University of the West of England
BRISTOL

Centre for Global Finance
Working Paper Series (ISSN 2041-1596)
Paper Number: 06/10

Title:

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Returns to UK "value" investment strategies:

Evidence from an inflation-adjusted Ohlson model

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Key words: Asset pricing; Contrarian strategy, Ohlson model, Book-to-market effect, Inflation-adjusted model

JEL Classification: G11; G12

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Abstract

In this paper we explore whether abnormal returns accrue to a "value" investing strategy based upon the inflation-adjusted Ohlson model of Gregory, Saleh and Tucker (2005). We motivate such an investigation by noting that if, consistent with previous empirical work, analysts over-extrapolate from past earnings, a model that allows for mean reversion in abnormal earnings should out-perform both a buy-and-hold strategy and a strategy that selects stocks on a simple book-to-market basis. We find that whilst returns to such a strategy cannot be fully explained by a three factor model, it does not appear to out-perform a simple book-to-market strategy.

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1. Introduction

There is a considerable body of research which seeks to explain the pattern of stock returns. Value measures such as the market value of equity, the book-to-market ratio, the cash flow yield, and earnings-price ratio can predict the cross-sectional patterns of stock returns (e.g. Fama and French, 1992, 1993, 1996 and 1998; Lakonishok, Shleifer, and Vishny, 1994; and Jaffe, Keim, and Westerfield, 1989 for the U.S., Gregory, Harris, and Michou, 2001 and 2003; Strong and Xu, 1997; Dissanaike, 1997, 1999 and 2002[1]; and Levis and Liodakis, 1999 for the UK, and Cai, 1997, Chan, Hamao, and Lakonishok, 1991, and Kubota, Sudu, and Takehara, 2002 for Japan).

Fama and French (1993 and 1996) and Lakonishok, Shleifer, and Vishny (1994) show that for US stocks, high book-to-market (B/M), earnings-to-price (E/P), or cash-flow-to-price (C/P) stocks produce higher average returns than low B/M, E/P, or C/P stocks. Likewise, Gregory, Harris, and Michou (2001), Strong and Xu (1997), and Dissanaike (2002) show similar results for UK firms. Moreover, Fama and French (1998) find that "value" stocks outperform "glamour" stocks in twelve out of thirteen markets.[2] Cai (1997) documents a similar result for the Tokyo stock market.

An important issue here is how to explain this book-to-market effect and whether the explanation lies in rational or irrational behaviour. The effect could be entirely rational, and therefore in keeping with efficient markets, in that the abnormal earnings from

[1] Note that Dissanaike (1997 and 2002) employs Contrarian portfolio techniques to identify evidence of price reversal, while Dissanaike (1999) employs cross-section regression tests. His results indicate that there is evidence of stock price reversals despite the technique that is used. This suggests that the price reversal phenomenon applies to the cross-section of firms, and not only to extreme winner and loser shares.

[2] Fama and French (1998) studied thirteen international stock markets: the US, Japan, the UK, France, Germany, Italy, the Netherlands, Belgium, Switzerland, Sweden, Australia, Hong Kong, and Singapore.

value investing are merely compensation for the increased risk associated with higher book-to-market value stocks. Alternatively, behavioural finance might explain this phenomenon with reference to various forms of irrational investor behaviour. Perhaps investors (and analysts) tend to over-extrapolate earnings and, further, perhaps they even fail to recognise that abnormal economic profits from investing tend to mean-revert.

Rational explanations of the abnormal returns from value investing focus on conventional neoclassical finance theory. Fama and French (1993, 1995, and 1996) argue in favour of rational risk pricing in their explanation of the value premium. They argue that value stocks outperform glamour stocks because the former are fundamentally riskier than the latter in certain respects.

By contrast, behavioural finance explanations of the success of value investment strategies tend to focus on the over-extrapolation of earnings and also investors failing to recognise that abnormal economic profits from investing tend to mean-revert. Instead of confirming rationality, they seek to illustrate and explain the irrational investor behaviour which gives rises to anomalies. Lakonishok, Shleifer, and Vishny (1994); Gregory, Harris, and Michou (2001); DeBondt and Thaler (1985 and 1987); LaPorta (1996); and Daniel and Titman (1997), among others, argue in favour of irrational investment in explaining the superiority of value stocks, that is, value stocks outperform glamour stocks because the market undervalues value stocks and overvalues glamour stocks. The essence of this argument is that investors are excessively optimistic (pessimistic) about glamour (value) stocks because they base their expectations of future growth in earnings upon past good (bad) earnings, that is, investors tend to over-extrapolate earnings.

Other interpretations of the superiority of value stocks include the bias induced by research design, such as survivorship bias and data "snooping" in the selection of the sample (Lo and Mackinlay, 1990; Kothari, Shanken, and Sloan, 1995); or that such superiority can be explained by the bid-ask spread and infrequent trading (Conrad and Kaul, 1993).

This study aims to build upon the advances of the modified (inflation-adjusted) version of the Ohlson model proposed by Gregory, Saleh and Tucker (2005), hereafter referred to as GST (2005), to explore the superiority of the value investment strategies documented in prior research by using different value measures estimated by means of the Ohlson model. Consequently, by employing this novel approach, this study will provide additional evidence regarding whether the abnormal returns found from "value" versus "glamour" investing strategies are largely associated with a naive over-extrapolation of past earnings alone or whether they also account for the mean-reversion in abnormal earnings.

To summarise our key results, the residual income model value investment strategy yields abnormal returns that are not fully explained by the 3-factor Fama-French model, or the extended four factor model of Carhart (1997). "Value" portfolios exhibit some evidence of earning superior returns, and this carries through into the returns for hedge portfolios (those that are long in "value" stocks and short in "glamour" stocks). However, interestingly, greater abnormal returns result from a simpler strategy based upon "replacement" book-to-market values. Furthermore, an interesting result is that when we separate our returns into "up market" and "down market" periods, the significant out-performance is limited to up-market periods. It would appear, then, that the full Ohlson model specification does not outperform a simple book-to-market strategy and that the mean-reversion in abnormal earnings is indeed recognised and implicit in value investment strategies.

The remainder of this paper is divided into the following sections. Section 2 describes the data and the methodology employed in this study. Section 3 discusses the empirical results. Finally, section 4 summarises and concludes.

2. Research hypothesis

Proponents of efficient markets argue that contrarian investment strategies merely give rise to returns commensurate with the increased risk of value stocks. Alternatively, if we accept that investors' irrationality may be the cause of the book-to-market effect, we must also accept that the degree of irrationality is a pertinent issue. An over-extrapolation of returns clearly gives rise to profitable investment opportunities. However, if investors also fail to recognise the mean-reversion dynamic discussed here, they are effectively constraining the extent of their investment strategy returns. Thus, it is argued that a naïve contrarian strategy based on the book-to-market ratio may earn lower abnormal returns than a strategy which recognises mean-reversion.

This paper seeks to test whether a value investment strategy based on an inflation-adjusted version of the Ohlson (1995) model outperforms a naïve book-to-market contrarian investment strategy. To explain how this is undertaken, it is useful to express the Ohlson model as follows:

$$P_t = b_t(1-\alpha_1 r) + \alpha_1 r\left(\frac{x_t(1+r)}{r} - d_t\right) + \alpha_2 v_t \tag{1}$$

Where P_t is the price of the firm's equity at date t, b_t is the book value of the firm at date t, r is the cost of equity capital, x_t is earnings for period (t-1,t), d_t is net dividends paid at date t, and v_t is the "other information" variable.

There is evidence (for example, Bulkley and Harris, 1997) that analysts over-extrapolate earnings, assuming that firms with high earnings growth will experience similar earnings growth in the future. A corollary of this is that they ignore the importance of the book value term, that is, the first term on the right hand side of equation (1). In contrast to this behaviour, naïve contrarian investors are concerned only with book value and its relationship with price.

What drives the apparent success of a book-to-market investment strategy? If a failure to recognise mean reversion is the driver, then recognition of the entire right hand side of equation (1) in a value investment strategy should yield superior price predictions, that is, an Ohlson-model-based value investment strategy should outperform a simple book-to-market based strategy. We therefore compare three basic fundamental-value-to-price models in this paper. The first model focuses simply on book value to market price, to reflect a naïve book-to-market strategy. The second model incorporates not only the book-to-market factor, but also mean-reverting abnormal earnings in the value to market price measure. This is the Ohlson model but ignoring the value of the other information variable. The third model employs all three terms of the Ohlson model specification to produce a full Ohlson model fundamental value to market price.

