external funds available for borrowing rather than the higher cost of borrowing, with the former being more relevant than the latter according to Jaffee and Russell (1976), Stiglitz and Weiss (1981), and Greenwald et al. (1984). Compared with the other alternative measures in Almeida and Campello (2007), payout ratio is a more direct and straight forward measure of the ability of a firm to mobilise funds. Hence this paper uses payout ratio to proxy for financial constraint.

In the light of Boudoukh et al. (2007), this paper uses net payout ratio, i.e. the sum of dividends and stock repurchase minus share issuance, scaled by net income. Gulen et al. (2008) use financial leverage as a measure for financial inflexibility of firms. There is a subtle difference between the debt overhang and the financial constraint of a firm. A firm might have high debt overhang but if it can get access to bank loans or capital markets, it is not financially constrained. The hypotheses to be tested relate to the financial constraint status of the firm. Therefore it is more appropriate to use net payout ratio to test the hypotheses in relation to firms' financial constraint status.

Methodology and data

An asset pricing model is used to test the relevance of information about firms' inflexibility and the financial constraint status to the value effect. Literature suggests the role of conditioning information in investigating the cross section of stock returns. This paper uses the conditional asset pricing framework in Avramov and Chordia (2006). The framework involves Fama and MacBeth two stage procedure. In stage one, stock returns of individual firms are adjusted for risks using an asset pricing model. In stage two, the risk adjusted returns are regressed against the variables that proxy for the widely documented asset pricing anomalies. An asset pricing anomaly is captured when the coefficient attached to it is not significantly different from zero. Lower adjusted R-square is the signal for the improving explanatory power of the model overall.

The framework in Avramov and Chordia (2006) uses firm-level data rather than the traditional portfolio approach in order to avoid (a) losing information when stocks are grouped into portfolios and (b) data snooping biases. Another advantage of the framework is that it can flexibly incorporate additional information into the main asset pricing model used to adjust stock returns for risks. Avramov and Chordia (2006) is the first study to use both firm level variables, i.e. BM and size, and the business cycle factor to condition betas. Antoniou et al. (2007) use Avramov and Chordia (2006) framework but include analyst forecast variables in the second stage to test the impact of these variables on the momentum effect and find that these behavioral variables are not relevant to the momentum effect. Bauer et al. (2009) use this framework to price 25 size-BM portfolios. Ho and Hung (2009) condition the Fama and French factors additionally on investment sentiment and find that the conditional models often but not always capture the value effect.

Size and BM are chosen as the conditioning variables in Avramov and Chordia (2006) as they proxy for asset-in-place and growth options in Berk et al. (2003). Zhang (2005), Cooper (2006) and Carlson et al. (2004) build on the work of Berk et al. (2003) to offer the explanations to the value effect. To test the role of several inflexibility measures that are hypothesized to be relevant to the value effect, I adopt several changes to the framework settings. Size and BM are replaced with three measures of investment irreversibility, operating leverage and efficiency. Financial constraint is subsequently added as a conditioning variable to test the supplementary role of this factor. To highlight the need to take into account the interaction of the inflexibility measures with the macro environment, I subsequently supplement the business cycle factor and the interaction terms with the inflexibility measures. Finally, I replace the business cycle factor with the survey based investor sentiment. Investor sentiment is chosen as it is supposed to reflect investors' view of the future macro environment which is closely tied with the firms' investment and financing decisions to produce the value effect according to the mechanisms by Zhang (2005), Cooper (2006) and Carlson et al. (2004) tested in this paper. Furthermore, prior studies in investor sentiment also suggest that value stocks are more sensitive to it while growth stocks are not.

The general model specification is described below. In stage one, the following time series regression is run for individual firms:

$$R_{jt} - R_{Ft} = \left[\alpha_{j,0} \quad \alpha_{j,1} \quad \alpha_{j,2}\right] \times \begin{bmatrix} 1 \\ BC_{t-1} \\ BF_{j,t-1} \end{bmatrix} +$$

$$+ \sum_{f=1}^{3} \left[\beta_{j,1} \quad \beta_{j,2} \quad \beta_{j,3} \quad \beta_{j,4} \quad \beta_{j,5} \quad \beta_{j,6}\right] \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \\ BC_{t-1} \\ BF_{j,t-1} \\ Firm_{j,t-1} \times BC_{t-1} \\ Firm_{j,t-1} \times BF_{j,t-1} \end{bmatrix} \times F_{ft} + e_{jt} \qquad (1)$$

in which R_{jt} is the return on stock j at time t; BC_{t-1} is one month lagged business cycle variable, chosen as the spread between US corporate bonds with Moody's rating of AAA and BAA. F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model (1993, 1996). Firm characteristic $Firm_{jt-1}$ is the firm level measurements of (a) investment irreversibility, (b) operating leverage, and (c) financial constraint. $BF_{j,t-1}$ is the investor sentiment factor.

The conditioning factors are introduced one by one to highlight the supplementary role of each factor. The investment irreversibility measures, the operating leverage and the efficiency measure are not simultaneously present in a model as they are competing factors in different models of Zhang (2005), Carlson et al. (2004) and Cooper (2006) respectively. The business cycle factor and the investor sentiment are not simultaneously present in a model at the same time as the sentiment factor contains subjective view of investors about the macro environment and therefore is correlated with the business cycle factor.

In stage two, i.e. the cross sectional regressions, the risk adjusted returns obtained from stage one are then regressed on lagged returns to assess the explanatory power of the model to the momentum effect. Size, BM and stock turnover are included in these cross sectional regressions to control for the existence of other well documented asset pricing anomalies in the sample.

$$R_{jt}^{*} = c_{0t} + c_{BM,t} BM_{j,t-1} + \begin{bmatrix} c_{1t} & c_{2t} & c_{3t} \end{bmatrix} \times \begin{bmatrix} Size_{j,t-1} \\ PR_{j,t-1} \\ Turnover_{j,t-1} \end{bmatrix} + u_{jt} \tag{2}$$

in which R_{jt}^{*} is the risk adjusted return of stock j at time t, measured as the sum of the constant and the residual terms from equation (1). The vector of size, past returns and stock turnover in equation (2) represent the control factors, representing other well documented asset pricing anomalies (size, momentum, and liquidity). The null hypothesis is that the coefficient $c_{BM,t}$ attached to the BM is not significantly different from zero, meaning that the value effect is captured when returns are adjusted for risks in stage one. Fama and MacBeth coefficients and t-statistics are reported. The t-statistics are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987).

I follow Avramov and Chordia (2006) to measure the variables in stage two. Size measures the market capitalisation of a stock at the end of each month. To calculate BM ratio, book value equals common equity plus deferred tax (if available), market value equals market capitalisation as of December of the previous year. This ratio is matched with the series of monthly stock returns from July current year to June following year. Three variables that measure past returns are cumulative returns for month 2 to 3, 4 to 6 and 7 to 12 prior to current month. The turnover of NYSE – AMEX stocks equal trading volume divided by outstanding number of shares if the stock is listed in NYSE or AMEX. The turnover of NASDAQ stocks is constructed in a similar manner.

Following Avramov and Chorida (2006) and Brennan et al. (1998), I perform transformation of the key variables measured above to avoid skewness. I measure investor sentiment by the one month lag consumer confidence index published by the Conference Board as in Lemmon and Portniaguina (2006).

The sample size includes stocks which are not in the financial and utility sectors and are listed in the three stock markets – NYSE, AMEX and NASDAQ. Stocks should have a minimum of 36 months of non-negative book value of equity to be included in the sample. The coverage period is from July 1964 to December 2006. The resulting sample is 1,484,375 firm-months over the period of July 1964 to December 2006, or 510 months. Total number of firms across the sample is 9,821. Data used in this paper is from CRSP – Compustat databases.

The results

The existence of the value effect

To determine whether the value premium exist in the sample, I first perform the cross-sectional regression of the excess returns of individual stocks on the transformed BM ratio. Other firm characteristics, i.e. size, lagged returns and stock turnovers are included in the regression to control for the size, momentum and liquidity anomalies. Results in part A of Table 1 show that the coefficient attached to the BM variable is positive and significant. The value effect exists in the sample when stock returns are not adjusted for risks.

[Table 1 about here]

Panel B of Table 1 investigates whether the value effect exists in our sample when returns are adjusted for risks using the (unconditional) Fama and French model in the following time-series regression:

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \beta_{j,1} F_{ft} + e_{jt} \qquad (3)$$

where F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of Fama and French. Equation (3) is the restricted version of equation (1) when we impose $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,2} = \beta_{j,3} = ... = \beta_{j,6} = 0$ to equation (1). Stocks returns are adjusted for risks using Fama and French model, which includes the HML factor representing the value effect. If the value factor in the Fama and French model is sufficient to capture the value effect, we can expect the coefficient $c_{BM,t}$ in the cross-sectional regression expressed in equation (2) to be insignificant.

Panel B of Table 1 shows that after adjusting for risks in the time series regressions using the Fama and French model, the remaining return components still exhibit significant coefficient attached to the BM variable in the cross sectional regressions. The value effect exists even after returns are adjusted for risks using the unconditional Fama and French model, although the model already contains a value factor. In the following sessions, I investigate whether the value effect can be captured by the conditional version of Fama and French model containing information at the firm level and the macro level which is theoretically argued to be relevant to the value effect.

In Panel C of Table 1, the classic value investment strategy is replicated. Firms in the sample from Panel B of Table 1 are ranked into deciles based on the BM, measured in December year t-1 for observations from July of year t to June of year t+1. The value strategy is tested by reporting unadjusted returns of ten equally weighted portfolios and of the hedge portfolio that goes long in value stocks with high BM and goes short in growth stocks with low BM. The hedge portfolio generates the return of 1.33% per month and is highly statistically significant. The three panels report strong evidence of the existence of the value effect in the sample, whether returns are unadjusted or adjusted using the unconditional Fama and French model.

