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The value relevance of EBITDA and book values: Evidence from the Johannesburg Stock Exchange

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Orientation: This paper stems from Ohlson's valuation framework, where residual income as a variable was substituted by the non-Generally Accepted Accounting Practices (GAAP) measure of earnings before interest, taxes, depreciation and amortisation (EBITDA).

Research purpose: The primary purpose was to determine whether EBITDA, together with the book value of equity (BV), could be shown to be value relevant by means of an intrinsic equity evaluation model. Secondary hereto was to focus on the value relevance of the residual between EBITDA and traditional bottom-line earnings, namely interest, taxes, depreciation and amortisation (ITDA).

Motivation for the study: The concern is that the current evidence value relevance of EBITDA offered in the literature has been premised on relative valuation approaches, meaning they are primarily anecdotal.

Research approach/design and method: Cross-sectional ordinary least square regression analyses were applied from the top 100 largest companies listed on the JSE, from 1995 to 2017.

Main findings: The results demonstrated that EBITDA, ITDA and BV accounted for significant variations in equity share prices when controlling for the confounding effects of scale, growth and the incidence of reported accounting losses.

Practical/managerial implications: Ultimately, these findings should be seen to confirm the validity of EBITDA as an alternative input to bottom-line earnings in the valuation of equity shares.

Contribution/value add: The study extends the debate by providing an alternative perspective based upon Ohlson's residual income valuation framework, in respect of which there has currently been a paucity of evidence.

Keywords: EBITDA; ITDA; value relevance; equity valuation; book values.

Introduction

A burgeoning body of evidence has begun to spotlight the efficacy of earnings before interest, taxes, depreciation and amortisation (EBITDA). as an alternative equity valuation metric. However, it is a non-Generally Accepted Accounting Practices (GAAP) measure of which the accounting rules do not require its inclusion in income statements (Davern et al. 2019; Mey & Lamprecht 2021). Consequently, EBITDA has, for the most part, remained largely unnoticed by international standard setters and researchers. Despite Kim and Ritter's (1999) initial hypothesis regarding its efficacy in equity valuation in the late 1990s, first-hand evidence of its actual use in equity valuation remained relatively undocumented. After several recent scientific surveys of the investment practices of modern-day valuations (e.g., Bancel & Mittoo 2014; Pinto, Robinson & Stowe 2019; Vydržel & Soukupová 2012), it is now apparent that valuation professionals are increasingly utilising EBITDA-based financial performance measures when making their equity investment decisions. Moreover, it was evident that these trends were prevalent across the board in several geographical regions of the globe, in both developed and emerging economies. On the other hand, there is currently a widely entrenched global reporting of non-GAAP figures earnings figures such as EBITDA by large, listed companies, especially in the capital market communication (Herr, Lorson & Pilhofer 2022), which could imply that such disclosures are regarded by financial executives and investors as an important disclosure tool that enables management to provide users of financial reports with proprietary, or arguably, better decision-useful information than GAAP earnings (Mey & Lamprecht 2021).

From a capital market research perspective, these trends have begged the question of the value relevance of such alternative performance measures. The argument is that, through the paradigmatic lens of the theoretical framework of value relevance, a reasonable hypothesis could be developed that if equity valuation professionals find EBITDA useful for their purposes, such measures could then be regarded as value relevant. The term *value relevance* was initially coined by Amir, Harris and Venuti (1993) as a description of accounting information variables that assisted in predicting either a company's future distributions to its equity participants or its market value. Contemporary capital market researchers agree that value relevance entails a statistical association between a variable measuring a company's accounting information at a particular point in time and another corresponding variable measuring its equity share prices or share price returns (Amir et al. 1993; Barth, Beaver & Landsman 2001; Francis & Schipper 1999; Mey & Lamprecht 2021). Thus, if a company's EBITDA measures are value relevant, the practical implication is that there will be a statistically significant correlation between its EBITDA measures and the market value of its equity shares or returns, which could be measured by empirical means. If there is no correlation, EBITDA numbers are not value relevant (Nhleko & Schutte 2019).

Early capital market researchers' attempts to determine whether EBITDA was useful for equity valuation can be broadly categorised into two streams. In the first one, the focus was purely on using EBITDA within the context of relative valuation techniques. Kim and Ritter (1999) introduced the concept that EBITDA could be used to evaluate a company within the context of initial public offerings (IPOs). They empirically demonstrated that multiples such as enterprise value (EV) over EBITDA (EV/EBITDA) resulted in a superior equity valuation strategy compared to traditional earnings approaches. Following Kim and Ritter's (1999) study, a flurry of academics explored the idea in various contexts. The typical methodology of these studies entails some statistical associations between EBITDA and share prices or share price returns. For example, Lie and Lie (2002) evaluated the overall performance of several valuation multiples. Gray and Vogel (2012) investigated which valuation metrics had performed the best over 40 years. Barton, Hansen and Pownall (2010) compared the associations between a comprehensive set of performance measures and their share price returns. Many of these researchers typically observed that as EBITDA is not affected by leverage, it permits meaningful comparisons of the financial efficiency between firms with different financing structures (Liu, Nissim & Thomas 2002; Setiawan & Sumirat 2021). Moreover, EBITDA is not affected by various mixes of operating leases (Lyons 2022) and even different industries (Rubio, Gutiérrez-Rodríguez & Forero 2021). Similarly, Shaffer (2023) found that EBITDA-based multiples were the most commonly used valuation tool in 2300 unique merger and acquisition deals. Recently, Steffen's (2021) findings have confirmed Gray and Vogel's (2012) earlier proposition of the superiority of EBITDA as a valuation tool and called it 'a relevant driver of value'.

The second 'stream' of literature comprises, as yet, only one notable attempt to examine the value relevance of EBITDA within a valuation model derived from the Ohlson (1995) residual income valuation framework. It thus, strictly speaking, belongs to the stream of studies premised on Ohlson's (1995) residual income valuation framework, which is based on the analytical demonstration that the intrinsic equity value of a company could be related to a linear regression function of equity book value (BV), residual income and 'other relevant' information. Thus, under this approach, evaluations of value relevance require the specification of at least the BV as an explanatory variable alongside an earnings variable of interest. The model's specification of the BV variable is significant because the latter has been consistently demonstrated to account for significant variations in share prices or returns (Collins, Maydew & Weiss 1997; Hayn 1995; Keener 2011; Spilioti & Karathanassis 2012). Consequently, evaluating the value relevance of EBITDA would entail the specification of BV alongside EBITDA. This perspective is synonymous with simultaneously evaluating a company's financial performance and position (Davern et al. 2019; Liu, Gould & Burgan 2014) and is premised on the assumption that the effects of financial position and performance are complementary in explaining share price variations (Collins et al. 1997; Liu et al. 2014). Stenheim et al.'s (2018) study is the most notable recent attempt in this regard. These researchers sought to examine the value relevance of EBITDA measures using 100 of the largest companies listed on the Oslo Stock Exchange from 2012 to 2016. However, as they conceded, several methodological and econometric hindrances ultimately thwarted their empirical endeavours. The most significant was attrition bias, which limited their findings' generalisability.

Problem statement and research objectives

Relative or multiples valuation approaches are widely accepted as valid equity valuation approaches within finance. However, it has been shown that, although popular in practice, such approaches are typically used as confirmatory measures in addition to other robust valuation approaches, such as intrinsic valuation approaches (Yin, Peasnell & Hunt 2016). On this basis, the relative valuation approaches of the first literature stream are not worth following, in these authors' opinion, because even though previous studies have yielded some evidence of EBITDA association with equity share prices, their methodologies are not robust enough. Thus, evidence of the value relevance of EBITDA based on such approaches does not have a solid theoretical basis but is mainly anecdotal. For this reason, the relative valuation approach of the first stream was not considered in this paper.

On the other hand, the second approach is based on a sound equity valuation framework premised on a robust and compelling synthesis of the foundations of valuation theory

and contemporary finance hypotheses regarding capital asset pricing and dividend policy irrelevancy. It also systematically combines these theoretical foundations with the methodological assumptions of clean surplus accounting and a linear information dynamic (Nhleko, Schutte & Steyn 2020). However, this does not mean that there have not been challenges with this approach. Firstly, an attempt to evaluate EBITDA's efficacy using the intrinsic valuation approach has been made in only very few studies (e.g., Stenheim et al. 2018), resulting in a paucity in the current literature. Secondly, as alluded to above, Stenheim et al.'s (2018) evidence was ultimately inconclusive because of significant methodological challenges, such as attrition bias.

