# THE VALUATION PERFORMANCE OF EQUITY-BASED MULTIPLES IN SOUTH AFRICAN CONTEXT

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## Abstract

Despite the popularity of multiples among analysts in practice, the emerging market literature offers little empirical guidance for the use thereof. This paper investigates the relative valuation performance of various value drivers when valuing the equity of South African companies listed on the JSE Securities Exchange for the period 2001-2010. The empirical results revealed, among other findings, that earnings-based value drivers offered the highest degree of valuation accuracy, while cash flow- and sales-based value drivers offered the lowest degree of valuation accuracy. Dividend- and asset-based value drivers offered average results. An interesting phenomenon was that, contrary to popular belief, cash flow-based value drivers only offered marginal improvements in valuation accuracy *viz-à-viz* sales-based value drivers; and not consistently so.

**Keywords:** Emerging Markets; Multiples; Value Drivers; JSE; Earnings; Cash Flow; Sales; Dividends; Assets

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## 1 Introduction

International research on corporate valuation practice focuses on the relatively deeply traded and liquid, developed markets in the United States of America (USA) and Europe, while shedding little light on emerging markets. However, emerging markets are projected to grow at 3.24 times the pace of developed markets (G-7 countries) over the period 2013-2017 (IMF, 2012). Developing countries also account for large parts of the world population, land mass and natural resources. Although investment inflows into emerging markets are significant, failure to agree on valuations remains the key hurdle obscuring cross-border transactions into emerging markets. Improved valuation practices could, therefore, significantly affect the welfare of investors. Consequently, this paper aims to expand the limited empirical evidence that is available on valuation practice in emerging markets.

The specific area within the field of corporate valuation practice that this paper focuses on is multiples, which are also referred to as relative valuations since they value assets, relative to the value of similar assets in the market (Damodaran, 2002). The popularity of multiples in practice is well established by research (PwC, 2012; Minjina, 2008; Roosenboom, 2007; Damodaran, 2006b; Asquith,

Mikhail and Au, 2005; Bhojraj and Lee, 2002). The traditional multiples approach comprises a numerator, the market price variable, relative to the denominator, the value driver. The focus in this paper is on the latter, i.e. the choice of value driver. The valuation performance of four categories of value drivers, namely earnings, cash flow, assets and revenue is pitted against each other. A total of 16 multiples are constructed and their efficacy is investigated in the equity valuation of companies listed on the JSE Securities Exchange (JSE) for the period 2001-2010.

First, the modelled valuations of each of the four value driver categories are compared to the market in order to establish each category's valuation performance. Secondly, the relative valuation performance of all four value driver categories is compared and quantified. Thirdly, biplots, based on principal component analysis (PCA), are employed to investigate the consistency of these rankings over time.

In Section 2 the literature review is discussed, followed by the data selection process in Section 3 and a discussion of the research methodology in Section 4. Empirical research findings are presented in Section 5, followed by concluding remarks in the final section.

## 2 Literature review

Analysts generally follow the following four steps when employing multiples to perform equity valuations (Damodaran, 2009, 2006a; Schreiner and Spremann, 2007): Firstly, they identify two value relevant measures, i.e. the market price variable and a matching value driver. Secondly, they select a set of comparable companies, known as a peer group. Thirdly, they estimate a peer group multiple. Lastly, they apply the estimated peer group multiple to the target company's value driver to determine the equity value of the target company.

The aim with this paper is to establish the efficacy of value drivers in step one in estimating the equity value of companies listed on the JSE. Although various value drivers can be extracted from the financial statements when constructing multiples, earnings, cash flow, assets and revenue are used most frequently in international literature (Liu, Nissim and Thomas, 2002a). Of these four, earnings and cash flow are most commonly used (Liu, Nissim and Thomas, 2007). The general perception, that cash flow may offer superior explanatory power *vis-á-vis* earnings, stems, in part, from the fact that cash flow is less susceptible, although not immune, to accounting manipulations (Mulford and Comiskey, 2002; Fink, 2002; Securities and Exchange Commission, 2002). However, analysts typically favour earnings-based multiples (Rappaport and Mauboussin, 2001).

Although limited empirical studies exist on multiples in emerging markets, various researchers have conducted empirical research on value drivers in developed markets. Most researchers came to the conclusion that earnings-based multiples are superior to their counterparts. Liu, Nissim and Thomas (2002b) found earnings to be the best value driver in valuing equity. Liu et al. (2002b) focused on price multiples and investigated which value drivers performed the best amongst earnings, cash flow, dividends and revenue, to approximate stock prices in ten countries, including South Africa, between 1987 and 2001. However, Liu et al. (2002b) neglected to investigate assets and limited the study to only four variables, which may have rendered their approach biased. It was found that multiples based on earnings generally performed the best valuations, while those based on cash flow and dividends produced average results. Multiples based on revenue performed the worst.

In a study of the valuation accuracy of the price earnings (P/E) ratio and the price to book value of equity (P/BVE) ratio as benchmarks between 1973 and 1992, Cheng and McNamara (2000) found similar results, i.e. earnings was the most important value driver. Herrmann and Richter (2003) and Abukari, Jog and McConomy (2000) drew similar conclusions.

In a research survey conducted in South Africa, Nel (2010) found that academia's order of preference when using multiples, in terms of value drivers, is (1) earnings-based multiples, (2) cash flow-based multiples, (3) asset-based multiples, and (4) revenue-based multiples. Although these preferences are fairly well aligned with international research findings (Herrmann and Richter, 2003; Liu et al., 2002a, 2002b; Abukari et al., 2000; Cheng and McNamara, 2000), Liu et al. (2002b) offers the only quantitative empirical evidence to substantiate these preferences.

Despite the popularity of multiples in the marketplace and among academia, multiple-based research tends to focus on a limited number of company years and investigates a limited number of multiples, e.g. the P/E multiple or earnings before interest, tax, depreciation and amortisation (EBITDA) (Liu et al., 2002a, Alford, 1992). In the majority of the current literature, studies tend to select a single value driver as representative of whole value driver categories, which suggests a biased approach. This paper aims to address the lack of empirical evidence in this regard by extending the previous selection of variables from four to 16, thereby including various multiples in each value driver category, and by including assets as a value driver category.