The role of firms' investment characteristics

To assess the sole contribution of firm level information to the value effect, the paper adjusts risks for individual stock returns using the conditional Fama and French model in which firms' investment characteristics are used as the conditioning variables. In stage one, the following time-series regression is run:

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \left[\beta_{j,1} \quad \beta_{j,2} \right] \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \end{bmatrix} \times F_{ft} + e_{jt} \tag{4}$$

in which R_{jt} is the return on stock j at time t; F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. Firm characteristic $Firm_{jt-1}$ represents the firm level variables that are relevant to the value effect, including the measurements of the extent to which firms' assets are irreversible, operating leverage, efficiency, and financial constraint status. Equation (4) is the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,3} = ... = \beta_{j,6} = 0$.

[Table 2 about here]

In Panel A of Table 2, the original sample is filtered by the availability of the measurements of investment irreversibility. Part A.1 replicates Panel B of Table 1and uses the unconditional Fama and French model to adjust for risks in stage one. Similar to the result in Panel B of Table 1, Part A.1 in Table 2 shows that the value effect is very strong in this subsample, with the coefficient $c_{BM,t}$ being highly statistically significant. In part A.2, the unconditional Fama and French model in stage one is replaced by the conditional version in which the betas are conditioned on the three measures of investment irreversibility. Given the highly significant coefficient $c_{BM,t}$ including only information about investment irreversibility does not help Fama and French model to capture the value effect. However, the coefficient $c_{BM,t}$ is smaller in part A.2, suggesting that introducing the information on firms' investment irreversibility helps reducing the economic significance of the value effect. Panel B and C of Table 2 exhibit a very similar behaviour with Panel A. In each subsample, the value effect strongly exists when the unconditional Fama and French model is used in stage one. Introducing information on operating leverage (Panel B), efficiency (panel C), or financial constraint (Panel D) does not help the model to capture the value effect, but does help to reduce the economic significance of the effect, with the coefficient $c_{BM,t}$ getting smaller when the relevant firm level information is used as the conditioning variable.

According to Caggese (2007), the effect of investment irreversibility on investment of capital stock is reinforced by the financial constraint. Hahn and Lee (2009) provide evidence that the cross sectional difference in firms' investment behaviour arise from financial constraint. We therefore expect that supplementing the conditional Fama and French model used in part A.2 with information about firms' financial constraint status can help to improve the ability of the model to capture the value effect. In Panel E, the original sample is filtered by the availability of information about both investment irreversibility measures and financial constraints. Part E.1 replicates part A.2 and uses the conditional Fama and French model with betas being conditioned on information about investment irreversibility to adjust for risks in stage one.

Similar to the result in part A.2, part E.1 shows that the value effect is very strong in this subsample with the coefficient $c_{BM,t}$ being highly statistically significant when only investment irreversibility is the conditioning variable. When financial constraint is the only conditioning variable, part E.2 reports similar result to part D.2, i.e. the coefficient $c_{BM,t}$ being highly statistically significant and hence the strong value effect. In part E.3, when both investment irreversibility and financial constraint are the conditioning variables, the value effect still strongly exists, yet with lower economic and statistical significance than in part E.1 and E.2 where only one factor plays the role of the conditioning variable.

Panel F resembles the procedures in Panel D except that the investment irreversibility factor is replaced with operating leverage. Similar patterns are also observed in part G when the investment irreversibility measure is replaced with the efficiency measure. Introducing information about firms' financial constraint to the conditional Fama and French model with firm level measurements of investment inflexibility being the conditioning variable is insufficient to capture the value effect. However, the economic and statistical significance are smaller than in the case of the single conditioning variable. Overall, the evidence from Table 2 suggests that the value effect can not be explained by taking into account solely the firm level characteristics, although the value effect could be reduced by considering both the investment inflexibility, i.e. investment irreversibility, operating leverage, or efficiency or capacity utilisation, and the financial constraint status.

The role of firm characteristics in the presence of the business cycle factor

Central to the mechanisms that give rise to the value effect in Zhang (2005), Carlson et al. (2004), and Cooper (2006) is the cyclical behaviour of firms due to their investment inflexibility. The empirical evidence presented so far suggests that solely firm level information is insufficient to capture the value effect. This session investigates the role of the business cycle in combination with the relevant firm level information.

[Table 3 about here]

Table 3 reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ. In stage one, the following time-series regression is run:

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \begin{bmatrix} \beta_{j,1} & \beta_{j,2} & \beta_{j,3} & \beta_{j,5} \end{bmatrix} \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \\ BC_{t-1} \\ Firm_{j,t-1} \times BC_{t-1} \end{bmatrix} \times F_{ft} + e_{jt} \quad (5)$$

The risk-adjusted return of individual stocks is measured as the sum of alpha and the error term. Equation (5) is the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,4} = \beta_{j,6} = 0$).

In Panel A of Table 3, the original sample is filtered by the availability of the business cycle factor and firms' investment irreversibility. Part A.1 replicates Panel B of Table 1 and uses the unconditional Fama and French model to adjust for risks in stage one. Similar to the result in Panel B of Table 1, part A.1 in Table 3 shows that the value effect is very strong in this subsample, with the coefficient $c_{BM,t}$ being highly statistically significant. Part A.2 replicates part A.2 in Table 2 where betas in the Fama and French model in stage one are conditioned on the investment irreversibility. The result is also similar, the coefficient $c_{BM,t}$ is still highly statistically significant, but the economic and statistical significance are lower than when the unconditional model is used. In part A.3 of Table 3, betas are conditioned solely on the business cycle factor. Introducing the business cycle factor only does not help the Fama and French model to capture the value effect, as the coefficient $c_{BM,t}$ is highly statistically significant.

In part A.4 of Table 3, betas are conditioned on both firms' investment irreversibility and the business cycle factor. As predicted by Zhang (2005), information about firms' investment irreversibility and its interaction with the business cycle could explain the value effect. The coefficient $c_{BM,t}$ becomes statistically insignificant and economically smaller than those in part A.1 to A.3. In addition to supporting the mechanism of Zhang (2005) this evidence also highlights the role of the external environment and the need to consider its interaction with firms' investment irreversibility.

When investment irreversibility is replaced with operating leverage in Panel B of Table 3, similar patterns are observed. The value effect exists in the subsample. Including information about operating leverage helps reduce the economic and statistical significance of the effect but is insufficient to capture it. When information about the business cycle and its interaction with firms' operating leverage is supplemented to the conditional Fama and French model, the model can capture the value effect. The coefficient $c_{BM,t}$ becomes statistically insignificant and economically smaller than those in part B.1 to B.3. In addition to supporting the mechanism of Carlson et al. (2004) this evidence also highlights the role of the external environment and the need to consider its interaction with firms' operating leverage.

In panel C of Table 3, investment irreversibility is replaced with efficiency measure. The value effect exists in the subsample. Including the information about firms' capacity utilisation has only a small impact on the economic significance of the value effect. When information about the business cycle and its interaction with efficiency is supplemented to the model, the value effect is still significant, although the economic and statistical significance is smaller. The evidence provides a weak support to Cooper (2006). Alternatively, the mechanism by Cooper (2006) might hold but the measurement of capacity utilization at firm level each year might prevent the empirical test from showing stronger supporting evidence. In Panel D of Table 3, the structure is similar to that in the previous panels except that the firm level characteristic is financial constraint. The value effect exists whether the asset pricing model in stage one is unconditional, or conditional on the financial constraint only, on the business cycle information only, or on both financial constraint and business cycle information. Hence it does not support the hypothesis that financial constraint directly contributes to the cross sectional difference in returns between value and growth stocks.

Panel E of Table 3 reports the result for the subsample with available information about the business cycle, investment irreversibility, and financial constraint. In part E.1 to E.3, the value effect exists in all scenarios when the asset pricing model in stage one is the Fama and French model, or the conditional version using both investment irreversibility and financial constraint factors as the conditioning variables, or the conditional version using solely the business cycle information. In part E.4 when all three variables, i.e. business cycle factor, investment irreversibility and financial constraint factors, are used as the conditioning variables, the Fama and French model completely captures the value effect. The coefficient $c_{BM,t}$ becomes statistically insignificant and economically smaller than those in part D.1 to D.3.

In comparison with the coefficient $c_{BM,t}$ in part A.4, the coefficient $c_{BM,t}$ in part E.4 is less significant both statistically and economically. This evidence suggests that financial constraint influences the cross sectional difference in the presence of investment irreversibility across the business cycle. It is in line with Caggese (2007) that financial constraint amplifies the impact of investment irreversibility on firms' investment in capital stock, and and Hahn and Lee (2009) that financial constraint affects the relationship between firms' investment and disinvestment and their stock returns. The result supports the hypothesis that financial constraint plays an indirect role to the value effect through amplifying the impact of investment irreversibility on the value effect across the business cycle.

Panel F of Table 3 resembles the structure of Panel E, except that investment irreversibility is replaced with operating leverage. The patterns in Panel F mirror those in Panel E. Specifically, in part F.1 to F.3, the value effect exists in all scenarios when the asset pricing model in stage one is the Fama and French model, or the conditional version using both operating leverage and financial constraint factors as the conditioning variables, or the conditional version using solely the business cycle information. In part F.4 when all three variables, i.e. business cycle factor, operating leverage and financial constraint factors, are used as the conditioning variables, the Fama and French model completely captures the value effect. The coefficient $c_{BM,t}$ becomes statistically insignificant and economically smaller than those in part F.1 to F.3. The result in Panel F confirms that in Panel E and support the hypothesis that financial constraint plays an indirect role to the value effect through amplifying the impact of operating leverage on the value effect across the business cycle.

In Panel G, the procedures in panel E is repeated when efficiency plays the role of firm level investment inflexibility. The value effect is statistically and economically weaker each time the asset pricing framework includes (a) information about financial constraint and efficiency, (b) business cycle factor, and (c) firm level information and business cycle information. In part G.4., when all three sources of information being firm level information about investment and financing inflexibility and business cycle are included in the framework, the value effect still exists. In light with the evidence from panel G of Table 2, the evidence in panel G of Table 3 suggests the weak support of Cooper (2006) and potential measurement problem for annual firm level capacity utilisation.

