



Value Relevancy of Revenues and Earnings in Explaining the Market Capitalization of American Software Companies

Rui Pedro Malafaia Salgueiro Ferreira
(152419031 – CLSBE; e193484 – ESCP)

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Abstract

Title: Value Relevancy of Revenues and Earnings in Explaining the Market Capitalization of American Software Companies

Author: Rui Pedro Malafaia Salgueiro Ferreira

This paper introduces univariate regression models with the aim of understanding how key Revenues and Earnings variables explain the valuation of American-listed Software companies, building on findings from previous research. Companies are divided into three samples – Small, Medium and Large – according to their Market Capitalization. Cross-sectional data are regressed using 5-year time windows from 2000 to 2019, as well as 2-year periods from 1998 to 2021. Additionally, three other variables – (1) dummy variable distinguishing positive from negative EBITDA companies, (2) dummy differentiating firms with a Net Cash from a Net Debt position, and (3) a market-based explanatory variable – are included in three further multivariate models in order to understand how they interact with the two main variables.

We find that while Revenues is always value relevant in all time windows and throughout time, there are four occasions where Earnings is not value relevant in explaining the value of Software companies. Also, apart from the occasion of two time periods, Revenues is more effective than Earnings in explaining the value of Software firms. Both the explanatory power of these variables and the relevancy of the inclusion of new ones in multivariate models are highly dependent on the time horizon and period.

Key words: Software companies valuation | Time-variability | Market Capitalization | Financial indicators | Revenues | Earnings | EBITDA | Net Debt | Negative EBITDA | Univariate regression analysis | Multivariate regression analysis | Log-linear model

Resumo

Título: Relevância do Volume de Negócios e dos Resultados Enquanto Fatores Explicativos da Capitalização Bolsista das Empresas Americanas de Software

Autor: Rui Pedro Malafaia Salgueiro Ferreira

Esta tese inclui modelos de regressão linear com o intuito de estudar a forma como variáveis fundamentais de *performance* financeira da empresa, tais como Volume de Negócios e Resultados, podem explicar a valorização de empresas de Software cotadas em bolsas americanas. As empresas são divididas em três amostras – Pequena, Média e Grande – conforme a sua capitalização bolsista. Uma amostra de dados *cross sectional* é regredida com recurso a janelas temporais de 5 anos, entre 2000 e 2019, bem como outras de 2 anos, desta feita entre 1998 e 2021. Adicionalmente, são introduzidas outras três variáveis – (1) variável *dummy* que distingue empresas de EBITDA negativo das outras, (2) variável *dummy* que diferencia empresas com posição líquida de caixa de empresas com posição líquida de dívida, bem como (3) uma variável explicatória de mercado – que permitem analisar a sua interação com as variáveis principais, Volume de Negócios e Resultados.

Descobrimos que enquanto o Volume de Negócios é sempre relevante em todas as janelas temporais e ao longo do tempo, há quatro ocasiões nas quais os Resultados não constituem uma variável relevante para explicar o valor das empresas de Software. Com a exceção de dois períodos, o Volume de Negócios é uma variável mais impactante do que os Resultados aquando da determinação do valor de empresas de Software. Tanto o poder explicatório destas variáveis como a relevância da inclusão de novas variáveis em modelos multivariados estão bastante dependentes do período e do horizonte temporal.

Palavras-chave: Valorização de empresas de software | Variação temporal | Capitalização bolsista | Indicadores financeiros | Volume de negócios | Resultados | EBITDA | Dívida líquida | EBITDA negativo | Análise de regressões univariada | Análise de regressões multivariada | Modelo log-linear

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1 Introduction

A so-called New Economy has started to emerge in the start of the 21st century as the result of vast technological improvements and an increasing digitalization. With these, new kinds of companies – commonly named New Economy Companies – have been developing over time. These are characterized by several features that differ from the “Old Economy”. These new sorts of companies, which feature businesses in industries such as internet-adjacent ones, biotechnology, or software, for instance, have a set of characteristics that add increasing layers of complexity when trying to find their value.

As these companies tend to grow at a faster pace, it is very difficult to accurately define when they may be able to reach their maturity level. Additionally, their future is usually uncertain, which brings difficulties when using traditional valuation methods. As these firms are typically very innovative and with disruptive business models, benchmarking them is not such a straightforward task. What is more, and as it has been mentioned earlier, these companies’ valuation component relies to a big extent on intangible assets which are not trivial to value. (Boulton, Libert, and Samek, 2000), (Damodaran, 2009) (Zarzecki, 2010)

Hence, when using the most traditional valuation methods, financial analysts are faced with several challenges. Using a traditional Discounted Cash Flow (DCF) model may prove to be very difficult due to the high degree of uncertainty that surrounds the company development. That may make the projection of the company’s growth rates a very inglorious exercise. What is more, there are also several issues regarding the estimation of discount rates that should be taken into account, as oftentimes the project is so risky that discount rates are very hard to determine. Additionally, issues regarding the potential survivorship potential of the company should also be taken into account. (Higson and Briginshaw, 2000) (Damodaran, 2009)

Valuing NE companies using multiples might be extremely tricky. For instance, prior to the dot-com bubble, there were several companies trading at more than 30 times their Revenues. Additionally, other issues arise, namely those featuring the risk variable. Given these firms are extremely risky, how should that be taken into account? Also, how should survival issues be taken into account? Considering these issues and due to the scaling factor (Revenues vs Earnings), several industry participants opt to value companies based on industry-specific multiples. If we give the example of internet firms, they may be valued as a multiple of the number of clicks on their website. As web traffic has an important impact on predicting future sales, it influences expectations over the short run. Some empirical papers, such as those by

Demers and Lev (2000), Rajgopal, Kotha and Venkatachalam (2000), Trueman, Franco Wong and Zhang (2000), and particularly, Jorion and Talmor (2001) show that valuations before the dot-com bubble were based on web traffic metrics. (Kaplan, 2003) (Zarzecki, 2010) (Damodaran, 2009)

When faced with these challenges, Schwartz and Moon (2000) argue that Internet firms have characteristics of a call option as they have a big growth potential upside and a limited downside potential, or risk of bankruptcy. If we further expand this approach, these companies may be analyzed as a stream of cash flows and some embedded options, depending on the opportunities they may have.

What is observable when analyzing research on the topic of the Valuation of New Economy Companies is that it tends to focus on Internet-based businesses as well as on biotechnology companies. While papers with a more practical approach either propose extensions to the existing models or propose options-based methods to value companies, prior empirical research tends to stick to the same kinds of firms and mostly dates back to the beginning of the 21st century. Additionally, it has always adopted a time-static approach, where only a sample of 1-or-2-year cross-sectional data is analyzed. Hence, it is very difficult to understand whether relation between firm fundamental factors and their Market Value may change throughout time.

More traditional research on “Internet Companies”, as that portrayed by Trueman, Franco Wong and Zhang (2000), Trautwein and Vorstius (2001) or by Hand (2000) explores the empirical relation that may exist between fundamental financial indicators, such as Revenues or Earnings, as well as new metrics, such as web-related ones, and the Market Valuation of these companies. This paper differs from those as it decides to focus solely on financial indicators. It does so because it has not been feasible to compile consistent non-financial data for a cross-sectional large sample. Additionally, it must be mentioned that the adopted definition of “Internet Companies” by the existing literature is outdated. Although it fitted the pre dot-com bubble business and industry environment, it is not particularly meaningful according to today’s standards. That definition relied on the one provided by a website denominated internet.com, which classified “Internet Companies” those which would carry most of its business from the Internet. As most businesses today rely on the Internet, a very large amount of them would certainly fit into this definition. Hence, the approach taken by this paper is to focus on an objective New Economy industry. The option has lied on Software companies as these have been developing over time. Additionally, software constitutes one of the stepping stones of technological progress and the New Economy as a whole.

This paper attempts at explaining the strength of the relationship between key financial indicators such as Revenues and Earnings and the Market Value of Equity of Software companies. As this may be affected by the size of the company, our sample of Nasdaq and NYSE-listed Software companies is broken down into three broad categories according to their stock Market Capitalization. Small, Medium and Large-Capitalizations are going to be taken into account. Potential time-varying patterns are also going to be studied. Therefore, we extract information on 20 years going from 1998 to 2021 and organize it in different periods, according to different time windows. While a first approach creates 5-year samples for the data going from 2000 to 2019, a second creates smaller 2-year periods going from 1998 to 2021.

When to empirically perform the outlined analysis, five regression models are built. The 2 initial ones are univariate and explore the relationship both the Revenues and Earnings variables may have with the Market Value. The three others are multivariate and, apart from Revenues and Earnings, include three other explanatory variables which are also prone to explain the MV of software companies. The main goal with those regressions is to understand whether all included variables are jointly value-relevant in explaining these types of companies. These variables are two dummies – one which distinguishes negative Earning companies from positive ones, as well as another distinguishing positive from negative Net Debt companies –, and a company-exogenous variable. The choice has lied on a more market-macro variable. Hence, it has also been decided to include the value of the S&P 500 Index as an indicator in those models.

The models are designed by log-transforming the models in order to allow the regressions to be OLS-regressed without violating any of that method's underlying properties. As both dependent and independent variables are log-transformed, estimated coefficients (apart from dummy-variable ones) should be interpreted as elasticities between the independent variables and the Market Value.

The main goals of this paper are: (i) to determine whether and in what periods Revenues and Earnings are value relevant for determining the Market Value of Software companies, (ii) to compare the explanatory power of both factors over time, (iii) to analyze time variability patterns of Revenues and Earnings, (iv) to understand the relation between the explanatory variables and the MV throughout time, and (v) to understand whether the variables added in the multivariate models are time varying as well.