In addition, although econometric models based on the residual income valuation approach facilitate the specification of other relevant correlated variables, Stenheim et al. (2018) neglected to do so. For example, they did not consider the effects of growth and negative earnings (Basu 1997; Ettredge et al. 2005; Hayn 1995; Kothari 2001), despite such variables having been previously demonstrated to affect equity valuations. Moreover, they ignored the significance of the residual between EBITDA and traditional bottom-line earnings, namely interest, taxes, depreciation and amortisation (ITDA). In respect of the latter, except for studies such as those of Begley, Chamberlain and Joo (2023), Bradshaw and Sloan (2001), so far there has been a paucity of literature that has focused on this issue.

Thirdly, although Stenheim et al. (2018) took BV into account in their model, their results were inconclusive because of other methodological problems. Thus, it is not yet known how the equity book value variable would fit into a revised intrinsic valuation model intended to determine the value relevance of EBITDA.

Ultimately the above problems mean that more research is necessary to investigate the value relevance of EBITDA. This paper stems from Ohlson's valuation framework, where the non-GAAP measure of EBITDA was specified as a substitute for the residual income variable. In light of the above, the primary purpose of this study was to determine whether EBITDA, together with BV, can be shown to be value relevant employing an intrinsic equity evaluation model. Secondary to that was also to evaluate the significance of the residual between EBITDA and traditional bottom-line earnings, namely ITDA, within the above-mentioned model. In this regard, there has so far been a lack of consensus with regard to the relevance of the previously mentioned items (i.e., ITDA) when performing an equity investment appraisal. For example, as Begley et al. (2023) pointed out, in practice some analysts might consider these items irrelevant (i.e., and rather focus on figures that exclude such items such as EBITDA), whereas others might focus on figures that include their impact, such as bottom-line earnings. This broad divergence in empirical equity valuation approaches calls into question the relevance of such excluded items (i.e., ITDA) in equity valuation. Consequently, insights into these items would have significant implications for several stakeholders such as equity valuation analysts.

The remainder of this paper is structured as follows. The next section describes the relevant conceptual and theoretical framework. The topics reviewed in this section include an analysis of the concept of EBITDA with the price model specification, the identification and discussion of the relevant theories and valuation concepts, and an analysis of prior studies in which associations between EBITDA measures and share prices were examined. In the section thereafter, the research methods utilised in this study are described. The analysis and discussion of the empirical results are presented in the next section. Finally, the last section deals with the study's conclusions.

Literature review

The notion that accounting and other relevant information can be functionally related to equity share prices or returns could more aptly be associated with the value relevance hypothesis. The latter, in turn, is best underpinned by a synthesis of valuation theory and the asset pricing hypothesis of market efficiency. Valuation theory, on the one hand, predicts that the intrinsic value of any equity share can, hypothetically, be derived by discounting the expected future cash flows that accrue to the equity participants at an appropriate discount rate (Abarbanell & Bushee 1997; Baresa, Bogdan & Ivanovic 2013; Penman 2010). The efficient market hypothesis (EMH), on the other hand, is underpinned by Fama's (1970) proposition that, at any point in time, share prices fully reflect all the available information about the value of a company (Clarke, Jandik & Mandelker 2001).

The value relevance theory combines both the abovementioned theories to support the underlying hypothesis that, in a reasonably efficient market situation, the market values of companies drift around their intrinsic equity values (Beisland 2009:7; Francis & Schipper 1999:325–327). Therefore, within the context of equity valuations, an empirical examination of the value relevance of EBITDA would entail establishing a statistical association between a company's EBITDA measure and its equity value or share price, or alternatively, its share price returns (Amir et al. 1993:230; Barth et al. 2001:79; Barth, Landsman & Lang 2008:477; Lang, Ready & Yetman 2003:375; Ota 2003:157; Setiawan & Sumirat 2021:129–130).

Thus, given the above context, any evidence of an association between accounting and other information to share prices or returns should be seen to validate valuation theory within the context of equity markets. Relevant studies in this regard are, for instance, Lie and Lie (2002), who sought to evaluate the overall performance of several valuation multiples, including EBITDA-based ones. They found that the EBITDA multiple generally yielded better estimates than other multiples, except for pharmaceutical companies. Similarly, Gray and Vogel (2012) sought to establish which valuation

metrics had performed the best over 40 years, from 1971 to 2010. Their population comprised companies listed on the New York Stock Exchange, the American Stock Exchange and the National Association of Securities Dealers Automated Quotations (NASDAQ), from which they gathered a comprehensive dataset. Furthermore, their methodological approach seems to be similar to Kim and Ritter' (1999) and Lie and Lie (2002) in that the underlying basis of their study was a relative valuation approach. Based on an analysis of compound annual growth rates for each of the valuation metrics for equal-weight and value-weight portfolios, Gray and Vogel (2012) found that EBITDA-based matrices in this case, EBITDA/total enterprise value (TEV) were relatively the best equity valuation strategy. Furthermore, Gray and Vogel (2012) found that EBITDA/TEV was the most effective measure when analysing the spread of returns between the cheapest and most expensive stocks, given a specific valuation measure. They concluded that EBITDA/TEV had historically tend to outperform other valuation metrics.

These results of the latter study were consistent with those of Barton et al. (2010). They had previously sought to estimate and compare the associations between a comprehensive set of performance measures and their share price returns. Barton et al. (2010) selected eight performance measures commonly disclosed in companies' financial statements, operating cashflows, sales, EBITDA, operating income, income before taxes, income before extraordinary items and discontinued operations, net income and total comprehensive income. Their sample comprised almost 20 000 firms from 46 countries over 10 years, from 1996 to 2005. The overall results revealed that, while the associations of the performance measures to the share price returns varied substantially across line items on the income statement, as well as across countries (Barton et al. 2010:754), the associations between EBITDA and share price returns existed in all but three of the 46 countries (Barton et al. 2010:752). In eight countries, namely the United Kingdom, Germany, Argentina, Indonesia, Malaysia, Singapore, South Africa and Thailand, EBITDA had the highest association with share price returns and the eight indicators. Recently, Mey and Lamprecht (2021) demonstrated that a significant number of companies (JSE-listed companies) (over 24%) chose to highlight some form of EBITDA-based performance measure in their financial performance communication on the Stock Exchange News Service reports during the 2014 to 2016 period.

In another recent study, Shaffer (2023) analysed 13 019 valuation ratios from 2300 unique merger and acquisition advisory deals. Data were analysed into equity versus enterprise valuations, past, current and future values of 10 possible value drivers, including EBITDA, net income, gross profit, among others and comparable transactions versus comparable trading multiples. The study found that the two most commonly used multiples from the above possible combinations were Enterprise Value to Current EBITDA for trading companies, and Enterprise Value to Past EBITDA for transaction companies, respectively. He further found that EBITDA was the most common value driver denominator, followed by net income, revenue, book equity and earnings before interest and taxes (EBIT).

Lessons learnt from the above literature is that EBITDA is a well-established and relevant driver of value. However, other recent studies warn against the misrepresentation of companies' performance. For example, Mey and Lamprecht (2021) investigated 185 JSE-listed company reports and found they signal the credibility of EBITDA as a performance measure to mask potential opportunistic disclosure. Furthermore, they refer to the acronym EBITDAC, where the 'C' refers to the profit lost because of the coronavirus disease 2019 (COVID-19) pandemic. Lyons's (2022) study also warns against misrepresentation because of differences between US GAAP and International Financial Reporting Standards (IFRS). The study also argues that EBITDA is only applicable when operating leases are excluded, but recommends using EBITDAR when operating leases are included, where 'R' represents the rent on leases. However, the latter two studies are beyond the focus of this paper.

Research design and method

This study proposed a price model specification as the basis for empirical analysis. Following the recommendations of the authors mentioned in the previous section, it was considered appropriate to modify the model specification advanced by Collins et al. (1997) to relate the equity value or share price of a company or a measure of its market value to its EBITDA, ITDA and BV in a linear regression function such that:

$$P_{jt} = \beta_0 + \beta_1 EBITDA_{jt} + \beta_2 ITDA_{jt} + \beta_3 BV_{jt} + e_{jt} \quad \text{[Eqn 1]}$$

Where: P_{jt} is the price per share for company j at time t; $EBITDA_{jt}$ is the EBITDA per share for company j at time t; $ITDA_{jt}$ is the sum of ITDA; BV_{jt} is the book value per share; β_0 is the intercept; β_1, β_2 and β_3 are the regression coefficients of the independent variables (IVs); and e_{jt} denotes other value-relevant information.