Overall, the evidence in Table 3 suggests the relevance of the interaction between firm level inflexibility and the business cycle. In addition, Table 3 also provides supportive evidence for the mechanisms suggested by Zhang (2005) and Carlson et al. (2004). It lends weak support to the mechanism by Cooper (2006). The weaker support to Cooper (2006) might potentially lies in the measurement of capacity utilisation. Furthermore, the evidence also suggests that financial constraint plays an indirect role to the value effect through amplifying the impact of investment inflexibility on the value effect across the business cycle.

The role of firm characteristics in the presence of investor sentiment

While there is no conclusive evidence that investor sentiment gives rise to the value effect, prior studies on investment sentiment suggest that there is evidence that value and growth firms react differently to investor sentiment. According to Lemmon and Portniaguina (2006), the survey based consumer confidence factor contains information about both investor sentiment and the macro environment prospect components. Ho and Hung (2009) find that when supplementing survey based investor sentiment information as the conditioning variable to the original Avramov and Chordia (2006) model, the value effect is often but not always captured. In Ho and Hung (2009), however, the two components of the survey based investor sentiment, i.e. the macro environment prospect and the investor sentiment, are not separated.

So far, this paper establishes that the macro environment information is relevant to the value effect given firm level inflexibility. This session tests whether the macro environment prospect component or the investor sentiment component in the consumer confidence factor is relevant to the value effect.

[Table 4 about here]

Table 4 reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ. In panel A, the following time-series regression is run in stage one:

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \left[\beta_{j,1} \quad \beta_{j,2} \quad \beta_{j,4} \quad \beta_{j,6} \right] \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \\ BF_{t-1} \\ Firm_{j,t-1} \times BF_{t-1} \end{bmatrix} \times F_{ft} + e_{jt} \qquad (6)$$

The risk-adjusted return of individual stocks is measured as the sum of alpha and the error term. Equation (6) is the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,3} = \beta_{j,5} = 0$). BF_{t-1} is the one month lagged consumer confidence index published by the Conference Board and used in Lemmon and Portniaguina (2006).

In Panel A of Table 4, the original sample is filtered by the availability of the consumer confidence and firms' investment irreversibility. Part A.1 replicates Panel B of Table 1 and uses the unconditional Fama and French model to adjust for risks in stage one. Similar to the result in Panel B of Table 1, part A.1 in Table 4 shows that the value effect is very strong in this subsample, with the coefficient $c_{BM,t}$ being highly statistically significant. Part A.2 replicates part A.2 in Table 2 where betas in the Fama and French model in stage one are conditioned on the investment irreversibility. The result is also similar, the coefficient $c_{BM,t}$ is still highly statistically significant, but the economic and statistical significance are lower than when the unconditional model is used. In part A.3 of Table 4, betas are conditioned solely on the consumer confidence variable. Introducing the consumer confidence factor only does not help the Fama and French model to capture the value effect, as the coefficient $c_{BM,t}$ is highly statistically significant. Investor sentiment is therefore not the sole factor to the value effect.

In part A.4 of Table 4, betas are conditioned on both firms' investment irreversibility and the consumer confidence factor. The coefficient $c_{BM,t}$ becomes statistically insignificant and economically smaller than those in part A.1 to A.3. The patterns in Panel A of Table 4 mirror those in Panel A of Table 3 where the business cycle factor is in the palce of the consumer confidence factor. This evidence suggests that the macro environment prospect component in the consumer confidence rather than the investor sentiment component is relevant to the value effect. Furthermore, given that the consumer confidence factor reflects the consumer's expectation about the prospect of the macro environment whereas the business cycle factor is the historical information about the macro environment, not surprisingly the coefficient $c_{BM,t}$ in part A.4 of Table 4 is also statistically and economically less significant than the coefficient $c_{BM,t}$ in panel A.4 of Table 3. Finally, not only the patterns in Panel A of Table 4 mirror those in Panel A of Table 3, the patterns in the other panels, i.e. B to G, of Table 4 also imitate those in the corresponding panels of Table 3. The evidence therefore confirms that of the two components of the survey based consumer confidence factor, the investor optimism component is not the driving factor to the value effect. The macro environment prospect component is relevant to the value effect in a similar way that the business cycle factor is relevant to it.

The value investment strategy

If theoretically and empirically investment inflexibility and financial constraint are relevant to the existence of the value effect, a practical question is how this information can benefit investors. Table 5 reports the value investment strategy among firms with different levels of investment and financial inflexibility. First, the sample from Panel B of Table 1 is filtered for the availability of the depreciation charge ratio in Panel A, rent ratio in Panel B, fixed asset sale proceed ratio in Panel C, operating leverage in Panel D, and financial constraint in Panel E. Firms within each of these subsamples are partitioned into high (70th percentile and above), medium (30th percentile to 70th percentile) and low measures (below 30th percentile) of flexibility or financial constraints. Within each subsample and subset, firms are ranked into deciles based on the BM, measured in December year t-1 for observations from July of year t to June of year t+1. The value strategy is tested by reporting unadjusted returns of ten equally weighted portfolios and of the hedge portfolio that goes long in value stocks with high BM and goes short in growth stocks with low BM. Given that the conditional framework with excess capacity in Tables 2, 3 and 4 only weakly support the mechanism by Cooper (2006), which might be due to the measurement of capacity utilisation, this section does not report the value investment strategy among firms with high vs. low levels of capacity utilisation.

[Table 5 about here]

With regard to the proxies for investment irreversibility, i.e. depreciation charge ratio, rent ratio and fixed asset sale proceeds ratio, on the one hand, arguably all three variables are positively correlated with firms' flexibility and negatively correlated with investment irreversibility. This is because the higher the depreciation charge ratio, the more quickly the asset are depreciated, the more easily the firm can replace it with new assets. The more assets are rented, the more easily the firm can replace them with new assets at the end of the rental contract, normally no longer than their useful life. Finally, the more active the second hand market is, the more easily the firm can replace an asset by selling it into the second hand market to buy a new one. On the other hand, in the same manner as Gulen et al. (2008)'s argument, we could also expect that firms with high asset sale proceeds ratio disinvest more often, and consequently face the irreversibility problem more frequently, hence the lower flexibility.

Similarly, the higher the depreciation charge and the rent ratios, the more frequently the firm faces the irreversibility problem and the lower the flexibility. Therefore, the three measures of investment irreversibility could be negatively correlated with firms' flexibility.

In Panel A of Table 5, the value premium is highest in the high depreciation charge subset of firms, and 31% higher than the value premium in the overall subsample. In Panel B of Table 5, it is also highest in the high rent subset and is 16% higher than the value premium in the overall subsample. This evidence suggests that in the context of value and growth stocks, high depreciation charge and high rental activities force firms to face the question of investment irreversibility more often, and firms that face this problem more often are less flexible. Among these less flexible firms, any difference in the flexibility between value and growth firms will be amplified into higher value premium. Accordingly, the value premium among these firms is highest.

In Panel C of Table 5, the value premium is higher at the two ends of the fixed asset sale proceeds spectrum but its magnitude only approximates the magnitude of the value premium in the overall subsample. The asset sale proceed measure reflects two sides of investment irreversibility which are both relevant to the value effect. On the one side, low sales proceeds means less active second hand market for firms' assets, exposing firms to more inflexibility. On the other side, high sales proceeds means firms disinvest more often as also argued in Gulen et al. (2008). Firms that face the question of investment irreversibility more often are less flexible. Hence in the context of value and growth stocks, firms at the two extremes of capital stock sale proceeds generate higher value premium.

In Panel D and E of Table 5, the value premium is highest in the high operating leverage and high financial constraint subsets respectively. The evidence is supportive of the hypotheses that the higher the operating leverage (financial constraint), the higher the value premium. However, there is no improvement in the performance of the overall sample and of the highest performing subsets.

The practical implications for investors from the empirical evidence can be summarised as follows. The subsets of firms with high depreciation charge and high rental expense generate higher value premium than the overall sample. Firms with high operating leverage and high financial constraint generate higher value premium than the remaining firms. However, there is no improvement as compared to the overall sample. Investors might benefit from saving transaction costs if they choose firms in these subsets instead of the overall universe of firms when pursing the value investment strategy.

Conclusion

The paper investigates the role of various sources from firms' real environment that contribute to the value effect. Consistent with the literature, this paper finds strong evidence of the existence of the value effect in the sample of firms listed in the three main stock exchanges in the U.S. from 1964 to 2006, even when the returns are adjusted for risks using Fama and French model which contains a value factor. Sole information about either firms' investment irreversibility or operating leverage is insufficient to completely explain the risk adjusted value premium. When investment irreversibility is considered together with the financial constraint status, this combination is still insufficient to capture the value effect but helps reduce the economic significance of the effect. Similar pattern is observed when financial constraint is combined with operating leverage or with capacity utilisation. The evidence suggests that the models of Zhang (2005), Carlson et al. (2004) and Cooper (2006) are not supported if only firm level information is taken into account.

The theoretical models of Zhang (2005), Carlson et al. (2004) and Cooper (2006) suggest that the value effect arises as firms' inflexibility makes value and growth firms behave differently across different phases of the business cycle. This paper reports that only when both investment irreversibility and business cycle are taken into account does the Fama and French model capture the value effect. This evidence supports the theory in Zhang (2005) and highlights the important role of the business cycle in explaining the value effect. Similarly operating leverage and the business cycle factor together help the Fama and French model to capture the value effect, a result that is supportive to Carlson et al. (2004). In the presence of both capacity utilisation and the business cycle factor, the Fama and French model still fails to capture the value effect, yet the economic and statistical significance of it are lower than when only capacity utilisation is present. Therefore, the mechanism in Cooper (2006) is weakly supported, and the weak support might be due to the measurement of capacity utilisation.

The paper does not find supportive evidence that the financial constraint status of firms solely influence the value effect. The Fama and French model fails to capture the value effect when conditioned only on financial constraint or on both financial constraint and the business cycle factor. However, when supplementing the financial constraint factor to the conditional Fama and French model which contains information about (a) investment irreversibility or operating leverage and (b) the business cycle factor, the explanatory power of the model with regard to the value effect significantly improves statistically and economically. This evidence suggests that the financial constraint status of firms affects the value effect indirectly through its influence on firms' investment and disinvestment. This is in line with Caggese (2007) that financial constraint amplifies the impact of investment irreversibility on firms' investment in capital stock. It is also consistent with the finding in Hahn and Lee (2009) that financial constraint affects the relationship between firms' investment and disinvestment and their stock returns.