Firstly, it can be concluded that Revenues are always value relevant, independently of the time window and period analyzed. On the other hand, EBITDA is mostly, but not always, value

relevant, as it is not effective in explaining the MV of Small-Caps in the 1998-1999 period, and of Mid-Caps in 2008-2009, 2014-2015, and 2020-2021. Secondly, the explanatory power of Revenues is mostly higher than that of EBITDA. Nevertheless, there are two exceptions. These take place in the Mid-Cap sample during the 2000-2001 and 2010-2011 periods. Thirdly, the behavior of Revenues and Earnings in explaining the MV is also mostly time varying. However, time variability is more limited once the bigger 5-year time horizon is considered. What is more, it is non-existing in that time window for both Mid and Large-Caps in the case of Revenues. Fourthly, the relation between Revenues and MV is always concave. Although the relation between SP and MV is also mostly concave, there are times where it is either convex or non-conclusive. In addition to that, the role played by the dummy variables in the model is not always the same. Fifthly, the addition of the three other explanatory variables is sometimes effective, with the degree of effectiveness depending on the type of company and the time period analyzed.

This study should be important for the future literature on the topic of the Valuation of New Economy companies, as well as for Equity Market participants who are interested in understanding the empirical behavior of the analyzed variables over time. Hence, by reading this paper, they should be able to have a better understanding of the behavior of key patterns and events.

The plan of this paper is as follows. Section 2 presents the Literature Survey. The Methodology chosen is presented in Section 3, while Section 4 describes the Data set. Results are presented in Section 5, and analyzed in Section 6. The final section concludes the paper and presents limitations to this study.

2 Literature Survey

2.1 Software Companies

2.1.1 Definition

Under a simplified vision, as portrayed in TechTarget (2022) and Computer Hope (2021), software may be defined as a set of instructions that enable the user to interact with a computer, its hardware and to execute tasks. Software is naturally the opposite of hardware, which describes the physical aspects of a computer. Thus, one may think of software as a variable part of a computer, and of hardware as the invariable part. This is also to say that computers would be far from being as important as they are today if there was no software available to run them.

According to Boston Consulting Group (2021), there are three broad categories of software. These include (i) horizontal applications, which cut across industries, such as for customer relationship management and enterprise resource planning, (ii) vertical applications for a specific industry (such as healthcare or insurance, and (iii) infrastructure software, such as for IT security and network management.

Software may also be categorized differently. For instance, it may be divided into system and application software, being the former designed to run a computer's hardware and provide a platform for applications to run on top of, while the latter fulfills a specific need or performs tasks.

2.1.2 Business Models & Considerations

Traditionally, software companies used to develop programs in order to sell them to clients, either corporates (B2B) or consumers (B2C), as a product. This is the oldest and most traditional method, and companies that operate using such a model are known as “product-based companies”. With the passage of time, companies have realized there is a great potential for decreasing sales volatility and to provide a better service to clients by selling the software as a service rather than a product. Thus, companies doing so are known as “service-based companies”. (AlgoWorks, 2022)

As services companies are becoming the norm when it comes to software companies, we have seen the rise of the “Software-as-a-Service” (SaaS) word in the industry jargon. SaaS businesses are naturally characterized by a recurring payment method as the client will pay a regular fee (monthly, annual, or other) to use the software product. Naturally, software is being consumed as a service, rather than as a traditional product. In terms of traditional corporates, the main advantage is that rather than buying a license for an application such as enterprise resource planning (ERP) or customer relationship management (CRM) and installing software on individual machines, there is significantly more flexibility with the application being hosted by the developing company. As such, it is considerably easier to switch vendors.

When to follow a SaaS business model, the set of required resources is also different, namely in what concerns cost structures as companies have more costs related to developing, hosting, supporting and managing SaaS based solutions. What is more, there is also an attention that should be paid to direct online sales, marketing, as well as customer support channels. (Nanoglobals, 2022) (McKinsey & Company, 2007) (DSouza, Kabbedijk, DongBack, Slinger, and Brinkkemper, 2012)

As it is described by Roketto, it is also possible to differentiate between Horizontal and Vertical SaaS companies within the broader scope of the SaaS concept. While Horizontal SaaS is meant to target a wide range of customers from different industries by offering services that are to help them improve their efficiency, Vertical targets a specific niche audience. Therefore, it tries to solve problems unique to the industry vertical.

After having understood the guiding business models, it is also important to look at the cost structure of software companies. Usually, an important core of their expenditure consists of Research and Development (R&D) as well as marketing spending. Although there is not a general rule, it is common to observe R&D costs in the range of 10%-20% of Revenues. For example, high-growth companies, such as those in the cloud computing segment, tend to spend more on R&D than low-growth companies, such as those in traditional middleware. However, it is important to note that these expenditures are not entirely channeled towards innovation, as there are also other features of R&D, such as product development, which do not feature that category. When it comes to innovation, industry experts believe that even less of 5% of the R&D budget might be allocated to innovation. When looking at sales and marketing costs, it is also known that the relative spending will depend on the company itself. Nevertheless, it is common in the industry to observe values around 15%-25% of sales. (Shukla, 2014) (Boston Consulting Group, 2019)

Apart from these core costs for any software company, there are also other support costs which include the help desk, customer support and other features that are meant to help clients and contribute to customer retention. (Shukla, 2014)

When analyzing a software firm's cost structure, it is important to note that it is largely a fixed-cost business. Hence, margins will largely expand when companies can gain a bigger scale. (Boston Consulting Group, 2019)

If we go a step further and combine the cost structure of SaaS businesses with traditional ones, we note that SaaS vendors have lower R&D costs as they do not develop and maintain multiple versions of a product, but rather keep a version and gradually improve it. Additionally, they will also have lower customer support costs and usually do not incur in distribution costs. However, delivery costs are higher because costs associated with hosting, bringing customers and users onboard, as well as managing the application and data center environments are more significant. (Statista, 2021)

Lastly, it is worthwhile covering the Cost of Goods Sold (COGS) structure of software companies. It is no surprise that COGS are variable costs. However, they are not necessarily correlated with Revenue. In the case of these companies, when they sell a new subscription (should they operate under such a model), they do not need to engage in additional costs. COGS will typically include infrastructure and customer supporting costs, aspects directly related to the product or service being administered. Thus, the COGS structure will reflect the level of attention that is given to supporting customers and help in client retention. (Software Equity Group, 2022)

2.1.3 Issues with Valuing Software Companies

Focus will be given on issues concerning the scalability of software ventures and its impact on valuation and on valuation methods themselves.

Software companies' marginal cost function has been changing over time. These days, economics are becoming more and more favorable with the development of the SaaS business model. As there is no need to substantially increase the cost with new sales once software has been written, debugged and successfully installed, the marginal cost for the next copy is close to \$0. This is a particularly important consideration these days because software companies will develop business plans taking into account the profitable growth that this feature may enable. However, small firms should realize they still have small customer bases and small sales forces. Hence, they require a bigger scale in order to take full advantage of this characteristic. The key issue we are highlighting is that this characteristic should not be overemphasized during the valuation process. (ToughNickel, 2020)

Once we move on to valuation methods, we realize that there are some considerations that one should have when using the DCF method to value software firms. As it is known, it is a method that relies on projections of the company's future performance. That is why it is very sensitive to growth rate projections. What happens is that most participants covering the industry will be quite skeptical of valuations relying on hypergrowth. Additionally, once hypergrowth is factored, it should be considered that there is a large capital infusion that is needed to support that growth. Hence, that should be taken into account in business models supporting DCF valuations. (ToughNickel, 2020)

What is more, there are also some issues with using relative valuation techniques. For instance, Earnings multiples may not be used if there are no Earnings or if these are negative. Also, sales multiples will not always be an option because these will not be an ideal choice when Revenues

are either highly volatile or declining. When looking at industry multiples, it is common to observe software worth somewhere between 1 and 2 times their annual Revenue. It is certain, however, that the multiple will be subject to a company's growth prospects and inherent risks.

Apart from the most well-known valuation models, it should also be noted that there are some other strategic considerations that should be factored. As an example, if a software company is being valued in the context of an acquisition, and if the buyer is primarily interested in the technology, an important analysis will be to determine how much it would cost the buyer to develop the technology in-house. Likewise, an estimate of how much it would cost the buyer to acquire a similar customer base may be undertaken, in case its biggest interest is the target's customer base.

2.2 Role of Financial Indicators in the Valuation of Software Companies

2.2.1 General Literature

This initial subsection shall focus on the literature that concerns most corporations independently of their sector of activity or industry. Therefore, the literature will be analyzed in order to understand whether there may be some stylized facts concerning the impact of certain financial statement information on the Market Value of Companies.

This part will start with a brief consideration on the relevance financial statements and information have on valuation. That will be followed by a review on the relative importance of Revenues, Earnings, and Cash-Flow. Finally, we will also look at other metrics, on accounting issues as well as the impact firms' maturity stage may have.

According to research by Coram, Mock and Monrow (2011) on the importance of financial and non-financial indicators on Equity Analysts' valuation decisions, the income statement was the financial statement most used, followed by the balance sheet. Lastly, they would look at the cash-flow statement. Another interesting paper by Francis and Schipper (1999), studies the returns on investments structured around financial statement information over time. What they observe is that the value relevance of financial reporting decreases over time. Similarly, Lev and Zarowin (1999) state that financial statements are becoming less relevant over time. As an example, they fail to include some very important and valuable intangibles on the balance sheet. (Lev and Zarowin, 1999)

Several academic articles, such as those of Ertimur, Livnat and Martikainen (2003), and Jegadeesh and Livnat (2006) evidence that stock prices respond to Revenue announcements. Additionally, Chandra and Ro (2008) suggest that Revenue is both an insightful summary

measure for valuation purposes as well as in presenting new information to the market, once Earnings information is controlled for. They also show that these results are not generated by technology firms, extreme Earnings news or loss situations, or by model misspecification. What is more, the impact of Revenue on the firm's value will be even bigger in extreme Earnings situations. That paper also stresses that while Revenues and Earnings are both traditionally important firm valuation drivers, Revenue is gradually surpassing Earnings in the value of information it brings in case the two variables are not perfectly correlated.

If we are to look at the specific case of companies that are pursuing an Initial Public Offer (IPO), Rees and Sivaramakrishnan (2007) identify Revenues as alternative information signals and that the market awards an even bigger emphasis in the case of high-growth firms. Furthermore, Massel, Park and Reichelt (2021) indicate that both the discretionary and the non-discretionary portions of Revenues are value relevant to the offering price.