The above-mentioned model specification is consistent with the intrinsic framework of valuation theory (Ohlson 1995; Ota 2003). This model specification's implicit assumption is that the IVs EBITDA, ITDA and BV would be the metrics of interest to equity analysts and investors when performing their equity valuations. This perspective is synonymous with simultaneously evaluating a company's financial performance and position (Davern et al. 2019; Liu et al. 2014) and is premised on the assumption that the effects of financial position and performance are complementary in explaining share price variations (Collins et al. 1997; Liu et al. 2014).

The adopted model specification's conceptualisation inherently addresses the possible effects of a shift in focus by investors from a financial position focus to a performance focus and

vice versa (Collins et al. 1997; Ely & Waymire 1999; Francis & Schipper 1999; Liu et al. 2014). This shift makes it possible to readily measure each variable's incremental value relevance and contribution (Collins et al. 1997; Keener 2011). Furthermore, the model specification makes it possible to address the presence of any heteroscedastic disturbances of scale (Gu 2005; Kothari & Zimmerman 1995; Tabachnick & Fidell 2014). It also avoids both the accounting lag problem (Gu 2005; Kothari & Zimmerman 1995) and the transitory earnings problem of the 'return' model (Gu 2005; Kothari 2001; Kothari & Zimmerman 1995).

Population and sampling

The target population consisted of companies listed on the main board of the JSE as of the end of December 2016. What made the JSE a compelling subject of study was its sophistication, despite the emerging nature of the South African economy (World Economic Forum 2016; Johannesburg Stock Exchange 2018). In 2016, the JSE was reportedly one of the top 20 exchanges in market capitalisation and had operated as a marketplace for trading financial products for more than 130 years (Johannesburg Stock Exchange 2018).

Table A1 in the annexure shows a list of the companies included in the sample. The initial sample consisted of the top 100 companies by capitalisation as of 31 December 2016, observed from 1995 to 2017, resulting in 23 years of data. These selection criteria ensured that all the financial company data from this period was available for testing. The starting point of 1995 was considered appropriate. That was when the Accounting Practices Board, which was responsible for developing and issuing the statements of Generally Accepted Accounting Practice (SA GAAP) in South Africa, decided to harmonise SA GAAP from 1995 with the International Financial Reporting Standards (IFRS Foundation 2016:02). We considered to update our JSE data; however, because of the effect of the COVID-19 epidemic on financial statements we decided to keep the data as is, which exclude the affected years. Hereto, the statistical model does not need to be altered to control for the COVID-19 effect.

Table 1 depicts the distribution of the company observations per sector. From this table, it is evident that companies from the sectors of banking, financial services, food production, general industrials, general retailers, mining and real estate investment trusts all contributed a high number of observations to the sample. This phenomenon indicated the dominant positions occupied during the sample period by these companies in the top 100 of the JSE.

TABLE 1: Distribution of classifications of sample observations by sector.

Sector	Total Number of Observations	% representation
Banks	112	7
Beverages	47	3
Chemicals	48	3
Construction & Materials	24	1
Electronic & Electrical Equipment	24	1
Financial Services	153	9
Fixed Line Telecommunications	15	1
Food & Drug Retailers	83	5
Food Producers	129	8
Forestry & Paper	35	2
General Industrials	110	7
General Retailers	130	8
Healthcare & Equipment Services	21	1
Household Goods & Home Construction	18	1
Industrial Metals & Mining	12	1
Industrial Transportation	46	3
Life Insurance	98	6
Media	23	1
Mining	203	12
Mobile Telecommunications	22	1
Non-life Insurance	24	1
Personal Goods	24	1
Pharmaceuticals & Biotechnology	24	1
Real Estate Investment & Services	8	0
Real Estate Investment Trusts	116	7
Software & Computer Services	42	3
Tobacco	10	1
Travel & Leisure	70	4
Total	**1671**	**100**

Source: Johannesburg Stock Exchange, 2018, *JSE Limited Integrated Annual Report for the year ended 31 December 2017*, Johannesburg Stock Exchange, Johannesburg

Data collection and testing of model assumptions

Research data for the companies under review were obtained from Iress and Profile Media, which provide company and market information in South Africa. The regression analysis was performed using the IBM Statistical Package for Social Sciences (SPSS). The statistical significance threshold was predetermined to be 0.05.

Scholars such as Hayn (1995) and Basu (1997) have previously indicated the negative relation an increase in the incidence of reported losses or negative earnings has on the incremental value relevance of earnings over time. Furthermore, the impact of growth on value relevance has been well argued (Entwistle, Feltham & Mbagwu 2010). As a result, the current study's model specification was adjusted to accommodate these confounding characteristics to ensure that the results were not biased because of omitted correlated variables. Similar to Entwistle et al. (2010), the market-to-book value ratio indicated growth, while 1 and -1 were used as indicators of profit or loss, respectively. By considering these control variables, the regression model was specified as follows:

$$P_{jt} = \beta_0 + \beta_1 Growth_{jt} + \beta_2 Earnings\_Ctrl_{jt} + \beta_3 EBITDA_{jt} + \beta_4 ITDA_{jt} + \beta_5 BV_{jt} + e_{jt} \quad \text{[Eqn 2]}$$

Therefore, hierarchical multiple regression was used to evaluate the ability of three variables, namely EBITDA, ITDA and BV to explain the level of variance in the share price of a company at a particular point in time over 23 years after controlling for the impact of growth and negative earnings variables. Before incorporating the control variables into the model, it was considered essential first to establish whether

there was a correlation between each of the control variables and the dependent variable. Thus, preliminary tests were performed for each of the 23 models to test the relationship between the independent control variables and the dependent variable using Spearman's Rho. The results showed that both control variables, growth, and negative earnings were generally positively correlated to the dependent variable. The control variables were therefore incorporated into the regression model as a first step.

Preliminary analyses were performed for each of the models to ensure no violations of the multiple linear regression model assumptions of normality, linearity, multicollinearity and homoscedasticity. The tests for normality were assessed by examining the Kolmogorov-Smirnov (KS) and the Shapiro-Wilk (SW) statistics (not reported), as well as by inspecting the normal probability plots of the residuals of the regression model. Both test statistics yielded statistically significant values for all the years under review. However, the initial distributions of the residuals did not appear reasonably normal, meaning that the assumption of normality was initially not validated. By the same token, when examining the homoscedasticity assumption, several instances were identified that indicated that this assumption was initially not fully validated when running the model with the share price as the dependent variable.

Consequently, according to Tabachnick and Fidell (2014), the dependent variable was transformed by taking its natural logarithm transformations before fitting the regression model. This procedure ensures that the normality assumption was reassessed on the transformed variable and validated. In addition, the assumption of homoscedasticity was retested by examining the residual plots, and it was shown to be adequately achieved throughout all the years under review (not reported). The regression models were therefore conducted using the natural logarithm of the share price ($Ln\ P_{jt}$) and the results of further analyses were interpreted on the scores of the natural logarithm of the share price.

An examination of the residual statistics and case-wise diagnostics indicated a few cases in which the standardised residuals were lying outside the -3 and +3 range, as indicated by both Cook's and Mahalanobis distances, could be interpreted as outliers. However, because of the evidence of normality of the distribution of residuals, the potential impact of these outliers on the overall model results was considered inconsequential; therefore, these cases were ignored (Pallant 2016:160).

Finally, the preliminary tests for multicollinearity seemed to exhibit some presence of high correlation, as shown by a variance inflation factor (VIF) of greater than 10, as well as a Pearson correlation of greater than 0.75 for several periods between the EBITDA and ITDA variables when all the model variables were entered. Several related prior studies have encountered similar challenges with their empirical modelling (Keener 2011). In order to address this violation, two regression models were run separately for each year, one with only EBITDA and BV as the IVs, and the other with only ITDA and BV, after controlling for growth and negative earnings for each of the models. Forty-six models were generated and evaluated, namely, 23 for each of the EBITDA and ITDA models. Following the application of this procedure, both the VIF and tolerance were reduced to acceptable levels.

Results and discussion

Table 2 shows descriptive statistics per model for the period 1995 to 2017. There are two parts to this table. The first part comprises the descriptive statistics for the EBITDA model, and the second part shows the descriptive statistics for the ITDA model. Per the model specifications, the results are presented per period across companies. Because of the econometric challenge of the time-series dependency of the data (not reported), this perspective was considered the most appropriate to analyse the resulting relationships.

