Multiple Choice?
An Industry Level Analysis of Equity Valuation Using Multiples

Andrew J. McCusker*
with the assistance of Xin Chang

Department of Finance
Faculty of Economics and Commerce
The University of Melbourne

July 30, 2007

Abstract
Using a model of median reversion, we seek to determine which of the 14 most commonly used valuation multiples has the greatest ability to predict future cross sectional stock returns within each industry group. Using a sample of US listed companies between 1980 and 2004, we found that whilst each of the six tested valuation multiples show some return predictability, the multiple with the most statistically reliable predictive power differs between the 21 industry groups tested thus far. Additionally, we expect to show that an industry relevant value investment strategy would have significantly outperformed a market wide value strategy over the sample period.

JEL Classification: G11
Keywords: equity valuation, multiples, relative valuation, industry multiples, contrarian trading strategy, value investing, median reversion, return predictability.

*Email: a.mccusker@ugrad.unimelb.edu.au
I would like to thank Dr Xin Chang, Dr Kim Sawyer, Dr Michael Chng and Dr Howard Chan for their valuable inputs, as well as other staff and students at the University of Melbourne who offered input in some form or another.
1. Introduction

Since Graham and Dodd (1934) first documented the market’s tendency to under-value certain out of favour securities, evidence that investors are able to earn positive abnormal returns by adopting value based investment strategies has mounted. A number of strategies have been put forth, many involving diverging tools of valuation such as simple valuation multiples and more complicated frameworks such as the dividend discount model, discounted cash flow model, and more recently, the residual income model. Whilst Lee et al (1999) suggest that the residual income model has greater predictive power of future stock returns than valuation multiples such as the P/B, P/E and the dividend yield (D/P) ratios, there remains little doubt that multiples remain the most commonly used tool for the valuation of equity securities in practice.

Multiples are widely used in the reports of equity research analysts, in the assessment of takeover fairness by independent experts (DeAngelo, 1990), in valuations associated with initial public offerings (Kim and Ritter, 1999), as well as in many mergers and acquisition transactions such as leveraged buyouts (Ruback, 1995).

A number of papers have addressed the power of valuation multiples as a predictor of future cross sectional returns using an entire market index as a sample set. Basu (1977, 1983) first documented the relationship between the earnings yield and future returns; whilst Rozeff (1984), Fama and French (1988), Campbell and Shiller (1989) and others made similar findings for the dividend yield. Furthermore, Rosenberg et al (1985) drew the link between P/B and subsequent returns, a finding which was later confirmed by Chan et al (1991) who found that both the cash flow yield and B/M to provide insight to future returns. Whilst these authors unanimously suggest that valuation multiples appear to provide some explanatory power of future stock returns, little attention has been devoted to finding the multiple that has the greatest ability to predict returns.

This study has two objectives. Firstly, we attempt to determine which valuation multiple can be best used to predict subsequent cross sectional returns for stocks within each industry. To do this, we compare the speed of the reversion in the value-to-price (V/P) ratio of each stock to its industry average, where value is calculated using fourteen commonly used valuation multiples. The multiple which has the quickest reversion for each industry is deemed most useful in predicting future stock returns. Using monthly observations between 1980 and 2004, we adopt an adjusted version of the reversion model outlined in Lau (1996) to test a sample of NYSE, NASDAQ and AMEX listed stocks in 48 industry groups as determined by the Fama and French industry classification system. Our findings to date illustrate that valuation multiples of US listed companies tend to revert to the medians for their industry sectors. Furthermore, the strongest reverting multiple differs significantly across each of the 21 industries tested to date. We hypothesise that the existence of a best multiple for each industry in driven by as extended investor clientele argument as first put forth by Elton and Gruber (1970). Here, we expect that investors within each industry measure performance using a particular metric and subsequently focus largely on one valuation multiple when determining relative value.

---

1 In a survey of European equity research analysts, Fernandez (2002) found that the P/E ratio was the most commonly used valuation tool, followed by the EV/EBITDA ratio and the residual income model.
2 The earnings yield (E/P) is the inverse of the P/E ratio.
3 The cash flow yield (CF/P) is the inverse of the P/CF ratio.
4 The book-to-market ratio (B/M) is the inverse of the price-to-book (P/B) ratio.
Secondly, we seek to determine whether an industry specific value investment strategy significantly outperformed a market wide value strategy over the sample period. Upon determining the multiple with the strongest predictive power for stocks within each industry, we compare the risk adjusted returns of a trading strategy that involves using the industry specific multiples to a market wide trading strategy using each of the fourteen individual multiples. Whilst we expect that the market wide trading strategy will produce positive abnormal returns for a majority of the fourteen tested valuation multiples, we believe that these returns will be statistically significantly improved by incorporating industry specific multiples into our trading strategy.

The ability to predict market returns is important in tactical asset allocation decisions, in which portfolio weights across stocks at an industry level are determined on the basis of their relative value. Should our analysis conclude that an industry specific value investing strategy is likely to outperform a market wide strategy; equity investors may be able to alter their investment strategy to incorporate our findings in an attempt to improve future risk adjusted returns. From an analyst’s perspective, an understanding of which valuation multiple most accurately predicts subsequent cross sectional returns for stocks within each industry will improve the quality of value driven stock recommendations. This analysis is especially useful for equity analysts within institutional broking houses where analyst stock coverage is allocated according to industry group. Furthermore, our results may be of interest to investors and advisors in a mergers and acquisitions setting by allowing the acquirers to more accurately predict future returns and ultimately improve investment performance.