The hypothesis that we test in this paper is that if the importance of mean reversion in abnormal earnings is under-recognised by investors then we should see both that abnormal earnings are generated from an investment strategy based on Ohlson model fundamentals and that such a strategy outperforms a naïve book-to-market strategy. Thus, the second model should dominate the first model in terms of abnormal returns. Further, if the "other information" variable is important, the third model should outperform the second model which excludes this term.

3. A brief explanation of the GST model

This paper employs a residual income model to measure firm value as a precursor to the testing of the Ohlson model value investment strategy against a simple book-to-market investment strategy. The precise specification of the Ohlson model in a UK setting warrants some explanation. There is a large body of literature which examines the relationship between accounting numbers and firm value. Peasnell (1982) clarified the previously established principle that the theoretical value of the firm was equal to the opening book value of its assets plus the present value of its residual income stream. The relationship between theoretical firm value and the residual income stream attracted considerable practitioner interest and resulted in a number of proprietary models of firm valuation such as the EVA model of Stern Stewart. At the very centre of subsequent developments in residual income models is the Ohlson (1995) model, which represented a special case of the general class of residual income model (RIM) described in Peasnell (1982). The Ohlson (1995) and Feltham and Ohlson (1995) residual income valuation models are seen as major developments in valuation (Bernard, 1995). In particular, the Ohlson model employs a "linear information dynamic" whereby abnormal earnings and an "other information" parameter follow an autoregressive process which reverts to a mean of zero, provided the autoregressive parameter does not take on the theoretical maximum value of unity.

Formally, the model can be described as:

$$x_{t+1}^a = \omega x_t^a + \nu_t + e_{1,t+1} \tag{2}$$

$$\nu_{t+1} = \gamma \nu_t + e_{2,t+1} \tag{3}$$

Here, "abnormal" earnings or residual income is given by $x_t^a = x_t - r_{et}.b_{t-1}$, b_{t-1} is the lagged or opening book value of equity, r_{et} is the cost of equity capital, and ω and γ are the persistence parameters in abnormal earnings and "other information" respectively, assumed to take on a value between 0 and 1. ν_t is value-relevant information other than abnormal earnings. Ohlson (1995) then shows that combining linear information dynamics with a residual income valuation model yields the following expression relating current equity market value to currently observable book equity, residual income, and "other information":

$$P_t = b_t + \alpha_1 x_t^a + \alpha_2 \nu_t \tag{4}$$

Where $\alpha_1 = \dfrac{\omega}{(1 + r_e - \omega)}$ (4a) $\alpha_2 = \dfrac{(1 + r_e)}{(1 + r_e - \omega)(1 + r_e - \gamma)}$ (4b)

Whilst imposing a particular dynamic upon abnormal earnings is useful for the purposes of analysis, the reason why such earnings should revert to zero remains an important question.

Importantly, economic theory suggests that abnormal earnings will only revert to zero if book value is related to economic value, though historical book values will not be economically meaningful in an inflationary economy with long asset replacement cycles. However, attempts to revalue certain assets (notably property assets) violate the clean surplus assumption required by any general RIM, although Stark (1997) points out that this is not necessarily a problem.

To address this problem inherent in inconsistent fixed asset valuation, Gregory, Saleh and Tucker (GST 2005) specify a version of the Ohlson model that is consistent with Walker's (1997, p.354) suggestion that historical cost accounting versions of the model be abandoned in favour of one based upon deprival values. UK accounting during the period under investigation employed, to some degree, partial deprival values with a particular form of "dirty surplus" accounting, that is, the revaluation of property assets and the crediting of that revaluation to a reserve account directly. Thus, GST attempt to make all fixed asset values consistent by revaluing them to a comparable inflation-adjusted basis (a proxy for the current value of these assets). They also estimate individual industry parameters to determine the impact of the varying importance of unrecognised intangible assets across industries. They provide strong evidence that the modified model appears to predict one year ahead earnings more successfully than the standard Ohlson model. They test three versions of this model, which are based upon the empirical tests of Dechow, Hutton and Sloan (1999).

4. Research methodology

4.1 The GST real version of the Ohlson model

This section highlights the basis for the *real* version of the Ohlson (1995) model, proposed by GST (2005), to deal with a particular aspect of "dirty surplus" accounting prevalent in the UK over the past three decades - the revaluation of property assets and the crediting of that revaluation direct to a reserve account. The residual income valuation model expresses the market value of equity as current equity book value plus discounted expected residual income to equity holders. The dividend discount model

(DDM) relies on one proposition: asset prices represent the present value of all expected dividends (PVED), that is[3]:

$$P_t = \sum_{J=1}^{\infty} R^{-J}.E(d_{t+i}) \qquad (5)$$

Where *Pt* is the market price of equity at date *t*, *dt* symbolizes dividends (or net cash payments to equity holders) received at the end of period *t*, *R* is unity plus the discounted rate *r*, and *Et* is the expectation operator based on the information set at date *t*.

To derive the RIM from the PVED, two additional assumptions are made (Edwards and Bell, 1961; Peasnell, 1982; and Ohlson, 1995). First, the book value of equity follows a "clean surplus" relation (CSR)[4] that only earnings (*Xt*) and net dividends modify book equity, that is, the change in book value from period to period is equal to earnings minus net dividends[5]. That is,

$$b_t = b_{t-1} + x_t - d_t \qquad (6)$$

Where *bt* represents book value of equity at date *t*, x_t represents earnings for period *t* and *dt* refers to net dividends distributed to shareholders at time *t*.

Second, the book value of equity grows at a rate less than *R* (Lo and Lys, 2000), that is:

$$R^{-J}.E(b_{t+J}) \xrightarrow{J\to\infty} 0$$

[3] Note that, the model assumes an economy with risk neutrality and homogenous beliefs, as well as the interest rate satisfying a non-stochastic and flat term structure.
[4] Clean surplus accounting implies that all value-relevant information is eventually reflected in the profit and loss account (McCare and Nilsson, 2001).
[5] Consistent with CSR, the Ohlson (1995) model assumes that dividends reduce current book value, but not current earnings.

Combining the two assumptions gives the RIM valuation expression[6]:

$$P_t = b_t + \sum_{J=1}^{\infty} (R)^{-J}.E(x^a_{t+j}) \qquad (7)$$

Where $x^a_t = x_t - r.b_{t-1}$ is the residual income or abnormal earnings[7]. The valuation function in the RIM is consistent with the idea that a company is expected to live forever. For valuation purposes, a finite horizon point in time is often introduced in this function[8].

GST define an inflation index (base year 0) for year *t* as:

$$I_t = \prod_{s=0}^{t} (1 + i_s) \qquad (8)$$

and a real (in year 0 price levels) equivalent of the dividend series given by $d_t^{'}$ where the real dividend is defined as:

$$d_t^{'} = d_t / I_t \qquad (9)$$

Then, they assume that there is a constant real cost of capital, $r^{'}$, so that a real terms valuation function can be defined as:

$$R_t^{'-j} = \frac{R_t^{-j}}{I_t} \qquad (10)$$

Thus, the residual income valuation model can now be expressed in *real* terms as:

$$P_t = \sum_{J=1}^{\infty} R^{'-J}.E(d_{t+i}^{'}) \qquad (11)$$

Further they define A_t as the book value of assets at time *t*, D_t as the book value of debt at time *t*, so that $B_t = A_t - D_t$, a_t as the investment in tangible and intangible net

[6] Lo and Lys (2000) argue that the PVED and the RIM are mathematically equivalent. Thus, rejecting the RIM is logically equivalent to rejecting the hypothesis that investors price securities as the present value of all expected future cash flows.
[7] Note that as in GST, all estimates are made using a 5% real cost of capital.
[8] For example, see Penman and Sougiannis (1998) for finite-horizon analysis.

assets, and m_t as the investment in monetary net assets (for simplicity we assume that the working capital cycle is zero days[9]) during year t, so that $A_t = A_{t-1}/(1+\delta_t) + a_t + m_t$, where δ_t is the rate of depreciation at the end of year t[10].