Each of the model statistics has 15 columns. The first part of the table comprises the descriptive statistics for the EBITDA model for the 1995 to 2017 periods. The statistics reported under the EBITDA model are for each of the model variables, namely $Ln\ P_{jt}$, $Growth_{jt}$, $Earnings\_Ctrl_{jt}$, $EBITDA_{jt}$ and BV_{jt} for each period. Similarly, the second part of the table shows the descriptive statistics for the ITDA model for each of the variables $Ln\ P_{jt}$, $Growth_{jt}$, $Earnings\_Ctrl_{jt}$, $ITDA_{jt}$ and BV_{jt} for the 1995 to 2017 periods.

For both the EBITDA and ITDA models, out of the initial 100 sample companies, there were 47 observations in 1995, which increased steadily to 68 in 2002 and stabilised between 78 and 68 between 2003 and 2008. The observations increased to 80 in 2010 and peaked at 81 between 2016 and 2015. The total observations were 1671 and comprised all the valid data variables per company over the 23 years.

Table 3 shows the model fit statistics of the annual regressions of the natural log of the share price on EBITDA and ITDA. The model specifications in this table comprise the regression of the natural log of the share price on the IVs. The first row indicates the model. The second row consists of labels for the results for each of the EBITDA and ITDA models. Here, the first and the fifth columns display the period for which the examination was made. The second, third and fourth columns show the R-squared, the adjusted R-squared and the F-ratio for the EBITDA model. Similarly, the sixth, seventh and eighth columns are comparable to the ITDA model.

The R-squared and the adjusted R-squared are consistent with those reported in the regression model summaries. An R-squared value of at least greater than 0.25 represents a significant correlation (Pallant 2016) between the dependent variable ($Ln\ P_{jt}$) and the IVs, after controlling for the effects of the confounding variables.

TABLE 2: Descriptive statistics per model for the period 1995 to 2017.

Year	EBITDA Model				ITDA Model			
	Variable	Mean	Std. Deviation	*N*	Variable	Mean	Std. Deviation	*N*
1995	Ln_Price	7.43	1.52	47	Ln_Price	7.43	1.52	47
	Growth	9.02	45.23	47	Growth	9.02	45.23	47
	Eam_ctrl	0.96	0.29	47	Earn_ctrl	0.96	0.29	47
	EBITDA	568.62	647.49	47	ITDA	285.06	380.91	47
	BV	2 575.50	5 044.57	47	BV	2 575.50	5 044.57	47
1996	Ln_Price	7.70	1.40	51	Ln_Price	7.70	1.40	51
	Growth	4.16	6.88	51	Growth	4.16	6.88	51
	Eam_ctrl	0.88	0.48	51	Earn_ctrl	0.88	0.48	51
	EBITDA	650.66	914.10	51	ITDA	344.51	654.77	51
	BV	2 707.70	5 439.13	51	BV	2 707.70	5 439.13	51
1997	Ln_Price	7.53	1.52	53	Ln_Price	7.53	1.52	53
	Growth	3.89	6.88	53	Growth	3.89	6.88	53
	Eam_ctrl	0.85	0.53	53	Earn_ctrl	0.85	0.53	53
	EBITDA	738.84	1 296.49	53	ITDA	405.70	966.25	53
	BV	2 902.60	5 849.70	53	BV	2 902.60	5 849.70	53
1998	Ln_Price	7.33	1.46	56	Ln_Price	7.33	1.46	56
	Growth	2.85	3.01	56	Growth	2.85	3.01	56
	Eam_ctrl	0.86	0.52	56	Earn Ctrl	0.86	0.52	56
	EBITDA	876.85	1 576.48	56	EBITDA	534.38	1188.15	56
	BV	2 776.50	5 511.36	56	BV	2 776.50	5 511.36	56
1999	Ln_Price	7.34	1.61	61	Ln_Price	7.34	1.61	61
	Growth	3.75	4.14	61	Growth	3.75	4.14	61
	Eam_ctrl	0.87	0.50	61	Earn_ctrl	0.87	0.50	61
	EBITDA	887.19	1 734.33	61	ITDA	597.82	1 516.96	61
	BV	1 613.00	2 197.72	61	BV	1 613.00	2 197.72	61
2000	Ln_Price	7.37	1.69	64	Ln_Price	7.37	1.69	64
	Growth	4.03	4.85	64	Growth	4.03	4.85	64
	Eam_ctrl	0.94	0.35	64	Earn_ctrl	0.94	0.35	64
	EBITDA	926.45	1 786.24	64	ITDA	584.95	1 419.40	64
	BV	1 564.50	2 112.56	64	BV	1 564.50	2 112.56	64
2001	Ln_Price	7.43	1.61	66	Ln_Price	7.43	1.61	66
	Growth	3.58	4.85	66	Growth	3.58	4.85	66
	Eam_ctrl	0.91	0.42	66	Earn_ctrl	0.91	0.42	66
	EBITDA	1055.50	2 511.91	66	ITDA	622.38	1 829.76	66
	BV	1 763.60	2 384.21	66	BV	1 763.60	2 384.21	66
2002	Ln_Price	7.47	1.57	68	Ln_Price	7.47	1.57	68
	Growth	6.71	26.88	68	Growth	6.71	26.88	68
	Eam_ctrl	0.91	0.41	68	Earn_ctrl	0.91	0.41	68
	EBITDA	994.41	2 257.87	68	ITDA	584.56	1 669.17	68
	BV	1 892.10	2 644.03	68	BV	1 892.10	2 644.03	68
2003	Ln_Price	7.46	1.34	71	Ln_Price	7.46	1.34	71
	Growth	4.68	13.84	71	Growth	4.68	13.84	71
	Earn_ctrl	0.77	0.64	71	Earn_ctrl	0.77	0.64	71
	EBITDA	948.67	2 158.60	71	ITDA	621.99	1 779.43	71
	BV	2 056.20	3 633.71	71	BV	2 056.20	3 633.71	71
2004	Ln_Price	7.78	1.24	70	Ln_Price	7.78	1.24	70
	Growth	5.36	14.48	70	Growth	5.36	14.48	70
	Earn_ctrl	0.94	0.34	70	Earn_ctrl	0.94	0.34	70
	EBITDA	766.08	1 015.30	70	ITDA	410.88	521.72	70
	BV	1 935.40	2 679.98	70	BV	1 935.40	2 679.98	70
2005	Ln_Price	8.10	1.23	73	Ln_Price	8.10	1.23	73
	Growth	6.90	20.45	73	Growth	6.90	20.45	73
	Earn_ctrl	0.95	0.33	73	Earn_ctrl	0.95	0.33	73
	EBITDA	935.04	1 312.82	73	ITDA	475.88	762.14	73
	BV	2 143.30	3 231.55	73	BV	2 143.30	3 231.55	73
2006	Ln_Price	8.47	1.19	74	Ln_Price	8.47	1.19	74
	Growth	6.91	26.42	74	Growth	6.91	26.42	74
	Earn_ctrl	0.92	0.40	74	Earn_ctrl	0.92	0.40	74
	EBITDA	1 226.30	1 894.68	74	ITDA	629.16	1 005.69	74
	BV	3 365.90	4 474.33	74	BV	3 365.90	4 474.33	74

Table 2 continues on the next page →

TABLE 2 (Continues...): Descriptive statistics per model for the period 1995 to 2017.