The paper finds the evidence that the survey based consumer confidence factor is relevant to the value effect in a similar way that the business cycle factor is relevant to it, suggesting that of the two components of the survey based consumer confidence factor used in Lemmon and Portniaguina (2006), it is the macro environment prospect component rather than the investor optimism component that is relevant to the value effect. Given that the consumer confidence factor reflects the consumer's expectation about the prospect of the macro environment whereas the business cycle factor is the historical information about the macro environment, not surprisingly the conditional Fama and French model with the consumer confidence factor captures the value effect better than that with the historical business cycle factor.

Finally, the performance of the value investment strategy among firms with different level of real flexibility is summarised as follows. Subsets of firms with high depreciation charge and high rental expense generate higher value premium than the overall sample. High operating leverage and high financial constraint generate higher value premium than in the remaining firms. However, there is no improvement as compared to the overall sample. Investors might gain more from the value investment strategy or they might save transaction costs if they choose firms in the subsets of high investment irreversibility, high operating leverage or high financial constraint instead of pursuing the strategy in the whole universe of stocks.

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Table 1: The existence of the value effect

This table reports the existence of the value effect in the sample. First, in Panel A, raw excess returns of individual stocks are cross-sectionally regressed against the transformed BM ratio. Other anomalies are controlled by including the transformed variables that proxy for them, including size, lagged returns, stock turnovers. Similar to Avramov and Chordia (2006), we include NASDAQ dummy to reflect the difference in the way trading volume is recorded for NYSE-AMEX versus NASDAQ stocks. Panel A reports the time-series averages of these cross-sectional regressions. A significant coefficient attached to the BM ratio is evident for the existence of the value effect in the sample using the raw stock returns.

Panel B reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ.

$$R^{*}_{jt} = c_{0t} + c_{BM,t} BM_{j,t-1} + \begin{bmatrix} c_{1t} & c_{2t} & c_{3t} \end{bmatrix} \times \begin{bmatrix} Size_{j,t-1} \\ PR_{j,t-1} \\ Turnover_{j,t-1} \end{bmatrix} + u_{jt} \qquad (2)$$

in which R^{*}_{jt} is the risk-adjusted returns of individual stocks using the Fama and French model. The risk adjusted returns are measured as the sum of alpha and error term in the following time-series regressions for individual stocks (the unconditional version of equation (1)):

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \beta_{j,1} F_{ft} + e_{jt} \qquad (3)$$

R_{jt} is the return on stock j at time t; F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. The vector of size, lagged returns and stock turnover in equation (2) represent the control factors, representing other well documented asset pricing anomalies (size, momentum, and liquidity). These factors are constructed following Avramov and Chordia (2006). Details of how these variables are constructed are in the Methodology and data session. The null hypothesis is that the coefficient $c_{BM,t}$ attached to the BM ratio is not significantly different from zero, meaning that the value effect does not exist once returns are adjusted for risks in stage one. The t-statistics are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure. *, ** and *** denote the statistical significance levels of 10%, 5% and 1% respectively. The coefficients are multiplied by 100.

Panel A: The value effect using raw returns	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.27	0.97	0.71	0.53	-0.16	-0.09	-0.11	-0.25	0.90	4.82%
t value	3.86	4.03	3.55	3.44	-3.16	-1.36	-1.78	-1.10	3.04	
p value	0%	0%	0%	0%	0%	17%	8%	27%	0%	
	***	***	***	***	***		*		***	

Panel B: The value effect using risk adjusted returns from unconditional model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.67	0.63	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.16	4.92	3.90	3.88	-2.73	-1.86	-3.55	-0.43	0.72	
p value	0%	0%	0%	0%	1%	6%	0%	67%	47%	
	***	***	***	***	***	*	***			

Panel C: The value effect in the value investment strategy

BM decile	Return	t-value	p-value	
Growth	0.69	2.10	4%	**
2	1.01	3.31	0%	***
3	1.14	3.99	0%	***
4	1.19	4.35	0%	***
5	1.36	5.14	0%	***
6	1.48	5.60	0%	***
7	1.60	6.03	0%	***
8	1.66	6.17	0%	***
9	1.85	6.54	0%	***
Value	2.02	6.39	0%	***
V-G	**1.33**	**6.13**	**0%**	***

Firms in the sample from Panel B of Table 1 are ranked into deciles based on the BM, measured in December year t-1 for observations from July of year t to June of year t+1. The value strategy is tested by reporting unadjusted returns of ten equally weighted portfolios and of the hedge portfolio that goes long in value stocks with high BM and goes short in growth stocks with low BM.

Table 2: The value effect and firms' investment characteristics

This table reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ.

$$R^*_{jt} = c_{0t} + c_{BM,t} BM_{j,t-1} + \begin{bmatrix} c_{1t} & c_{2t} & c_{3t} \end{bmatrix} \times \begin{bmatrix} Size_{j,t-1} \\ PR_{j,t-1} \\ Turnover_{j,t-1} \end{bmatrix} + u_{jt} \qquad (2)$$

in which R^*_{jt} is the risk-adjusted returns of individual stocks, measured as the sum of alpha and error term in the following time-series regressions for individual stocks (the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,3} = ... = \beta_{j,6} = 0$):

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \begin{bmatrix} \beta_{j,1} & \beta_{j,2} \end{bmatrix} \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \end{bmatrix} \times F_{ft} + e_{jt} \qquad (4)$$

R_{jt} is the return on stock j at time t; F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. $Firm_{j,t-1}$ represents the firm level variables that are relevant to the value effect, including the measurements of the extent to which firms' assets are irreversible, operating leverage, efficiency and financial constraint status. The measurements of three aspects of investment irreversibility are depreciation charge during the year, rental expense, and sum of the proceeds from fixed asset sale in the last three years, all scaled by beginning of the year net fixed assets. Arguably, all three variables are positively correlated with firms' flexibility and negatively correlated with investment irreversibility. To measure the operating leverage, this paper uses the three year moving average of the ratio of percentage changes in operating profit before tax to percentage changes in sales. If the three year moving average is negative, it is replaced with a missing value. Efficiency is measured by comparing firms within each of 49 Fama and French industries and estimating the optimal inputs (fixed capital and labour) given the level of output (inflation adjusted sales), using the DEA technique. If optimisation is not possible, the efficiency measure is assigned zero. Net payout ratio, i.e. the sum of dividends and stock repurchase minus share issuance, scaled by net income, is used to proxy for financial constraint. These accounting products are measured in December each year and matched with stock returns from June the next year to July the following year. These variables are lagged one month to become $Firm_{j,t-1}$ in equation (4). Panel A, B and C report the results of the subsamples with available information to measure investment irreversibility, operating leverage and financial constraint respectively. Panel D reports the result of the subsample with available information to measure both investment irreversibility and financial constraint. Panel E reports the result of the subsample with available information to measure both operating leverage and financial constraint.

The vector of size, lagged returns and stock turnover in equation (2) represent the control factors, representing other well documented asset pricing anomalies (size, momentum, and liquidity). These factors are constructed following Avramov and Chordia (2006). Details of how these variables are constructed are in the Methodology and data session. The null hypothesis is that the coefficient $c_{BM,t}$ attached to the BM ratio are not significantly different from zero, meaning that the value effect is captured when returns are adjusted for risks in stage one. The t-statistics are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure. *, ** and *** denote the statistical significance levels of 10%, 5% and 1% respectively. The coefficients are multiplied by 100.

Panel A: Subsample with investment irreversibility availability										
A.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.22	0.78	0.55	0.50	-0.09	-0.10	-0.11	-0.34	0.06	2.01%
t value	3.82	3.39	3.24	3.26	-2.29	-1.93	-2.41	-1.53	0.79	
p value	0%	0%	0%	0%	2%	5%	2%	13%	43%	
	***	***	***	***	**	**	**			
A.2. Betas are conditioned on investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	0.69	0.55	0.49	-0.07	-0.10	-0.10	-0.21	0.13	2.05%
t value	2.68	2.83	3.10	3.35	-2.01	-2.18	-2.24	-1.17	1.95	
p value	1%	0%	0%	0%	5%	3%	3%	24%	5%	
	***	***	***	***	**	**	**		**	
Panel B: Subsample with operating leverage availability										
B.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.28	0.62	0.53	-0.07	-0.07	-0.19	0.02	0.05	2.29%
t value	2.65	5.53	3.53	3.64	-2.56	-2.07	-4.05	0.09	0.78	
p value	1%	0%	0%	0%	1%	4%	0%	93%	43%	
	***	***	***	***	***	**	***			

B.2. Betas are conditioned on operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.10	1.28	0.63	0.53	-0.06	-0.07	-0.19	0.05	0.06	2.23%
t value	2.20	5.41	3.61	3.64	-2.40	-2.12	-4.21	0.24	1.04	
p value	3%	0%	0%	0%	2%	3%	0%	81%	30%	
	**	***	***	***	**	**	***			

PanelC: Subsample with efficiency

C.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.07	0.64	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.16	4.93	3.91	3.88	-2.74	-1.86	-3.56	-0.43	0.70	
p value	0%	0%	0%	0%	1%	6%	0%	67%	48%	
	***	***	***	***	***	*	***			
C.2. Betas are conditioned on efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.15	1.07	0.63	0.53	-0.08	-0.09	-0.17	-0.09	0.05	2.23%
t value	3.14	4.95	3.86	3.87	-2.67	-1.89	-3.63	-0.41	0.72	
p value	0%	0%	0%	0%	1%	6%	0%	68%	47%	
	***	***	***	***	***	*	***			