Cash flow, c_t, is defined so that $x_t = c_t - \left[1 - \frac{1}{(1+\delta_t)}\right]A_{t-1} - D_t + D_{t-1}$. The accounting identity implies that $d_t = c_t - a_t - m_t$, hence:

$$\begin{aligned} b_t &= A_{t-1} - \left(1 - \frac{1}{1+\delta_t}\right).A_{t-1} - D_t + D_{t-1} + a_t + m_t \\ &= \frac{b_{t-1}}{1+\delta_t} + a_t + m_t - D_t + D_{t-1} \end{aligned} \tag{12}$$

Next, they define an approximation of the current replacement book value of assets, b'_t and a current replacement cost depreciation charge. They assume that asset prices increase in line with the general rate of inflation and that the rate of technological innovation is given by θ_t. Assuming the firm commenced business in year zero, as Lindenberg and Ross (1981) show the recursive relation of replacement cost of assets will be given by:

$$b'_t - m_t = (b'_{t-1} - m_{t-1})\left(\frac{[1+i_t]}{[1+\delta_t][1+\theta_t]}\right) + a_t \tag{13}$$

Continuing the recursion they have:

$$b'_t - m_t = \sum_{\tau=0}^{t}\prod_{s=\tau}^{t}\left(\frac{[1+i_s]}{[1+\delta_s][1+\theta_s]}\right)a_\tau \tag{14}$$

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[9] Changing this assumption simply requires a revaluation expression for stocks of raw materials and work in progress.
[10] Note that in keeping with the usual assumptions of discrete time discounted cash flow models, all cash flows and value changes are assumed to occur at the year end.

Note they assume that the rate of depreciation on current cost asset values is identical to the rate of depreciation on historical book values. The historical book value of the fixed assets is simply:

$$b_t - m_t = \sum_{\tau=0}^{t} \prod_{s=\tau}^{t} \left(\frac{1}{1+\delta_s} \right) a_\tau \tag{15}$$

So that difference between historical book values and nominal book values, or the cumulative holding gain, is defined as:

$$b_t' - b_t = \sum_{\tau=0}^{t} \coprod_{s=\tau}^{t} \left(\frac{1}{1+\delta_s} \right) \left[\frac{\prod_{s=\tau}^{t} (1+i_s)}{\prod_{s=\tau}^{t} (1+\theta_s)} - -1 \right] a_\tau \tag{16}$$

Following Edwards and Bell (1961) they partition nominal earnings in any one year into holding gains on assets, debt and real earnings. Assume that asset prices increase in line with general inflation, that net monetary assets (excluding debt), m_t, are zero (or, equivalently, that the overall average price increase on assets is the rate of inflation), and that the rate of technological improvement is zero.[11] Re-defining book values in terms of current price levels, they have holding gains, h_t, given by $h_t = b'_{t-1}.i_t$. By assumption there are no real holding gains on assets. As in O'Hanlon and Peasnell (2004) these holding gains can be decomposed into the holding gain on debt, $h_t^d = D_{t-1}.i_t$, and the holding gain on assets, $h_t^a = A_{t-1}.i_t$. As they note, the holding gain on assets is "fictional". However, the gain on debt is not, but merely serves to offset the increased (nominal) interest charge lenders require to offset the decreased purchasing

[11] These simplifying assumptions merely avoid real holding gains or losses occurring on assets. If real holding gains or losses occur they are simply recognised as real income in what follows, which is a variation on Peasnell (1982, p.362).

power of the principal.[12] The effect of adjusting for this holding gain on debt is identical (ignoring tax effects) to replacing the nominal interest charge in the profit and loss statement with a real interest charge. Real earnings expressed in end year *t* price levels can then be defined as[13]:

$$x_t^{rt} = x_t - h_t = b'_t - (1 + i_t)b'_{t-1} + d_t \qquad (17)$$

So real abnormal earnings in year *t* can now be defined as:

$$x_t^{art} = b'_t - (1 + r')(1 + i_t)b'_{t-1} + d_t \qquad (18)$$

This is a real terms version of the Edwards and Bell/Peasnell (1961, 1982) model, so that accounting is clean surplus in real terms, given the assumption that there are no *real* holding gains on assets. However, since $-(1 + r')(1 + i_t) = -(1 + r)$, real abnormal earnings are identical to nominal abnormal earnings based upon current book values. Thus the key distinguishing feature of the GST model is the uplifting of the book values on which the abnormal earnings construct is defined. Once that is done, there is no distinction between "real" and "nominal" abnormal earnings.

Making the usual assumption for residual income and dividend discount models, that the present value of the book assets in year *N* will be approximately zero, enables the final term to be dropped, which then leaves:

$$P_t = b'_t + \sum_{\tau}^{\infty} \frac{x_{t+\tau}^{art}}{(1 + r)^{\tau}} \qquad (19)$$

Thus, GST follow the spirit of Ohlson but assume that the real abnormal earnings (or, equivalently, *nominal current value abnormal earnings*) follow an autoregressive process of the following type:

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[12] Throughout, we assume that inflation is anticipated.
[13] Note that 'inflation gain on debt' is not included here, since it is already embedded within the capital maintenance adjustment to opening equity. For example, see O'Hanlon (2005).

$$x^{art}_{t+1} = \omega x^{art}_{t} + \nu_t + \varepsilon_{1,t+1}$$
$$\upsilon_{t+1} = \gamma \nu_t + \varepsilon_{2,t+1} \qquad (20)$$

Note that following GST, we estimate the other information variable as the difference between the market expectation of residual income for period t+1 based on all available information and the expectation of abnormal earnings based only on current period residual income. We apply Capstaff, Paudyal, and Rees (1995) to estimate earnings forecast error. The persistence parameter of abnormal earnings and the persistence parameter of the other information variable are estimated over the period 1976-2000 as follows[14]:

$$x^{a}_{t+1} = \omega_0 + \omega_1 x^{a}_{t} + e_{t+1} \qquad (21)$$

$$v_{t+1} = \gamma_0 + \gamma_1 v_t + e_{t+1} \qquad (22)$$

As in the Ohlson model ω is assumed to have a value between zero and 1.0. The particular focus of the GST model is on the nature of h_t within the British accounting system. Here GST partition assets into three categories: property assets, *p*, other fixed assets, *f*, and net working capital, *w*, such that $b_t = p_t + f_t + w_t$. They observe that British firms have historically revalued property assets regularly[15], but that the holding gain is taken directly to reserves in contravention of clean surplus accounting principles. Thus, they make the simplifying assumption that property prices increase in line with general inflation, that no other assets are revalued using "dirty surplus" accounting, and that the working capital holding period is not significantly different from zero days. It

[14] Note that the value of $\omega_0(\omega_1)$ is -0.004 (0.57) with t-statistic of -0.63 (17.93), whereas the value of $\gamma_0(\gamma_1)$ is 0.001 (0.58) with t-statistic of 0.37 (13.08). All t-statistics are calculated using White (1980) corrections.

[15] For example, Samuels, Brayshaw and Craner (1995, p.144) note that British companies generally value property on an open market value for existing use basis, and that in the UK most revaluations undertaken relate to property assets. See also Aboody, Barth and Kasznik (1999).

then follows that property assets (by virtue of dirty surplus revaluation in line with inflation) and current assets (by assumption) are already valued at current value to the business, but that other fixed assets need to be revalued to reflect the change in price levels. In other words, the adjustments required by (14) and (16) above do not need to be applied to all book assets, but merely to non-property and non-working capital assets.

4.2 The three GST model specifications

GST estimated three specifications of the inflation-adjusted Ohlson (1995) model. The first specification simply models the mean reversion in residual income, that is:

$$P_t = b_t + \alpha_1 x_t^a \qquad (23)$$

This specification assumes that all expectations of future abnormal earnings are based on current abnormal earnings, and that abnormal earnings mean revert at their unconditional historical rate.

The second specification is the "full" Ohlson model and includes other information as well as residual income, that is:

$$P_t = b_t + \alpha_1 x_t^a + \alpha_2 v_t \qquad (24)$$

This specification includes value-relevant information from non-accounting sources. The third, and simplest, specification omits the "other information" variable, and assumes the immediate reversion of residual income to a zero mean, that is:

$$P_t = b_t \qquad (25)$$

This specification assumes that all value-relevant information is reflected in the estimated replacement book value of equity, that is, expectations of future abnormal earnings are based on information in current abnormal earnings and that abnormal earnings are purely transitory. Thus, equity market value is represented by the current book value of equity. This is included as it is a model based upon modified book values (in effect, an estimate of replacement costs) it provides a benchmark comparator with portfolio formations based upon book-to-market values. This specification is the basis for the most simple book-to-market contrarian investment strategy.