Year	EBITDA Model				ITDA Model			
	Variable	Mean	Std. Deviation	*N*	Variable	Mean	Std. Deviation	*N*
2007	Ln_Price	8.59	1.14	77	Ln_Price	8.59	1.14	77
	Growth	7.75	33.66	77	Growth	7.75	33.66	77
	Earn_ctrl	0.95	0.32	77	Earn_ctrl	0.95	0.32	77
	EBITDA	1 164.70	1 703.72	77	ITDA	637.30	1 000.58	77
	BV	3 114.80	3 411.95	77	BV	3 114.80	3 411.95	77
2008	Ln_Price	8.26	1.21	79	Ln_Price	8.26	1.21	79
	Growth	3.35	7.33	79	Growth	3.35	7.33	79
	Earn_ctrl	0.92	0.39	79	Earn_ctrl	0.92	0.39	79
	EBITDA	1174.50	1 595.90	79	ITDA	624.13	879.76	79
	BV	3 372.50	3 632.13	79	BV	3 372.50	3 632.13	79
2009	Ln_Price	8.20	1.30	78	Ln_Price	8.20	1.30	78
	Growth	2.83	3.05	78	Growth	2.83	3.05	78
	Earn_ctrl	0.87	0.49	78	Earn_ctrl	0.87	0.49	78
	EBITDA	909.58	1 007.12	78	ITDA	540.31	637.64	78
	BV	3 255.00	3 386.11	78	BV	3 255.00	3 386.11	78
2010	Ln_Price	8.46	1.24	80	Ln_Price	8.46	1.24	80
	Growth	3.09	2.84	80	Growth	3.09	2.84	80
	Earn_ctrl	0.95	0.31	80	Earn_ctrl	0.95	0.31	80
	EBITDA	1040.20	1 206.08	80	ITDA	562.75	665.20	80
	RV	3 611.90	3 970.80	80	BV	3 611.90	3 970.80	80
2011	Ln_Price	8.58	1.22	80	Ln_Price	8.58	1.22	80
	Growth	3.16	3.08	80	Growth	3.16	3.08	80
	Earn_ctri	0.95	0.31	80	Earn_ctrl	0.95	0.31	80
	EBITDA	1 218.30	1 509.20	80	ITDA	609.06	770.20	80
	BV	4 309.60	4 989.66	80	BV	4 309.60	4 989.66	80
2012	Ln_Price	8.78	1.09	80	Ln_Price	8.78	1.09	80
	Growth	3.89	5.64	80	Growth	3.89	5.64	80
	Earn_ctri	0.98	0.22	80	Earn_ctrl	0.98	0.22	80
	EBITDA	1 191.30	1 361.70	80	ITDA	609.13	716.82	80
	BV	4 723.20	5 189.29	80	BV	4 723.20	5 189.29	80
2013	Ln_Price	8.90	1.08	80	Ln_Price	8.90	1.08	80
	Growth	5.93	25.17	80	Growth	5.93	25.17	80
	Earn_ctri	0.95	0.31	80	Earn_ctrl	0.95	0.31	80
	EBITDA	1 298.30	1 616.34	80	ITDA	644.50	827.88	80
	BV	5 370.20	6 043.06	80	BV	5 370.20	6 043.06	80
2014	Ln_Price	9.06	1.05	80	Ln_Price	9.06	1.05	80
	Growth	3.31	2.90	80	Growth	3.31	2.90	80
	Earn_ctri	0.92	0.38	80	Earn_ctrl	0.92	0.38	80
	EBITDA	1 385.60	1 620.78	80	ITDA	689.34	827.18	80
	BV	5 925.70	6 753.05	80	BV	5 925.70	6 753.05	80
2015	Ln_Price	9.08	1.02	81	Ln_Price	9.08	1.02	81
	Growth	3.10	2.98	81	Growth	3.10	2.98	81
	Earn_ctri	0.93	0.38	81	Earn_ctrl	0.93	0.38	81
	EBITDA	1457.90	1 569.90	81	ITDA	750.10	868.33	81
	BV	8 706.20	19 668.67	81	BV	8 706.20	19 668.67	81
2016	Ln_Price	9.09	1.09	81	Ln_Price	9.09	1.09	81
	Growth	2.72	2.66	81	Growth	2.72	2.66	81
	Earn_ctri	0.88	0.48	81	Earn_ctrl	0.88	0.48	81
	EBITDA	1 465.00	1 591.09	81	ITDA	802.27	975.25	81
	BV	6 685.40	6 954.30	81	BV	6 685.40	6 954.30	81
2017	Ln_Price	9.02	1.33	78	Ln_Price	9.02	1.33	78
	Growth	2.57	2.28	78	Growth	2.57	2.28	78
	Earn_ctri	0.87	0.49	78	Earn_ctrl	0.87	0.49	78
	EBITDA	1 505.20	1 742.45	78	ITDA	858.56	1 068.67	78
	BV	7 354.00	8 755.38	78	BV	7 354.00	8 755.38	78

EBITDA, earnings before interest, taxes, depreciation and amortisation; ITDA, interest, taxes, depreciation and amortisation.
Note: EBITDA model: Ln Pjt, Growthjt, Earnings_Ctrljt, EBITDAjt and BVjt; ITDA model: Ln Pjt, Growthjt, Earnings_Ctrljt, ITDAjt and BVjt.

An analysis of the EBITDA model results indicates that all the R-squared values were above 0.25 for the period under review. The lowest R-squared value was 0.421 in 2015, and the highest was 0.728 in 2009. The adjusted R-squared values are displayed alongside the total R-squared figures in the third column. The lowest adjusted R-squared value

TABLE 3: Fit statistics of annual regressions of the share price on earnings before interest, taxes, depreciation and amortisation and interest, taxes, depreciation and amortisation.

Year	R-squared	Adjusted R-squared	F-ratio
EBITDA MODEL			
1995	0.519	0.473	F(4,42) = 11.320, $p < 0.05$
1996	0.579	0.542	F(4,46) = 15.811, $p < 0.05$
1997	0.638	0.607	F(4,48) = 21.108, $p < 0.05$
1998	0.498	0.459	F(4,51) = 12.657, $p < 0.05$
1999	0.568	0.537	F(4,56) = 18.419, $p < 0.05$
2000	0.657	0.633	F(4,59) = 28.197, $p < 0.05$
2001	0.701	0.681	F(4,61) = 35.756, $p < 0.05$
2002	0.467	0.433	F(4,63) = 13.776, $p < 0.05$
2003	0.461	0.429	F(4,66) = 14.125, $p < 0.05$
2004	0.546	0.518	F(4,65) = 19.510, $p < 0.05$
2005	0.517	0.488	F(4,68) = 18.185, $p < 0.05$
2006	0.671	0.652	F(4,69) = 35.121, $p < 0.05$
2007	0.597	0.575	F(4,72) = 26.684, $p < 0.05$
2008	0.684	0.667	F(4,74) = 40.041, $p < 0.05$
2009	0.728	0.714	F(4,73) = 48.956, $p < 0.05$
2010	0.637	0.617	F(4,75) = 32.850, $p < 0.05$
2011	0.622	0.602	F(4,75) = 30.866, $p < 0.05$
2012	0.562	0.538	F(4,75) = 24.044, $p < 0.05$
2013	0.500	0.474	F(4,75) = 18.769, $p < 0.05$
2014	0.624	0.604	F(4,75) = 31.109, $p < 0.05$
2015	0.421	0.390	F(4,76) = 13.812, $p < 0.05$
2016	0.620	0.600	F(4,76) = 30.984, $p < 0.05$
2017	0.535	0.509	F(4,73) = 20.984, $p < 0.05$
ITDA MODEL			
1995	0.451	0.399	F(4,42) = 8.633, $p < 0.05$
1996	0.522	0.480	F(4,46) = 12.537, $p < 0.05$
1997	0.598	0.565	F(4,48) = 17.886, $p < 0.05$
1998	0.476	0.435	F(4,51) = 11.585, $p < 0.05$
1999	0.567	0.536	F(4,56) = 18.325, $p < 0.05$
2000	0.656	0.633	F(4,59) = 28.152, $p < 0.05$
2001	0.701	0.682	F(4,61) = 35.780, $p < 0.05$
2002	0.467	0.433	F(4,63) = 13.815, $p < 0.05$
2003	0.499	0.469	F(4,66) = 16.463, $p < 0.05$
2004	0.571	0.544	F(4,65) = 21.613, $p < 0.05$
2005	0.507	0.478	F(4,68) = 17.492, $p < 0.05$
2006	0.646	0.625	F(4,69) = 31.470, $p < 0.05$
2007	0.583	0.560	F(4,72) = 25.151, $p < 0.05$
2008	0.672	0.655	F(4,74) = 37,952, $p < 0.05$
2009	0.736	0.722	F(4,73) = 50.994, $p < 0.05$
2010	0.622	0.602	F(4,75) = 30.835, $p < 0.05$
2011	0.597	0.575	F(4,75) = 27.759, $p < 0.05$
2012	0.531	0.506	F(4,75) = 21.257, $p < 0.05$
2013	0.472	0.444	F(4,75) = 16.747, $p < 0.05$
2014	0.617	0.596	F(4,75) = 30.162, $p < 0.05$
2015	0.379	0.346	F(4,76) = 11.575, $p < 0.05$
2016	0.611	0.591	F(4,76) = 29.852, $p < 0.05$
2017	0.518	0.492	F(4,73) = 19.633, $p < 0.05$

Source: Authors' calculations from IRESS and Profile Media data

EBITDA, earnings before interest, taxes, depreciation and amortisation; ITDA, interest, taxes, depreciation and amortisation.

EBITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3\ EBITDA_{jt} + \beta_4\ BV_{jt} + e_{jt}$

ITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3\ ITDA_{jt} + \beta_4\ BV_{jt} + e_{jt}$

was 0.39, recorded in 2015, and the rest of the correlations were above this figure, with the highest being 0.714 in 2009.