There are several earnings measures, namely EBITDA, EBIT or Net Income. PwC (2014) defines EBITDA as "a non-GAAP metric that is the most commonly used by listed corporations". Looking at the case of this variable, Cormier, Demaria and Magnan (2016) find that EBITDA reporting is related with a bigger analyst following and, as a consequence, with less information asymmetry. It also contributes towards enhancing the positive relationship between Earnings and stock pricing, as well as future cash flows. EBITDA will also contribute towards a better assessment of the firm's Earnings when its corporate governance is weak.

It is also worthwhile mentioning that lower price responses to extreme Earnings and losses imply the relation between Earnings and stock returns will be non-linear, as it has been documented by Freeman and Tse (1992), and Das and Lev (1994).

Overall, it may be said that there are not large differences between the competing definitions of Earnings. The problem, however, is that non-GAAP measures sometimes risk being ambiguously defined and some companies may take advantage of the freedom to compute pro-forma income in different manners. (Cornell and Landsman, 2003)

Before moving to the next variable, focus will be given to the impact Earnings may have on the Market Value of a company when it is to publicly float. Surprisingly, firms with more negative Earnings tend to have higher valuations than firms with less positive Earnings. Also, firms with more positive Earnings have higher valuations than firms with less positive Earnings. Hence, negative Earnings may be interpreted as a proxy for growth opportunities for some firms during the IPO stage. (Aggarwal, Bhagat, and Rangan, 2009)

In a similar study, Massel, Park and Reichelt (2021) find that Earnings are not value-relevant to the IPO price, a result consistent with Armstrong, Foster and Taylor (2016). Hence, there is not a consensus on what the impact of Earnings is on IPO firms.

Research on Cash-Flow focuses on firms that are either in the pre-IPO or in the IPO stage. Considered research by Cox (2019) also targets Cash-Flow volatility and its impact on firm valuation. The results state that pre-IPO cash-flow volatility is important for investors, suggesting it is a vehicle driving the traditional underpricing. The results suggest firms with higher pre-IPO cash flow volatility are associated with higher post-IPO aftermarket valuations. This is in line with research by Pástor and Veronesi (2003) who indicate investors provide higher valuations on more uncertain firms. Cox (2019) also highlights IPO investors place a higher emphasis on Cash-Flows when compared to Earnings as the latter are more prone to possible manipulation.

If we are to look at the impact of other variables, we should know that it is negative for Selling & Administrative (S&A), Inventory, as well as for Order Backlog. (Lev and Thiagarajan, 1993)

Additionally, research by Reitmaier and Schultze (2017) shows that share-based compensation, leverage, corporate size as well as share volatility are important variables in explaining German companies' market value.

After having looked at the impact of some key variables on a company's value, it is also important to look at some accounting considerations, as it is an aspect whose role in valuation should not be overlooked. As it is noted in Baever and Morse (1978), accounting method effects are of two kinds – use of different rules (e.g., depreciation methods) by different firms for essentially the same or similar events, and errors introduced by applying a uniform accounting rule (e.g., historical cost) to differing economic circumstances (e.g., current value of assets).

In line with what has been seen on Earnings, there seems to be a decline in the relevance of Earnings information at the same time as there is an increase in the relevance of balance sheet and book value information. (Francis and Schipper, 1999)

Finally, it is also important to note that the impact of financial statement information on firm valuation will highly depend on the firm's maturity level. (Hand J. , 2005)

2.2.2 Literature on New Economy Companies

In what concerns the broader “New Economy”, a careful study of some papers that date back to the late 20th century as well as others dating to the beginning of the 21st century and that

cover Internet companies has been carried out. Later in this paper, it may be interesting to compare these with the results of this thesis. The structure of this section shall be similar to the previous one. It will cover key variables such as Revenues, Earnings and Cash-Flow.

Existing literature provides us three main reasons for which Revenues are especially important in valuing firms in the technological sector. Firstly, firms are usually facing an environment of uncertainty and rapid change (Lev and Zarowin, 1999). Secondly, technology companies are characterized for having larger than usual R&D expenditures, which are expensed but may not be priced by the market as assets (Lev and Sougiannis, 1996). Thirdly, given technology firms operate in innovative industries, which tend to be younger and thus have higher than usual growth rates (Chandra, Wasley, and Wavmire, 2004).

While Trueman, Franco Wong and Zhang (2000) verify that historical Revenue growth has some incremental predictive power in what concerns firm value, Trautwein and Vorstius (2001) also show that there is a positive association of total sales with Market Capitalization. Additionally, Trueman, Franco Wong and Zhang (2000) also analyze Analysts' forecasts and find that these are typically underestimated for Internet firms. Xu, Cai and Paterson (2016) also find that sales Revenues are highly value relevant in the valuation of high-tech firms, especially loss-making ones, in a tendency that is verified both before and after the 2000 market crash.

Besides this more general approach, a difference must also be drawn between firms with positive and with negative Earnings. Chandra and Ro (2008) find that Revenues are more important in extreme Earnings situations, namely companies in loss-making industries.

When it comes to Earnings, Trautwein and Vorstius (2001) do not have any evidence that Earnings impact firms' market value, a result which is consistent with that of Trueman, Franco Wong and Zhang (2000). However, some components of Earnings, that is, some cost components do play an important role in driving companies' valuation. In line with most literature, Xu, Cai and Paterson (2016) do not find Earnings and Book Value of Equity as being value-relevant for the valuation of firms in the high-tech sector. For instance, Trautwein and Vorstius (2001) show that Marketing Expenses are relevant in explaining the valuation of e-retailers. On the other hand, Trueman, Franco Wong and Zhang (2000) show that Gross Profits are positively and significantly associated with Stock Prices.

Under a similar reasoning, Hayn (1995) suggests that losses are regarded by the market as transitory. It is mentioned that Earnings may not be a proxy of future operating potential for high-tech growth industries as current Earnings may be distorted by expensing large R&D and

intangibles. A similar argument is attributed to the Book Value of Equity variable – high-tech companies do not usually have large values because of large investments in intangibles and R&D, the latter which must sometimes be fully expensed.

Hand (2000) also concludes that Earnings are an important variable in explaining the Market Capitalization of Internet companies. However, rather than looking at contemporaneous Earnings, he looks at one-year ahead forecasting Earnings as well as to a long-term (3 years) prediction.

Finally, in what concerns Cash-Flow, Trautwein and Vorstius (2001) also do not find any association between these firms' Cash-Flows and their market values.

3 Methodology

3.1 Statistical Methodology

As most of the other studies outlined in the Literature Survey, this study's statistical approach is centered on regression analysis. Hence, some financial variables as well as a market-based variable are regressed against the Market Value of Equity of Software companies in order to understand the impact of the relationship between the variables. Similar to other analogous studies, namely those by Trautwein and Vorstius (2001), Trueman, Franco Wong and Zhang (2000) and Hand (2000), models are regressed based on the Ordinary Least Squares Method (OLS).¹

This study differs from similar ones performed to date as it takes into account that there may be differences between firms depending on their size. Hence, we shall focus on three main kinds of firms, which are segmented based on their size. The chosen measure is Market Capitalization, a reason for which Small Capitalizations (Small-Caps), Medium Capitalizations (Mid-Caps), and Large Capitalizations (Large-Caps) will be considered. Although there is no formal and official definition for each of them, we have used the popularly-adopted definitions, which have also been described by Indeed (2021) and Fool (2022). Thus, the overall sample is filtered and broken down into three sub-samples, based on the Market Capitalization, i.e. Market Value of Equity of the Companies, which are defined in the following manner:

- Small-Caps are companies which MVE lies between \$300mn and \$2bn

¹ Least Squares regression (OLS) is a common technique for estimating coefficients of linear regression equations which describe the relationship between one or more independent quantitative variables and a dependent variable (simple or multiple linear regression)

- Mid-Caps are companies which MVE lies between \$2bn and \$10bn
- Large-Caps are companies which MVE lies between \$10 bn and \$200bn

As a consequence, Mega Capitalizations, those above \$200bn are not included. Similarly, all capitalizations below Small Caps are not in the scope of this analysis.

Once all regressions have been performed, this paper shall try to understand the significance of variables across time, identifying relevant patterns, namely in what concerns time variability and differences between the three samples based on firm sizes. Also, we will understand which models have more explanatory power by looking at the R^2 of univariate models as well as the adjusted R^2 of multivariate models. Additionally, we will also pay attention to the type of relationship (positive or negative, as well as concave, convex or linear) between the independent and the dependent variables, which is conveyed by the signs in the regression analysis.

3.2 The Log-Linear Regression Model

As the variables included in these models are prone to having significant size differences between themselves, a standard linear regression model would likely be exposed to scale effects that cause heteroscedasticity² as well to a significant number of outliers³, as it was explained by Trautwein and Vorstius (2001). Hence, there is a need to scale the variables. In order to do so, there are two possible approaches. One is to deflate both the dependent and the independent variables by another one, which in this case could be the Book Value of Assets, the Book Value of Equity or the Number of Share, as advocated by Trueman, Franco Wong and Zhang (2000). The alternative would be to log-transform both the dependent as well as the independent variables, as done by Trautwein and Vorstius (2001) and Hand (2000). Considering these two options, it is believed that the best one – both for econometric and economic reasons – is to log-scale the variables and, therefore, opt for a linear model where both the dependent and the independent variables are log-transformed. Such models are commonly known as log-linear models.

The log-linear model will be particularly useful because it accommodates concavity. Thus, it is applicable whether the relationship between the independent and the dependent variables is

² Heteroskedasticity happens when the standard deviations of a predicted variable, monitored over different values of an independent variable or as related to prior time periods, are non-constant

³ An outlier is a data point that differs significantly from other observations

linear, concave or convex as long as the transformation is monotonic. Also, and as it has been mentioned, it will significantly decrease the risk of having heteroscedasticity problems in the model as well as outliers. This would have been a relevant risk given the skewness these distributions normally have.

At this stage, it has become clear that applying OLS to unscaled data would have yielded in significant violations of the assumptions implied by OLS.