## 3 Data selection

The following variables were extracted from the McGregor BFA database: Market capitalisation (MCap), Shares in issue, Gross profit (GP), Earnings before interest, tax, depreciation and amortisation (EBITDA), Earnings before interest and tax (EBIT), Profit after tax (PAT), Profit before tax (PBT), Headline earnings (HE), Total assets (TA), Invested capital (IC), Book value of equity (BVE), Turnover (R), Cash as operations, Increase/decrease in working capital, Net retained cash (NCIfOA), Cash generated (NCIfIA), Ordinary dividend (OD), Taxation paid, Fixed assets acquired, Net interest paid/received, Secondary tax on companies, Capital profits/losses on financial assets, Normal taxation included in extraordinary items, Total profit of an extraordinary nature and Sector.

The data that were extracted from the McGregor BFA database were screened based on three criteria: 1) All multiples are positive, i.e. multiples with negative values were discarded, 2) The companies have at least three years of positive company year multiples, and 3) Each sector has at least four observations that meet criteria 1) and 2) above. Although many companies' sector classifications have changed over the past ten years, for the purposes of this study, companies were allocated to the sectors where they resided as at 31 December 2010.

The first condition eliminates unrealistic multiples that cannot be used. The second condition ensures that selected companies have a reasonable history as a going concern and the third ensures that the number of companies within each sector is not prohibitively small, preventing the situation where there are too few observations to warrant a realistic mean calculation. Observations located outside of the 1st and 99th percentiles were removed from the pooled observations, since the initial analysis indicated the

prevalence of a number of outliers, which may have distorted the research results (Nel, Bruwer and Le Roux, 2013a; 2013b). The final population of observations represents approximately 71% of the total number of listed companies on the JSE as at 31 December 2010 and approximately 91% of the market capitalisation of the companies listed on the JSE at the same date, which serves as a fair representation for the conclusions drawn.

The number of observations (N) contained in each value driver category was different, depending on how well their multiples satisfied criteria 1) to 3). Consequently, each value driver category contains different sample sizes, ranging from 2 263 to 12 747 observations, with a total population of 31 467 observations for the period 2001-2010. These observations were used to calculate 16 multiples, i.e. multiples where market price (P) was used as the market price variable. Although various potential combinations of P and value drivers exist, the focus for the purpose of this paper, was on the most popular multiples within each of the four most popular value driver categories, namely earnings, cash flow, assets and revenue (PwC, 2012; Nel, 2010; Nel, 2009a; Liu et al., 2002a; Liu et al., 2002b; Cheng and McNamara, 2000). The multiples, i.e. the ratio of P to the respective value drivers, that were used in each value driver category are summarised in Table 1.

**Table 1.** Framework of multiples

| | Value drivers | | | |
|---|---|---|---|---|
| | **Earnings** | **Book value** | **Revenue** | **Cash flow** |
| **P** | GP | TA | R | CgbO |
| | EBITDA | IC | | NCIfOA |
| | EBIT | BVE | | NCIfIA |
| | PAT | | | OD |
| | PBT | | | FCFE |
| | HE | | | FCFF |

P - Market price
GP - Gross profit
EBITDA - Earnings before interest, tax, depreciation and amortisation
EBIT - Earnings before interest and tax
PAT - Profit after tax
PBT - Profit before tax
HE - Headline earnings
TA - Total assets
IC - Invested capital
BVE - Book value of equity
R - Revenue
CgbO - Cash generated by operations
NCIfOA - Net cash inflow from operating activities
NCIfIA - Net cash inflow from investment activities
OD - Ordinary cash dividend
FCFE - Free cash flow to equity
FCFF - Free cash flow to the firm

## 4 Research methodology

Traditional multiples-based valuation theory assumes that the actual equity value ($V_{it}^e$) of a company (*i*) at a given point in time (*t*) is equal to the product of a multiple ($\lambda_t^e$) and a specific value driver ($\alpha_{it}$) at that specific point in time, so that

$$V_{it}^e = \lambda_t^e \cdot \alpha_{it} \qquad (1)$$

The objective is to quantify the ability of equation (1) to approximate actual share prices on the JSE. After extracting and screening the data from the McGregor BFA database, an out-of-sample peer group multiple ($\hat{\lambda}_{ct}^e$) is estimated for each company by calculating the harmonic mean of all the other remaining companies in the same sector. Although there is a lack of academic consensus regarding which averaging procedure constitutes best practice (Dittman and Maug, 2008), most researchers regard the harmonic mean as a viable and unbiased estimator (Bhojraj and Lee, 2002; Liu et al., 2002b; Beatty, Riffe and Thompson, 1999). The application of an industry-specific approach to multiples is well established by research (Nel et al., 2013b; Nel, 2009a; Nel, 2009b; Goedhart, Koller and Wessels, 2005; Liu et al., 2002a; Fernández, 2001; Barker, 1999). The McGregor BFA sector-level industry classification is applied, since previous research established that it was the optimal industry classification when conducting a cross-section analysis (Nel et al., 2013b)[1].

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[1] The McGregor BFA industry classifications are industry, supersector, sector and subsector

The peer group estimate of each company ($\hat{\lambda}^e_{ct}$) is then multiplied by the target company's actual value driver ($\alpha_{it}$) to calculate an equity value prediction ($\hat{V}^e_{it}$):

$$\hat{V}^e_{it} = \hat{\lambda}^e_{ct} \cdot \alpha_{it} \qquad (2)$$

Subtracting equation (2) from equation (1) produces (3) for the calculation of the error margin (valuation error):

$$\hat{V}^e_{it} - V^e_{it} \qquad (3)$$

Since companies with higher values tend to have higher valuation errors, (3) is not independent of value. It is anticipated that expressing (3) proportionally to $V^e_{it}$ will improve the efficacy of the peer group multiple estimate (Beatty et al., 1999). The standardised form of (3), $\varepsilon_{it}$, is therefore expressed proportionally to $V^e_{it}$, where[2]

$$\varepsilon_{it} = \left| \frac{\hat{V}^e_{it} - V^e_{it}}{V^e_{it}} \right| \qquad (4)$$

Valuation errors were calculated for each company year and subsequently aggregated. Absolute valuation errors were used since the netting of positive and negative valuation errors may have resulted in artificially low valuation errors. The most accurate value driver category is the one with the lowest median valuation error. Consequently, the average median valuation errors of the four value driver categories were compared to establish which value driver category offered the greatest explanatory power.