The fourth column of Table 3 indicates the F-ratios for the EBITDA model for the period under examination. As the results show, all the model F-ratios were statistically significant at $p < 0.05$ for all the examined years. This finding implies that in each of the years examined, changes in the IVs (BV and EBITDA) significantly explained the changes in the dependent variable ($Ln\ P_{jt}$) after controlling for the confounding factors, namely growth and negative earnings.

The ITDA model yielded similar results to the EBITDA model in that all the R-squared values were above 0.25, the lowest being 0.379 in 2015 and the highest being 0.736 in 2009. The ITDA model's adjusted R-squared values were also all above the 0.25 mark, with the lowest being 0.346 in 2015 and the highest being 0.722 in 2009.

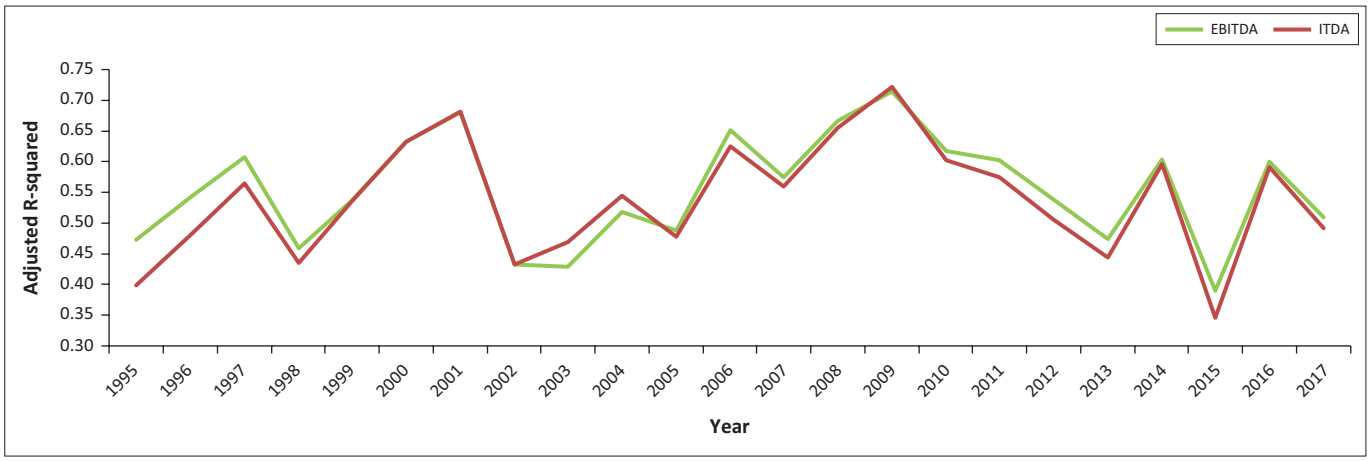
The eighth column of Table 3 shows the F-ratio for the regression model for the entire period under examination. Again, all the F-ratios were statistically significant at $p < 0.05$ for all the years. Similar results were obtained when the models were run stepwise; again, the F-values for all the models were significant ($p < 0.05$ for all the years).

The diagram shown in Figure 1 illustrates a line plot of the adjusted R-squared values (Y-axis) for both the EBITDA and the ITDA models over the period under study (X-axis).

As can be seen, the average adjusted R-squared values hovered above an average value of 0.346 for the EBITDA model. Similarly, an average value of 0.390 was obtained for the ITDA model. It is evident from this representation that the correlation between the IVs and dependent variables was statistically significant throughout the period under study. A distinctive picture that emerges from this analysis is that, under each of the EBITDA and ITDA models, changes in the IVs significantly explain changes in the dependent variable ($Ln\ P_{jt}$) for each of the years under review after controlling for the confounding variables. Moreover, the resemblance between the trends of the EBITDA and ITDA models was glaring.

Furthermore, it accentuated the earlier point regarding the high multicollinearity between the two variables. Thus, the inevitable implication is that both EBITDA and the residual between EBITDA and traditional bottom-line earnings, namely ITDA, are significantly value relevant. Overall, this finding is consistent with the earlier result of Bradshaw and Sloan (2001) who reported that the magnitude of the difference caused by items excluded from non-GAAP measures was often economically significant. Moreover, this evidence also resonates with recent results of Begley et al. (2023), who found that depreciation and amortisation expense was significant in explaining valuations.

This study's secondary purpose was to examine how each IV contributed to the total observed value relevance. Table 4: and Table 5 provide the answers to this question. Table 4 shows the final model results of the stepwise regression analysis per year for each of the EBITDA and the ITDA models. The box reports the R-squared contribution per each IV for the EBITDA and the ITDA models.



Source: Authors' calculations from IRESS and Profile Media data

EBITDA, earnings before interest, taxes, depreciation and amortisation; ITDA, interest, taxes, depreciation and amortisation.

FIGURE 1: Adjusted R-squared values for earnings before interest, taxes, depreciation and amortisation and interest, taxes, depreciation and amortisation models.

The columns under the EBITDA model heading are similar to those under the ITDA model headings. The year column shows the period under review. The EBITDA, BV and ITDA columns show the R-squared contribution of each of the variables identified. The control column shows the combined contribution of the confounding variables to the total R-squared.

Under each of the EBITDA and the ITDA models, growth and negative earnings were entered at step 1, explaining variances in the share price of between 1% and 28% in the R-squared values from 1995 to 2017. After the entry of the EBITDA and the BV variables into the model, there was a clear and significant increase in the total variance explained by each of the models, which generally increased the overall R-squared contribution to between 42% and 72% (EBITDA model) and between 37% and 77% (ITDA model) for the periods under review.

In the EBITDA model, the combined impact of the entry of the two variables, EBITDA and BV, explained an additional 28% (2015) to 66% (2008) of the variance in the total R-squared, after controlling for growth and earnings. However, in the ITDA model, the entry of ITDA and BV variables contributed an additional 24% (2015) to 65% (2008) of the variance to the total R-squared.

The contribution of EBITDA was consistently positive for all the years under review, except for 2004 and 1999 to 2002, when there was no contribution. The highest EBITDA contributions occurred in 1995 (0.49), followed by 2005 (0.45), 1996 (0.38), 1997 (0.35), 1998 (0.31) and, lastly, 2015 (0.28). For all these periods, EBITDA was the highest and the greatest contributor to the total R-squared contribution among all the variables entered. In three periods, namely 1995, 1997 and 2015, EBITDA was the singular variable explaining the total R-squared contribution besides the control variables. However, except for these periods, the contribution of BV was constant and positive throughout the years reviewed.

It was evident that the EBITDA and the BV variables consistently complemented each other in their contribution to the total R-squared over the review period. The total R-squared values were significant over all the years; the lowest value was 0.42 in 2015 and the highest being 0.72 in 2009. In a similar vein, the trends highlighted by the ITDA model results closely resembled those of the EBITDA model in that the total R-squared contributions were significant across all the years, with the lowest being 0.37 in 2015 and the highest being 0.77 in 1997. Furthermore, the ITDA contribution was consistently positive, except for almost the same periods as in the EBITDA model, namely from 1999 to 2002, when it did not contribute to the total R-squared contribution.

The comparison of the EBITDA contribution statistics with the ITDA model demonstrates that the order of contribution of the IVs to the total value relevance was consistent. As indicated in Table 4, in the EBITDA model, the years in which the BV could not explain the variance in share price, it was exceeded by the EBITDA contribution (1995 to 1998, 2005 and 2015). Similarly, in the ITDA model, the BV variable also consistently explained the variances in the share price and resulted in the most significant contribution to the total model R-squared variance for all the periods, except for 2015.

There was a common thread that cut across both the EBITDA and ITDA models in 2015, because the BV could not explain any changes in the share price variance, despite the overall model's R-squared showing a strong correlation and being statistically significant. In addition, the trends of the annual JSE capitalisation (Figure 1) indicated that all the JSE market valuations fell significantly across the board during this period, resulting in the outlying fall in the total R-squared values to the lowest point throughout the review period.

This paradox was particularly pronounced because of the unmistakable dip observed during this period in the diagram shown in Figure 1. The corresponding trends for the same periods indicated by the model fit Table 3, and the R-squared

TABLE 4: Results of stepwise regression per year for the two models with R-squared contribution.