Other than the two presented dummy⁴ variables, all other variables are log transformed. In most case, the variable of any variable, X, is transformed by taking the natural logarithm of the variable. Alternatively, there are some exceptions, which have values close to zero and, for those cases, \$1 million is added to X so that the values are not so close to zero. That is the case of Revenues in the case of Small and Mid-Caps, as well as EBITDA in all three cases.

3.3 Time Windows

It has been seen in the literature that most of the studies performed to date are limited in the scope of the analyzed time window. While Hand (2000) resorts to panel data based on one single date, February 1st 2000, others do analyze cross-sectional data. However, the analysis is most of the time limited to one or two years and it has happened by the beginning of the millennium, thus reporting to the aftermath of the dot-com era⁵. As additional examples. Trautwein and Vorstius (2001) sample dates from October 1999 to May 2000, while Trueman, Franco Wong and Zhang (2000) looks at the 1-year window dating from September 1998 to September 1999.

In an attempt to cover more time periods, this research paper looks at both 2 and 5-year periods, each including quarterly cross-sectional data. There are four 5-year periods from 2000 until 2019. These are: 2000-2004, 2005-2009, 2010-2014, and 2015-2019. On the opposite, there are twelve 2-year periods, also including quarterly cross sectional data. These are 1998-1999, 2000-2001, 2002-2003, 2004-2005, 2006-2007, 2008-2009, 2010-2011, 2012-2013, 2014-2015, 2016-2017, 2018-2019, and 2020-2021.

⁴ A dummy variable is one that takes only the value 0 or 1 to indicate the absence or presence of some categorical effect that may be expected to shift the outcome

⁵ The dotcom bubble is a stock market bubble that was caused by speculation in dotcom or internet-based businesses from 1995 to 2000. The companies were largely those with a “.com” domain on their internet address. It was followed by a sharp decline in the valuation of technology companies in the early 2000s

This approach is complementary as the 5-year periods constitute a bigger and therefore more robust sample which enables us to identify time persistent patterns, while the smaller 2-year periods allow for a more detailed look at the data and the micro analysis of particular key events such as the dot com bubble, the global financial crisis⁶, as well as the coronavirus pandemic⁷.

3.4 Regression Models

Similarly to the models designed both by Trueman, Franco Wong and Zhang (2000) and Trautwein and Vorstius (2001), these models also feature a contemporaneous relation between the variables. As for their focus on financial variables, the most important variables are also those meant to assess both Revenues and Earnings. While Revenue is used as a variable, the chosen Earnings measure will be EBITDA, as it is a fairly simple variable, which is taken into account by most investors and may be, under certain circumstances, a good proxy for Cash-Flow. Although it would also be interested to consider what happens with Cash-Flow variables, those were only available at the yearly frequency. As that would not be adequate under the chosen frequency of analysis, it has been opted not to include any Cash-Flow variable.

These two variables are regressed against the firm's Market Value both in univariate, i.e. individually, as well as in multivariate models, that is, together with other variables. However, it has been decided not to include Revenues and EBITDA together in the same model as it is extremely likely to be a high degree of multicollinearity⁸ between the two. The reason for that is that Revenue is indeed EBITDA's first line item.

For the multivariate models, three more variables are included. Together with models that include Revenue, there is a dummy variable that will take the value of 1 for companies having a non-negative EBITDA figure, and 0 for those having a negative one. This variable was naturally chosen to study the level of importance the market will provide to firms with negative Earnings vis-à-vis those with positive ones. Additionally, there is another financial-related dummy variable which is related with the firm's capital structure. This will be denominated LEV, and accounts for the sign of the Net Debt position. Hence, the variable shall take the value of 1 for companies with a Net Debt position, and 0 for those with a negative one (or, in other words, a positive Net Cash position). The reason for choosing this variable is attached to the

⁶ Took place in 2008

⁷ Pandemic caused by the emergence of the Sars-Cov-2 virus in early 2020. It led to a sharp global equities' correction

⁸ Multicollinearity is a statistical concept where several independent variables in a model are correlated

importance the industry typically gives to holding cash as it is particularly important to have an available capacity to pursue eventual growth opportunities that may arise. Furthermore, a positive Net Cash position is a considerable sign that the firm will probably skew to the Equity Market vis-à-vis the Debt one when to fund itself. The final variable is an exogenous one and it is market related. As it is common sense that there is some of the variation of a company's value which may be attached to the overall market conditions, it has been decided to also include the level of the S&P 500 Index ⁹as an additional explanatory variable in some of the models.

Having explained the models' design as well as the reasoning behind the variables to include, it is now time to present the five models which will be used for the three – Small, Mid and Large – Capitalizations, across the different and aforementioned time windows. All these variables are explained with further detail over the next section. It is also worthwhile to remember that all variables except those that are of a dummy nature are log-transformed.

Univariate:

$$\text{Model A : } MV = \beta_0 + \beta_1REV + e$$

$$\text{Model B : } MV = \beta_0 + \beta_1EBITDA + e$$

Multivariate:

$$\text{Model C : } MV = \beta_0 + \beta_1REV + \beta_2LEV + \beta_3SP + e$$

$$\text{Model D : } MV = \beta_0 + \beta_1REV + \beta_2pEBITDA + \beta_3LEV + \beta_4SP + e$$

$$\text{Model E : } MV = \beta_0 + \beta_1EBITDA + \beta_2LEV + \beta_3SP + e$$

4 Data

4.1. Data Variables & Definition

Most of the data used in the regression models were retrieved from Refinitiv Datastream with the exception of the data for the S&P 500, which was extracted from the CRSP repository.

Table 1: Variables and Their Definitions lists the variables used in the model – before any log-transformations – and also provides their description.

⁹ The S&P 500 Index, or Standard & Poor's 500 Index, is a market-capitalization-weighted index of 500 leading publicly traded companies in the U.S.

Variable	Label	Units	Frequency	Description and/or computational details	Source
Market Value of Equity	MV	\$ millions	Quarterly	Market Value on Datastream is the share price multiplied by the number of ordinary shares in issues. The amount in issue is updated whenever new tranches of stock are issued or after a capital change.	Datastream
Revenues	REV	\$ millions	Quarterly	Net Sales or Revenues represents gross sales and other operating revenue less discounts, returns and allowances.	Worldscope
Earnings Before Interest, Depreciation and Amortization	EBITDA	\$ millions	Quarterly	Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) represents the earnings of a company before interest expense, income taxes and depreciation. It is calculated by taking the pre-tax income and adding back interest expense on debt and depreciation, depletion and amortization and subtracting interest capitalized.	Datastream (Worldscope)
Non-negative EBITDA Position	pEBITDA	Binary (0 or 1)	Quarterly	The variable takes the value of 1 when EBITDA is non-negative, and 0 otherwise.	Datastream (Worldscope)
Net Debt Position	LEV	Binary (0 or 1)	Quarterly	Net Debt represents Total Debt minus Cash. Cash represents Cash & Short Term Investments for all other industries. Hence, LEV takes the value of 1 for positive Net Debt values, and 0 for negative.	Datastream (Worldscope)
Standard & Poor's 500 Index	SP	Levels	Quarterly	The level of the Standard & Poor's 500 Composite Index at the end of the trading day or month. This data is collected from publicly available sources such as the Dow Jones News Service, The Wall Street Journal or Standard & Poor's Statistical Services.	CRSP

Table 1: Variables and Their Definitions

4.2. Sample Selection Criteria

Time series dating from 1998 to 2021 on Software and Computer Services – Datastream’s industry category that would most fit the scope of this paper – was retrieved for company’s belonging to the NASDAQ and the NYSE. Data had to be filtered so that only the relevant observations were regressed. First, observations with a MV below \$50mn as well as those higher than \$200bn were eliminated. What is more, outliers – such as firms which showed no Revenues for an extended period of time – were also eliminated.

It is also important to mention that only firms which had at least 5 observations were included so that the data sample would be the most consistent possible. One natural consequence of the

approach taken in regards to the data is that different periods do not necessarily have either the same number of observations or the same number of companies in the sample.

Once data were treated, we were left with 6458 quarterly cross-sectional observations from 1443 different companies dating from 1998 to 2021. Additionally, if we are to only consider those observations from 2000 to 2019, which is the smaller sample used in the 5-year window regressions, we are left with 5643 quarterly observations, comprising 735 companies.

4.3. Descriptive Statistics

4.3.1. Descriptive Statistics – Untransformed Variables

4.3.1.1. Small-Capitalization Companies

Before looking at the descriptive statistics of the transformed data, it is worthwhile analyzing the original (non-transformed one), as they convey information with important economic value.

Small-Caps have the highest total sample with 6458 observations, which is also well balanced throughout time. On the other hand, Mid-Caps have a very substantial increase in the sample size after 2006, while the increase in that of Large-Caps only comes after 2016. Prior to 2016, the sample size is very reduced. All this also induces that there are several companies which have been growing over time. Therefore, some have changed from the Small Capitalization sample to the Medium one, while others have been upgraded to the Large-Caps pool from the Mid-Caps. Likewise, it does not seem that many companies have realized such a loss in value throughout time that they have changed to a category with a lower Market Capitalization.

Let us first focus on the 5-year sample present in Table 11, which presents descriptive statistics for Small Capitalization companies in the untransformed format. There is a significant increase in both the mean and median Revenues from the 2000-2004 period to the following one. Afterwards, this value stabilizes in the \$120mn-\$135mn range in the case of the mean, while the median stabilizes in the \$70-73mn range. When performing a similar exercise, but in regards to EBITDA, one realizes that the median and the average also jump from 2000-2004 to 2005-2009, but then it does not stabilize but rather decreases afterwards. Also, while the average EBITDA is higher in 2014-2019 than in the 2000-2004 period, the median is smaller.

Once we look at the smaller 2-year windows, we can identify some interesting patterns. While average Revenues and EBITDA decline from 1998-1999 to 2000-2001, they then continuously increase from 2002-2003 until 2008-2009. After that period, there is a trend of decline until 2014-2015. Finally, while EBITDA's behavior is not so clear, Revenues decrease from 2018-2019 to 2020-2021.

All this implies that, in general, valuation multiples were increasing prior to the dot-com bubble, but then there was a downward general correction until 2009. After that period, they would increase until 2015.