Panel D: Subsample with financial constraint availability

D.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.08	0.64	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.12	4.99	3.92	3.88	-2.74	-1.96	-3.51	-0.43	0.72	
P value	0%	0%	0%	0%	1%	5%	0%	66%	47%	
	***	***	***	***	***	**	***			
D.2. Betas are conditioned on financial constraints	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.14	1.04	0.66	0.55	-0.08	-0.10	-0.15	-0.15	0.06	2.17%
t value	2.96	4.82	4.15	4.06	-2.66	-2.20	-3.41	-0.72	0.97	
P value	0%	0%	0%	0%	1%	3%	0%	47%	33%	
	***	***	***	***	***	**	***			

Panel E: Subsample with investment irreversibility and financial constraint availability

E.1. Betas are conditioned on investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	0.70	0.55	0.50	-0.07	-0.11	-0.10	-0.21	0.13	2.05%
t value	2.68	2.86	3.08	3.36	-2.00	-2.17	-2.25	-1.18	1.96	
P value	1%	0%	0%	0%	5%	3%	2%	24%	5%	
	***	***	***	***	**	**	**		**	
E.2. Betas are conditioned on financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.20	0.72	0.58	0.51	-0.08	-0.11	-0.10	-0.37	0.08	1.96%
t value	3.77	3.14	3.45	3.42	-2.20	-2.20	-2.17	-1.62	1.06	
P value	0%	0%	0%	0%	3%	3%	3%	11%	29%	
	***	***	***	***	**	**	**			
E.3. Betas are conditioned on both investment irreversibility and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	0.68	0.56	0.51	-0.06	-0.12	-0.09	-0.25	0.14	2.20%
t value	2.38	2.70	2.99	3.49	-1.93	-2.42	-2.20	-1.37	2.11	
P value	2%	1%	0%	0%	5%	2%	3%	17%	4%	
	**	***	***	***	**	**	**		**	

Panel F: Subsample with operating leverage and financial constraint availability

F.1. Betas are conditioned on operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.10	1.28	0.63	0.53	-0.06	-0.07	-0.19	0.05	0.06	2.23%
t value	2.20	5.44	3.62	3.64	-2.41	-2.17	-4.20	0.25	1.04	
P value	3%	0%	0%	0%	2%	3%	0%	80%	30%	
	**	***	***	***	**	**	***			
F.2. Betas are conditioned on financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	1.26	0.62	0.56	-0.06	-0.08	-0.18	-0.02	0.06	2.23%
t value	2.35	5.46	3.54	3.96	-2.33	-2.49	-3.93	-0.09	1.04	
P value	2%	0%	0%	0%	2%	1%	0%	93%	30%	
	**	***	***	***	**	***	***			

F.3. Betas are conditioned on both operating leverage and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.08	1.25	0.62	0.58	-0.06	-0.08	-0.18	0.09	0.07	2.28%
t value	1.86	5.24	3.39	4.11	-2.25	-2.57	-4.09	0.48	1.33	
P value	6%	0%	0%	0%	2%	1%	0%	63%	18%	
	*	***	***	***	**	***	***			

Panel G: Subsample with efficiency and financial constraint availability

G.1. Betas are conditioned on efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.15	1.09	0.63	0.53	-0.08	-0.10	-0.16	-0.09	0.05	2.23%
t value	3.11	5.03	3.88	3.88	-2.67	-1.99	-3.59	-0.41	0.72	
P value	0%	0%	0%	0%	1%	5%	0%	68%	47%	
	***	***	***	***	***	**	***			
G.2. Betas are conditioned on financial constraint										
Coefficient	0.14	1.05	0.66	0.55	-0.08	-0.10	-0.15	-0.15	0.06	2.18%
t value	2.96	4.83	4.14	4.06	-2.68	-2.20	-3.42	-0.72	0.96	
P value	0%	0%	0%	0%	1%	3%	0%	47%	34%	
	***	***	***	***	***	**	***			
G.3. Betas are conditioned on both efficiency and financial constraint										
Coefficient	0.13	1.05	0.66	0.55	-0.08	-0.10	-0.16	-0.15	0.06	2.16%
t value	2.91	4.82	4.09	4.06	-2.62	-2.24	-3.49	-0.70	1.00	
P value	0%	0%	0%	0%	1%	3%	0%	48%	32%	
	***	***	***	***	***	**	***			

Table 3: The value effect and the supplementary role of the business cycle

This table reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ.

$$R^*_{jt} = c_{0t} + c_{BM,t} BM_{j,t-1} + \begin{bmatrix} c_{1t} & c_{2t} & c_{3t} \end{bmatrix} \times \begin{bmatrix} Size_{j,t-1} \\ PR_{j,t-1} \\ Turnover_{j,t-1} \end{bmatrix} + u_{jt} \quad (2)$$

R^*_{jt} is the risk-adjusted returns of individual stocks, measured as the sum of alpha and error term in the following time-series regressions for individual stocks (the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,4} = \beta_{j,6} = 0$):

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \begin{bmatrix} \beta_{j,1} & \beta_{j,2} & \beta_{j,3} & \beta_{j,5} \end{bmatrix} \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \\ BC_{t-1} \\ Firm_{j,t-1} \times BC_{t-1} \end{bmatrix} \times F_{ft} + e_{jt} \quad (5)$$

R_{jt} is the return on stock j at time t; BC_{t-1} is the one month lagged business cycle variable, chosen as the spread between US corporate bonds with Moody's rating of AAA and BAA. F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. $Firm_{j,t-1}$ represents the firm level variables that are relevant to the value effect, including the measurements of the extent to which firms' assets are irreversible, operating leverage, efficiency and financial constraint status. The measurements of three aspects of investment irreversibility are depreciation charge during the year, rental expense, and sum of the proceeds from fixed asset sale in the last three years, all scaled by beginning of the year net fixed assets. Arguably, all three variables are positively correlated with firms' flexibility and negatively correlated with investment irreversibility. To measure the operating leverage, this paper uses the three year moving average of the ratio of percentage changes in operating profit before tax to percentage changes in sales. If the three year moving average is negative, it is replaced with a missing value. Efficiency is measured by comparing firms within each of 49 Fama and French industries and estimating the optimal inputs (fixed capital and labour) given the level of output (inflation adjusted sales), using the DEA technique. If optimisation is not possible, the efficiency measure is assigned zero. Net payout ratio, i.e. the sum of dividends and stock repurchase minus share issuance, scaled by net income, is used to proxy for financial constraint. These accounting products are measured in December each year and matched with stock returns from

June the next year to July the following year. These variables are lagged one month to become $Firm_{j,t-1}$ in equation (5). Panel A, B and C report the results of the subsamples with available information to measure (a) both investment irreversibility and the business cycle factor, (b) both operating leverage and the business cycle factor, and (c) both financial constraint and the business cycle factor respectively. Panel D reports the result of the subsample with available information to measure investment irreversibility, financial constraint and the business cycle factor. Panel E reports the result of the subsample with available information to measure operating leverage, financial constraint and the business cycle factor. The vector of size, lagged returns and stock turnover in equation (2) represent the control factors, representing other well documented asset pricing anomalies (size, momentum, and liquidity). The null hypothesis is that the coefficient $c_{BM,t}$ attached to the BM ratio are not significantly different from zero, meaning that the value effect is captured when returns are adjusted for risks in stage one. The t-statistics are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure. *, ** and *** denote the statistical significance levels of 10%, 5% and 1% respectively. The coefficients are multiplied by 100.

Panel A: Subsample with business cycle information and investment irreversibility availability										
A.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.22	0.78	0.55	0.50	-0.09	-0.10	-0.11	-0.34	0.06	2.01%
t value	3.82	3.39	3.24	3.26	-2.29	-1.93	-2.41	-1.53	0.79	
p value	0%	0%	0%	0%	2%	5%	2%	13%	43%	
	***	***	***	***	**	**	**			
A.2. Betas are conditioned on investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	0.69	0.55	0.49	-0.07	-0.10	-0.10	-0.21	0.13	2.05%
t value	2.68	2.83	3.10	3.35	-2.01	-2.18	-2.24	-1.17	1.95	
p value	1%	0%	0%	0%	5%	3%	3%	24%	5%	
	***	***	***	***	**	**	**		**	
A.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	0.74	0.55	0.55	-0.07	-0.12	-0.11	-0.39	0.04	1.96%
t value	3.39	3.32	3.25	3.74	-2.05	-2.64	-2.28	-1.71	0.56	
p value	0%	0%	0%	0%	4%	1%	2%	9%	58%	
	***	***	***	***	**	***	**	*		

A.4. Betas are conditioned on both business cycle factor and investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.07	0.70	0.66	0.65	-0.04	-0.10	-0.10	-0.19	0.10	2.22%
t value	1.62	2.77	3.88	4.91	-1.44	-2.43	-2.60	-1.21	1.64	
p value	11%	1%	0%	0%	15%	2%	1%	23%	10%	
		***	***	***		**	***		*	
Panel B: Subsample with business cycle information and operating leverage availability										
B.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.28	0.62	0.53	-0.07	-0.07	-0.19	0.02	0.05	2.29%
t value	2.65	5.53	3.53	3.64	-2.56	-2.07	-4.05	0.09	0.78	
p value	1%	0%	0%	0%	1%	4%	0%	93%	43%	
	***	***	***	***	***	**	***			
B.2. Betas are conditioned on operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.10	1.28	0.63	0.53	-0.06	-0.07	-0.19	0.05	0.06	2.23%
t value	2.20	5.41	3.61	3.64	-2.40	-2.12	-4.21	0.24	1.04	
p value	3%	0%	0%	0%	2%	3%	0%	81%	30%	
	**	***	***	***	**	**	***			
B.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	1.31	0.73	0.58	-0.05	-0.09	-0.16	0.00	0.01	2.37%
t value	2.46	5.69	4.28	3.88	-2.08	-2.73	-3.44	-0.01	0.22	
p value	1%	0%	0%	0%	4%	1%	0%	99%	83%	
	***	***	***	***	**	***	***			
B.4. Betas are conditioned on both business cycle factor and operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.07	1.33	0.76	0.61	-0.05	-0.08	-0.15	0.11	0.03	2.35%
t value	1.62	5.52	4.63	4.25	-1.92	-2.79	-3.54	0.60	0.52	
p value	11%	0%	0%	0%	6%	1%	0%	55%	61%	
		***	***	***	*	***	***			