Inter-value driver category improvements was subsequently calculated, indicating the extent to which the valuation accuracy of the multiples improved by switching between value driver categories. First, the four value driver categories were ranked according to their median valuation errors in order to determine the optimal value driver category. Second, the potential percentage improvement (IMP) in valuation accuracy was calculated based on substituting each of the three sub-optimal value driver categories with the optimal one. Third, the incremental IMP in valuation accuracy was calculated by adopting a step-wise substitution approach, i.e. by starting with the least accurate value driver category

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[2]Functions for the calculation of $\varepsilon_{it}$ and the statistical analysis thereof were developed in the R-package, an open source programming language that lends itself to statistical analysis and graphics (R Development Core Team, 2012).

and continuously substituting it with the next most accurate value driver category.

The initial analysis was based on pooled valuation errors that covered the entire period between 2001 and 2010. It is equally important to consider whether the performance of the value driver categories holds over time. However, the multi-dimensional nature of the data obscures a comprehensive grasp of the relative valuation performance of the four value driver categories for each observation year. Consequently, two-dimensional biplots, which are based on PCA, were constructed from the data in order to assess the behaviour of the observations over the period 2001-2010. A one-dimensional biplot was also constructed, offering a linear display of the optimal ranking between the value driver categories over this period.

## 5 Empirical results

The valuation performance of the four value driver categories was compared in order to ascertain which value driver category performed the most accurate equity valuations. Four pools of valuation errors were estimated, based on the sector industry classification.

### 5.1 Pooled valuation errors

In Figure 1, the median valuation errors are grouped per value driver category and then averaged. As is evident from Figure 1, the earnings-based value driver category performed the most accurate valuations, followed by the assets-, cash flow- and revenue-based value driver categories. In terms of valuation accuracy, earnings offers good results, assets offer average results and cash flow and revenue offer poor results.

The superiority of the earnings-based value driver category becomes even more apparent when one considers the magnitude of the performance gap between the earnings-based value driver category and the other three value driver categories. The IMP in terms of valuation accuracy, when switching from the second most accurate value driver category, namely assets, to the earnings-based value driver category, is 24.21%. The corresponding IMPs for the other two value driver categories, relative to earnings, are 28.54% (cash flow-to-earnings) and 29.49% (revenue-to-earnings), respectively. A step-wise analysis of the incremental performance improvement in valuation accuracy, when moving from the worst to the best performing value driver category, is illustrated in Figure 2. The results indicate that a switch from revenue, the least accurate value driver category, to any other value driver category will improve the valuation accuracy of multiples. The most significant improvement in valuation accuracy occurs when the switch is made to earnings.

**Figure 1.** The valuation accuracy of the four value driver categories
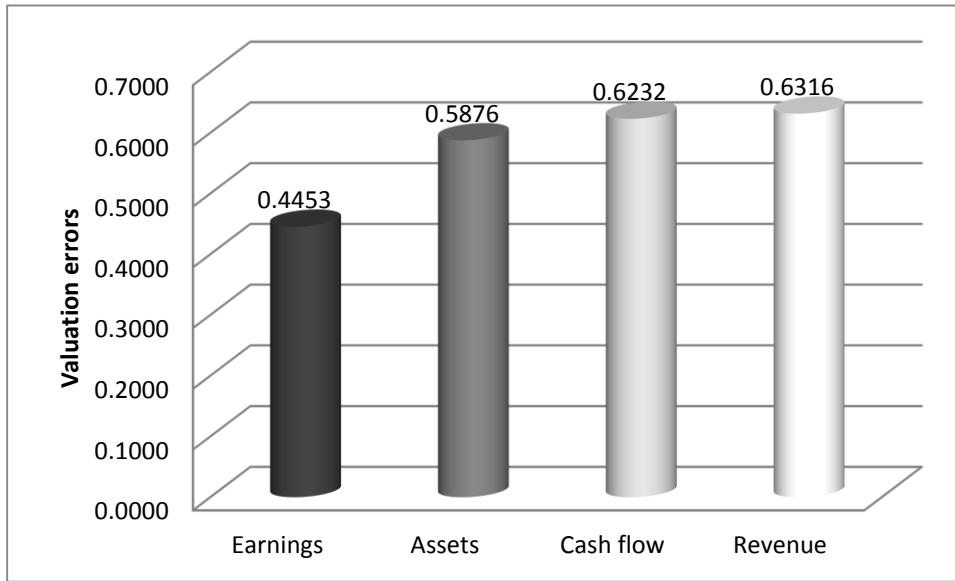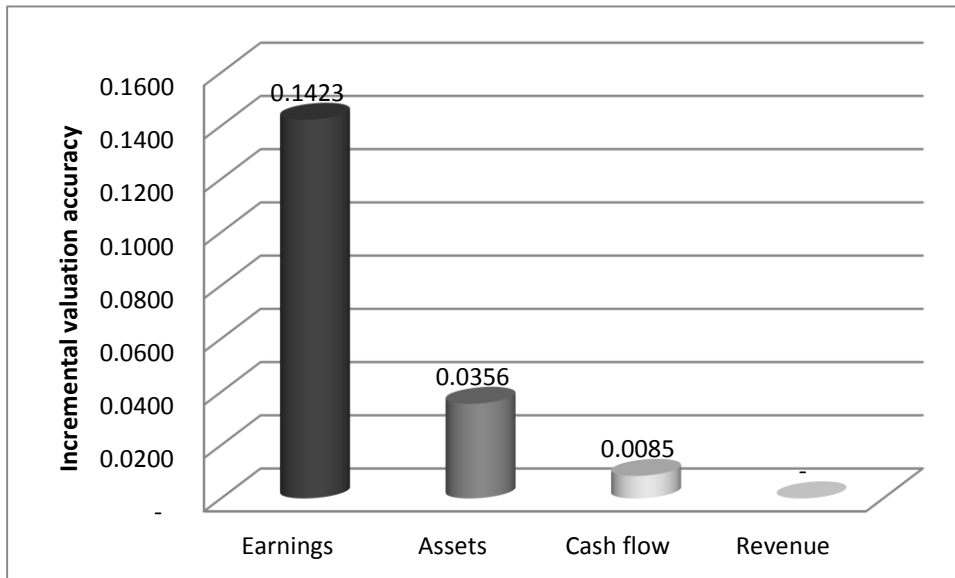