4.3.1.2. Medium-Capitalization Companies

It is now time to comment the descriptive statistics concerning some of the model variables, in the untransformed form, for Mid-Caps, which are present in Table 13 and Table 14.

As before, we shall start by looking at the statistics of the 5-year window periods. Although there is not a clear pattern concerning mean Revenues, the median increases from \$265.5mn in 2000-2004 to \$300.3mn in 2005-2009. After this period, it declines in the next two periods, until it finally reaches a value of \$246.138mn in 2015-2019. This is a sign that, in what concerns Revenue multiples, valuations have increased in the former 10-year interval. EBITDA's behavior is similar. The median also significantly increases in the 5-year period after the dot-com bubble, but it will then fall in 2010 to levels below those registered in the 2000-2004 window.

When looking at what happens in the smaller 2-year windows, the general behavior is similar to the one of Mid-Caps. The most highlightable differences are that the correction in valuation multiples is more subtle from 2004-2005 onwards. Also, there is a significant drop in mean REV to 2014-2015. Finally, there is a decrease in both mean and median Revenues and EBITDA from 2018-2019 to 2020-2021, which clearly signals higher valuation multiples during the COVID-19-induced pandemic.

4.3.1.3. Large-Capitalization Companies

Finally, it is still worthwhile looking at the Large-Caps descriptive statistics, which may be consulted in Table 15 and Table 16. As usual, we shall start with the 5-year time window. In an already seen path, average and mean Revenues increase from the first to the second period, and then drop afterwards.

The path with EBITDA is rather similar. Nonetheless, the increase to the second period is actually bigger than 100% in what concerns the median, while the drops from 2005-2009 to 2014-2020 are always close to 50%, in what is a sign of increasing valuation multiples.

When it comes to shorter 2-year time periods, the general behavior of REV and EBITDA are not so different with Large-Caps. Particular differences in the movement from 2002 to 2009 are that it is quite subtle and steady until 2007, and then there is a sharp increase in 2008-2009.

Also, after 2009, there are two consecutive periods of considerable mean and median decreases in both REV and EBITDA.

4.3.2. Descriptive Statistics – Transformed Variables

At this stage, it is not so important to provide particularly thorough comments on the first moment (mean) as well as the median since that has already been done with the untransformed data. On the other hand, relevant behavior in what concerns standard deviations will be described.

4.3.2.1. *Small-Capitalization Companies*

We shall start with statistics on Small-Caps, as presented in Table 17, Table 18 and Table 19. In the 5-year sample, standard deviation of the MV is mostly around 0.5, around 1 in the case of REV, and 2 in the case of EBITDA, with an exception in 2005-2009, where it is at around 1.6. In the pEBITDA variable, 2005-2009 is also an exception – being at c. 0.3 vis-à-vis the usual c. 0.4-0.5. LEV is traditionally not so different from 0.4, and SP around 0.2.

When looking at MV, we observe it is positively skewed in the initial two periods, and negatively afterwards. While this happens, kurtosis is always negative. This means that tails are not so large, but most of the distribution concentrates on the left-end side in the initial two periods and on the right-end side in the last two.

Revenue is negatively skewed, with the exception of the last period, while kurtosis is positive. What is more, the two initial periods have an even higher kurtosis. Therefore, most of the REV information is on the initial part of the distribution.

In the case of EBITDA, it is negatively skewed, which means most of the information is concentrated on the right part of the distribution. Kurtosis, on the other hand, is positive with the exception of the last period. It is also worth noting that it is higher than the normal distribution in the 2005-2009 period. pEBITDA has a similar behavior in what concerns skewness, but it has a negative kurtosis in the 1st and last periods, while it is also larger than that of a normal distribution in 2005-2009.

Finally, SP is negatively skewed in the two first windows and it is skewed positively in the last ones. Kurtosis is always negative except for the 2005-2009 period, meaning the tails are rather thin.

When we analyze the standard deviation of the 2-year window, EBITDA's standard deviation is indeed lower at around 1.4 and 1.5 in 2004-2008. Later on, however, there is an exception

with a standard deviation of c. 0.5 in 2014-2015, which is naturally lower than what it had been in most periods. Apart from this detail, the behavior of most variables is similar to what is observed in the 5-year window.

When looking at the 2-year window, MV and LEV's behavior in terms of skewness and kurtosis is relatively similar. REV is likewise very similar in the new time window, with an exception in 2002-2003, where these two moments have different signs than during 2000-2004. EBITDA almost has a similar pattern in the shorter window, with the key difference in the sign of kurtosis during the 2000-2001 period. In the case of pEBITDA, there are only two exceptions with kurtosis in both 2002-2003 and 2010-2011. Finally, SP differs in the smaller window during the 2010-2011 and 2018-2019 periods, while kurtosis has a different sign in both 2006-2007 and 2008-2009.

4.3.2.2. Medium-Capitalization Companies

After having looked at the distribution of Small-Capitalizations, let us now follow a similar reasoning for Mid-Caps, which may be consulted in Table 20, Table 21 and Table 22. Once again, we shall start with the 5-year time periods, and we will compare these statistics with those of Small Capitalizations. The standard deviation of the Market Value is once again very similar, being most of the time slightly below 0.5, Revenue is also most of the time around 1. EBITDA is also around 2, but it has increases over the last 2 periods, to c. 2.5 and 3.6, respectively. pEBITDA shows, once again, volatility levels between 0.3 and 0.4, and LEV slightly below 0.5. The second moment for SP is very similar to that previously observed.

When we compare these values with those of Small-Caps, skewness is now mostly positive in REV. Hence, most of the data is concentrated on the left-end part of the distribution. Kurtosis is also similar with what has been previously observed, but it is now higher than the normal distribution in the last period. The pattern with EBITDA is similar with that of Small Capitalization in what comes to skewness and, somehow, kurtosis. In this case, kurtosis has less periods where it is higher than the normal distribution. That only happens in the 2005-2009 interval.

pEBITDA has similar skewness behaviors, but some differences in kurtosis. It is now positive in three periods, while with Small-Caps it was so in just one. It is higher than the normal distribution in the first period, and negative in the last one.

The LEV variable presents a similar pattern in what comes to skewness. In terms of kurtosis, while it is mostly negative, it is positive in the 2010-2014 period. Additionally, in very similar

circumstances to Small Capitalizations, apart from the third period, SP is always positive in terms of skewness, while kurtosis is likewise only positive in 2005-2009.

In terms of what has been described in terms of standard deviation, there are just minor notes to draw in the 2-year window. It is rather low for EBITDA at 1.6 in 2010-2011, and c. 0.5 in 2018-2019. In a different direction, it is particularly high in 2020-2021 at c. 3.6.

At this stage, it is also important to look at the 2-year time windows and understand if there are major differences with the 5-year period. While MV, EBITDA and pEBITDA case show a similar pattern in both of these moments, Revenues never have a kurtosis level higher than that of a normal distribution. LEV is now still mostly negative in terms of kurtosis, but positive in the final period. SP, in turn, is not negatively skewed in the 2002-2003, 2012-2013 and 2016-2017.

4.3.2.3. Large-Capitalization Companies

Finally, the second, third and fourth moments of Large-Capitalizations, as presented in Table 23, Table 24 and Table 25 will also be analyzed. As usual, the discussion will start with the 5-year period, after which it will change to the 2-year time window.

After the Small and Medium samples have been described, only key differences will be presented. The standard deviation of Revenues is now higher at c. 1.2. It is, however, even higher in the 2000-2004 period, at almost 1.6. The volatility of the EBITDA variable is also higher. Although it is c. 2 in the 2005-2009 window, it was almost at the 3 level in the initial period. In the last periods, it reaches particularly high values, at c. 2.5 in 2010-2014, and c. 3.7 in 2015-2019.

At the MV level, and in the 5-year period, skewness is similar to that of Mid-Caps. However, kurtosis differs because it is negative in 2000-2009. REV, in turn, differs in terms of skewness – now always positively skewed. The behavior with kurtosis is also somehow similar as it is now negative with the exception of the 2015-2019 period.

EBITDA's behavior is now very similar to the one observed in Mid-Caps, with only a material difference: kurtosis is also positive in 2015-2019. Likewise, pEBITDA also has a distribution that resembles the one of Mid-Caps. On the other hand, LEV only shows one difference: kurtosis is positive in 2010-2014. In a very similar situation, SP only shows an important difference: it now has a slightly positive skewness in the 2010-2014 period.

In the 2-year period, the standard deviation of Revenues is higher in the 2 initial windows, where it is almost 2 in 1998-1999, and almost 1.6 in 2000-2001. EBITDA's volatility is also particularly big in the two first periods, at more than 3.4. Values higher than this last one are also achieved from 2014 onwards. What is more, it is important to mention that the 2020-2021 has a particularly high standard deviation, set at more than 6.

When we are comparing skewness and kurtosis with the 2-year window vis-à-vis the 5-year one, it is observable that in the 2010-2014 period, there are some differences. Kurtosis is, in this case, negative in 2012-2013 and 2014-2015. In terms of Revenues, the few differences in skewness lies in the 2000-2001 and 2002-2003 intervals, where it is negative in this sample. On the other hand. There are some differences in kurtosis, notable in the long periods from 2012 to 2021.

When looking at EBITDA, there are only two slight differences, with skewness being negative in 2000-2001, and kurtosis also negative in 2020-2021. Additionally, pEBITDA only has a difference in the last period, where kurtosis is now negative.

Finally, there is no significant difference in terms of the LEV variable, while there are two small ones with SP: kurtosis in 2008-2009 (now negative), and skewness in 2016-2017 (now positive).

4.3.2.4. Cross-Sample

Once the three kinds of companies are taken into account, it is observable that the number of companies in the sample is far larger in the Small-Caps sample. When looking at the 5-year time windows, it is observable that the number of companies is relatively well distributed and, thus, stable in Small-Caps. On the other hand, in the case of Mid-Caps, it increases every period and, overall, more than doubles in what concerns Mid-Caps. This is the more pronounced after 2010 and when we compare the 1st period (2000-2009) to the 2nd (2010-2019), it more than doubles.

In the case of Large-Caps, the number of companies is very small at first, but then more than doubles from the 2010-2014 to the 2015-2019 period.