Panel C: Subsample with business cycle information and efficiency

C.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.07	0.64	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.16	4.93	3.91	3.88	-2.74	-1.86	-3.56	-0.43	0.70	
p value	0%	0%	0%	0%	1%	6%	0%	67%	48%	
	***	***	***	***	***	*	***			

C.2. Betas are conditioned on efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.15	1.07	0.63	0.53	-0.08	-0.09	-0.17	-0.09	0.05	2.23%
t value	3.14	4.95	3.86	3.87	-2.67	-1.89	-3.63	-0.41	0.72	
p value	0%	0%	0%	0%	1%	6%	0%	68%	47%	
	***	***	***	***	***	*	***			

C.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.04	0.64	0.57	-0.08	-0.10	-0.16	-0.14	0.02	2.21%
t value	2.80	4.90	3.91	4.26	-2.42	-2.42	-3.49	-0.68	0.40	
p value	1%	0%	0%	0%	2%	2%	0%	50%	69%	
	***	***	***	***	**	**	***			

C.4. Betas are conditioned on both business cycle factor and efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.04	0.62	0.57	-0.07	-0.10	-0.16	-0.14	0.03	2.18%
t value	2.77	4.90	3.83	4.25	-2.34	-2.43	-3.61	-0.66	0.45	
p value	1%	0%	0%	0%	2%	2%	0%	51%	65%	
	***	***	***	***	**	**	***			

Panel D: Subsample with business cycle information and financial constraint availability

D.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.08	0.64	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.12	4.99	3.92	3.88	-2.74	-1.96	-3.51	-0.43	0.72	
p value	0%	0%	0%	0%	1%	5%	0%	66%	47%	
	***	***	***	***	***	**	***			

D.2. Betas are conditioned on financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.14	1.04	0.66	0.55	-0.08	-0.10	-0.15	-0.15	0.06	2.17%
t value	2.96	4.82	4.15	4.06	-2.66	-2.20	-3.41	-0.72	0.97	
P value	0%	0%	0%	0%	1%	3%	0%	47%	33%	
	***	***	***	***	***	**	***			
D.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.05	0.64	0.57	-0.08	-0.11	-0.16	-0.14	0.03	2.21%
t value	2.78	4.94	3.90	4.27	-2.41	-2.49	-3.44	-0.68	0.41	
p value	1%	0%	0%	0%	2%	1%	0%	50%	68%	
	***	***	***	***	**	***	***			
D.4. Betas are conditioned on both business cycle factor and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.09	1.01	0.67	0.63	-0.07	-0.10	-0.16	-0.19	0.05	2.15%
t value	2.07	4.70	4.26	4.88	-2.36	-2.51	-3.52	-0.98	0.79	
p value	4%	0%	0%	0%	2%	1%	0%	33%	43%	
	**	***	***	***	**	***	***			

Panel E: Subsample with business cycle information, investment irreversibility and financial constraint availability

E.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.22	0.79	0.55	0.50	-0.08	-0.11	-0.11	-0.34	0.06	2.01%
t value	3.82	3.42	3.23	3.27	-2.28	-1.98	-2.40	-1.53	0.80	
p value	0%	0%	0%	0%	2%	5%	2%	13%	43%	
	***	***	***	***	**	**	**			
E.2. Betas are conditioned on both investment irreversibility and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.20	0.72	0.58	0.51	-0.08	-0.11	-0.10	-0.37	0.08	1.96%
t value	3.77	3.14	3.45	3.42	-2.20	-2.20	-2.17	-1.62	1.06	
p value	0%	0%	0%	0%	3%	3%	3%	11%	29%	
	***	***	***	***	**	**	**			

E.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	0.74	0.55	0.55	-0.07	-0.13	-0.11	-0.38	0.04	1.97%
t value	3.39	3.34	3.24	3.74	-2.04	-2.60	-2.27	-1.70	0.56	
p value	0%	0%	0%	0%	4%	1%	2%	9%	58%	
	***	***	***	***	**	***	**	*		
E.4. Betas are conditioned on business cycle factor, investment irreversibility and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.06	0.66	0.68	0.64	-0.03	-0.10	-0.10	-0.17	0.10	2.39%
t value	1.45	2.50	3.95	5.25	-1.19	-2.34	-2.68	-1.11	1.82	
p value	15%	1%	0%	0%	24%	2%	1%	27%	7%	
		***	***	***		**	***		*	
Panel F: Subsample with business cycle information, operating leverage and financial constraint availability										
F.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.29	0.62	0.54	-0.07	-0.07	-0.19	0.02	0.05	2.29%
t value	2.66	5.55	3.54	3.65	-2.56	-2.10	-4.04	0.10	0.78	
P value	1%	0%	0%	0%	1%	4%	0%	92%	44%	
	***	***	***	***	***	**	***			
F.2. Betas are conditioned on both operating leverage and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	1.26	0.62	0.56	-0.06	-0.08	-0.18	-0.02	0.06	2.23%
t value	2.35	5.46	3.54	3.96	-2.33	-2.49	-3.93	-0.09	1.04	
p value	2%	0%	0%	0%	2%	1%	0%	93%	30%	
	**	***	***	***	**	***	***			

F.3. Betas are conditioned on business cycle factor	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	1.32	0.73	0.58	-0.05	-0.09	-0.16	0.00	0.01	2.38%
t value	2.46	5.71	4.29	3.88	-2.08	-2.73	-3.42	0.00	0.21	
p value	1%	0%	0%	0%	4%	1%	0%	100%	83%	
	***	***	***	***	**	***	***			
F.4. Betas are conditioned on business cycle factor, operating leverage and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.03	1.27	0.78	0.73	-0.04	-0.09	-0.15	0.11	0.04	2.42%
t value	0.92	5.19	4.73	5.61	-1.57	-3.08	-3.65	0.65	0.78	
p value	36%	0%	0%	0%	12%	0%	0%	51%	43%	
		***	***	***		***	***			

Panel G: Subsample with business cycle information, efficiency and financial constraint

G.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.09	0.64	0.53	-0.09	-0.09	-0.16	-0.09	0.05	2.25%
t value	3.12	5.00	3.92	3.89	-2.75	-1.96	-3.52	-0.43	0.71	
p value	0%	0%	0%	0%	1%	5%	0%	66%	48%	
	***	***	***	***	***	**	***			
G.2. Betas are conditioned on both financial constraint and efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.14	1.05	0.66	0.55	-0.08	-0.10	-0.15	-0.15	0.06	2.18%
t value	2.96	4.83	4.14	4.06	-2.68	-2.20	-3.42	-0.72	0.96	
p value	0%	0%	0%	0%	1%	3%	0%	47%	34%	
	***	***	***	***	***	**	***			

G.3. Betas are conditioned on business cycle	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.06	0.64	0.57	-0.08	-0.11	-0.16	-0.14	0.03	2.21%
t value	2.78	4.95	3.90	4.27	-2.43	-2.49	-3.45	-0.68	0.40	
p value	1%	0%	0%	0%	2%	1%	0%	50%	69%	
	***	***	***	***	**	***	***			
G.4. Betas are conditioned on business cycle, financial constraint, and efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.08	1.01	0.66	0.63	-0.07	-0.10	-0.16	-0.18	0.05	2.14%
t value	2.04	4.70	4.18	4.84	-2.28	-2.52	-3.64	-0.97	0.84	
p value	4%	0%	0%	0%	2%	1%	0%	33%	40%	
	**	***	***	***	**	***	***			

Table 4: The value effect and the supplementary role of investor sentiment

This table reports the time-series averages of individual stocks' cross-sectional OLS regression coefficients (equation (2)) for all stocks listed in NYSE – AMEX – NASDAQ.

$$R^*_{jt} = c_{0t} + c_{BM,t} BM_{j,t-1} + \begin{bmatrix} c_{1t} & c_{2t} & c_{3t} \end{bmatrix} \times \begin{bmatrix} Size_{j,t-1} \\ PR_{j,t-1} \\ Turnover_{j,t-1} \end{bmatrix} + u_{jt} \qquad (2)$$

R^*_{jt} is the risk-adjusted returns of individual stocks, measured as the sum of alpha and error term in the following time-series regressions for individual stocks (the restricted version of equation (1) when $\alpha_{j,1} = \alpha_{j,2} = 0$ and $\beta_{j,3} = \beta_{j,5} = 0$):

$$R_{jt} - R_{Ft} = \alpha_{j,0} + \sum_{f=1}^{3} \begin{bmatrix} \beta_{j,1} & \beta_{j,2} & \beta_{j,4} & \beta_{j,6} \end{bmatrix} \times \begin{bmatrix} 1 \\ Firm_{j,t-1} \\ BF_{t-1} \\ Firm_{j,t-1} \times BF_{t-1} \end{bmatrix} \times F_{ft} + e_{jt} \qquad (6)$$

R_{jt} is the return on stock j at time t; BF_{t-1} is the one month lagged consumer confidence index published by the Conference Board and used in Lemmon and Portniaguina (2006). F_{ft} represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. $Firm_{j,t-1}$ represents priced risk factors, which include the market factor, the HML and SMB factors of the Fama and French model. $Firm_{j,t-1}$ represents the firm level variables that are relevant to the value effect, including the measurements of the extent to which firms' assets are irreversible, operating leverage, efficiency and financial constraint status. The measurements of three aspects of investment irreversibility are depreciation charge during the year, rental expense, and sum of the proceeds from fixed asset sale in the last three years, all scaled by beginning of the year net fixed assets. Arguably, all three variables are positively correlated with firms' flexibility and negatively correlated with investment irreversibility. To measure the operating leverage, this paper uses the three year moving average of the ratio of percentage changes in operating profit before tax to percentage changes in sales. If the three year moving average is negative, it is replaced with a missing value. Efficiency is measured by comparing firms within each of 49 Fama and French industries and estimating the optimal inputs (fixed capital and labour) given the level of output (inflation adjusted sales), using the DEA technique. If optimisation is not possible, the efficiency measure is assigned zero. Net payout ratio, i.e. the sum of dividends and stock repurchase minus share issuance, scaled by net income, is used to proxy for financial constraint. These accounting products are measured in December each year and matched with stock returns from June the next year to July the following year. These variables are lagged one month to become $Firm_{j,t-1}$ in equation (6). The vector of size, lagged returns and stock turnover in equation (2) represent the control factors, representing other well documented asset pricing anomalies (size, momentum, and liquidity). The null hypothesis is that the coefficient $c_{BM,t}$ attached to the BM ratio are not significantly different from zero, meaning that the value effect is captured when returns are adjusted for risks in stage one. The t-statistics are corrected for autocorrelation and heteroskedasticity using the Newey and West (1987) procedure. *, ** and *** denote the statistical significance levels of 10%, 5% and 1% respectively. The coefficients are multiplied by 100.