**Figure 2.** Incremental inter-value driver category improvements in valuation accuracy



The incremental improvements illustrated in Figure 2, expressed in percentage terms, are 1.34% (revenue-to-cash flow), 5.70% (cash flow-to-assets) and 24.21% (assets-to-earnings). These results concur with, and contradict, empirical evidence from developed markets. The superior performance of earnings and the inferior performance of revenue are well established in the developed market literature (Herrmann and Richter, 2003; Liu et al., 2002a, 2002b; Abukari et al., 2000; Cheng and McNamara, 2000). However, evidence from the developed market literature also suggests that assets and cash flow produce average results in terms of valuation accuracy (Herrmann and Richter, 2003; Liu et al., 2002a, 2002b; Abukari et al., 2000; Cheng and McNamara, 2000). As is evident from Figure 2, cash flow produce poor results, i.e. the valuation performance of cash

flow is closer to revenue than to assets, offering a marginal IMP in valuation accuracy over revenue of just 1.34%, which contradicts the evidence from the developed market literature. This discrepancy becomes even more apparent when one considers that, for the purpose of this study, OD is included as a cash flow-based value driver, while comparative studies in developed capital markets isolate it as a separate value driver. If similar logic is applied in this study, i.e. if OD is stripped from cash flow, revenue would have outperformed cash flow, rendering cash flow the least accurate value driver category. Isolating OD from the cash flow value driver category results in a cash flow-to-revenue IMP of 1.40% (not included in the analysis). Although this may seem insignificant, one needs to take cognisance of the fact that this contradicts evidence from the developed market

literature, all of which indicates that revenue performs the least accurate equity valuations.

This discrepancy is important, since there is a common misconception among analysts that cash flow-based multiples offer a good, if not greater degree of valuation accuracy compared to earnings-based multiples (Liu *et al.*, 2007). The perception regarding the credibility of cash flow as a value driver also surfaced from surveyed findings by Nel (2010), where the evidence suggested that cash flow offer superior explanatory power compared to assets and revenue. The evidence, however, contradicts the common belief regarding the explanatory power of cash flow-based multiples *vis-á-vis* the other value drivers, particularly earnings-based multiples, which

highlights the misconception of analysts who opt for cash flow-based multiples.

## 5.2 The multi-dimensional nature of the data and the reduction in dimensionality

The observations discussed thus far were based on pooled valuation errors for the entire period 2001-2010. However, these observations do not reflect the consistency of the results over this period. Table 2 contains an analysis of the pooled valuation errors and the annual valuation performance of the four value driver categories over time, which affords one the opportunity to assess the consistency of the results.

**Table 2.** Pooled and annual median valuation errors

| | | Value driver categories | | | |
| --- | --- | --- | --- | --- | --- |
| | | **Earnings** | **Assets** | **Cash flow** | **Revenue** |
| **Pooled** | | 0.4453 | 0.5876 | 0.6232 | 0.6316 |
| **Annual** | **2010** | 0.4635 | 0.5807 | 0.6121 | 0.5751 |
| | **2009** | 0.4522 | 0.5308 | 0.6480 | 0.6412 |
| | **2008** | 0.4026 | 0.5516 | 0.5798 | 0.6388 |
| | **2007** | 0.4226 | 0.5704 | 0.6410 | 0.6013 |
| | **2006** | 0.4397 | 0.6116 | 0.6099 | 0.6762 |
| | **2005** | 0.4167 | 0.6083 | 0.6284 | 0.6192 |
| | **2004** | 0.4581 | 0.5993 | 0.6233 | 0.6103 |
| | **2003** | 0.5100 | 0.6388 | 0.6010 | 0.6690 |
| | **2002** | 0.4750 | 0.5994 | 0.6298 | 0.6278 |
| | **2001** | 0.4655 | 0.6497 | 0.7029 | 0.7074 |

The multi-dimensional nature of the data contained in Table 2 complicates a careful analysis of the general trend of the data and obscures the visibility of the consistency of the data over time. Since the data occupies multi-dimensional space, i.e. it encapsulates multiple coordinate axes, the use of a conventional two-dimensional scatter plot is inappropriate (Gower, Lubbe and Le Roux, 2011).

However, the use of biplots accommodates higher-dimensional data by approximating it in lower, usually two-, dimensional space, enabling the visualisation of multi-dimensional data. The interpretations of biplots and conventional two-dimensional scatterplots are similar, except that biplots can accommodate more than two variables in the form of calibrated axes. However, these axes cannot intersect perpendicularly in two dimensions. If the loss of information resulting from this

approximation is negligible, much can be learned about the multivariate nature of the data. To this end, the valuation accuracy of the four value driver categories for the period 2001-2010, as measured annually by the median absolute valuation errors, is illustrated as a biplot in Figure 3.

The PCA-based biplot in Figure 3 approximates the data in the best possible two-dimensional space. Although biplots provide a useful and versatile method to visualise multi-dimensional data, the reduction of the multi-dimensional nature of the data, as illustrated in Figure 3, can only be achieved with a certain loss of data accuracy (Greenacre, 2007). The data points displayed on the biplot are therefore approximations of the actual data points. Both the approximations and the actual data points are contained in Table 3.