This study relates to three core streams of the accounting and finance literature. Firstly, our work extends prior studies that examine the relationship between equity valuation multiples and subsequent cross sectional stock returns (such as Basu (1977 and 1983), Rozeff (1984), Rosenberg et al (1985), Fama and French (1988), Campbell and Shiller (1989), Chan et al (1991), O'Shaughnessy (1996), and others). Whilst these studies find that valuation multiples provide some return predictability when tested over an entire market index, our results to date show that the forecasting power of these multiples improves when industry relevant multiples are used. Secondly, our work enters the debate on which methodology should be used to select comparable firms when undertaking relative valuation (see Alford (1992), Bhojraj and Lee (2001), Damodaran (2002), and Weiner (2005)). Because we assume that institutional investors adopt a top-down investment approach, selecting comparable firms based on industry classification provides the most useful insights to investors. Thirdly, assuming that valuation multiples do not provide a proxy for firm risk, we hypothesise that our findings will provide further evidence against market efficiency by suggesting that contrarian investment strategies can outperform market returns on a risk adjusted basis. In addition, our findings of reversion in V/P ratios over time provide evidence that divergence between price and value is caused by the under and over reaction of market prices.

The remainder of this paper is organised as follows. Section 2 provides an outline of the core literature relating to valuation multiples and contrarian trading strategies. Section 3 provides further detail into the data and methodology that have been used to conduct the empirical test. Section 4 provides an outline of the empirical results to date as well as a hypothesis of further results, and Section 5 concludes.
2. Literature Review

Given its widespread use in practice, the valuation of equity securities using multiples has been the subject of surprisingly limited academic attention. In a survey of European institutional equity analysts, Fernandez (2002) found that the multiples such as the P/E ratio and the EV/EBITDA multiple are more commonly used than more complex valuation tools such as the residual income model and the discounted cash flow method. Furthermore, Damodaran (2002) notes that almost 90% of equity research valuations and 50% of acquisition valuations utilise multiples. Therefore, given the apparent preference of analysts to use multiples when valuing equity securities, we suggest that they require further academic attention, particularly regarding their ability to predict future cross sectional returns.

A significant portion of the literature relating to multiples addresses the accuracy of multiples as a valuation tool. Driven by the theory of perfect capital markets whereby price and intrinsic value does not diverge, these papers define a good valuation as one which closely correlates with the market value of the stock. Consequently, these papers ultimately test the value relevance of various multiple drivers. In a study of US listed stocks, Liu et al (2002) find that multiples derived from forward earnings explain stock prices remarkably well relative to other multiple drivers such as historical earnings, cash flows, book value and sales. Furthermore, they find these results consistently in a cross section of industries. These results were later confirmed by the same authors in 2007 in a cross-national study spanning ten different markets. In contrast to these findings, a similar study by Lie and Lie (2002) found that valuations using multiples based on asset values more accurately reflect market prices than when sales and earnings are used. This paper also discovered that using forecasted earnings improves the accuracy of valuation based on the P/E ratio, as well as confirmed the findings of Baker and Ruback (1999) that EBITDA carries more value relevance than EBIT. Most interestingly, this paper determined that the accuracy of the valuations varied greatly according to the extent of intangible assets, as well as other factors. This finding suggests that stocks with a high portion of intangible assets on their balance sheet are best valued using non-balance sheet multiples such as those based on operating performance metrics such as earnings, cash flows, dividends or sales. Whilst these papers signal that multiple drivers such as forecasted earnings, EBITDA and book value provide the most accurate valuation technique, they provide little insight into whether or not they can be used as a predictor of future cross section sectional stock returns.

The focus on value relevance follows the traditional assumption that the stock market is perfectly efficient which implies that the price of a stock reflects its intrinsic value at all times. However, more recently in the finance literature, it has commonly been accepted that the relation between price and value is one of divergence rather than static equality. This divergence has been commonly explained by limits to arbitrage such as transaction costs, fundamental risk and noise trader risk (Barberis and Thaler, 2002). Whilst it is likely that transaction costs and fundamental risk account for some of the deviation between price and value, a majority of the academic literature focuses on noise trader risk. Under this explanation, market mispricing is driven by the participation of noise traders who do not seek to profit from exploiting the arbitrage between the intrinsic value of the stock and the market price. Hong and Stein (1999) explain that these noise (or ‘momentum’) traders seek to profit by ‘trend chasing’ in
order to take advantage of the apparent under-reaction to news caused by the slow diffusion of information. This trend chasing behaviour continues, even after the information is fully reflected in market prices as positive feedback traders create excessive momentum in prices that inevitably culminates in over-reaction. Ultimately, it is the existence of this under-reaction and ultimate over-reaction to new information that largely explains the divergence between stock prices and the intrinsic value of listed companies.

If stock prices diverge from intrinsic value, it would be possible for investors to earn consistently positive abnormal returns by adopting contrarian based trading strategies if the value and price ultimately converge over time. According to the model of momentum outlined by Hong and Stein (1999), this is exactly what occurs. Here, when market prices under-react to the release of information, ‘news watchers’ trade in order to profit from the arbitrage between price and value. Upon observing this, momentum traders who trade on past price behaviour adopt a trend chasing strategy. Whilst this behaviour increases the speed at which the under-reaction is eliminated, in doing so, it creates an ultimate over-reaction. This over reaction occurs until the release of new information suggests that the stock is mispriced, causing the trend to reverse, and therefore leading to a convergence between the market price and the intrinsic value of the stock.