Although the analysis focuses on the 2-year and 5-year time windows, it may also be interesting to understand the data on the three kinds of company, with regards to Market Capitalization, for the entire period, which dates from 1998 to 2021.

Starting with MV, it is positively skewed, and kurtosis is negative, except in the case of Large Capitalizations. Revenues, in turn, are also positively skewed, with the exception of Small-Caps. Kurtosis is always positive, but slightly smaller in the case of Large-Caps. It is also noticeable that there is a higher standard deviation of Revenues in the Large-Cap sample. On the other hand, EBITDA is negatively skewed – particularly in the case of Large-Caps –, while kurtosis is positive. Without surprise, given it is a dummy variable based on the value of EBITDA, pEBITDA shows similar characteristics to the EBITDA variable.

LEV shows positive skewness – which is particularly high in the case of Small-Caps –, and a negative kurtosis, that is even more negative in the Large-Cap part of the sample. Finally, SP also shows positive skewness and a kurtosis that is negative in the case of Mid and Large-Caps, but positive in the case of Small-Caps.

Given the information conveyed by the third (skewness¹⁰) and fourth (kurtosis¹¹) moments, MV, Revenues, LEV and SP are, in general, skewed to the right, with most of the information on the left and a long right tail. Additionally, although kurtosis is sometimes positive, it is never larger than that of a normal distribution.

4.4. Correlation Matrices

In this section, the Spearman correlation¹² between all model variables but the dummy ones will be presented. These may be consulted in Table 26, Table 27 and Table 28. In addition to that, we will also look at the Pearson correlation between the dummy variables and between those dummy variables and other variables in the model, which may be consulted in Table 29, Table 30 and Table 31.

We have largely relied on Spearman correlations as it is a method which affords a non-linear relation between the variables. What is more, given the variables are monotonically transformed, such an approach provides itself as a safer one.

This exercise was particularly important given it shows, as it has been previously hypothesized, that there is a positive and very significant positive monotonic relation between Revenues and

¹⁰ Skewness is a measure of asymmetry or distortion of symmetric distribution

¹¹ Kurtosis is a measure of the combined weight of a distribution's tails relative to the center of the distribution

¹² The Spearman correlation between two variables is equal to the Pearson correlation between the rank values of those two variables; while Pearson's correlation assesses linear relationships, Spearman's correlation assesses monotonic relationships (whether linear or not).

EBITDA. Although this was already sizeable in the Mid-Cap segment, where the correlation is at 0.697, it was particularly large in the Large-Cap one, where it is at 0.85.

The most unexpected outcomes of the Spearman correlations have been the negative monotonic relation between some of the variables, particularly between EBITDA and SP in the Small and Mid-Cap sample as well as between REV and SP in both the Mid and Large-Cap sample. However, there is a strong correlation between REV and SP in the Small-Cap case. This implies that, in the case of software companies that fit these two aforementioned categories, there may be some kind of countercyclicality in what comes to Revenue and Earnings performance when the overall Equity Market is in a downturn.

It is also worth mentioning that most correlations between the variables are quite moderate, in the 0.3-0.5 range, with some negative, as well as others which are particularly weak, involving SP and other variables in the model.

We have used Pearson correlations mainly to assess the correlation among the dummy variables and between them and the other model variables. We have done so as it would not be particularly insightful to rank dummy variables in order to perform Pearson correlations.

In this case, it is not a surprise that correlations involving the pEBITDA variable are somehow similar to those with EBITDA, as the dummy variable relates to EBITDA. Similar to what we have seen before, there is a negative correlation – now in all three cases – between pEBITDA and SP. Apart from that, pEBITDA shows a mild correlation with all other variables, and a moderate one with Revenues.

LEV shares some of the characteristics of the pEBITDA variable in the sense that it does not show very strong correlations. It is somewhat moderate with the REV variable, mild with EBITDA, and weak with MV and SP. Additionally, it is weak with MV in the Small and Large-Cap samples. In the case of the Mid-Caps, its correlation with MV is actually negative.

Finally, the correlation between LEV and pEBITDA is mild at 0.141 in Small-Caps, 0.189 in Mid-Caps, and 0.106 in Large-Caps.

5 Results

All Tables from Table 2 to Table 10 present the regression results for the five different models and all the different time periods. These results are presented for both 2-and-5-year windows. Variable coefficients are introduced, as well as the number of observations, the R^2 or adjusted R^2 – when regressions are multivariate –, and respective t-statistics.

5.1. Small-Capitalization Companies

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
2000-2004	A	5,748 [109,22]****	0,191 [14,91]****					1454	13,28%
	B	6,455 [421,94]****		0,046 [7,70]****				1454	3,92%
	C	0,678 [1,14]	0,241 [16,83]****			-0,094 [-2,54]**	0,694 [8,48]****	1454	17,34%
	D	0,675 [1,12]	0,241 [16,24]****		0,001 [0,04]	-0,094 [-2,54]**	0,694 [8,43]****	1454	17,28%
	E	3,830 [6,44]****		0,049 [8,06]****		0,095 [2,55]**	0,370 [4,39]****	1454	5,44%
2005-2009	A	4,951 [86,49]****	0,373 [29,20]****					1456	36,97%
	B	6,306 [284,98]****		0,130 [15,98]****				1456	14,94%
	C	2,623 [5,35]****	0,408 [30,27]****			-0,142 [-5,45]****	0,312 4,65]****	1456	39,05%
	D	2,511 [5,13]****	0,404 [29,98]****		0,137 [3,54]****	-0,144 [-5,30]****	0,313 [4,68]****	1456	39,53%
	E	6,004 [10,75]****		0,130 [15,56]****		0,007 [0,22]	0,042 [0,54]	1456	14,78%
2010-2014	A	5,757 [97,11]****	0,212 [15,81]****					1466	14,58%
	B	6,574 [379,04]****		0,058 [8,99]****				1466	5,23%
	C	4,649 [9,65]****	0,226 [15,34]****			-0,053 [-1,69]*	0,146 [2,25]**	1466	14,89%
	D	4,803 [9,74]****	0,231 [15,18]****		-0,051 [-1,45]	-0,050 [-1,57]	0,127 [1,92]	1466	14,96%
	E	5,229 [10,27]****		0,058 [8,33]****		0,056 [1,76]*	0,183 [2,63]***	1466	5,67%
2015-2019	A	5,668 [85,57]****	0,250 [17,00]****					1267	18,60%
	B	6,742 [422,14]****		0,037 [6,21]****				1267	2,96%
	C	6,540 [9,03]****	0,272 [16,70]****			-0,107 [-3,13]****	-0,121 [-1,31]	1267	19,22%
	D	6,568 [9,06]****	0,276 [16,37]****		-0,027 [-0,89]	-0,103 [-2,97]****	-0,124 [-1,35]	1267	19,20%
	E	7,921 [10,06]****		0,032 [4,95]****		0,084 [2,34]**	-0,154 [-1,52]	1267	3,26%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectively, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 2: Small-Capitalization Companies' 5-Year Window Results

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
1998-1999	A	6,215 [74,54]****	0,090 [4,22]****					416	4,12%
	B	6,533 [219,85]****		0,015 [1,21]				416	0,35%
	C	0,141 [0,08]	0,113 [4,77]****			-0,047 [-0,66]	0,839 [3,50]****	416	6,24%
	D	0,343 [0,20]	0,139 [5,49]****		-0,168 [-2,76]***	-0,056 [-0,79]	0,815 [3,42]****	416	7,72%
	E	2,047 [1,18]		0,017 [1,37]		0,074 [1,11]	0,626 [2,58]**	416	1,52%
2000-2001	A	6,120 [85,11]****	0,113 [6,03]****					626	5,51%
	B	6,522 [295,87]****		0,027 [3,13]****				626	1,54%
	C	1,300 [0,97]	0,148 [7,01]****			-0,127 [-1,93]*	0,656 [3,60]****	626	7,33%
	D	1,298 [0,97]	0,150 [6,64]****		-0,008 [-0,17]	-0,128 [-1,93]*	0,656 [3,59]****	626	7,19%
	E	4,281 [3,32]****		0,028 [3,16]****		0,033 [0,53]	0,312 [1,74]*	626	1,59%
2002-2003	A	5,110 [56,09]****	0,322 [15,16]****					512	31,07%
	B	6,376 [242,16]****		0,056 [5,59]****				512	5,78%
	C	0,697 [0,61]	0,358 [15,50]****			-0,122 [-2,28]**	0,621 [3,86]****	512	33,08%
	D	0,675 [0,59]	0,357 [15,32]****		0,020 [0,42]	-0,121 [-2,26]**	0,622 [3,84]****	512	32,97%
	E	5,343 [4,14]****		0,053 [5,31]****		0,155 [2,63]***	0,147 [0,79]	512	6,62%
2004-2005	A	4,647 [50,89]****	0,444 [21,01]****					609	42,10%
	B	6,084 [176,32]****		0,207 [15,52]****				609	28,41%
	C	7,326 [2,37]**	0,455 [20,63]****			-0,070 [-1,60]	-0,383 [-0,88]	609	42,13%
	D	7,519 [2,46]**	0,443 [20,08]****		0,232 [3,73]****	-0,073 [-1,68]*	-0,433 [-1,00]	609	43,34%
	E	7,992 [2,32]**		0,205 [15,02]****		0,044 [0,91]	-0,270 [-0,56]	609	28,19%
2006-2007	A	4,955 [58,73]****	0,382 [19,66]****					587	39,79%
	B	6,194 [187,42]****		0,186 [14,39]****				587	26,14%
	C	-0,191 [-0,10]	0,402 [19,77]****			-0,103 [-2,43]**	0,702 [2,55]**	587	40,73%
	D	-0,576 [-0,29]	0,391 [19,39]****		0,247 [4,33]****	-0,104 [-2,47]**	0,731 [2,70]***	587	42,48%
	E	2,205 [0,99]		0,186 [14,12]****		0,032 [0,69]	0,549 [1,79]**	587	26,22%
2008-2009	A	5,117 [50,49]****	0,331 [15,22]****					576	28,75%
	B	6,496 [191,03]****		0,060 [5,21]****				576	4,51%
	C	2,670 [3,41]****	0,377 [16,69]****			-0,204 [-5,14]****	0,331 [3,02]****	576	32,47%
	D	2,659 [3,38]****	0,377 [16,67]****		0,011 [0,18]	-0,205 [-5,13]****	0,332 [3,02]****	576	32,35%
	E	5,623 [6,22]****		0,063 [5,32]****		-0,043 [-0,92]	0,127 [0,98]	576	4,31%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 3: Small-Capitalization Companies' 2-Year Window Results (1998-2009)