**Figure 3.** PCA biplot reflecting the consistency of the relative valuation performance of the four value driver categories over the period 2001-2010[3]
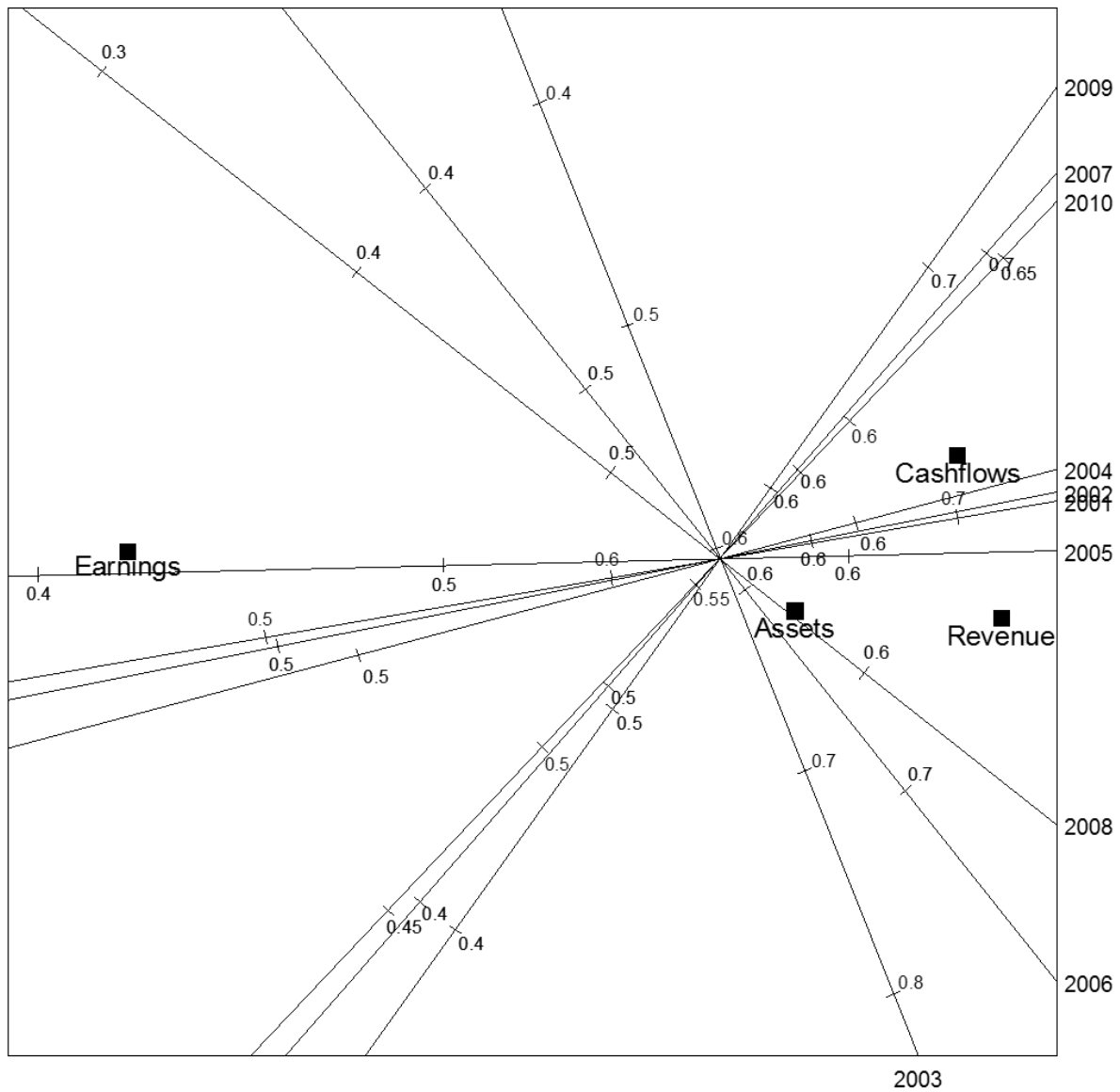


**Table 3.** Actual valuation errors and their predictions over the period 2001-2010

| Year | Value driver categories | | | | | | | |
|------|--------|---------|--------|---------|--------|---------|--------|---------|
| | Earnings | | Assets | | Cash flow | | Revenue | |
| | Actual | Predict | Actual | Predict | Actual | Predict | Actual | Predict |
| **2010** | 0.4635 | 0.4683 | 0.5807 | 0.5608 | 0.6121 | 0.6110 | 0.5751 | 0.5913 |
| **2009** | 0.4522 | 0.4432 | 0.5308 | 0.5684 | 0.6480 | 0.6500 | 0.6412 | 0.6101 |
| **2008** | 0.4026 | 0.3979 | 0.5516 | 0.5712 | 0.5798 | 0.5809 | 0.6388 | 0.6228 |
| **2007** | 0.4226 | 0.4245 | 0.5704 | 0.5623 | 0.6410 | 0.6406 | 0.6013 | 0.6079 |
| **2006** | 0.4397 | 0.4381 | 0.6116 | 0.6183 | 0.6099 | 0.6103 | 0.6762 | 0.6707 |
| **2005** | 0.4167 | 0.4220 | 0.6083 | 0.5862 | 0.6284 | 0.6272 | 0.6192 | 0.6372 |
| **2004** | 0.4581 | 0.4617 | 0.5993 | 0.5841 | 0.6233 | 0.6225 | 0.6103 | 0.6226 |
| **2003** | 0.5100 | 0.5106 | 0.6388 | 0.6364 | 0.6010 | 0.6009 | 0.6690 | 0.6710 |
| **2002** | 0.4750 | 0.4762 | 0.5994 | 0.5946 | 0.6298 | 0.6295 | 0.6278 | 0.6317 |
| **2001** | 0.4655 | 0.4655 | 0.6497 | 0.6497 | 0.7029 | 0.7029 | 0.7074 | 0.7074 |

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[3]The R code for constructing the PCA biplots utilises the UBbipl package, which is available at the following link http://dl.dropbox.com/u/17860902/UBbipl_1.0.zip

The comparison between the actual and predicted data points over all four value driver categories in Table 3 indicates that the loss in data accuracy is negligible. The predictions contained in Table 3 can be read from the PCA biplot displayed in Figure 4. The relevant data points of the earnings value driver category, for example, are illustrated by the perpendicular readings. Although not shown here, similar readings can be traced to Table 3 for assets, cash flow and revenue. Note that an exact reading (to the fourth decimal) from the biplot is not possible, but can be achieved algebraically.