Intuitively, we can think of market prices differing from intrinsic valuation for two reasons. Firstly, consider the situation whereby the intrinsic valuation changes but the market price does not. According to Hong and Stein (1999), this situation could occur as the result of an initial under-reaction to the release of new information to the market. As was discovered by Ball and Brown (1968), it is possible for investors to profit from the ‘post earnings announcement drift’ which results from the correction to the initial under-reaction to earnings announcements. Here, an investor should purchase a stock immediately following a better than expected earnings announcement and should sell a stock immediately following a worse than expected earnings announcement. The abnormal returns that can be earned by exploiting the post earnings announcement drift are related to the convergence between price and value that is driven by arbitrage investors. This strategy was also documented by Jagadeesh and Titman (1993) who describe that a strategy of buying past winners and selling past losers generates positive abnormal returns over a three to twelve month holding period. The second source of divergence between market price and intrinsic value occurs when market prices change but intrinsic value does not. This situation is most commonly referred to as over-reaction, whereby trending market prices and momentum traders cause the stock price to over-shoot intrinsic value. The findings of De Bondt and Thaler (1985) that portfolios of prior losers are found to outperform portfolios of prior winners by 25% on average over a thirty six month period provides evidence for the existence of over-reaction. These abnormal returns occurred despite the prior winners being more ‘risky’ than the outperforming prior losers. These findings suggest that investors are able to earn positive abnormal returns by taking advantage of the over-reacting behaviour of stock prices.
A value investment strategy seeks to earn abnormal returns from the ultimate reversion of price towards its intrinsic value\(^5\). According to the traditional finance theory, any investment strategy that allows an investor to earn positive abnormal returns consistently over time is the result of an anomaly in an otherwise perfectly efficient capital market. For many years, scholars and investment professionals have argued that value related investment strategies outperform market returns. Graham and Dodd (1934) laid the foundation for work on the value anomaly by emphasising the markets tendency to irrationally under-value certain out of favour securities. Since then, academics such as Basu (1977 and 1983), Rosenberg et al (1984), Fama and French (1988, 1992), Lee et al (1999), and others, have confirmed the profitability of value related investment strategies. Whilst it seems likely that a value related anomaly does exist, the interpretation of why this is the case remains a controversial issue. In the development of their three risk factor model, Fama and French (1992) included the B/M ratio as a value related factor, arguing that it provides a noisy proxy for a risk factor related to distress. Since then, many alternative explanations have arisen. Most notably, Lakonishok et al (1994) suggest that contrarian investment strategies may produce abnormal returns because they 'exploit the suboptimal behaviour of the typical investor' which causes an inability to price securities correctly. Here, the authors consider 'suboptimal behaviour' such as the over-reaction to good or bad news, extrapolating recent earnings growth too far into the future, or having a bias for well run companies regardless of price. Also mentioned by Barberis and Thaler (2002) in their paper linking the psychological behaviour of investors and market prices, these biases provide evidence that the abnormal returns from value investing are the result of exploiting a market anomaly rather than bearing additional risk.

Investors are able to earn positive abnormal returns by profiting from the under-reaction and over-reaction in stock prices which causes the reversion between price and intrinsic value over time. Therefore, the key problem for investors is to accurately determine when a stock is under and over valued. As Lee et al (1999) stated, ‘once we admit the possibility that price may diverge from value, the measurement of intrinsic value becomes paramount’. Few academic studies have focused on the practical problem of measuring intrinsic value. Perhaps, the scant attention paid to this topic reflects the standard academic view that a security’s market price is the best available measure of intrinsic value. Undoubtedly, the valuation of equity securities is most commonly undertaken by market participants using multiples. Tools such as the P/E ratio, dividend yield, and EV/EBITDA multiple often form part of a strategy of investment analysis. There are a number of attractive characteristics of multiples which possibly explain their common use in practice. Firstly, valuation multiples allow the investor to efficiently gain an understanding of the relative value between a set of equity securities. Often, the calculation of these multiples is simple and requires widely available information such as the current share price, published company financial data, and, if forward multiples\(^6\) are calculated, forecasted financial data. Secondly, given the simplicity and widespread use of equity valuation multiples, they are often well understood by market participants. Thirdly and perhaps most importantly, valuations based on multiples do not incorporate arbitrary steady state assumptions which according to Sawyer and Joo (2004) can account for more than fifty percent of the total

\(^5\) Given our argument that the divergence between price and value is driven largely by investor sentiment, we believe that a contrarian trading strategy is synonymous with value investing. Subsequently, we use these terms interchangeably throughout this paper.

\(^6\) Forward multiples are calculated using the consensus forecasts of value drivers such as EPS, DPS, FCF and Sales; as obtained from the IBES database.
firm valuation. However, despite their practical significance, the use of multiples has come under recent scrutiny by Lee et al (1999) who show that the residual income model is a better predictor of future cross sectional stock returns than valuation multiples such as the B/P, E/P and D/P ratios. However, we believe that the cross sectional predictability of multiples can be improved by adopting an industry relevant approach.