4.3 The portfolio formation procedure

We conduct a portfolio analysis approach to investigate whether the value measures implied by the real version of the Ohlson model and its alternative specifications are able to predict long-run future stock returns of up to five years. Based on GST (2005), we use the ratio of the intrinsic model values to observed equity values, the *V/P ratio*. Here, *V* is the fundamental or intrinsic value measured based on the *real* or inflation-adjusted version of the Ohlson (1995) model and/or one of its alternative specifications, and *P* is the market value of equity six months after the fiscal year end. For each year, then, stocks are sorted into deciles based on *V/P ratio* values for each specification of the real model. Lower deciles consist of stocks that are overpriced (glamour or growth stocks) relative to fundamental value and are likely to experience lower future stock returns. Higher deciles consist of stocks that are under-priced (value stocks) relative to fundamental value and are expected to generate higher future stock returns.

We begin portfolio formation on the first of September every year because more than two thirds of the firms listed on the London Stock Exchange have their fiscal year end in December and March. To be included in the sample, firms must have data on the *V/P ratio* recorded between the end of April of year *t-1* and the first of May of year *t*. The proceeds from a stock that de-lists during the holding period are distributed among other stocks in the portfolio according to their value-weight in the case of the value-weighted analysis and equal-weight in case of the equally weighted analysis. We allow for at least a four-month lag between the measurement of accounting and returns data to ensure that accounting data are available at the date of formation. For each portfolio, we compute returns for: (1) each of the following five years, R1 to R5; (2) the average annual return over the five-year period (AR); and, (3) the average cumulative five-year return with annual compounding. In this study, we focus upon a value-weighted return calculation, in which each stock is weighted in proportion to its market value at the beginning of year *t*[16]. Furthermore, we allow for a size effect in returns by constructing the size-adjusted returns for the portfolios.

4.4 Risk adjusted returns

In order to explore the ability of the *real* version of the Ohlson (1995) model, proposed by GST (2005), to predict future long-run returns of up to five years, we conduct a portfolio analysis approach. First, we see whether the CAPM can explain differences in the returns between value and glamour portfolios (or VMG portfolios).

$$R_{it} - R_{ft} = a_i + \beta_i \left(R_{mt} - R_{ft}\right) + e_{\mathrm{it}} \qquad (26)$$

Where:

Ri = the monthly portfolio value-weighted returns.

R_m = the monthly return of the FTSE All Share Total Return Index

R_f = the monthly 3-month Treasury bill rate at the beginning of the month

Following Gregory, Harris, and Michou (2001), we test whether the intercept in each of the regressions is equal to zero using a conventional *t*-statistic. Portfolio returns are

[16] Note that whilst we also calculate equally weighted returns, we discuss only the value-weighted returns in this paper. However, the equally weighted returns are available from the authors upon request.

calculated by equally weighting each of the 5 years' value-weighted portfolio returns in calendar time. This implies some modest re-balancing each year, as the previous year 5 portfolio holding drops out and has to be replaced by the new first year portfolio. In addition, weightings between years change. The advantage of this approach is that information from all 5 years of a portfolio's life is used, as opposed to previous approaches to risk assessment where only first year returns are examined. An important characteristic is that this strategy is replicable by investors.

In addition to the one-factor analysis, we also employ the Fama and French (1993) three-factor model to explain the difference in returns between value and glamour stocks. The model is:

$$R_{it} - R_{ft} = a_i + \beta_i \left(R_{mt} - R_{ft} \right) + s_i SMB_t + h_i HML_t + e_{\mathrm{it}} \tag{27}$$

SMB (small minus big) is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big-stock portfolios (B/L, B/M, and B/H). HML is the difference, each month, between the average of the returns of the two high-book-to-market portfolios (S/H and B/H) and the average of the returns on the two low-book-to-market portfolios (S/L and B/L). Following Fama and French, and also Gregory, Harris, and Michou (2001), the mimicking portfolios[17] for the size (SMB) and book-to-market (HML) factors are constructed as follows[18]. At the end of June of each year *t* stocks are allocated to two groups (big or small, b or s) based on whether their market value is

[17] Mimicking portfolios refer to portfolios that may be substituted for the factors in a factor model regression to measure the betas, and whose expected returns are the risk premium (Ferson and Harvey, 1993).
[18] We are very grateful to Maria Michou for updating the series SMB and HML.

above or below the median of the largest 350 companies.[19] Further, stocks are allocated in an independent sort to three book-to-market groups (high, medium, and low; H, M or L) based on the breakpoints for the top 30 percent, middle 40 percent, and bottom 30 percent of the book-to-market values recorded for the largest 350 companies at the end of year *t-1*.

From the intersection of the two size groups (S and B) and the three book-to-market groups (L, M, H), six size-book-to-market portfolios are constructed (S/L, S/M, S/H, B/L, B/M, B/H).

In addition, we examine returns in "up markets" and "down markets", and additionally extend the Fama and French three-factor models for each of the VMG portfolios in both up markets and down markets.

5. Empirical results

5.1 The returns to the residual income model value investment strategy

5.1.1 Analysis of raw returns

Table 1 reports value-weighted returns for portfolios based on Ohlson model estimations of the V/P ratio. Panel A gives returns for the first specification, where residual income is assumed to mean revert. A general result is that as V/P increases, returns tend to increase, though do not increase monotonically. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.119 (0.120) and the average cumulative five-year return is 0.598 (0.599). Panel B gives the returns for the second specification of the Ohlson model, where the other information variable is included in addition to residual income. Again, as V/P increases, returns tend to increase, though

[19] This uses the largest 350 companies instead of the whole sample in order to reduce the imbalance in the market value of the small and large groups. The approach here is consistent with Fama and French (1993 and 1996).

not monotonically. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.129 (0.125) and the average cumulative five-year return is 0.668 (0.633). Panel C gives the returns for the third specification of the Ohlson model, where the other information variable is omitted and residual income is assumed to revert immediately to zero. Again, as the V/P ratio increases, returns tend to increase, though not monotonically. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.117 (0.115) and the average cumulative five-year return is 0.555 (0.551).

5.1.2 Analysis of size-adjusted returns

To allow for a potential size effect in returns, we construct the size-adjusted returns for the portfolios as follows. Each year, stocks are sorted into decile portfolios on the basis of the market capitalization at the end of the previous year. Then the average return of each size decile portfolio is computed - this is referred to as the size decile return. Size adjusted returns for a given portfolio are then computed as follows. For each stock in the portfolio, we identify its corresponding size portfolio, and its size decile return. A size benchmark portfolio is constructed by replacing each stock’s return with its corresponding size decile return. The size adjusted portfolio return is then computed as the difference between its raw return and its size benchmark return.

Table 2 reports value-weighted size-adjusted returns for portfolios based on the V/P ratio. Panel A gives returns for the first Ohlson-model specification, where residual income is assumed to mean revert. Broadly, as the V/P ratio increases, stock returns tend to increase from negative to positive, though the pattern is far from monotonic. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.084

(0.089) and the average cumulative return is 0.444 (0.459). Panel B gives returns for the second Ohlson model specification, where the other information variable is included in addition to residual income. Again, as the V/P ratio increases, stock returns tend to increase from negative to positive, though far from monotonically. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.087 (0.097) and the average cumulative return is 0.453 (0.496). Panel C give returns for the third Ohlson model specification, where the other information variable is omitted and residual income is assumed to revert immediately to zero. Again, as the V/P ratio increases, stock returns increase from negative to positive in an almost monotonic pattern. The average return for the VMG1 (VMG2) portfolio over the five-year period is 0.083 (0.091) and the average cumulative return is 0.401 (0.438).

5.2 Explaining the difference in returns between value and glamour stocks

5.2.1 The one-factor analysis.

We start by testing whether the CAPM can explain portfolio returns in each of our deciles and differences between value and glamour stocks (the returns in our VMG portfolios). Table 3 presents CAPM model parameters with decile returns or VMG returns as the dependent variable. Here, we use monthly returns for portfolios based on the V/P ratio over a five-year horizon, for each of the three Ohlson model specifications. In the three specifications of the Ohlson model given in panels A to C, the intercept is typically close to zero with a few exceptions for extreme value portfolios. The estimated loading of the market factor is highly significant and ranges from 0.924 to 1.078 across the three model specifications. Further, the one-factor model explains a high proportion of the time series variation in returns for all ten portfolios. However, in relation to the hedge portfolios, VMG1 and VMG2, the intercept is significantly greater than zero across specifications for VMG1 portfolios at the 10 per cent level of significance (and at the 5 per cent level of significant for VMG2 portfolios). The estimated loading factor for these portfolios is negative and insignificant across the model specifications. Therefore, there is no evidence here to suggest that value-based investing strategies are conventionally more risky than glamour strategies.