**Figure 4.** PCA biplot readings for earnings
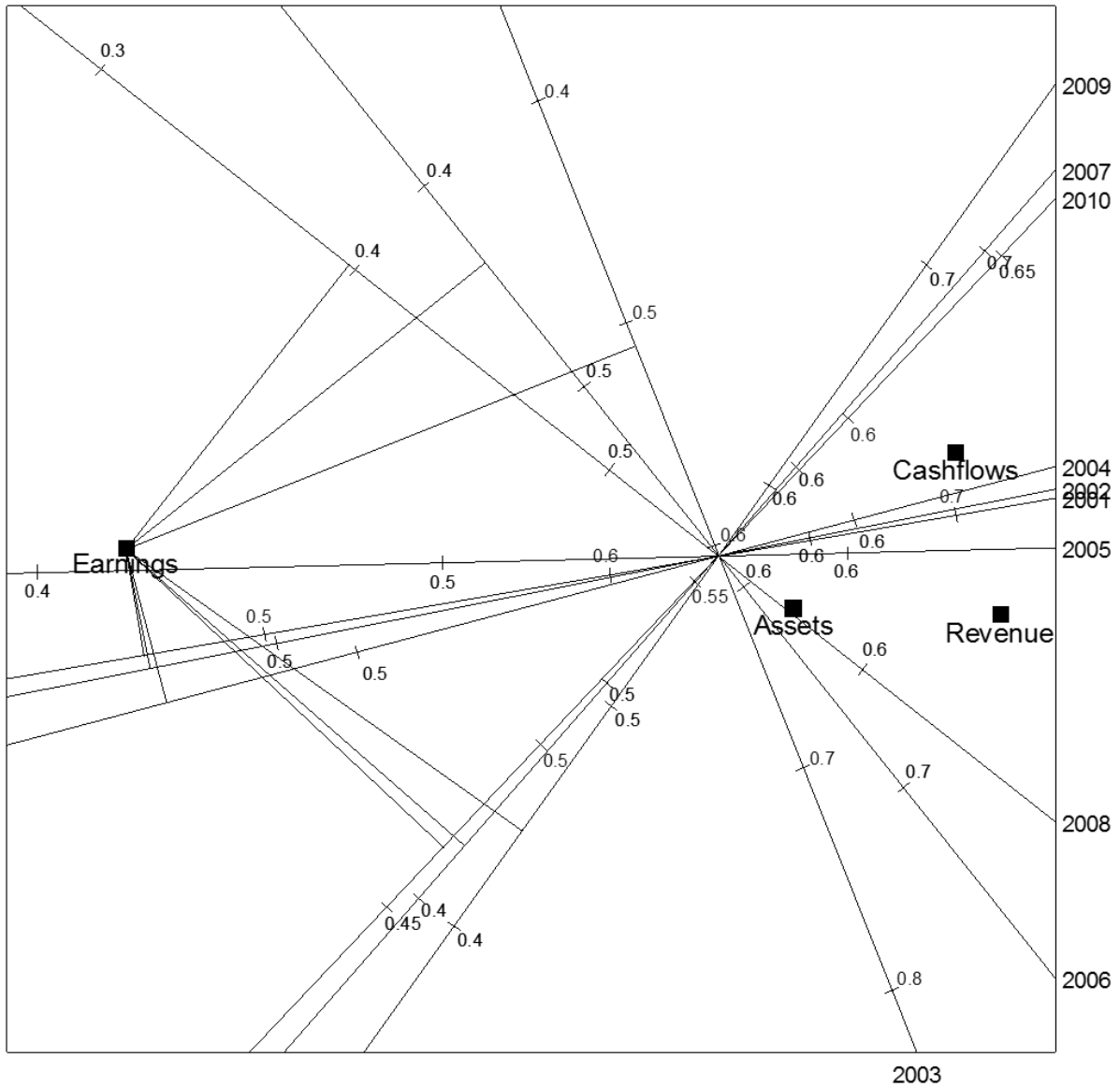


When using biplots, it is important to ascertain the magnitude of the loss in data accuracy in order to determine whether it is acceptable. The PCA biplot output obtained from the R-package, the code that was applied in this study, produces PCA quality of display and predictivity readings, which affords one the opportunity to assess the loss of data accuracy (Gower et al., 2011). In this analysis, the lower dimensionality was achieved with a PCA quality reading of 97.86% and annual predictivity readings as contained in Table 4, confirming a negligible loss of data accuracy. The greatest loss in accuracy occurs in 2009, but at 90.8% it remains a very accurate reading.

**Table 4.** Predictivity readings over the period 2001-2010

| Years | 2010 | 2009 | 2008 | 2007 | 2006 | 2005 | 2004 | 2003 | 2002 | 2001 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Predictivity** | 0.946 | 0.908 | 0.978 | 0.996 | 0.997 | 0.973 | 0.978 | 0.999 | 0.998 | 1.000 |

### 5.3 Consistency of the results

The use of biplots proved particularly useful in this study as it afforded one the opportunity to visualise the consistency of the relative valuation performance of the four value driver categories over time. In the biplot in Figure 3, each of the ten years over the period 2001-2010 is represented by a separate calibrated axis. The mean of the four value driver categories for each of the ten years is located at the point of intersection (origin) of the ten axes. Note that the valuation performance of the four value driver categories is depicted relative to each other and relative to the origin, i.e. the mean for each of the ten years. The value driver categories with the smaller valuation errors, i.e. a greater degree of valuation accuracy, are located to the left of the origin, while the less accurate value drivers are located to the right of the origin. As is evident from Figure 3, the superiority of earnings holds for each of the ten years.