There are two core issues relating to the use of multiples in the valuation of equity. Firstly, we must define a comparable set of firms against which, the relative value of an individual stock can be determined. Damodaran (2002) defines a comparable firm as one with cash flows, growth potential and risk similar to the firm being valued. In line with this argument, Cheng and McNamara (2000) and Bhojraj and Lee (2001) argue that picking comparables using a combination of industry categorisation and fundamentals, such as total assets, yields more precise valuations than using just industry classification. In contrast to this, Alford (1992) in a test of the value relevance of multiples suggests that industry membership is an effective criterion when selecting comparable firms. Of the four commonly used industry classification methods\(^7\), Bhojraj et al (2003) found that GICS classifications are significantly better at explaining stock return co-movement and cross sectional variations in valuation multiples. In conclusion to these diverse findings, McCarthy (1999) argues that the selection of comparable firms is essentially an art form and should be left to investment professionals. Therefore, it seems as though there is no universally accepted method to selecting comparable firms.

Secondly, we must determine which value driver to use in the valuation multiple. Given that we are interested in devising a profitable investment strategy, we plan to use a value driver which carries the most predictive power of future stock returns. In a market wide study, Basu (1977 and 1983) found that stocks with higher earnings yields earn, on average, higher risk-adjusted returns than stocks with low earnings yields, even when controlled for size. Furthermore, Rozeff (1984), Fama and French (1988), Campbell and Shiller (1989) and others document the strong predictive power of dividend yields as an indicator of expected future stock returns. The B/M ratio was also found to have a significant positive impact on expected returns by Rosenberg et al (1985), a finding which was later confirmed by Chan et al (1991) who also discovered the relevance of the cash flow yield. In a study of US companies over 43 years, O'Shaughnessy (1996) found that the P/E, P/B, P/CF, D/P and P/S ratios have some cross-sectional predictive power. Therefore, it appears as though value drivers such as earnings, dividends, cash flows and sales all provide some predictive power of future stock returns. However, it remains unanswered which value driver provides the greatest predictive power of future stock returns.

---

\(^7\) This study compares four industry classification schemes including the Standard Industry Classification (SIC) system, North American Industry Classification Scheme (NAICS), Global Industry Classification Standard (GICS) codes, and the Fama and French algorithm.
3. Research Design

3.1 Industry Breakdown
Despite the argument of Cheng and McNamara (2000) and Bhojraj and Lee (2001) that firm specific adjustments need to be made to an industry based classification approach, we divide our sample set of stocks into industry groups according to their Fama and French classification methodology. Under this system, stocks are classified into industry groups according to an algorithm which condenses the 444 classes of four-digit SIC codes into 48 clearly defined industry groups\(^8\). We justify this approach based on the assumption that investors adopt a top down investment strategy. Here, investment capital is allocated by region, market, industry, and finally by asset. Consequently, investors ultimately face an allocation decision amongst assets within a particular industry group. As a result, they are required to determine relative value between a set of investment asset substitutes. Therefore, in order to improve the relevance of our findings to these investors, we select comparable stocks according to industry classification alone. In order to generate preliminary results, we will limit our sample set to stocks just 21 of the 48 Fama-French industry groups.

3.2 Which Multiples?
We test the predictive power of fourteen commonly used multiples over our sample period. These fourteen multiples have been selected according to the degree in which they are used in practice, theoretical justification and evidence of their ability to predict future stock returns. Suozzo et al (2001) in their guide to using valuation multiples provide an explanation of the five core equity multiples such as the P/E, P/CF, P/B, PEG and the D/P ratios. This forms the base for our selection of multiples. Additionally, Fernandez (2002) in their survey of European equity analysts found the P/E multiple to be the most commonly used valuation multiple, sequentially followed by EV/EBITDA, EV/EG, P/B, P/CF, EV/S, P/S, EV/CF and finally PEG. Of this list, we eliminate the multiples which include earnings growth due to the high frequency of companies with at least one occurrence of negative earnings growth over our sample period. Consequently, we arrive at a total of eight valuation multiples being the P/E, P/S, D/P, P/CF, P/B, EV/EBITDA, EV/S and EV/CF ratios. Of these eight ratios, seven have their value drivers derived from performance based measures such as earnings, sales, cash flows or dividends; whilst the remaining multiple is derived from the financial position related measure of book value.

Given the findings of Frankel and Lee (1998) and Lee et al (1999) that value estimates based on consensus forecasts are highly correlated with contemporaneous stock returns, we will test the test six of the seven performance ratios outlined above using both historic reported financial information and market consensus forecasts as the value drivers. We will not use forecasted values of book value or free cash flows due to the unreliability of these forecasts. Therefore, in total we will test fourteen multiples in this study. The definitions and formulae used in the calculation of these multiples are available upon request. For the purposes of this colloquium paper, we will test the reverting properties of six multiples, being the P/E, P/S, D/P, P/FCF, P/B, and the forward P/E ratio.