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
2010-2011	A	5,580 [58,93]****	0,249 [11,85]****					601	18,98%
	B	6,575 [201,35]****		0,048 [4,13]****				601	2,76%
	C	1,933 [1,15]	0,296 [13,28]****			-0,226 [-5,08]****	0,494 [2,11]**	601	22,43%
	D	2,179 [1,31]	0,310 [13,70]****		-0,201 [-3,24]****	-0,224 [-5,06]****	0,476 [2,05]**	601	23,65%
	E	5,121 [2,76]***		0,051 [4,29]****		-0,045 [-0,96]	0,206 [0,78]	601	2,53%
2012-2013	A	5,852 [63,75]****	0,190 [9,09]****					583	12,45%
	B	6,559 [242,96]****		0,066 [6,45]****				583	6,68%
	C	2,360 [1,49]	0,178 [7,52]****			0,074 [1,40]	0,481 [2,23]**	583	13,00%
	D	2,460 [1,55]	0,185 [7,41]****		-0,049 [-0,89]	0,076 [1,43]	0,468 [2,17]**	583	12,97%
	E	2,886 [1,77]*		0,055 [5,05]****		0,166 [3,23]****	0,497 [2,45]**	583	8,54%
2014-2015	A	5,741 [54,25]****	0,231 [9,52]****					568	13,81%
	B	6,670 [286,29]****		0,068 [7,50]****				568	9,04%
	C	0,001 [0,00]	0,227 [8,63]****			0,020 [0,36]	0,757 [1,25]	568	13,61%
	D	-0,849 [-0,19]	0,207 [7,59]****		0,125 [2,58]***	-0,008 [-0,14]	0,871 [1,44]	568	14,47%
	E	-2,362 [-0,50]		0,065 [6,63]****		0,051 [0,88]	1,188 [1,9]*	568	9,28%
2016-2017	A	5,807 [51,38]****	0,225 [8,99]****					481	14,43%
	B	6,777 [268,84]****		0,033 [3,54]****				481	2,30%
	C	4,941 [2,42]**	0,230 [8,43]****			-0,024 [-0,44]	0,110 [0,42]	481	13,95%
	D	4,935 [2,42]**	0,233 [8,21]****		-0,021 [-0,42]	-0,020 [-0,37]	0,110 [0,42]	481	13,80%
	E	7,053 [3,27]****		0,026 [2,45]**		0,104 [1,82]*	-0,039 [-0,14]	481	2,36%
2018-2019	A	5,580 [59,18]****	0,260 [12,55]****					500	24,03%
	B	6,715 [257,30]****		0,025 [2,59]****				500	1,34%
	C	4,857 [2,40]**	0,298 [12,80]****			-0,180 [-3,48]****	0,078 [0,26]	500	25,36%
	D	4,389 [1,85]*	0,315 [13,24]****		-0,142 [-2,98]****	-0,160 [-3,06]****	0,137 [0,46]	500	26,53%
	E	6,370 [2,33]**		0,019 [1,88]*		0,101 [1,80]*	0,039 [0,11]	500	1,39%
2020-2021	A	5,750 [62,34]****	0,217 [10,43]****					399	21,51%
	B	6,660 [227,39]****		0,025 [2,26]**				399	1,26%
	C	5,149 [4,72]****	0,219 [9,98]****			-0,009 [-0,16]	0,073 [0,55]	399	20,98%
	D	5,300 [4,87]****	0,234 [10,15]****		-0,111 [-2,02]**	-0,006 [-0,11]	0,055 [0,42]	399	21,59%
	E	6,771 [5,62]****		0,019 [1,69]*		0,139 [2,24]**	-0,019 [-0,13]	399	1,76%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 4: Small-Capitalization Companies' 2-Year Window Results (2010-2021)

5.2. Medium-Capitalization Companies

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2	
2000-2004	A	7,542 [84,39]****	0,135 [8,75]****					442	14,81%	
	B	8,122 [230,19]****		0,053 [6,26]****				442	8,17%	
	C	5,183 [5,78]****	0,178 [9,45]****			-0,156 [-3,30]****	0,306 [2,55]**	442	17,13%	
	D	5,207 [5,80]****	0,182 [9,17]****			-0,047 [-0,69]	-0,158 [-3,56]****	0,305 [2,54]*	442	17,03%
	E	8,296 [9,93]****		0,053 [5,92]****			-0,023 [-0,51]	-0,024 [-0,21]	442	7,61%
2005-2009	A	7,239 [60,04]****	0,182 [9,24]****					525	14,02%	
	B	8,145 [174,28]****		0,047 [4,57]****				525	3,84%	
	C	4,475 [6,02]****	0,216 [10,98]****			-0,236 [-5,85]****	0,369 [3,61]****	525	20,36%	
	D	4,539 [6,06]****	0,216 [10,97]****			-0,063 [-0,71]	-0,236 [-5,83]****	0,369 [3,6]****	525	20,29%
	E	5,871 [7,43]****		0,052 [5,07]****			-0,139 [-3,27]****	0,323 [2,92]****	525	6,56%
2010-2014	A	7,464 [88,35]****	0,150 [10,34]****					853	11,17%	
	B	8,226 [326,47]****		0,029 [4,89]****				853	2,73%	
	C	6,265 [11,44]****	0,190 [12,63]****			-0,250 [-7,63]****	0,142 [1,98]**	853	16,65%	
	D	6,470 [11,63]****	0,198 [12,75]****			-0,090 [-1,96]**	-0,241 [-7,30]****	0,119 [1,64]	853	16,93%
	E	7,666 [13,34]****		0,037 [5,87]****			-0,159 [-4,69]****	0,079 [1,02]	853	4,87%
2015-2019	A	7,041 [47,67]****	0,227 [8,94]****					408	16,44%	
	B	8,289 [517,85]****		0,026 [6,27]****				408	3,20%	
	C	5,470 [8,21]****	0,217 [15,42]****			-0,142 [-5,25]****	0,218 [2,63]****	408	16,49%	
	D	5,493 [8,16]****	0,218 [15,05]****			-0,007 [-0,24]	-0,140 [-5,02]****	0,216 [2,56]**	408	16,42%
	E	7,099 [10,05]****		0,031 [6,91]****			-0,071 [-2,42]**	0,154 [1,71]*	408	3,64%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectively, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 5: Medium-Capitalization Companies' 5-Year Window Results

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
1998-1999	A	7,805 [54,88]****	0,091 [3,42]****					177	6,27%
	B	8,156 [151,22]****		0,038 [2,91]****				177	4,61%
	C	3,257 [1,40]	0,127 [4,30]****			-0,180 [-1,91]*	0,615 [1,93]*	177	8,36%
	D	3,251 [1,38]	0,127 [3,80]****		0,002 [0,02]	-0,180 [-1,91]*	0,616 [1,92]*	177	7,83%
	E	4,785 [2,09]**		0,048 [3,43]****		-0,119 [-1,28]	0,470 [1,48]	177	5,05%
2000-2001	A	7,738 [69,69]****	0,103 [5,06]****					199	11,51%
	B	8,103 [181,49]****		0,058 [5,16]****				199	11,89%
	C	7,279 [3,97]****	0,121 [4,91]****			-0,114 [-1,59]	0,055 [0,22]	199	11,30%
	D	7,189 [3,91]****	0,110 [4,06]****		0,086 [0,91]	-0,110 [-1,54]	0,065 [0,26]	199	11,22%
	E	8,867 [5,16]****		0,059 [4,79]****		-0,046 [-0,69]	-0,105 [-0,44]	199	10,84%
2002-2003	A	7,134 [32,58]****	0,198 [5,57]****					151	17,26%
	B	8,160 [125,76]****		0,048 [3,29]****				151	6,78%
	C	3,028 [1,49]	0,260 [5,77]****			-0,160 [-1,77]*	0,548 [1,93]*	151	19,03%
	D	3,065 [1,50]	0,262 [5,70]****		-0,033 [-0,27]	-0,160 [-1,77]*	0,545 [1,92]*	151	18,52%
	E	5,798 [2,78]***		0,046 [2,99]****		0,086 [1,07]	0,341 [1,13]	151	6,42%
2004-2005	A	6,983 [40,91]****	0,226 [7,91]****					180	26,00%
	B	7,943 [87,22]****		0,091 [4,34]****				180	9,55%
	C	1,939 [0,42]	0,277 [9,92]****			-0,337 [-5,60]****	0,684 [1,06]	180	36,39%
	D	2,269 [0,50]	0,275 [9,93]****		-0,317 [-1,84]	-0,335 [-5,61]****	0,682 [1,07]	180	37,25%
	E	6,362 [1,19]		0,100 [4,75]****		-0,194 [-2,86]****	0,226 [0,30]	180	13,61%
2006-2007	A	7,254 [38,83]****	0,188 [5,77]****					213	13,60%
	B	8,102 [103,06]****		0,068 [3,79]****				213	6,36%
	C	8,362 [2,68]***	0,247 [7,89]****			-0,404 [-6,36]****	-0,187 [-0,43]	213	26,71%
	D	8,276 [2,65]***	0,247 [7,89]****		0,164 [1,15]	-0,408 [-6,42]****	-0,196 [-0,46]	213	26,83%
	E	8,692 [2,56]**		0,078 [4,49]****		-0,296 [-4,44]****	-0,076 [-0,16]	213	13,25%
2008-2009	A	7,244 [38,36]****	0,173 [5,71]****					224	12,80%
	B	8,236 [129,69]****		0,018 [1,31]				224	0,77%
	C	4,619 [3,99]****	0,177 [5,75]****			-0,043 [-0,69]	0,374 [2,58]**	224	13,70%
	D	4,938 [4,16]****	0,177 [5,77]****		-0,190 [-1,59]	-0,046 [-0,74]	0,354 [2,14]	224	14,30%
	E	5,504 [4,42]****		0,021 [1,51]		0,030 [0,46]	0,389 [2,19]**	224	1,76%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 6: Medium-Capitalization Companies' 2-Year Window Results (1998-2009)