Although, at first glance, the order in valuation performance confirms the observation in Figure 1, a closer examination reveals that, besides earnings, the relative valuation performance of the other three value driver categories did not remain constant on an annual basis over the period 2001-2010. As is evident from Figure 3, earnings is the only value driver category that consistently delivers a superior valuation

performance *vis-á-vis* the other three value driver categories, i.e. for each of the ten years observed, earnings produced the most accurate equity valuations. Earnings is also the only value driver category that consistently delivered below average valuation errors, as is evident from its location to the left of the origin for each of the ten years observed. Figure 3 also illustrates the magnitude of the superior explanatory power of earnings, which is depicted by the distance of the earnings value driver category's location from the origin and the other three value driver categories.

From the PCA biplot one can deduce one-dimensional optimal scaling values for the four value driver categories, which is illustrated in Figure 5. The one-dimensional optimal scaling values, as depicted in Figure 5, confirmed the superior valuation performance of earnings, which is located to the far left of the linear spectrum with a scaled value of 1.4260. As with the biplot, the distance between earnings and the other three value driver categories reflects the magnitude of its superior explanatory power *vis-á-vis* the other three value driver categories over the period 2001-2010. The use of PCA effectively reduces the dimensionality of the data cluster, thereby affording one the opportunity to more easily visualise the relative valuation performance of the four value driver categories.

**Figure 5.** Optimal one-dimensional scaling of the relative valuation
performance of the four value driver categories over the period 2001-2010
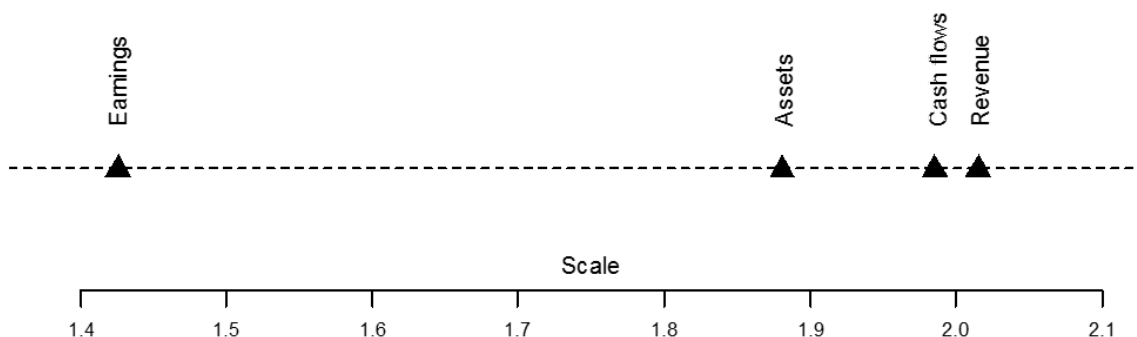


As is evident from Figure 3, assets predominantly produced the second most accurate results over the ten years, generally tending towards the mean of the four value driver categories. However, assets is located a significant distance to the right of earnings in Figure 3 and Figure 5, which suggests that its valuation performance is considerably less accurate than that of earnings. The latter is reflected in its scaled value of 1.8807.

Contrary to popular belief, cash flow produced far less accurate valuation results than earnings, which is evident from the significant distance between the locations of the two value drive categories in Figure 3. Cash flow was the least-, or next to least, accurate value driver for most of the years in the period 2001-2010. Cash flow is located to the right of the origin in

Figure 3, reflecting its poor valuation performance, i.e. it produced valuation errors higher than the mean for each of the ten years, except for 2003. It obtained a scaled value of 1.9857, as depicted in Figure 5, reflecting the significance of the disparity between cash flow and earnings.

As the evidence suggests, in terms of the consistency of their valuation performance, cash flow and revenue offer similar results, with cash flow offering an insignificant increase in valuation performance over revenue. From Figure 3 one can deduce that revenue was primarily the least accurate value driver for the period 2001-2010. Revenue is situated to the right of the origin in Figure 3, reflecting its consistent inability to produce valuation errors below the mean. Revenue produced the least accurate

valuation results over the period 2001-2010, with a scaled value of 2.0154.

## 6 Conclusion

The first contribution of this paper is that it offers an emerging market perspective on the explanatory power of four value driver categories, namely earnings, assets, cash flow and revenue. The empirical evidence suggests that earnings offer the greatest degree of valuation accuracy *vis-á-vis* assets, cash flow and revenue. In terms of valuation accuracy, the latter three value driver categories offer distant alternatives to earnings. Compared to earnings, assets offered moderate results, while cash flow and revenue offered poor results. Except for cash flow, these findings concur with empirical evidence from the developed market literature.

However, while the developed market literature suggests that cash flow produce average results, the findings in this study indicate that cash flow offers poor results. The evidence also suggests that, when a more narrowly defined cash flow-based value driver category is selected, revenue may, in fact, offer a greater degree of valuation accuracy compared to cash flow, which also contradicts evidence from the developed market literature.

The study employed PCA-based biplots to investigate the consistency of the relative valuation performance of the four value driver categories over time. Given the multi-dimensionality of the data contained in this study, biplots seem to be a promising tool for analysing and visualising multi-dimensional data of this nature. The consistency of the results, i.e. the ability of the respective value drivers to maintain their valuation performance on an annual basis throughout the period 2001-2010, confirmed the initial findings. Earnings is the only value driver that consistently offers superior results over this period. Assets maintained a reasonable amount of consistency over this period, while cash flow and revenue offered the least consistent results.

The research results present strong evidence in support of the use of earnings as superior value driver when employing multiples to perform equity valuations, which concur with empirical evidence from developed capital markets. The evidence therefore justifies analysts' preference for earnings-based multiples.