\(^8\) See Appendix One of Fama and French (1997) for more detail regarding the grouping of SIC codes into the 48 defined industry classes.
3.3 Data Sources
We ran tests on monthly data from January 1980 to December 2004 on all NYSE, AMEX and NASDAQ firms with the necessary CRSP and Compustat data. We obtain our financial statement data from Standard and Poor’s Compustat database. From this database, we extracted annual financial information used in the calculation of the multiples. Because we only use annual financial data, as opposed to half yearly or quarterly, we were unable to calculate rolling multiples. This shortfall may provide an opportunity for future research. Furthermore, we obtain forecasted financial data from the Thomson Financial Institutional Brokers Estimates System (IBES) database. Here, we obtain one year forward consensus analyst forecasts for financial performance measures such as earnings, sales, EBITDA and dividends. Monthly share price observations were sourced from the Centre for Research in Security Prices (CRSP) database and then merged with the abovementioned Compustat and IBES information to form our full data set.

3.4 Calculating the Intrinsic Value and V/P Ratios
We calculate the intrinsic value of each stock at each observation point using each of the 14 valuation multiples. To do this, we calculate the median value of each multiple for each industry at each point in time. We use the median as our measure of central tendency in order to eliminate the effect of extreme and negative values. To calculate the intrinsic value of each stock within an industry, we multiply the industry median multiple value by the stock specific multiple driver such as earnings per share, sales per share, book value per share or the like (as shown in equation 1 below).

\[ IV_{i,m,t} = M_{m,I,t} \times X_{m,i,t} \]  

where:
- \( IV_{i,m,t} \) = the intrinsic value of stock \( i \) calculated using multiple \( m \) at time \( t \)
- \( M_{m,I,t} \) = the industry median value of multiple \( m \) of industry \( I \) at time \( t \)
- \( X_{m,i,t} \) = the multiple driver of multiple \( m \) for stock \( i \) at time \( t \)

We then calculate the V/P ratio of each stock under each multiple at each observation point by dividing the intrinsic value by the current market price (according to equation 2 below).

\[ \frac{V}{P_{i,m,t}} = \frac{IV_{i,m,t}}{P_{i,t}} \]  

where:
- \( \frac{V}{P_{i,m,t}} \) = the V/P ratio of stock \( i \) calculated using multiple \( m \) at time \( t \)
- \( IV_{i,m,t} \) = the intrinsic value of stock \( i \) calculated using multiple \( m \) at time \( t \)
- \( P_{i,t} \) = the closing market price of stock \( i \) at time \( t \)
3.5 Model of Reversion

In order to determine which multiples possess the strongest ability to predict future cross sectional returns within each industry, we will test the speed to which the V/P ratio of each stock reverts towards its industry median. Here we assume that if intrinsic value remains constant, any reversion towards the V/P ratio will be driven by price. Adopting a value investment strategy involving V/P ratios, an investor should take an overweight position in stocks with high V/P ratios (underpriced) and an underweight position in stocks with low V/P ratios (overpriced). Therefore, if the stock price rises, the V/P falls, resulting in a profit on the overweight position in the high V/P stock. Therefore, the faster the reversion of the high V/P stock to the industry average, the more quickly this profit is obtained by the investor. By testing the reversion in the V/P ratio as opposed to a return predictability model such as that derived by Fama and French (1988), we need not control for other factors driving stock returns such as size, leverage or momentum. Consequently, we test for reversion in the V/P ratio over time.

We use a reversion model adapted from Lau (1996) which was used to test for mean reversion in the P/E ratio of firms. However, rather than testing for reversion in absolute value of the each of the multiples, we test for reversion in the V/P ratios calculated using each of the fourteen multiples. This provides a consistent base for comparison across multiples when testing for the speed of reversion. Additionally, rather than testing for reversion to the industry mean, we use the industry median as our measure of centrality. This is an important adjustment to make as it controls for extreme and negative V/P ratios.

Our reversion model is a function of two relationships. The first relationship models the equilibrium V/P ratio of the firm which is shown in equation 3, below. Here we assume that the V/P ratio of a firm trades at a premium or discount to the industry median V/P ratio (captured by the \( \beta_i \) coefficient term). Furthermore, an intercept term (\( \alpha_i \)) captures any constant indirect effects on the firm’s V/P ratio that are not taken into account by the fluctuations in the premium or discount to the industry average. Therefore, a firm’s equilibrium V/P ratio is modeled at a consistent premium or discount to the median V/P ratio of the industry.

\[
(V/P)_{i,m}^* = \alpha_i + \beta_i (V/P)_{I,m} + \nu_{i,t}
\]  

where:

- \((V/P)_{i,m}^*\) = equilibrium V/P ratio for firm i at time t calculated using multiple m
- \((V/P)_{I,m}\) = median V/P ratio for industry I at time t calculated using multiple m
- \(\alpha_i\) = the firm specific intercept term capturing other permanent effects
- \(\beta_i\) = sensitivity of firm i’s V/P ratio to changes in the industry median V/P ratio
- \(\nu_{i,t}\) = the white noise error or residual term

The second relationship (shown in equation 4) models the reversion of the current V/P ratio to its equilibrium level. Here, a firm’s V/P ratio is calculated as its equilibrium level adjusted for a reverting component which is affected by the disequilibrium between the estimated and equilibrium V/P ratios in the previous period. Here, each stock is assumed to have a constant median reverting coefficient across the complete sample period.
\[ \frac{(V/P)_{i,t}}{= (V/P)_{i,t}^* \pm \phi_i \left[ (V/P)_{i,t-1} - (V/P)_{i,t-1}^* \right] + \epsilon_{i,t}} \]

where:
- \((V/P)_{i,t}\) = the estimated value-to-price ratio for firm \(i\) and time \(t\)
- \((V/P)_{i,t}^*\) = the equilibrium value-to-price ratio for firm \(i\) and time \(t\)
- \(\phi_i\) = the median reverting coefficient for firm \(i\) (assumed to be constant over time)
- \((V/P)_{i,t-1}\) = the estimated value-to-price ratio for firm \(i\) at time \(t-1\)
- \((V/P)_{i,t-1}^*\) = the equilibrium value-to-price ratio for firm \(i\) at time \(t-1\)
- \(\epsilon_{i,t}\) = the white noise error or residual term