Panel A: Subsample with investor sentiment information and investment irreversibility availability										
A.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.22	0.78	0.55	0.50	-0.09	-0.10	-0.11	-0.34	0.06	2.01%
t value	3.82	3.39	3.24	3.26	-2.29	-1.93	-2.41	-1.53	0.79	
p value	0%	0%	0%	0%	2%	5%	2%	13%	43%	
	***	***	***	***	**	**	**			
A.2. Betas are conditioned on investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	0.69	0.55	0.49	-0.07	-0.10	-0.10	-0.21	0.13	2.05%
t value	2.68	2.83	3.10	3.35	-2.01	-2.18	-2.24	-1.17	1.95	
p value	1%	0%	0%	0%	5%	3%	3%	24%	5%	
	***	***	***	***	**	**	**		**	
A.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.19	0.72	0.65	0.54	-0.06	-0.14	-0.11	-0.34	0.02	1.98%
t value	3.35	2.72	3.88	3.54	-1.78	-2.96	-2.26	-1.64	0.30	
p value	0%	1%	0%	0%	8%	0%	2%	10%	77%	
	***	***	***	***	*	***	**	*		

A.4. Betas are conditioned on both investor sentiment and investment irreversibility	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.05	0.82	0.57	0.59	-0.05	-0.17	-0.09	-0.17	0.13	2.13%
t value	1.14	2.87	3.08	4.40	-1.66	-3.94	-2.25	-1.25	2.04	
p value	26%	0%	0%	0%	10%	0%	3%	21%	4%	
		***	***	***	*	***	**		**	

Panel B: Subsample with investor sentiment information and operating leverage availability

B.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.15	1.22	0.55	0.51	-0.06	-0.08	-0.18	0.02	0.04	2.17%
t value	3.00	5.24	3.06	3.26	-2.01	-2.10	-3.97	0.09	0.59	
p value	0%	0%	0%	0%	5%	4%	0%	93%	56%	
	***	***	***	***	**	**	***			

B.2. Betas are conditioned on operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.12	1.24	0.57	0.50	-0.05	-0.08	-0.18	0.06	0.06	2.13%
t value	2.49	5.22	3.17	3.26	-1.88	-2.17	-4.21	0.27	0.88	
p value	1%	0%	0%	0%	6%	3%	0%	79%	38%	
	***	***	***	***	*	**	***			

B.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.38	0.76	0.52	-0.01	-0.11	-0.07	0.08	-0.07	2.23%
t value	2.51	5.70	4.36	3.32	-0.41	-3.20	-0.67	0.31	-0.65	
p value	1%	0%	0%	0%	68%	0%	50%	76%	51%	
	***	***	***	***		***				

B.4. Betas are conditioned on both investor sentiment and operating leverage	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.45	0.74	0.52	-0.01	-0.13	-0.05	0.25	-0.03	2.25%
t value	1.86	5.79	4.19	3.54	-0.16	-3.69	-0.51	1.18	-0.34	
p value	6%	0%	0%	0%	87%	0%	61%	24%	73%	
	*	***	***	***		***				

Panel C: Subsample with investor sentiment information and efficiency

C.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.03	0.56	0.50	-0.07	-0.09	-0.15	-0.10	0.04	2.14%
t value	3.47	4.58	3.40	3.50	-2.24	-1.87	-3.35	-0.43	0.52	
p value	0%	0%	0%	0%	3%	6%	0%	67%	61%	
	***	***	***	***	**	*	***			
C.2. Betas are conditioned on efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.03	0.55	0.49	-0.07	-0.10	-0.16	-0.10	0.04	2.12%
t value	3.46	4.60	3.37	3.49	-2.17	-1.89	-3.41	-0.41	0.53	
p value	0%	0%	0%	0%	3%	6%	0%	68%	59%	
	***	***	***	***	**	*	***			
C.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.06	0.64	0.52	-0.05	-0.11	-0.15	-0.08	-0.01	2.14%
t value	3.28	4.75	4.08	3.72	-1.57	-2.37	-3.47	-0.35	-0.19	
p value	0%	0%	0%	0%	12%	2%	0%	73%	85%	
	***	***	***	***		**	***			
C.4. Betas are conditioned on both efficiency and investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.07	0.63	0.52	-0.04	-0.11	-0.16	-0.08	-0.01	2.12%
t value	3.23	4.79	3.98	3.70	-1.48	-2.41	-3.54	-0.35	-0.15	
p value	0%	0%	0%	0%	14%	2%	0%	73%	88%	
	***	***	***	***		**	***			

Panel D: Subsample with investor sentiment information and financial constraint availability

D.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.04	0.56	0.50	-0.07	-0.10	-0.15	-0.10	0.04	2.14%
t value	3.43	4.66	3.42	3.51	-2.26	-1.97	-3.34	-0.43	0.52	
p value	0%	0%	0%	0%	2%	5%	0%	67%	60%	
	***	***	***	***	**	**	***			

D.2. Betas are conditioned on financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	0.99	0.58	0.51	-0.07	-0.11	-0.15	-0.16	0.05	2.07%
t value	3.29	4.44	3.65	3.71	-2.21	-2.20	-3.24	-0.71	0.80	
p value	0%	0%	0%	0%	3%	3%	0%	48%	42%	
	***	***	***	***	**	**	***			
D.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.08	0.64	0.53	-0.05	-0.12	-0.15	-0.08	-0.01	2.14%
t value	3.24	4.82	4.10	3.75	-1.57	-2.43	-3.47	-0.35	-0.19	
p value	0%	0%	0%	0%	12%	2%	0%	73%	85%	
	***	***	***	***		**	***			
D.4. Betas are conditioned on both investor sentiment and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.11	1.05	0.65	0.56	-0.05	-0.13	-0.14	-0.11	0.03	2.07%
t value	2.52	4.70	4.13	4.17	-1.68	-3.19	-3.45	-0.51	0.44	
p value	1%	0%	0%	0%	9%	0%	0%	61%	66%	
	***	***	***	***	*	***	***			

Panel E: Subsample with investor sentiment information, investment irreversibility and financial constraint availability

E.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.22	0.79	0.55	0.50	-0.08	-0.11	-0.11	-0.34	0.06	2.01%
t value	3.82	3.42	3.23	3.27	-2.28	-1.98	-2.40	-1.53	0.80	
p value	0%	0%	0%	0%	2%	5%	2%	13%	43%	
	***	***	***	***	**	**	**			
E.2. Betas are conditioned on both investment irreversibility and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.20	0.72	0.58	0.51	-0.08	-0.11	-0.10	-0.37	0.08	1.96%
t value	3.77	3.14	3.45	3.42	-2.20	-2.20	-2.17	-1.62	1.06	
p value	0%	0%	0%	0%	3%	3%	3%	11%	29%	
	***	***	***	***	**	**	**			

E.3. Betas are conditioned on						NASDAQ	NYSE – AMEX			
investor sentiment	BM	RET23	RET46	RET712	Size	Turnover	Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.19	0.73	0.65	0.54	-0.06	-0.15	-0.11	-0.34	0.02	1.98%
t value	3.35	2.75	3.87	3.55	-1.78	-2.94	-2.26	-1.64	0.30	
p value	0%	1%	0%	0%	8%	0%	2%	10%	77%	
	***	***	***	***	*	***	**	*		

E.4. Betas are conditioned on investor sentiment, investment irreversibility and financial						NASDAQ	NYSE – AMEX			
constraint	BM	RET23	RET46	RET712	Size	Turnover	Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.03	0.84	0.53	0.58	-0.05	-0.17	-0.08	-0.18	0.16	2.31%
t value	0.80	2.77	2.76	4.53	-1.70	-3.76	-2.15	-1.38	2.42	
p value	42%	1%	1%	0%	9%	0%	3%	17%	2%	
		***	***	***	*	***	**		**	

Panel F: Subsample with investor sentiment information, operating leverage and financial constraint availability

F.1. Unconditional Fama and						NASDAQ	NYSE – AMEX			
French model	BM	RET23	RET46	RET712	Size	Turnover	Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.15	1.22	0.55	0.51	-0.06	-0.08	-0.18	0.02	0.04	2.17%
t value	3.01	5.26	3.06	3.27	-2.01	-2.12	-3.96	0.10	0.59	
p value	0%	0%	0%	0%	5%	3%	0%	92%	56%	
	***	***	***	***	**	**	***			

F.2. Betas are conditioned on both operating leverage and						NASDAQ	NYSE – AMEX			
financial constraint	BM	RET23	RET46	RET712	Size	Turnover	Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.13	1.19	0.55	0.53	-0.05	-0.09	-0.17	-0.02	0.06	2.11%
t value	2.73	5.11	3.04	3.61	-1.81	-2.51	-3.83	-0.10	0.88	
p value	1%	0%	0%	0%	7%	1%	0%	92%	38%	
	***	***	***	***	*	***	***			