However, the evidence rejects the general perception that cash flow-based multiples offer relatively accurate valuations compared to earnings-based multiples. The opportunity benefit of switching from the cash flow- to earnings-based value drivers could provide an increase in valuation accuracy of up to 28.54%, which is significant. Consequently, the evidence suggests that analysts who use cash flow-based multiples in practice should consider switching to earnings-based multiples.

The second contribution of this paper is that it quantifies the magnitude of the potential improvement in valuation accuracy when substituting a less accurate value driver with a more accurate one. Based on the median valuation errors, the potential improvement in valuation accuracy lies between 1.34% and 29.49%. It is therefore evident that analysts can, by switching value drivers, significantly improve the valuation accuracy of their multiples models.

There are limitations to the study: Firstly, with the initial screening of the data, observations outside the 1st and 99th percentiles were omitted. The reasoning is two-fold. One, excluding extreme observations will prevent the severe distortion of the research results and two, rational analysts will most certainly exclude these extreme observations when estimating peer group multiples in practice. Secondly, value driver categories were analysed and not the individual value drivers. There will be individual value drivers within each of the value driver categories that will, for example, outperform other value driver categories. However, this is a topic for future research. Thirdly, the focus of this paper was specifically on the valuation performance of trailing multiples, whose value drivers are historical in nature. Although a more comprehensive approach may also incorporate forward multiples, this is severely hamstrung by a lack of depth in the South African market, particularly at the level that the authors would envisage testing them.

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**Appendix A.** Acronyms

| Acronym/Abbreviation | Description |
|---|---|
| BFA | Bureau of Financial Analysis |
| BVE | Book value of equity |
| CgbO | Cash generated by operations |
| ε | Error term |
| EBIT | Earnings before interest and tax |
| EBITDA | Earnings before interest, tax, depreciation and amortisation |
| FCFE | Free cash flow to equity |
| FCFF | Free cash flow to the firm |
| GP | Gross profit |
| HE | Headline earnings |
| *i* | Company *i* |
| IC | Invested capital |
| IMP | Potential percentage improvement |
| JSE | JSE Securities Exchange |
| MCap | Market capitalisation |
| N | Number of observations |
| NCIfIA | Net cash inflow from investing activities |
| NCIfOA | Net cash inflow from operating activities |
| OD | Ordinary cash dividend |
| P | Market price |
| PAT | Profit after tax |
| PBT | Profit before tax |
| PCA | Principal component analysis |
| PwC | PricewaterhouseCoopers |
| R | Revenue |
| t | Time period *t* |
| TA | Total assets |
| USA | United States of America |
| $\lambda_t^e$ | Equity multiple |
| $\hat{\lambda}_{ct}^e$ | Estimated peer group equity multiple at time period *t* |
| $\alpha_{it}$ | Actual value driver |
| $V_{it}^e$ | Actual value of equity of company *i* at time period *t* |
| $\hat{V}_{it}^e$ | Estimated value of equity of company *i* at time period *t* |

**Appendix B.** Classification of variables

All data were extracted from the McGregor BFA database. The classifications were largely derived from the descriptions as presented in the McGregor BFA user manuals.

### *B.1 Market price variable*

1. Market capitalisation (MCap) represents the market value of an entity's issued ordinary share capital. MCap is calculated by multiplying the market price per share as at the entity's financial year end with the issued volume of shares at the same date.

### *B.2 Earnings-based multiples*

2. Gross profit (GP) represents and is calculated as the difference between revenue or revenue and the cost of revenue.

3. Earnings before interest, taxation, depreciation and amortisation (EBITDA) represents an entity's earnings before interest, taxation, depreciation and amortisation. It is calculated by taking EBIT and adding back depreciation and amortisation.

4. Earnings before interest and tax (EBIT) represents an entity's earnings before interest and taxation. It is calculated by taking income before taxation and adding back interest.

5. Profit before tax (PBT) represents an entity's net profit, including realised profits and all losses of an extraordinary nature, after interest, but before taxation. It is calculated by taking profit before interest and taxation and deducting interest.

6. Profit after tax (PAT) represents an entity's net profit, including realised profits and all losses of an extraordinary nature, after interest and taxation. It is calculated by taking PBT and deducting taxation.

7. Headline earnings (HE) represents an entity's earnings generated by normal operational activities. It is calculated by taking PAT and adding back profits/losses associated with non-core operational activities, such as the sale of fixed assets or the termination of discontinued operations.

### *B.3 Book value-based multiples*

8. Total assets (TA) represents the total of all the tangible assets employed by the entity. It is calculated by adding total fixed assets, total long-term investments and total current assets.

9. Invested capital (IC) represents the total cash investment by fund providers. It is calculated by deducting cash and cash equivalents from TA.

10. Book value of equity (BVE) represents the equity of the ordinary shareholders. It is calculated by adding ordinary share capital and reserves; and deducting the cost of control of subsidiaries and intangible assets.

### *B.4 Revenue-based multiple*

11. Turnover (R) represents the gross revenue or revenue of the entity.

### *B.5 Cash flow-based multiples*

12. Cash generated by operations (CgbO) represents pre-tax cash flows net of working capital requirements. It is calculated by taking operating profits, adding back non-cash items and deducting changes in working capital.

13. Net cash inflow from operating activities (NCIfOA) represents post-tax operational cash flows. It is calculated by taking CgbO and deducting net interest, net dividends and taxation.

14. Net cash inflow from investment activities (NCIfIA) represents post-tax operational cash flows net of fixed capital requirements. It is calculated by taking NCIfOA and deducting acquisitions of fixed capital items net of capital gains tax.

15. Ordinary dividend (OD) represents the amount of dividends paid to ordinary shareholders as per the cash flow statement.

16. Free cash flow to the firm (FCFF) represents post-tax cash flows that are available to be distributed to all the fund providers of an entity, net of capital requirements to grow or maintain the business. It is calculated by taking NCIfIA and adding back non-operational items, such as net interest and net dividends.

17. Free cash flow to equity (FCFE) represents post-tax cash flows that are available to be distributed to all the equity fund providers of an entity, net of capital requirements to grow or maintain the business. It is calculated by taking FCFF and adding/deducting debt capital movements and interest paid.