5.2.2 The three-factor analysis

In Table 4, we test whether the three-factor model can explain differences in returns between value and glamour portfolios. The table reveals that the three-factor model significantly improves our ability to explain the time series variation of returns for each of the V/P decile portfolios. The higher V/P portfolio models in particular show a dramatic improvement with R-squared statistics increasing by approximately 15 percentage points. Even neutral portfolios experienced an improvement of around 5 percentage points. Individual V/P decile portfolio returns are generally significantly positively related to the loading of the market factor, the book to market factor and size. However, lower V/P decile (glamour) portfolios tend to produce a negative loading factor for the book to market factor. As expected, the loading on the book to market factor is higher for value than for glamour portfolios, though is positive for neutral portfolios. The intercepts of the V/P decile portfolios appear to be closer to zero when comparing the three-factor model with the one-factor model across specifications, and therefore the former explains better the cross-section differences in returns across portfolios than the latter.

The results for the VMG1 and VMG2 hedge portfolios reveal that the three-factor model has far greater explanatory power in terms of R-squared than the one-factor model. Indeed, the intercepts are all insignificantly different from zero for the VMG 1 portfolio, apart from for the third specification of the Ohlson model where returns are significantly positive at the 10% level. For the VMG2 portfolio, returns are significantly positive at the 10% level for the first two specifications, but significant at the 5% level for the third specification. Hedge portfolio returns are significantly positively related to the loading of the book to market factor and size, though are not significantly related to the loading of the market factor. In terms of economic significance, the monthly abnormal returns for VMG1 (VMG2) are 0.29% (0.34%), 0.24% (0.31%) and 0.40% (0.42%) respectively for each of the three specifications.

In sum, the three-factor model captures more of the variation in returns than the one-factor model, with individual V/P decile portfolios evidencing negative intercepts in the glamour through to neutral portfolio range. However, for VMG hedge portfolios, the three-factor model represents a significant improvement, though demonstrates that portfolio returns are partially accounted for by the book to market and size factors and not by the market loading factor. It is important to note that whilst the three factor model represents an improvement in explaining the variability of portfolio returns from value investing, it still explains less than half of that variability. The implication of this is, then, that there are other as yet unexplained factors not captured by the Fama and French three-factor model which could help us to explain the returns to value-investing. Furthermore, following Carhart (1997) we include the winner-loser effect on the Fama-French three factor model[20]. The general results are consistent with the simple three

[20] Whilst the results are not tabulated here, they are available from the authors upon request.

factor model discussed above, that is, the model coefficients for the V/P decile portfolios change little. However, there is some marginal improvement in explanatory power across the specifications for V/P decile portfolios. The WML factor appears in general to be significantly negatively related to the returns of the portfolios sorted by V/P ratios in most of the V/P decile portfolios formed, though is less significant in lower V/P decile portfolios.

5.2.3 Analysis of up and down markets

Next, we examine returns in "up" and "down" markets by estimating the Fama and French three-factor model in each state of nature. The aim here is to investigate the profitability of a value investing strategy in different market conditions. Lakonishok, Shleifer and Vishny (1994) state that:

> *Value stocks would be fundamentally riskier than glamour stocks if, first, they underperform glamour stocks in some state of the world, and second, those are on average "bad" states, in which the marginal utility of wealth is high, making value stocks unattractive to risk-averse investors*.

Thus, if the risk-model is plausible in explaining the difference in returns between value and glamour stocks, we would expect that value stocks do worse in poor market (bad state) conditions. To shed further light on this issue, we follow Gregory, Harris and Michou (2003) by running regressions for months when the market returns are positive (up market analysis) and for months when the market returns are negative (down market analysis).

Table 5 (Table 6) gives the three factor model estimated in an up market (down market), again using portfolios formed on the basis of Ohlson model computed V/P ratios and value minus glamour portfolios. In up market conditions, perusal of the value minus glamour portfolios, VMG1 and VMG2, reveals mixed evidence regarding the performance of extreme value stocks over extreme glamour stocks. Intercepts for all three model specifications are close to zero and insignificant for the VMG1 portfolios. However, the intercepts are positive and significant for the VMG2 portfolios. The market risk premium tends to be negative though insignificant in its effect, whilst the size and book-to-market factors tend to be significantly positive. In down market conditions, looking at the value minus glamour portfolios, VMG1 and VMG2, reveals that extreme value stocks do not significantly outperform extreme glamour stocks. Although positive, intercepts for all three model specifications are close to zero and insignificant, in contrast with the up market conditions models. Interestingly, although the size and book-to-market factors remain significantly positive across specifications, the size of the SMB and HML coefficients are considerably smaller for the two RIV specified models.

In terms of model power, the three factor model has significantly greater explanatory power in up market than down market conditions, with R-squared figures of 0.53, 0.50 and 0.53 compared with figures of 0.20, 0.22 and 0.22 for the extreme value minus glamour (VMG1) portfolios based upon values computed for each of the three respective Ohlson model specifications.

6. Summary and conclusions

The analysis presented has investigated whether abnormal returns accrue to a value investment strategy based upon the inflation-adjusted Ohlson model of Gregory, Saleh and Tucker (2005). In so doing, we also explore whether an inflation-adjusted RIV model can provide any insights into the mis-pricing versus the rational risk pricing debate. If the use of an RIV model gave rise to greater investment return "anomalies", then one might tentatively conclude that such evidence favoured mis-pricing and was in line with other work (see Bulkley and Harris, 1997) which supports an explanation based upon over-extrapolation from past performance. If, on the other hand, such anomalous returns disappeared when an RIV model was employed, then the over-extrapolation story would not hold water. The evidence here is that the anomalous returns shown to exist in previous UK studies of value investing do not disappear in the presence of an RIV model. What actually happens is that abnormal returns remain, but are weaker. Perhaps this is not altogether surprising given the results reported for returns to B/M and E/P strategies in GHM (2001, 2003) and the fact that an "Ohlson" valuation (excluding the "other information" parameter) can be expressed in terms of a weighted average of earnings and book values. Moreover, we find that a three factor model cannot fully explain the returns to an investment strategy based on a model which allows for mean reversion in abnormal earnings, though such a strategy fails to outperform a naïve book to market strategy.

One further contribution of this paper has been to show that applying uplifts to asset values in an attempt to mitigate the effects of inflation does not, in itself, affect conclusions drawn with regard to returns to portfolios formed on book to market ratios. This is important in so far as it effectively rules out explanations of book to market returns based upon investor misperceptions of the effects of inflation on asset values and returns (see, for example, Ritter and Warr, 2002). One challenge for future research would be to employ a more sophisticated version of RIV modelling in order to investigate whether that adds anything to the current approach.

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Table 1 Value Weighted Returns for Portfolios Based on the V/P ratio

Panel A: Real Model $\omega = \omega^u, \nu = 0$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
R1	0.189	0.125	0.162	0.188	0.156	0.208	0.229	0.261	0.271	0.313	0.125	0.135	0.210
R2	0.165	0.129	0.171	0.199	0.209	0.189	0.254	0.287	0.250	0.293	0.128	0.124	0.215
R3	0.162	0.164	0.198	0.179	0.201	0.207	0.258	0.230	0.301	0.283	0.121	0.129	0.218
R4	0.171	0.152	0.179	0.174	0.204	0.231	0.279	0.234	0.298	0.304	0.132	0.139	0.223
R5	0.158	0.149	0.200	0.190	0.218	0.222	0.200	0.231	0.206	0.246	0.088	0.073	0.202
AR	0.169	0.144	0.182	0.186	0.198	0.211	0.244	0.249	0.265	0.288	0.119	0.120	0.214
CR5	0.622	0.484	0.650	0.705	0.728	0.795	1.008	1.039	1.084	1.220	0.598	0.599	0.833

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
R1	0.175	0.150	0.161	0.168	0.159	0.193	0.245	0.250	0.286	0.326	0.151	0.144	0.211
R2	0.163	0.141	0.161	0.196	0.205	0.193	0.269	0.275	0.279	0.274	0.111	0.125	0.216
R3	0.163	0.149	0.199	0.189	0.194	0.205	0.270	0.223	0.288	0.296	0.134	0.136	0.218
R4	0.161	0.173	0.155	0.188	0.213	0.228	0.267	0.244	0.271	0.308	0.147	0.122	0.221
R5	0.148	0.143	0.221	0.181	0.224	0.222	0.191	0.237	0.237	0.248	0.100	0.097	0.205
AR	0.162	0.151	0.179	0.185	0.199	0.208	0.248	0.246	0.272	0.290	0.129	0.125	0.214
CR5	0.591	0.522	0.624	0.692	0.728	0.774	1.049	1.004	1.120	1.260	0.668	0.633	0.836