Year	Contribution							
	EBITDA model				ITDA model			
	EBITDA	BV	Control	Total R2	ITDA	BV	Control	Total R2
1995	0.49	-	0.02	0.51	0.12	0.31	0.02	0.45
1996	0.38	0.05	0.15	0.58	0.05	0.32	0.15	0.52
1997	0.35	-	0.28	0.62	0.21	0.29	0.28	0.77
1998	0.31	0.04	0.19	0.54	0.05	0.28	0.19	0.52
1999	-	0.46	0.11	0.57	-	0.46	0.11	0.57
2000	-	0.53	0.13	0.66	-	0.53	0.13	0.66
2001	-	0.50	0.21	0.71	-	0.50	0.21	0.71
2002	-	0.43	0.03	0.46	-	0.43	0.03	0.46
2003	0.10	0.32	0.04	0.46	0.14	0.32	0.04	0.50
2004	-	0.51	0.02	0.53	0.04	0.51	0.02	0.57
2005	0.45	0.03	0.03	0.52	0.04	0.44	0.03	0.51
2006	0.07	0.56	0.04	0.67	0.05	0.56	0.04	0.65
2007	0.06	0.51	0.03	0.60	0.04	0.51	0.03	0.58
2008	0.04	0.62	0.02	0.68	0.03	0.62	0.02	0.67
2009	0.02	0.57	0.14	0.72	0.03	0.57	0.14	0.73
2010	0.04	0.56	0.04	0.64	0.03	0.56	0.04	0.62
2011	0.10	0.51	0.01	0.62	0.07	0.51	0.01	0.60
2012	0.12	0.40	0.04	0.56	0.09	0.40	0.04	0.53
2013	0.10	0.37	0.03	0.50	0.07	0.37	0.03	0.47
2014	0.09	0.49	0.05	0.62	0.08	0.49	0.05	0.62
2015	0.28	-	0.13	0.42	0.24	-	0.13	0.37
2016	0.06	0.45	0.11	0.62	0.05	0.45	0.11	0.61
2017	0.09	0.35	0.09	0.53	0.07	0.35	0.09	0.51

Source: Authors' calculations from IRESS and Profile Media data

EBITDA, earnings before interest, taxes, depreciation and amortisation; ITDA, interest, taxes, depreciation and amortisation.

EBITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3\ EBITDA_{jt} + \beta_4 BV_{jt} + e_{jt}$

ITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3 ITDA_{jt} + \beta_4 BV_{jt} + e_{jt}$

contribution statistics in Table 4 support this observation. Although this outlier seemed an interesting case to examine, it was clearly beyond the scope of this study. However, the media widely reported that significant socio-political events related to the phenomenon dubbed 'state capture' occurred around this period in South Africa. This includes a surprise dismissal of that country's minister of finance, which saw mass capital sell-offs from the capital markets. These events have been hypothesised to lead to the collapse of the local currency and the capitalisation of equity markets.

Despite this scenario, the total explanatory power of both the EBITDA and ITDA models was still definite, although the intensity was somewhat subdued in contrast to the average levels. Given this phenomenon, reasonable speculation would be that EBITDA is better placed to explain variations in the share price than the BV variable in the face of significant uncertainties or deterioration in the operating environment.

The ITDA model indicated that the BV contribution trends were similar to the EBITDA model, except for 1995 to 1998. In two of these years, 1995 and 1997, BV did not contribute to the EBITDA model; however, its contributions to the ITDA model were 0.31 and 0.29 in 1995 and 1997, respectively. In 1996, the BV contribution was 0.05 in the EBITDA model, while a contribution of 0.32 was recorded in the ITDA model. Similarly, in 1998 the BV variable reported a marginal contribution of 0.04, whereas the ITDA model yielded a contribution of 0.28 for this variable. The control variables yielded the same values for all the years under review in both the EBITDA and the ITDA models.

The overall R-squared values in both the EBITDA and the ITDA models were above 0.25 for all the years under review. This finding validated the point made earlier that the changes in the IVs significantly explained variations in the dependent variable throughout the review period.

In the final analysis, while it could be argued that all the variables mentioned above were complementary in explaining the share price variance under a price model, the contribution of the BV variable to the model's total explanatory power seemed to be more significant in about 17 of the 23 periods, with the R-squared contribution of the EBITDA variable exceeding that of the BV variable in only six of the 23 years. Furthermore, the BV variable's contribution was statistically significant in all the periods under review, except for three periods in the EBITDA model and one in the ITDA model. This finding sharply contradicts the argument recently posited by Atanas and Olufemi (2019), who purported that the BV variable had lost its explanatory power on the JSE.

Table 5 shows the betas of the IVs for EBITDA and ITDA, respectively, when the IVs were regressed on the share price. The headings in the first row show the model being run. There are 10 columns in this table. The first, titled 'year', shows the period being examined. Columns two, three, four and five depict the beta values for the $Growth_{jt}$, $Earnings\_Ctrl_{jt}$, $EBITDA_{jt}$ and the BV_{jt} variables for the EBITDA model.

TABLE 5: Regressions of earnings before interest, taxes, depreciation and amortisation and interest, taxes, depreciation and amortisation on the share price.

Year	Beta							
	EBITDA model				ITDA model			
	Growth	Earn_ctrl	EBITDA	BV	Growth	Earn_ctrl	ITDA	BV
1995	0.137	0.022	0.612	0.145	0.125	0.058	0.392	0.393
1996	-0.058	0.244	0.443	0.293	-0.066	0.271	0.242	0.502
1997	-0.084	0.416	0.389	0.291	-0.086	0.434	0.252	0.451
1998	0.063	0.275	0.378	0.293	0.063	0.288	0.253	0.438
1999	0.196	0.189	0.117	0.615	0.199	0.189	0.089	0.651
2000	0.446	-0.081	0.028	0.709	0.451	-0.084	-0.002	0.731
2001	0.440	0.167	0.007	0.706	0.442	0.166	-0.017	0.722
2002	0.039	0.083	-0.162	0.802	0.036	0.080	-0.124	0.749
2003	0.111	0.219	-1.217	1.741	0.089	0.161	-0.857	1.338
2004	0.084	0.096	0.291	0.463	0.082	0.094	0.320	0.478
2005	-0.064	-0.106	0.401	0.336	-0.014	-0.028	0.247	0.527
2006	-0.096	-0.126	0.341	0.547	-0.071	-0.078	0.260	0.618
2007	-0.099	-0.129	0.286	0.562	-0.044	-0.049	0.236	0.610
2008	0.195	-0.025	0.248	0.670	0.198	0.003	0.198	0.716
2009	0.343	0.191	0.160	0.688	0.335	0.223	0.191	0.669
2010	0.260	0.077	0.258	0.610	0.290	0.094	0.202	0.646
2011	0.208	-0.018	0.364	0.549	0.228	-0.011	0.311	0.575
2012	0.109	-0.039	0.381	0.516	0.118	0.033	0.330	0.553
2013	-0.012	0.071	0.356	0.466	-0.016	0.082	0.303	0.485
2014	0.390	0.000	0.330	0.582	0.394	0.010	0.313	0.593
2015	0.419	-0.059	0.539	0.080	0.425	-0.030	0.493	0.088
2016	0.435	-0.066	0.266	0.571	0.446	-0.025	0.237	0.608
2017	0.368	-0.056	0.325	0.520	0.389	0.002	0.285	0.548

Source: Authors' calculations from IRESS and Profile Media data

EBITDA, earnings before interest, taxes, depreciation and amortisation; ITDA, interest, taxes, depreciation and amortisation.

EBITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3\ EBITDA_{jt} + \beta_4\ BV_{jt} + e_{jt}$

ITDA model: $Ln\ P_{jt} = \beta_0 + \beta_1\ Growth_{jt} + \beta_2\ Earnings\_Ctrl_{jt} + \beta_3\ ITDA_{jt} + \beta_4\ BV_{jt} + e_{jt}$

Similarly, columns seven, eight, nine and 10 show the betas values obtained from the ITDA model for $Growth_{jt}$, $Earnings\_Ctrl_{jt}$, $ITDA_{jt}$ and BV_{jt} variables.

Under the EBITDA model, all the betas for the EBITDA and BV variables seemed reasonably significant, and the positive trend was mostly maintained throughout the review period. With respect to the sizes of the betas for the EBITDA variable, similar to those of the BV variable, they seemed sufficiently large. From 1995 to 1998, the EBITDA betas were between 0.378 and 0.612 and were generally more extensive than the BV variable. However, from 2004 to 2017, the values for the EBITDA variable betas seem to have stabilised to a minimum and maximum range of 0.160 to 0.539.

These high betas indicate that both the EBITDA and BV variables significantly accounted for the variations in the dependent variable. A similar trend was evident when examining the betas for the ITDA model.