If we substitute the equilibrium V/P model (equation 1) into the median reversion model (equation 2), we arrive at the final reversion model (equation 5).

\[ \frac{(V/P)_{i,t}}{= \alpha_i (1 - \phi_i) + \phi_i (V/P)_{i,t-1} - \phi_i \beta_i (V/P)_{I,t-1} + \beta_i (V/P)_{I,t} + \sigma_{i,t}} \]

where:
- \((V/P)_{i,t}\) = the estimated value-to-price ratio for firm \(i\) and time \(t\)
- \((V/P)_{I,t}\) = the median value-to-price ratio for industry \(I\) at time \(t\)
- \(\phi_i\) = the median reverting coefficient for firm \(i\) (assumed to be constant over time)
- \(\alpha_i\) = the firm specific intercept term capturing other permanent effects
- \(\beta_i\) = sensitivity of firm \(i\)'s V/P ratio to changes in the industry median V/P ratio
- \((V/P)_{i,t-1}\) = the estimated value-to-price ratio for firm \(i\) at time \(t-1\)
- \((V/P)_{I,t-1}\) = the value-to-price ratio for industry \(I\) at time \(t-1\)
- \(\sigma_{i,t}\) = the white noise error or residual term

In order to eliminate the effects that the change in the V/P ratio a particular firm has on the industry average V/P, we estimate the average reverting coefficients using a system of Seemingly Unrelated Regressions (SUR) within each sector. This approach addresses the issues of heteroscedasticity and contemporaneous correlation in the errors across equations that would result if changes in individual stock V/P ratios impact the industry median V/P ratio.

A key limitation of this model is that it does not allow constituents within a particular industry group to change over the sample period. Consequently, we must eliminate stocks from our sample set that listed, delisted or changed industry classification during our period of observation. Furthermore, companies without a full set of consensus forecasts over the observation period were also removed from our sample set. Given the length of our observation period, these restrictions resulted in the elimination of a significant portion of the total observations contained within our database. These restrictions are important in order to ensure that the reversion coefficient captures on the reversion rather than the effects of additions or deletions to the index which affect the industry median.

---

9 The lack of earnings forecasts resulted in the elimination of approximately 40% of our observations.
The value of the reverting coefficient (\( \phi \)) measures the rate at which the V/P ratio of a particular stock reverts to the median V/P of the industry. For the V/P ratio to be median reverting, the reversion coefficient must have a value between -1 and 1. If this is not the case, the P/E ratio of the firm will not revert but diverge from its equilibrium level. Furthermore, the reversion coefficient must be significantly different from zero.

To determine which valuation multiple has the fastest median reverting properties within a particular industry, we find the multiple with the median reverting coefficient most statistically significantly \( |\phi| < 1 \). This multiple is then determined to carry the strongest predictive power of future returns for stocks within that sector.

3.6 Formation of Portfolios
After determining which valuation multiple has the most predictive power for stocks within each industry, we hope to test whether the returns of an industry relevant value investment strategy outperform a market wide strategy using each of the fourteen multiples. To do this, we will create a portfolio which contains stocks with V/P ratios in the top decile of their industry when calculated using the multiple which best predicts future stock returns for that particular industry. Changes to the portfolio will then be made as stocks move in and out of the top decile as sorted by the V/P ratio.

Additionally, a market wide portfolio will be formed for each of the fourteen tested multiples. Again, these portfolios will contain the top decile of stocks when sorted by V/P ratios. Changes to the portfolio will be made as stocks move in and out of the top decile for each portfolio.

3.7 Measuring Abnormal Returns
We will compare the returns of the industry relevant value strategy against the returns of each of the market wide investment strategies. We will measure average monthly returns on a risk adjusted basis using the Sharpe Ratio\(^{10}\). If the risk adjusted return from the industry relevant strategy is statistically significantly greater than each of the market wide value strategies, it will suggest that over our sample period, investors could have improved investment performance by adopting an industry relevant approach to equity valuation.

---

\(^{10}\) Developed by Sharpe (1966), the Sharpe Ratio compares returns on a risk adjusted basis by considering the variability of returns over the sample period, as measured by the standard deviation.
4. Preliminary and Expected Results

Our testing to date spans US listed stocks in 21 of the 48 Fama-French industry groups. We find that whilst most multiples tend to show reversion towards their industry median, the multiple with the most significant reversion and consequently the best future return predictability differs across industry groups. Table One contains our results.