Panel C: Real Model $\omega = 0$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
R1	0.189	0.146	0.157	0.174	0.188	0.189	0.221	0.250	0.256	0.308	0.119	0.114	0.208
R2	0.173	0.129	0.152	0.190	0.188	0.219	0.266	0.264	0.288	0.287	0.114	0.137	0.216
R3	0.155	0.162	0.198	0.169	0.185	0.219	0.264	0.251	0.290	0.252	0.097	0.112	0.215
R4	0.162	0.180	0.201	0.150	0.216	0.217	0.261	0.236	0.274	0.324	0.162	0.128	0.222
R5	0.149	0.154	0.202	0.199	0.206	0.218	0.200	0.212	0.231	0.243	0.094	0.085	0.202
AR	0.166	0.154	0.182	0.177	0.197	0.213	0.242	0.243	0.268	0.283	0.117	0.115	0.212
CR5	0.606	0.531	0.631	0.644	0.739	0.787	0.996	0.990	1.078	1.161	0.555	0.551	0.816

Note: Table 1 values represent mean one- to five-year buy and hold return for portfolios formed on September each year, based on the fundamental value to price ratio (V/P). The sample period is 1976-1995. V represents value measures computed by the Ohlson model (using r= 0.05 constant), estimated on industry basis. P is the market value of equity six months after the fiscal year end. AR is the average return for R1-R5. CR5 is the five-year cumulative return. VMG1 represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 and 9 and the average of portfolio 1 and 2.

Table 2 Value Weighted Size-Adjusted Returns for Portfolios Based on the V/P ratio

Panel A: Real Model $\omega = \omega^u, \nu = 0$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
SAAR1	-0.018	-0.075	-0.027	-0.021	-0.053	0.007	0.026	0.051	0.058	0.100	0.118	0.126	0.005
SAAR2	-0.042	-0.061	-0.021	0.002	0.006	-0.006	0.050	0.071	0.038	0.075	0.117	0.108	0.011
SAAR3	-0.027	-0.016	-0.001	-0.020	0.010	0.026	0.061	0.039	0.087	0.074	0.101	0.101	0.023
SAAR4	-0.055	-0.059	-0.021	-0.062	-0.016	0.010	0.038	0.014	0.040	-0.012	0.043	0.071	-0.012
SAAR5	-0.042	-0.054	0.007	-0.003	-0.006	0.000	0.000	0.014	-0.018	0.001	0.043	0.039	-0.010
AR	-0.037	-0.053	-0.012	-0.021	-0.012	0.007	0.035	0.038	0.041	0.048	0.084	0.089	0.003
CR5	-0.175	-0.265	-0.096	-0.095	-0.081	0.018	0.204	0.215	0.210	0.269	0.444	0.459	0.020

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
SAAR1	-0.035	-0.061	-0.050	-0.047	-0.051	-0.016	0.030	0.031	0.056	0.090	0.125	0.121	-0.005
SAAR2	-0.050	-0.073	-0.054	-0.026	-0.011	-0.021	0.042	0.052	0.058	0.037	0.087	0.109	-0.005
SAAR3	-0.045	-0.060	-0.014	-0.022	-0.028	-0.018	0.055	0.002	0.077	0.072	0.117	0.127	0.002
SAAR4	-0.070	-0.057	-0.072	-0.053	-0.021	-0.002	0.021	0.019	0.020	-0.013	0.057	0.067	-0.023
SAAR5	-0.086	-0.082	0.001	-0.035	-0.020	-0.011	-0.025	0.002	-0.009	-0.035	0.051	0.062	-0.030
AR	-0.057	-0.067	-0.038	-0.037	-0.026	-0.013	0.025	0.021	0.041	0.030	0.087	0.097	-0.012
CR5	-0.242	-0.311	-0.217	-0.164	-0.137	-0.078	0.179	0.134	0.228	0.210	0.453	0.496	-0.040

Panel C: Real Model $\omega = 0$

	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2	Average
SAAR1	-0.032	-0.067	-0.066	-0.048	-0.033	-0.033	-0.002	0.024	0.025	0.066	0.098	0.095	-0.017
SAAR2	-0.040	-0.082	-0.061	-0.026	-0.023	0.003	0.043	0.051	0.066	0.057	0.097	0.123	-0.001
SAAR3	-0.046	-0.037	-0.005	-0.036	-0.027	0.006	0.057	0.038	0.072	0.039	0.085	0.097	0.006
SAAR4	-0.070	-0.052	-0.028	-0.079	-0.020	-0.015	0.016	0.001	0.026	0.026	0.096	0.087	-0.019
SAAR5	-0.089	-0.104	-0.033	-0.030	-0.044	-0.032	-0.025	-0.024	-0.037	-0.052	0.037	0.053	-0.047
AR	-0.055	-0.068	-0.038	-0.044	-0.030	-0.014	0.018	0.018	0.031	0.028	0.083	0.091	-0.016
CR5	-0.231	-0.294	-0.212	-0.194	-0.121	-0.073	0.134	0.129	0.181	0.170	0.401	0.438	-0.051

Note: Table 2 values represent mean one- to five-year buy and hold size-adjusted returns for portfolios formed on September each year, based on the fundamental value to price ratio (V/P). The sample period is 1976-1995. V represents value measures computed by the Ohlson model (using r= 0.05 constant), estimated on industry basis. P is the market value of equity six months after the fiscal year end. AR is the size-adjusted average returns for SAAR1-SAAR5. CR5-SAAR is the five-year size-adjusted cumulative return. VMG1 represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 and 9 and the average of portfolio 1 and 2.

Table 3 One-Factor Time Series Regressions for Monthly Excess Returns for Portfolios Based on the V/P ratio: Five Year Horizon

Panel A: Real Model $\omega = \omega^u, \nu = 0$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
A	-0.0012	-0.0025	-0.0007	-0.0009	-0.0005	0.0004	0.0025	0.0026	0.0033	0.0047	0.0059	0.0059	0.0008
t(a)	-0.71	-2.02	-0.61	-0.68	-0.45	0.32	1.74	1.45	1.67	1.86	1.90	2.43	0.26
B	0.983	0.942	1.008	1.017	0.999	1.000	1.037	1.070	0.974	0.927	-0.055	-0.011	0.996
t(b)	30.67	36.51	40.80	36.38	42.51	43.29	37.60	28.67	25.44	20.08	-0.93	-0.25	34.20
R^2	0.76	0.85	0.89	0.86	0.87	0.86	0.84	0.79	0.70	0.57	-0.001	-0.004	0.80

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
a	-0.0013	-0.0021	-0.0008	-0.0013	-0.0004	0.0009	0.0023	0.0020	0.0035	0.0041	0.0054	0.0055	0.0007
t(a)	-0.78	-1.88	-0.74	-1.12	-0.36	0.75	1.69	1.16	1.83	1.72	1.83	2.47	0.23
b	0.967	0.942	1.003	0.994	0.988	0.990	0.965	1.040	0.959	0.924	-0.042	-0.012	0.977
t(b)	29.82	39.68	38.13	40.68	38.84	35.62	39.93	27.07	26.29	21.16	-0.77	-0.30	33.72
R^2	0.77	0.88	0.89	0.88	0.87	0.86	0.82	0.78	0.70	0.59	-0.003	-0.004	0.80

Panel C: Real Model $\omega = 0$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
a	-0.0019	-0.0018	-0.0010	-0.0011	-0.0006	0.0002	0.0028	0.0022	0.0044	0.0049	0.0069	0.0066	0.0008
t(a)	-1.20	-1.57	-0.90	-0.88	-0.53	0.16	2.08	1.21	2.09	2.00	2.32	2.73	0.25
b	0.987	0.954	1.012	1.012	0.989	0.997	1.019	1.078	0.949	0.932	-0.055	-0.030	0.993
t(b)	32.32	41.50	42.21	39.18	40.58	40.95	39.23	27.70	24.37	19.82	-0.95	-0.65	34.79
R^2	0.78	0.87	0.89	0.87	0.87	0.85	0.86	0.78	0.67	0.58	-0.001	-0.003	0.80

Notes:

$$R_{it} - R_{ft} = a_i + \beta_i (R_{mt} - R_{ft}) + e_{it},$$

Where R_{it} is the monthly portfolio return. R_{ft} is the monthly Treasury bill rate at the beginning of the month. R_{mt} is the monthly return on the FTSE All Share Total Return Index. t( ) is the t-statistic with standard errors calculated using White (1980) corrections. R^2 is adjusted for degrees of freedom. Hedge return (VMG1) represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 plus 9 and the average of portfolio 1 plus 2.