F.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.38	0.76	0.52	-0.01	-0.11	-0.07	0.08	-0.07	2.23%
t value	2.51	5.71	4.37	3.33	-0.42	-3.21	-0.67	0.32	-0.65	
p value	1%	0%	0%	0%	68%	0%	50%	75%	52%	
	***	***	***	***		***				
F.4. Betas are conditioned on investor sentiment, operating leverage and financial constraint	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.04	1.50	0.70	0.66	-0.03	-0.12	-0.15	0.11	0.07	2.25%
t value	0.78	5.96	3.92	5.14	-1.27	-3.40	-3.97	0.68	1.14	
p value	43%	0%	0%	0%	20%	0%	0%	50%	26%	
		***	***	***		***	***			

Panel G: Subsample with investor sentiment information, efficiency and financial constraint

G.1. Unconditional Fama and French model	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.18	1.04	0.56	0.50	-0.07	-0.10	-0.15	-0.10	0.04	2.14%
t value	3.43	4.67	3.42	3.50	-2.26	-1.97	-3.34	-0.43	0.52	
p value	0%	0%	0%	0%	2%	5%	0%	67%	60%	
	***	***	***	***	**	**	***			
G.2. Betas are conditioned on both financial constraint and efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	0.99	0.58	0.51	-0.07	-0.11	-0.15	-0.16	0.05	2.07%
t value	3.30	4.45	3.64	3.71	-2.21	-2.21	-3.24	-0.71	0.80	
p value	0%	0%	0%	0%	3%	3%	0%	48%	42%	
	***	***	***	***	**	**	***			

G.3. Betas are conditioned on investor sentiment	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.16	1.08	0.64	0.53	-0.05	-0.12	-0.15	-0.08	-0.01	2.14%
t value	3.24	4.83	4.09	3.74	-1.57	-2.43	-3.47	-0.35	-0.19	
p value	0%	0%	0%	0%	12%	2%	0%	73%	85%	
	***	***	***	***		**	***			
G.4. Betas are conditioned on investor sentiment, financial constraint, and efficiency	BM	RET23	RET46	RET712	Size	NASDAQ Turnover	NYSE – AMEX Turnover	NASDAQ	Intercept	adjr2
Coefficient	0.10	1.06	0.64	0.55	-0.05	-0.13	-0.14	-0.11	0.03	2.07%
t value	2.41	4.74	4.06	4.11	-1.67	-3.20	-3.48	-0.51	0.48	
p value	2%	0%	0%	0%	10%	0%	0%	61%	63%	
	**	***	***	***	*	***	***			

Table 5: Portfolio strategies

The sample from Panel B of Table 1 is filtered for the availability of the depreciation charge ratio in Panel A, rent ratio in Panel B, fixed asset sale proceed ratio in Panel C, operating leverage in Panel D, and financial constraint in Panel E. Firms within each of these subsamples are partitioned into high (70th percentile and above), medium (30th percentile to 70th percentile) and low measures (below 30th percentile) of flexibility or financial constraints. Within each subsample and each subset, firms are ranked into deciles based on the BM, measured in December year t-1 for observations from July of year t to June of year t+1. The value strategy is tested by reporting unadjusted returns of ten equally weighted portfolios and of the hedge portfolio that goes long in value stocks with high BM and goes short in growth stocks with low BM. Overall columns refer to the value strategy within each subsample. High, medium and low columns refer to the value strategy within three corresponding subsets of a subsample. *, ** and *** denote the statistical significance levels of 10%, 5% and 1% respectively.

Panel A: Investment irreversibility measured by depreciation charge

	Overall			High charge			Medium charge			Low charge		
BM decile	Return	t-value		Return	t-value		Return	t-value		Return	t-value	
Growth	0.69	2.10	**	0.60	1.49		0.86	2.75	***	0.78	2.92	***
2	1.01	3.31	***	0.99	2.67	***	1.06	3.52	***	1.07	4.26	***
3	1.14	3.99	***	1.13	3.11	***	1.11	4.06	***	1.08	4.38	***
4	1.19	4.35	***	1.25	3.66	***	1.36	4.81	***	1.23	5.25	***
5	1.36	5.14	***	1.40	4.12	***	1.55	5.65	***	1.24	5.17	***
6	1.48	5.60	***	1.62	4.63	***	1.62	5.94	***	1.41	5.89	***
7	1.60	6.03	***	1.72	4.96	***	1.56	5.72	***	1.52	6.25	***
8	1.66	6.17	***	1.77	5.25	***	1.92	6.85	***	1.57	5.98	***
9	1.85	6.54	***	1.89	5.41	***	2.01	6.98	***	1.81	6.56	***
Value	2.02	6.39	***	2.35	6.45	***	2.07	6.16	***	1.91	5.91	***
Value - Growth	**1.33**	**6.13**	*******	**1.75**	**6.65**	*******	**1.21**	**4.45**	*******	**1.13**	**5.05**	*******

Panel B: Investment irreversibility measured by rent

	Overall			High rent			Medium rent			Low rent		
BM decile	Return	t-value		Return	t-value		Return	t-value		Return	t-value	
Growth	0.69	2.10	**	0.66	1.67	*	0.91	2.65	***	0.69	2.40	**
2	1.01	3.31	***	0.99	2.73	***	1.11	3.71	***	0.87	3.10	***
3	1.14	3.99	***	1.02	2.87	***	1.12	3.86	***	0.97	3.81	***
4	1.19	4.35	***	1.21	3.70	***	1.47	5.18	***	1.27	4.99	***
5	1.36	5.14	***	1.28	3.77	***	1.57	5.51	***	1.28	5.08	***
6	1.48	5.60	***	1.52	4.62	***	1.49	5.30	***	1.43	5.83	***
7	1.60	6.03	***	1.54	4.94	***	1.44	5.06	***	1.54	6.19	***
8	1.66	6.17	***	1.72	5.34	***	1.75	6.15	***	1.58	6.25	***
9	1.85	6.54	***	1.89	5.74	***	2.02	6.74	***	1.68	6.29	***
Value	2.02	6.39	***	2.20	6.16	***	1.87	5.82	***	1.86	5.66	***
Value - Growth	**1.33**	**6.13**	*******	**1.55**	**6.10**	*******	**0.96**	**3.77**	*******	**1.17**	**4.74**	*******

Panel C: Investment irreversibility measured by proceeds from sale of fixed assets

	Overall			High proceed			Medium proceed			Low proceed		
BM decile	Return	t-value		Return	t-value		Return	t-value		Return	t-value	
Growth	0.65	1.76	*	0.83	2.31	**	0.65	1.76	*	0.62	1.53	
2	1.08	3.19	***	1.04	3.06	***	1.07	3.18	***	1.15	3.03	***
3	1.10	3.47	***	1.22	3.86	***	1.41	4.32	***	1.27	3.57	***
4	1.34	4.39	***	1.34	4.36	***	1.55	4.56	***	1.36	4.20	***
5	1.45	4.89	***	1.44	4.78	***	1.60	4.88	***	1.62	5.05	***
6	1.55	5.32	***	1.52	4.90	***	1.72	5.72	***	1.61	5.09	***
7	1.66	5.72	***	1.52	4.81	***	1.71	5.75	***	1.75	5.83	***
8	1.73	5.75	***	1.62	5.10	***	1.87	5.90	***	1.76	5.45	***
9	1.87	6.09	***	2.07	6.47	***	2.10	6.38	***	1.85	5.62	***
Value	2.20	6.51	***	2.36	6.51	***	1.98	5.73	***	2.18	5.72	***
Value - Growth	**1.55**	**6.41**	*******	**1.53**	**5.74**	*******	**1.33**	**4.62**	*******	**1.56**	**5.37**	*******

Panel D: Operating leverage

	Overall			High leverage			Medium leverage			Low leverage		
BM decile	Return	t-value		Return	t-value		Return	t-value		Return	t-value	
Growth	0.73	2.32	**	0.81	2.15	**	0.85	2.87	***	0.82	2.58	***
2	1.03	3.49	***	1.11	3.28	***	1.12	3.93	***	0.98	3.19	***
3	1.08	3.95	***	1.04	3.39	***	1.21	4.31	***	1.11	4.06	***
4	1.19	4.38	***	1.50	4.93	***	1.49	5.48	***	1.14	4.27	***
5	1.33	5.10	***	1.49	5.04	***	1.47	5.47	***	1.28	4.91	***
6	1.42	5.50	***	1.62	5.47	***	1.45	5.28	***	1.38	5.15	***
7	1.49	5.75	***	1.75	5.93	***	1.61	5.90	***	1.58	6.19	***
8	1.65	6.31	***	1.86	6.06	***	1.70	5.88	***	1.50	5.87	***
9	1.78	6.36	***	2.08	6.49	***	1.92	6.35	***	1.58	5.99	***
Value	1.98	6.42	***	2.07	6.11	***	1.71	5.02	***	1.84	6.17	***
Value - Growth	**1.25**	**5.91**	*******	**1.25**	**5.19**	*******	**0.86**	**3.07**	*******	**1.01**	**4.18**	*******

Panel E: Financial constraint

	Overall			High constraint			Medium constraint			Low constraint		
BM decile	Return	t-value		Return	t-value		Return	t-value		Return	t-value	
Growth	0.69	2.11	**	0.73	1.97	**	0.82	2.47	***	0.67	2.26	**
2	1.01	3.32	***	0.99	2.76	***	1.10	3.72	***	1.12	4.05	***
3	1.15	4.03	***	1.06	3.05	***	1.23	4.31	***	1.13	4.45	***
4	1.19	4.36	***	1.12	3.25	***	1.43	5.15	***	1.25	5.24	***
5	1.36	5.12	***	1.18	3.51	***	1.52	5.64	***	1.28	5.41	***
6	1.47	5.57	***	1.34	3.96	***	1.57	5.89	***	1.45	6.09	***
7	1.60	6.02	***	1.50	4.26	***	1.54	5.71	***	1.49	6.54	***
8	1.66	6.17	***	1.87	5.54	***	1.68	6.12	***	1.57	6.26	***
9	1.86	6.55	***	1.93	5.53	***	1.94	6.82	***	1.70	6.84	***
Value	2.03	6.40	***	2.05	5.52	***	2.04	6.53	***	1.76	6.45	***
Value - Growth	**1.33**	**6.13**	*******	**1.32**	**4.72**	*******	**1.22**	**5.56**	*******	**1.09**	**5.17**	*******