Table One

Comparison of the Reversion Coefficient between Various Valuation Multiples

Using monthly data between 1980 and 2005, we model the reversion to the industry median of the V/P ratio where value is calculated using a sample of six popular valuation multiples. In this table, we present the value of the reversion coefficient as determined using a reversion model based on that presented in Lau (1996). We undertake this analysis on a selection of 23 industry groups as determined using the Fama-French classification methodology. A reversion coefficient significantly less than one provides statistical evidence for the reversion of the V/P ratio towards its industry median, and consequently greater predictability in future cross sectional stock returns. In this table, we highlight the reversion coefficient which was found to be most significantly different from one for each industry in bold. Furthermore, we denote the coefficients according to their significance level with an ‘a’ if significant to 0.1%, ‘b’ if significant to 1% and ‘c’ if significant to the 5% level. A coefficient NA as presented for the dividend yield in industries 30, 35 and 37 is the result of the median dividend yield, and consequently intrinsic value, having a value of zero.

<table>
<thead>
<tr>
<th>Fama-French Industry Classification</th>
<th>Stocks</th>
<th>P/E Hist</th>
<th>P/E For</th>
<th>P/S Hist</th>
<th>DY Hist</th>
<th>P/FCF Hist</th>
<th>P/B Hist</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Food Products</td>
<td>6</td>
<td>0.9880c</td>
<td>0.9688c</td>
<td>0.9822</td>
<td>0.9818</td>
<td>0.9756a</td>
<td>0.9777</td>
</tr>
<tr>
<td>8 Printing &amp; Publishing</td>
<td>13</td>
<td>0.9743</td>
<td>0.9611c</td>
<td>0.9774</td>
<td>0.9677</td>
<td>0.9795c</td>
<td>0.9767</td>
</tr>
<tr>
<td>9 Consumer Goods</td>
<td>14</td>
<td>0.9833</td>
<td>0.9555b</td>
<td>0.9861c</td>
<td>0.9640c</td>
<td>0.9875</td>
<td>0.9700a</td>
</tr>
<tr>
<td>10 Apparel</td>
<td>8</td>
<td>0.9820b</td>
<td>0.8877a</td>
<td>0.9828c</td>
<td>0.8937b</td>
<td>0.9673a</td>
<td>0.9706c</td>
</tr>
<tr>
<td>13 Pharmaceutical Products</td>
<td>10</td>
<td>0.9778</td>
<td>0.9413c</td>
<td>0.9779</td>
<td>0.9641</td>
<td>0.9679c</td>
<td>0.9707</td>
</tr>
<tr>
<td>14 Chemicals</td>
<td>14</td>
<td>0.9515</td>
<td>0.8529a</td>
<td>0.9534</td>
<td>0.8985a</td>
<td>0.9730</td>
<td>0.9494</td>
</tr>
<tr>
<td>17 Construction Materials</td>
<td>17</td>
<td>0.9812c</td>
<td>0.9583a</td>
<td>0.9790b</td>
<td>0.9465a</td>
<td>0.9887c</td>
<td>0.9729c</td>
</tr>
<tr>
<td>19 Steel Works</td>
<td>8</td>
<td>0.9819</td>
<td>0.8842a</td>
<td>0.9843</td>
<td>0.9832</td>
<td>0.9835</td>
<td>0.9805</td>
</tr>
<tr>
<td>21 Machinery</td>
<td>27</td>
<td>0.9826a</td>
<td>0.9077a</td>
<td>0.9805b</td>
<td>0.9788a</td>
<td>0.9853b</td>
<td>0.9796a</td>
</tr>
<tr>
<td>22 Electrical Equipment</td>
<td>7</td>
<td>0.9835c</td>
<td>0.9499</td>
<td>0.9531</td>
<td>0.9185b</td>
<td>0.9920</td>
<td>0.9653</td>
</tr>
<tr>
<td>23 Miscellaneous</td>
<td>7</td>
<td>0.9849c</td>
<td>0.8953b</td>
<td>0.9767</td>
<td>1.0251</td>
<td>0.9754b</td>
<td>0.9788</td>
</tr>
<tr>
<td>30 Coal</td>
<td>24</td>
<td>0.9744c</td>
<td>0.9456c</td>
<td>0.9830</td>
<td>NA</td>
<td>0.9747</td>
<td>0.9767</td>
</tr>
<tr>
<td>31 Petroleum &amp; Natural Gas</td>
<td>61</td>
<td>0.9869b</td>
<td>0.9040a</td>
<td>0.9886c</td>
<td>0.9871</td>
<td>0.9894c</td>
<td>0.9829c</td>
</tr>
<tr>
<td>34 Personal Services</td>
<td>16</td>
<td>0.9329</td>
<td>0.9179</td>
<td>0.9217</td>
<td>0.9688a</td>
<td>0.9747</td>
<td>0.9183</td>
</tr>
<tr>
<td>37 Business Services</td>
<td>7</td>
<td>0.9859</td>
<td>0.9009a</td>
<td>0.9639</td>
<td>NA</td>
<td>0.9620c</td>
<td>0.9291c</td>
</tr>
<tr>
<td>38 Measuring &amp; Control Equip.</td>
<td>15</td>
<td>0.9611b</td>
<td>0.9525c</td>
<td>0.9683c</td>
<td>NA</td>
<td>0.9752c</td>
<td>0.9547c</td>
</tr>
<tr>
<td>39 Business Supplies</td>
<td>7</td>
<td>0.9733c</td>
<td>0.9321a</td>
<td>0.9750c</td>
<td>0.9024</td>
<td>0.9822c</td>
<td>0.9738c</td>
</tr>
<tr>
<td>41 Transportation</td>
<td>9</td>
<td>0.9884</td>
<td>0.8372a</td>
<td>0.9705c</td>
<td>0.9158a</td>
<td>1.0001</td>
<td>0.9621a</td>
</tr>
<tr>
<td>42 Wholesale</td>
<td>14</td>
<td>0.9860c</td>
<td>0.8748a</td>
<td>0.9745a</td>
<td>0.9683a</td>
<td>0.9820</td>
<td>0.9776b</td>
</tr>
<tr>
<td>43 Retail</td>
<td>23</td>
<td>0.9881</td>
<td>0.9459a</td>
<td>0.9845</td>
<td>0.9439a</td>
<td>0.9860</td>
<td>0.9764b</td>
</tr>
<tr>
<td>48 Trading</td>
<td>5</td>
<td>0.9881</td>
<td>0.9474a</td>
<td>0.9845</td>
<td>0.9439a</td>
<td>0.9860</td>
<td>0.9764b</td>
</tr>
</tbody>
</table>