Table 4 Three-Factor Time Series Regressions For Monthly Excess Returns For Portfolios Based on the V/P ratio: Five Year Horizon

Panel A: Real Model $\omega = \omega^u, \nu = 0$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
a	0.0009	-0.0018	-0.0007	-0.0017	-0.0014	-0.0008	0.0013	0.0017	0.0022	0.0037	0.0029	0.0034	0.0003
t(a)	0.60	-1.56	-0.64	-1.52	-1.36	-0.72	1.08	1.19	1.32	1.72	1.21	1.83	0.01
b	0.986	0.953	1.017	1.030	1.008	1.008	1.049	1.094	0.999	0.962	-0.024	0.011	1.011
t(b)	37.72	38.97	42.67	44.28	51.37	51.64	42.68	34.54	32.39	26.23	-0.53	0.32	40.25
s	0.027	0.225	0.186	0.288	0.212	0.202	0.280	0.528	0.545	0.740	0.714	0.517	0.323
t(s)	0.41	4.51	4.04	6.19	4.98	4.57	5.80	8.86	7.48	8.37	6.36	5.97	5.52
h	-0.517	-0.110	0.067	0.275	0.283	0.341	0.366	0.365	0.435	0.438	0.955	0.750	0.194
t(h)	-6.85	-2.32	0.87	4.72	5.19	6.39	6.26	6.23	6.55	4.55	8.30	9.53	3.16
R^2	0.83	0.87	0.90	0.89	0.91	0.90	0.89	0.87	0.81	0.71	0.42	0.42	0.86

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
a	0.0006	-0.0016	-0.0012	-0.0017	-0.0013	-0.0001	0.0012	0.0008	0.0021	0.0030	0.0024	0.0031	0.0002
t(a)	0.41	-1.53	-1.10	-1.70	-1.31	-0.08	1.03	0.63	1.47	1.50	1.08	1.87	-0.07
b	0.971	0.953	1.011	1.007	0.999	1.003	0.977	1.063	0.984	0.956	-0.014	0.008	0.992
t(b)	38.23	43.54	41.41	49.90	45.69	39.11	45.34	32.23	32.42	25.92	-0.33	0.24	39.38
s	0.063	0.218	0.170	0.289	0.253	0.270	0.286	0.509	0.542	0.690	0.628	0.476	0.329
t(s)	1.00	4.70	3.75	6.90	6.56	6.20	5.78	9.66	8.171	8.89	5.96	6.35	6.16
h	-0.455	-0.070	0.133	0.194	0.296	0.331	0.363	0.439	0.494	0.470	0.925	0.744	0.220
t(h)	-5.79	-1.45	2.02	3.53	5.70	7.05	6.35	7.41	8.39	5.36	8.06	10.02	3.86
R^2	0.82	0.89	0.90	0.91	0.91	0.91	0.88	0.87	0.83	0.73	0.41	0.45	0.87

Table 4 continued

Panel C: Real Model $\omega = 0$

	P1 Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**	**Average**
a	-0.0001	-0.0011	-0.0012	-0.0018	-0.0015	-0.0010	0.0019	0.0011	0.0033	0.0039	0.0040	0.0042	0.0004
t(a)	-0.50	-1.00	-1.12	-1.72	-1.43	-0.89	1.63	0.79	1.86	1.98	1.76	2.27	-0.04
b	0.993	0.963	1.023	1.022	1.001	1.007	1.033	1.101	0.974	0.969	-0.024	-0.007	1.009
t(b)	40.04	44.17	46.53	46.09	46.73	52.26	45.99	32.70	31.34	26.97	-0.56	-0.19	41.28
s	0.988	0.175	0.230	0.226	0.257	0.215	0.303	0.512	0.538	0.786	0.688	0.525	0.423
t(s)	1.64	3.79	5.29	4.90	6.18	4.56	6.84	8.30	6.75	9.27	6.56	6.19	5.75
h	-0.449	-0.134	0.230	0.249	0.285	0.353	0.325	0.401	0.419	0.463	0.912	0.732	0.214
t(h)	-6.01	-2.69	5.29	4.25	5.27	6.27	6.06	6.76	5.95	5.62	8.75	10.01	3.68
R^2	0.84	0.88	0.91	0.90	0.91	0.90	0.90	0.87	0.77	0.75	0.43	0.41	0.86

Notes: $R_{it} - R_{ft} = a_i + \beta_i(R_m - R_{ft}) + s_i SMB + h_i HML + e_{it}$,

Here, R_{it} is the monthly portfolio return, R_{ft} is the monthly Treasury bill rates at the beginning of the month, and R_{mt} is the monthly returns of the FTSE All Share Total Return Index. t( ) are the t-statistics with standard errors calculated using White (1980) corrections. R^2 is adjusted for degrees of freedom. SMB (small minus big) is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big- stock portfolios (B/L, B/M, and B/H). HML is the difference, each month, between the average of the returns on the two high-book-to-market portfolios (S/H and B/H) and the average of the returns on the two low-book-to-market portfolios (S/L and B/L). Hedge return (VMG1) represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 plus 9 and the average of portfolio 1 plus 2.

Table 5 The Three-Factor Model (Up Market)

Panel A: Real Model $\omega = \omega^u, \nu = 0$

Variable	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2
a t(a)	0.0016 (0.47)	-0.0044 (-1.84)	-0.0042 (-2.00)	-0.0053 (-2.39)	-0.0056 (-2.55)	-0.0036 (-1.49)	-0.0021 (-0.92)	0.0012 (0.44)	0.0068 (2.06)	0.0047 (0.96)	0.0031 (0.68)	0.0071 (2.00)
b t(b)	0.948 (12.87)	1.023 (18.33)	1.112 (19.81)	1.102 (20.16)	1.091 (22.60)	1.057 (18.32)	1.112 (22.32)	1.091 (16.88)	0.879 (11.24)	0.922 (9.06)	-0.027 (-0.26)	-0.085 (-1.07)
s t(s)	-0.097 (-1.11)	0.197 (2.98)	0.198 (3.05)	0.248 (3.95)	0.226 (3.94)	0.185 (2.93)	0.273 (4.50)	0.464 (5.87)	0.547 (6.68)	0.728 (7.27)	0.826 (6.27)	0.588 (6.06)
h t(h)	-0.551 (-5.85)	-0.121 (-2.10)	-0.048 (0.48)	0.319 (5.01)	0.294 (4.37)	0.370 (5.48)	0.404 (6.20)	0.393 (5.91)	0.407 (5.14)	0.514 (4.66)	1.065 (8.51)	0.796 (9.27)
Adj-R^2	0.58	0.66	0.72	0.71	0.75	0.74	0.76	0.67	0.59	0.52	0.53	0.52

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

Variable	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2
a t(a)	0.0023 (0.67)	-0.0040 (-1.89)	-0.0038 (-1.82)	-0.0051 (-2.44)	-0.0042 (-1.96)	-0.0034 (-1.45)	0.0019 (0.71)	0.0020 (0.77)	0.0068 (2.22)	0.0083 (1.73)	0.0060 (1.31)	0.0084 (2.44)
b t(b)	0.908 (12.55)	1.009 (18.75)	1.078 (16.96)	1.070 (20.57)	1.048 (18.97)	1.053 (18.45)	0.940 (14.73)	1.022 (15.76)	0.863 (10.39)	0.800 (7.84)	-0.108 (-1.07)	-0.127 (-1.53)
s t(s)	-0.486 (-0.56)	0.170 (2.95)	0.181 (2.81)	0.265 (5.13)	0.237 (4.68)	0.268 (4.44)	0.255 (4.21)	0.446 (6.26)	0.517 (6.48)	0.662 (6.58)	0.711 (4.99)	0.529 (5.36)
h t(h)	-0.490 (-4.95)	-0.092 (-1.61)	0.117 (1.38)	0.237 (4.18)	0.305 (4.75)	0.356 (6.51)	0.410 (6.04)	0.466 (6.70)	0.488 (6.68)	0.546 (5.03)	1.036 (7.52)	0.808 (9.21)
Adj-R^2	0.55	0.71	0.71	0.74	0.74	0.76	0.68	0.68	0.60	0.49	0.50	0.51