An exception to these trends emerged in two of the 23 periods, namely 2002 and 2003, when the EBITDA variable's betas were anomalously negative, accompanied by a corresponding anomalous increase in the beta for the BV variable. In 2003, a similar picture emerged from the ITDA model, when the beta for the BV variable exceeded 1 and resulted in a value of 1.338. Similar to the EBITDA model trend for the same period, the corresponding ITDA beta was negative (-0.857). Furthermore, in the ITDA model, the ITDA variable's betas were slightly below zero for the years 2000 to 2003, while the comparable betas of the BV variable for these periods were significant and positive.

A re-examination of the residual and collinearity statistics for each of the EBITDA and ITDA models signified the possibility that these observed anomalies were attributable to the impact of the few remaining cases of outliers in the dataset. This finding was confirmed by removing the cases with *p*-values lower than the 0.01 critical level determined when taking the transformation of 1 less the cumulative distribution function of the chi-square of the Mahalanobis distance, using the number of model regressors as the degrees of freedom. Performing this procedure reduced the BV variable's betas to 0.881 in the EBITDA model in 2003 and a beta of 0.70 for the BV variable in the ITDA model for the same period. In addition, generally positive betas were obtained under each of the EBITDA and ITDA model variables, and ultimately the fit of the models was improved throughout the review periods.

In the end, it was evident from the analysis that, in a price model specification, changes in the EBITDA, ITDA, and the BV variables significantly explained variations in the share price ($Ln\ P_{jt}$) of a company after controlling for the effects of growth and negative earnings. This finding implies that the EBITDA, ITDA, and the BV variables are all significantly value-relevant. In particular, the overall trends indicated that the EBITDA variable was significantly value-relevant.

Moreover, it was evident that this phenomenon was consistent across all the years observed. These results provide validity for utilising EBITDA as an alternative performance measure in equity valuations. Furthermore, it is apparent that not only is EBITDA value relevant, but so is ITDA.

This evidence explains why authors such as Bancel and Mittoo (2014), Pinto et al. (2019) and Shaffer (2023) have found an extensive prevalence of the utilisation of EBITDA measures by equity valuation professionals in practice. Moreover, the finding of the significant value relevance of ITDA is in accord with the findings of Bradshaw and Sloan (2001:56). They also observed that the magnitude of the difference caused by the items excluded from non-GAAP measures such as EBITDA was economically significant.

Conclusion

With respect to the primary research purpose – whether EBITDA, together with BV, can be shown to be value relevant by means of an intrinsic equity valuation model – the results of this study constitute significant evidence that, within the context of an intrinsic equity valuation framework, EBITDA, together with BV, is significantly value relevant.

Similarly, in response to the second purpose – how significant is the residual between EBITDA and traditional bottom-line earnings, namely ITDA, within the above-mentioned model – the residual between EBITDA and traditional bottom-line earnings is also significant in explaining equity valuations when specified together with BV. Moreover, each of the EBITDA, ITDA and BV variables possesses significant incremental explanatory power relative to variances in equity share prices. In particular, the contribution of the BV variable to the model's total explanatory power was pronounced throughout the review period, as shown by its contribution, which was statistically significant in all of the 23 review periods, except for three in the EBITDA model and one in the ITDA model. Ultimately, whether coupled with the EBITDA or the ITDA variable, the BV variable consistently explained the total variance in the dependent variable ($Ln\ P_{jt}$) for each of the years under review after controlling for the confounding variables. This was to be expected, considering that the econometric model used in this study was premised on Ohlson's (1995) framework.

However, to return to the primary purpose of this study, the explanatory power of EBITDA within this model is of particular interest. An inference can be drawn from this that using EBITDA as an alternative performance measure in equity valuation has merit. In this regard, the findings of this study could also be seen as a reasonable explanation of the prevalence of valuation professionals utilising EBITDA measures as an equity valuation metric.

This research makes two key contributions. Firstly, evidence of the value relevance of EBITDA earnings should be useful to standard-setters such as the International Accounting Standards Board (IASB), which is currently engaged in an improvement project to consider additional subtotals such as EBITDA earnings in financial performance statements. Given the conclusive evidence of the value relevance of EBITDA measures reported in this study, standard-setters should consider explicitly standardising such measures' determination, presentation, and disclosure. Secondly, evidence of the value relevance of EBITDA measures has broader implications for users of financial reports, such as equity investment professionals. Such users might, for example, consider evaluating whether sufficient and appropriate attention is given to any useful signals EBITDA information might provide when making their economic decisions.

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Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

The content of this article was extracted from the MCom dissertation of R.N. to whom the degree was awarded in 2021. D.P.S. was the supervisor to the MCom study. M.O. reviewed and assited in writing the final article.

Ethical considerations

Ethical clearance to conduct this study was obtained from the North-West University Economic and Management Sciences Research Ethics Committee (EMS-REC) (No. NWU-00554-18-A4).

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Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study. Original data were extracted from different parts of the database of Iress and Profile Media.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

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Annexure start on the next page →

Annexure

TABLE 1-A1: List of sample companies.

Number	Company	Number	Company
1	AECI Ltd	51	Mr Price Group Ltd
2	African Rainbow Minerals Ltd	52	MTN Group Ltd
3	Anglo American Platinum Ltd	53	Nampak Ltd
4	Anglo American plc	54	Naspers Ltd
5	AngloGold Ashanti Ltd	55	Nedbank Group Ltd
6	Aspen Pharmacare Holdings Ltd	56	Net 1 UEPS Technologies Inc
7	Attacq Ltd	57	Netcare Ltd
8	AVI Ltd	58	New Europe Property Investments Plc
9	Barclays Africa Group Ltd	59	Northam Platinum Ltd
10	Barloworld Ltd	60	Oakbay Resources and Energy Ltd
11	BHP Billiton Plc	61	Oceana Group Ltd
12	Bidvest Ltd	62	Old Mutual plc
13	Brait SE	63	Pick n Pay Stores Ltd
14	British American Tobacco Plc	64	Pioneer Food Group Ltd
15	Capital & Counties Properties Plc	65	PPC Ltd
16	Capital & Regional plc	66	PSG Group Ltd
17	Capitec Bank Holdings Ltd	67	PSG Konsult Ltd
18	Clicks Group Ltd	68	Rand Merchant Investment Holdings Ltd
19	Compagnie Financière Richemont S.A.	69	RCL Foods Ltd
20	Coronation Fund Managers Ltd	70	Redefine International Plc
21	Curro Holdings Ltd	71	Redefine Properties Ltd
22	Datatec Ltd	72	Reinet Investments S.C.A.
23	Discovery Ltd	73	Remgro Ltd
24	Distell Group Ltd	74	Resilient Reit Ltd
25	EOH Holdings Ltd	75	Reunert Ltd
26	Erin Energy Corporation	76	RMB Holdings Ltd
27	Exxaro Resources Ltd	77	Rockcastle Global Real Estate Company
28	Famous Brands Ltd	78	SABMiller plc
29	FirstRand Ltd	79	Sanlam Ltd
30	Fortress Income Fund Ltd	80	Santam Ltd
31	Glencore plc	81	Sappi Ltd
32	Gold Fields Ltd	82	Sasol Ltd
33	Growthpoint Properties Ltd	83	Shoprite Holdings Ltd
34	Hosken Consolidated Investments Ltd	84	Sibanye Gold Ltd
35	Hyprop Investments Ltd	85	South32 Ltd
36	Impala Platinum Holdings Ltd	86	Standard Bank Group Ltd
37	Imperial Holdings Ltd	87	Steinhoff International Holdings N.V.
38	Intu Properties plc	88	Sun International Ltd
39	Investec Plc	89	Super Group Ltd
40	Investec Property Fund Ltd	90	Telkom SA SOC Ltd
41	Italtile Ltd	91	The Foschini Group Ltd
42	JSE Ltd	92	The Spar Group Ltd
43	KAP Industrial Holdings Ltd	93	Tiger Brands Ltd
44	Kumba Iron Ore Ltd	94	Tongaat Hulett Ltd
45	Liberty Holdings Ltd	95	Truworths International Ltd
46	Life Healthcare Group Holdings Ltd	96	Tsogo Sun Holdings Ltd
47	Massmart Holdings Ltd	97	Vodacom Group Ltd
48	Mediclinic International Ltd	98	Vukile Property Fund Ltd
49	MMI Holdings Ltd	99	Woolworths Holdings Ltd
50	Mondi plc	100	Zeder Investments Ltd

Source: Johannesburg Stock Exchange, 2018, *JSE Limited Integrated Annual Report for the year ended 31 December 2017*, Johannesburg Stock Exchange, Johannesburg