We found that of the 135 median reverting coefficients, only two had a value above one indicating that the valuation multiples tend to revert towards their industry median. Furthermore, of these 135 coefficients, 77 were statistically significantly less than one at least the 5% level, providing evidence of reversion and hence cross sectional return predictability of valuation multiples. We expect this to continue across the remaining industry groups and multiples yet to be tested. These results are not surprising given that
the six valuation multiples are likely to correlate with each other to some extent. For example, given that earnings are a function of sales, we would expect the P/S and P/E to show some degree of correlation over time.

Furthermore, the multiple with the reversion coefficient most significantly less than one differs across industry groups. In our analysis of six commonly used valuation multiples to date, we find that the forward P/E demonstrates the most statistically significant reversion in 12 of the 23 tested industry groups. This is followed by the dividend yield which best predicted returns in six industries, the P/E and P/FCF in two each, and the P/B in one industry group. Additionally, in 17 of the 23 industries tested, the best multiple demonstrated reversion significant to 0.1%, whilst the best multiple in all industries was significant to at least the 5% level. The variety these findings across industry groups confirm our hypothesis that value is determined different across industry groups. Consequently, when using multiples to value equity securities, investors should concentrate on the industry relevant multiple which best predicts future stock returns. Whilst we suggest that this is related to the existence of investor clientele within each industry group who focus on a particular valuation metric, this cannot be confirmed by our study.

Additionally, we find that the forward P/E carried more predictive power of future cross sectional stock returns in 20 of the 23 tested industries, providing further evidence for the use of analyst forecasts when using valuation multiples. We believe that these results can be attributed to the forward looking nature of market participants. As a result, we expect our findings to show a bias towards forward multiples such as the forward dividend yield and forward EV/EBITDA multiples as they added to our study.

In our comparison of returns generated from the industry specific value strategy relative to a market wide approach, we expect to find that risk adjusted returns from the industry specific strategy significantly outperformed those obtained under the market wide strategy over our sample period. Whilst this would not imply that this will occur in the future, it may provide support for the use of an industry specific approach to equity valuation by investors and analysts, particularly when using multiples.
5. Conclusion

Unlike previous work focusing on the cross sectional predictability of valuation multiples over an entire market index, we take an industry level comparison to determine which multiple provides the strongest predictability of future returns. Our testing to date spans 21 of the 48 Fama-French industry groups. We have found that the valuation multiple that best predicts future stock returns differs significantly across industries. Whilst out testing has been limited to six multiples including the P/S, D/P, P/FCF, P/B, P/E and forward P/E; we find that the forward P/E showed the most significant return predictability in 12 industry groups, the D/P in 6, the P/FCF and P/E in 2 and the P/B in one industry group. Furthermore, in the 17 of the 23 industries tested, the best multiple demonstrated reversion significant to 0.1%, whilst all industries were significant to at least the 5% level. In addition, we found that the forward P/E contained more predictive power than the historical P/E ratio in 20 of the 23 tested industries, providing further evidence for the use of forecasted financial data when calculating multiples.

As our empirical testing advances, we expect our results to continue to diverge across each of the 48 Fama-French classified industry groups. Furthermore, as more forward multiples are included in our analysis, we expect that they will better predict future returns than the historic multiples tested. In addition, we expect to find that adopting an industry relevant value investment strategy would have yielded significantly stronger positive abnormal returns than a market wide value strategy.

To the investor, our findings may assist investors when allocating capital between stocks at an intra-industry level by providing evidence of the most appropriate valuation tool. Furthermore, our results will provide industry specialist sell side analysts with a focus on the most relevant measure of value for the industry group of stocks that they cover.

Whilst our results fail to compare the industry relevant value investment strategy based on multiples to the returns from a strategy based on the residual income model, this is an area of research that may possibly be pursued in the future. Furthermore, our analysis does not consider the interaction between value and momentum, and provides no allowance for the findings of Asness (1997) that value strategies largely fail for firms with strong momentum.

In conclusion, this paper serves to broaden the scope of research on multiples as a tool of equity valuation. As academic support for the theory of diversion between market prices and intrinsic value mounts, interest in multiples and in particular, their ability to predict future cross sectional returns is likely to strengthen. Ultimately, regardless of the interest of future academic work, the well understood ability of value investment strategies to outperform the market is incentive enough for practitioners to focus on this intriguing area of research.
References