Table 5 continued

Panel C: Real Model $\omega = 0$

Variable	**P1** Glamour	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10 Value**	**VMG1**	**VMG2**
a	0.0007	-0.0045	-0.0031	-0.0050	-0.0051	-0.0041	-0.0014	0.0005	0.0077	0.0035	0.0028	0.0075
t(a)	(0.22)	(-2.09)	(-1.51)	(-2.15)	(-2.47)	(-1.76)	(-0.67)	(0.19)	(2.04)	(0.87)	(0.66)	(2.16)
b	0.958	1.0595	1.076	1.082	1.065	1.063	1.094	1.102	0.855	0.962	0.0039	-0.100
t(b)	(13.13)	(22.16)	(20.18)	(18.53)	(22.45)	(19.22)	(24.07)	(16.46)	(10.06)	(10.72)	(0.04)	(-1.28)
s	-0.013	0.161	0.215	0.212	0.261	0.181	0.296	0.453	0.511	0.790	0.803	0.576
t(s)	(-0.16)	(2.70)	(3.47)	(3.27)	(4.81)	(2.68)	(5.20)	(5.52)	(5.50)	(8.92)	(6.82)	(6.29)
h	-0.482	-0.151	0.102	0.290	0.319	0.383	0.356	0.423	0.398	0.511	0.993	0.771
t(h)	(-5.18)	(-2.51)	(1.26)	(4.23)	(5.07)	(5.52)	(5.74)	(6.26)	(4.70)	(5.55)	(8.86)	(10.11)
Adj-R^2	0.57	0.71	0.71	0.70	0.76	0.73	0.77	0.68	0.51	0.60	0.53	0.50

Notes: $R_{it} - R_{ft} = a_i + \beta_i(R_m - R_{ft}) + s_i SMB + h_i HML + e_{it}$,

R_{it} is the monthly portfolio return, R_{ft} is the monthly Treasury bill rate at the beginning of the month, and R_{mt} is the monthly return on the FTSE All Share Total Return Index. All t-statistics are in parentheses with standard errors calculated using White (1980) corrections. R^2 is adjusted for degrees of freedom. The hedge return (VMG1) represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 plus 9 and the average of portfolio 1 plus 2. SMB (small minus big) is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big- stock portfolios (B/L, B/M, and B/H). HML is the difference, each month, between the average of the returns on the two high-book-to-market portfolios (S/H and B/H) and the average of the returns on the two low-book-to-market portfolios (S/L and B/L).

Table 6 The Three-Factor Model (Down Market)

Panel A: Real Model $\omega = \omega^u, \nu = 0$

Variable	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2
a	0.0025	-0.0034	-0.0017	-0.0004	0.0023	0.0020	0.0041	0.0023	0.0040	0.0044	0.0019	0.0047
t(a)	(1.03)	(-1.54)	(-1.01)	(-0.23)	(1.35)	(1.05)	(1.64)	(0.81)	(1.07)	(0.88)	(0.34)	(1.09)
b	1.022	0.906	0.979	1.020	1.048	1.034	1.071	1.096	1.067	0.967	-0.055	0.053
t(b)	(31.02)	(27.21)	(34.69)	(28.01)	(36.61)	(40.40)	(22.23)	(16.83)	(18.03)	(12.38)	(-0.66)	(0.78)
s	0.241	0.304	0.193	0.387	0.196	0.242	0.307	0.651	0.497	0.760	0.518	0.355
t(s)	(3.03)	(4.66)	(4.57)	(8.74)	(3.90)	(4.51)	(3.71)	(6.92)	(3.82)	(4.35)	(2.47)	(2.19)
h	-0.431	-0.107	0.099	0.155	0.270	0.277	0.276	0.290	0.535	0.252	0.683	0.663
t(h)	(-4.92)	(-1.49)	(1.33)	(1.93)	(4.32)	(4.93)	(2.69)	(2.71)	(4.12)	(1.48)	(3.04)	(4.00)
Adj-R^2	0.87	0.86	0.92	0.92	0.92	0.92	0.87	0.87	0.75	0.63	0.20	0.24

Panel B: Real Model $\omega = \omega^u, \gamma = \gamma^u$

Variable	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2
a	0.0030	-0.0014	-0.0008	0.0004	0.0019	0.0047	0.0030	0.0006	0.0029	0.0051	0.0022	0.0032
t(a)	(1.33)	(-0.63)	(-0.40)	(0.26)	(1.13)	(2.47)	(1.24)	(0.20)	(0.90)	(1.19)	(0.45)	(0.95)
b	1.028	0.943	1.003	1.016	1.039	1.065	1.007	1.060	1.029	1.02	-0.011	0.037
t(b)	(34.93)	(28.03)	(29.95)	(33.90)	(31.86)	(26.58)	(32.48)	(14.98)	(22.42)	(13.72)	(-0.14)	(0.66)
s	0.242	0.321	0.164	0.352	0.285	0.273	0.331	0.622	0.550	0.699	0.457	0.343
t(s)	(3.28)	(4.89)	(3.85)	(6.34)	(5.56)	(4.84)	(4.29)	(7.97)	(4.86)	(5.52)	(2.93)	(3.02)
h	-0.356	-0.024	0.169	0.088	0.287	0.289	0.257	0.364	0.526	0.308	0.665	0.608
t(h)	(-3.74)	(-0.33)	(2.28)	(1.09)	(4.74)	(4.37)	(3.63)	(3.82)	(5.31)	(2.43)	(3.71)	(5.01)
Adj-R^2	0.88	0.88	0.91	0.94	0.93	0.91	0.88	0.87	0.80	0.71	0.22	0.31

Table 6 continued

Panel C: Real Model $\omega = 0$

Variable	P1 Glamour	P2	P3	P4	P5	P6	P7	P8	P9	P10 Value	VMG1	VMG2
a t(a)	0.0012 (0.57)	-0.0031 (-1.43)	-0.0025 (-1.66)	0.0001 (0.06)	0.0022 (1.23)	0.0013 (0.71)	0.0041 (1.74)	0.0017 (0.57)	0.0052 (1.23)	0.0059 (1.21)	0.0047 (0.87)	0.0065 (1.46)
b t(b)	1.024 (35.15)	0.906 (34.61)	0.986 (40.52)	1.029 (29.99)	1.039 (33.48)	1.022 (40.39)	1.048 (24.48)	1.103 (15.22)	1.040 (15.67)	0.994 (12.64)	-0.030 (-0.36)	0.052 (0.72)
s t(s)	0.292 (4.23)	0.238 (3.60)	0.278 (6.78)	0.268 (6.15)	0.257 (4.63)	0.290 (5.23)	0.330 (4.83)	0.624 (6.34)	0.544 (3.87)	0.775 (4.41)	0.483 (2.39)	0.394 (2.40)
h t(h)	-0.364 (-4.05)	-0.120 (-1.59)	0.106 (1.51)	0.147 (1.93)	0.213 (3.30)	0.277 (4.40)	0.252 (2.88)	0.339 (3.10)	0.497 (3.80)	0.354 (2.14)	0.718 (3.38)	0.668 (4.00)
Adj-R^2	0.89	0.86	0.93	0.93	0.92	0.92	0.88	0.86	0.72	0.66	0.22	0.25

Notes: $R_{it} - R_{ft} = a_i + \beta_i(R_m - R_{ft}) + s_i SMB + h_i HML + e_{it}$,

R_{it} is the monthly portfolio return, R_{ft} is the monthly Treasury bill rates at the beginning of the month, and R_{mt} is the monthly return on the FTSE All Share Total Return Index. All t-statistics are in parentheses with standard errors calculated using White (1980) corrections. The R^2 is adjusted for degrees of freedom. The hedge return (VMG1) represents the difference between portfolio 10 and portfolio 1. VMG2 represents the difference between the average of portfolio 10 plus 9 and the average of portfolio 1 plus 2. SMB (small minus big) is the difference, each month, between the average of the returns on the three small-stock portfolios (S/L, S/M, and S/H) and the average of the returns on the three big-stock portfolios (B/L, B/M, and B/H). HML is the difference, each month, between the average of the returns on the two high-book-to-market portfolios (S/H and B/H) and the average of the returns on the two low-book-to-market portfolios (S/L and B/L).