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2	
2010-2011	A	7,369 [44,02]****	0,163 [5,86]****					275	11,17%	
	B	7,794 [109,38]****		0,131 [8,17]****				275	19,64%	
	C	6,017 [2,46]**	0,180 [6,24]****			-0,130 [-2,10]**	0,182 [0,53]	275	11,68%	
	D	5,200 [2,13]**	0,167 [5,76]****			0,363 [2,47]****	-0,136 [-2,21]****	0,258 [0,76]	275	13,31%
	E	5,007 [2,15]**		0,138 [8,44]****			-0,101 [-1,76]*	0,393 [1,2]	275	20,02%
2012-2013	A	7,542 [67,34]****	0,138 [7,17]****					359	12,60%	
	B	8,224 [252,88]****		0,035 [4,45]****				359	5,25%	
	C	4,528 [3,09]****	0,182 [9,44]****			-0,315 [-6,69]****	0,387 [1,96]*	359	22,03%	
	D	4,519 [3,06]****	0,182 [9,09]****			0,003 [0,05]	-0,316 [-6,63]****	0,388 [1,96]*	359	21,81%
	E	6,139 [3,93]****		0,042 [5,41]****			-0,221 [-4,42]****	0,288 [1,36]	359	9,88%
2014-2015	A	7,233 [51,00]****	0,197 [7,89]****					419	12,98%	
	B	8,361 [272,40]****		-0,008 [-1,05]				419	0,26%	
	C	6,004 [1,38]	0,288 [10,83]****			-0,343 [-7,37]****	0,112 [0,20]	419	22,49%	
	D	6,376 [1,50]	0,310 [11,76]****			-0,249 [-4,61]****	-0,296 [-6,35]****	0,071 [0,13]	419	26,10%
	E	8,235 [1,67]*		-0,002 [-0,20]			-0,105 [-2,09]**	0,020 [0,03]	419	0,59%
2016-2017	A	7,049 [54,39]****	0,218 [9,91]****					437	18,42%	
	B	8,171 [275,23]****		0,052 [7,14]****				437	10,50%	
	C	5,754 [3,14]****	0,237 [10,19]****			-0,104 [-2,38]**	0,159 [0,67]	437	19,02%	
	D	5,606 [3,07]****	0,225 [9,51]****			0,123 [2,17]**	-0,130 [-2,89]****	0,175 [0,75]	437	19,71%
	E	6,727 [3,51]****		0,058 [7,36]****			-0,088 [-1,89]*	0,189 [0,76]	437	10,75%
2018-2019	A	7,437 [71,03]****	0,168 [8,86]****					555	12,44%	
	B	8,322 [393,07]****		0,020 [3,45]****				555	2,11%	
	C	3,143 [1,60]	0,190 [9,43]****			-0,111 [-2,78]***	0,530 [2,16]**	555	13,82%	
	D	3,273 [1,66]*	0,194 [9,30]****			-0,032 [-0,76]	-0,103 [-2,51]**	0,513 [0,04]	555	13,76%
	E	4,413 [2,11]**		0,024 [3,71]****			-0,043 [-0,99]	0,493 [1,88]*	555	2,34%
2020-2021	A	7,758 [81,51]****	0,115 [6,64]****					565	7,27%	
	B	8,382 [452,26]****		-0,003 [-0,56]				565	0,06%	
	C	5,840 [7,51]****	0,146 [7,83]****			-0,143 [-3,85]****	0,221 [2,85]**	565	9,82%	
	D	5,771 [7,57]****	0,177 [9,12]****			-0,180 [-4,76]****	-0,113 [-3,07]****	0,220 [2,42]**	565	13,17%
	E	7,228 [9,05]****		-0,001 [-0,25]			-0,027 [-0,72]	0,142 [1,46]	565	-0,03%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 7: Medium-Capitalization Companies' 2-Year Window Results (2010-2021)

5.3. Large-Capitalization Companies

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
2000-2004	A	7,476 [30,13]****	0,379 [10,98]****					146	45,59%
	B	9,456 [73,63]****		0,135 [6,14]****				146	20,77%
	C	-3,535 [-1,32]	0,594 [12,44]****			-0,773 [-5,31]****	1,380 [3,87]****	146	55,50%
	D	-4,457 [-1,75]*	0,699 [13,53]****		-0,814 [-4,19]****	-1,019 [-6,91]****	1,524 [4,90]****	146	60,15%
	E	10,597 [3,47]****		0,122 [5,39]****		0,348 [2,55]**	-0,169 [-0,40]	146	22,77%
2005-2009	A	5,738 [16,80]****	0,587 [13,77]****					161	54,39%
	B	8,399 [41,13]****		0,314 [10,19]****				161	39,52%
	C	0,947 [0,41]	0,724 [16,11]****			-0,738 [-6,15]****	0,554 [1,81]*	161	62,56%
	D	0,960 [0,42]	0,731 [15,83]****		-0,251 [-0,67]	-0,755 [-6,15]****	0,580 [1,88]*	161	62,43%
	E	12,442 [4,63]****		0,309 [10,00]****		0,076 [0,57]	-0,567 [-1,51]	161	39,31%
2010-2014	A	5,330 [22,88]****	0,641 [20,75]****					268	61,80%
	B	9,165 [71,32]****		0,167 [7,99]****				268	19,34%
	C	0,602 [0,45]	0,657 [21,34]****			0,003 [0,03]	0,630 [3,56]****	268	63,19%
	D	1,606 [1,21]	0,688 [22,45]****		-0,737 [-4,33]****	0,039 [0,38]	0,557 [3,24]****	268	65,50%
	E	6,308 [3,25]****		0,171 [8,05]****		0,131 [0,85]	0,385 [1,47]	268	19,45%
2015-2019	A	7,260 [44,06]****	0,387 [17,12]****					540	35,26%
	B	9,705 [197,03]****		0,078 [9,05]****				540	13,20%
	C	6,520 [4,38]****	0,414 [17,56]****			-0,222 [-3,72]****	0,080 [0,43]	540	36,54%
	D	6,492 [4,36]****	0,420 [16,72]****		-0,056 [-0,68]	-0,216 [-3,58]****	0,084 [0,45]	540	36,47%
	E	11,203 [6,57]****		0,080 [8,93]****		-0,060 [-0,87]	-0,189 [-0,87]	540	13,00%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectively, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 8: Large-Capitalization Companies' 5-Year Window Results

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2	
1998-1999	A	8,476 [23,52]****	0,249 [4,70]****					45	33,91%	
	B	9,763 [50,03]****		0,075 [2,18]**				45	9,98%	
	C	0,382 [0,05]	0,334 [4,54]****			-0,339 [-1,26]	1,073 [1,05]	45	33,57%	
	D	1,805 [0,26]	0,460 [5,67]****			-0,984 [-2,84]***	-0,614 [-2,99]**	0,895 [0,95]	45	43,32%
	E	9,032 [1,05]		0,066 [1,74]*			0,322 [1,24]	0,088 [0,07]	45	7,03%
2000-2001	A	8,157 [25,77]****	0,297 [6,34]****					74	35,85%	
	B	9,703 [71,08]****		0,094 [3,79]****				74	16,65%	
	C	-0,688 [-0,14]	0,563 [8,39]****			-1,062 [-5,05]****	1,037 [1,61]	74	51,15%	
	D	-7,199 [-1,57]	0,772 [9,94]****			-0,927 [-4,26]****	-1,532 [-7,01]****	1,886 [3,09]****	74	60,75%
	E	17,179 [3,08]****		0,087 [3,48]****			0,119 [0,64]	-1,042 [-1,35]	74	16,14%
2002-2003	A	5,967 [12,74]****	0,563 [9,27]****					42	68,22%	
	B	8,534 [24,44]****		0,291 [5,18]****				42	40,11%	
	C	1,512 [0,27]	0,721 [9,06]****			-0,671 [-2,88]***	0,509 [0,64]	42	71,87%	
	D	1,983 [0,34]	0,732 [8,73]****			-0,283 [-0,48]	-0,712 [-2,85]***	0,470 [0,59]	42	71,29%
	E	9,106 [1,15]		0,266 [4,58]****			0,543 [2,20]**	-0,092 [-0,08]	42	42,70%
2004-2005	A	6,273 [12,99]****	0,517 [8,14]****					61	52,92%	
	B	8,788 [29,14]****		0,233 [4,92]****				61	29,11%	
	C	9,605 [0,73]	0,731 [9,81]****			-0,863 [-4,36]****	-0,658 [-0,35]	61	62,84%	
	D	8,072 [0,63]	0,792 [10,07]****			-0,872 [-2,02]**	-1,055 [-4,91]****	-0,378 [-0,21]	61	64,75%
	E	11,987 [0,66]		0,233 [4,94]****			0,395 [1,94]*	-0,470 [-0,18]	61	30,09%
2006-2007	A	5,778 [10,78]****	0,581 [8,46]****					73	50,18%	
	B	7,621 [22,78]****		0,426 [8,15]****				73	48,31%	
	C	1,150 [0,16]	0,837 [13,64]****			-1,193 [-7,62]****	0,427 [0,43]	73	71,79%	
	D	0,936 [0,13]	0,835 [13,42]****			0,115 [0,21]	-1,193 [-7,56]****	0,443 [0,44]	73	71,39%
	E	2,979 [0,31]		0,465 [8,81]****			-0,470 [-2,61]**	0,630 [0,48]	73	50,93%
2008-2009	A	5,119 [8,61]****	0,660 [9,36]****					57	61,44%	
	B	8,895 [27,38]****		0,260 [5,67]****				57	36,91%	
	C	2,477 [0,63]	0,669 [8,97]****			-0,041 [-0,20]	0,370 [0,68]	57	59,62%	
	D	2,523 [0,64]	0,659 [8,61]****			0,457 [0,64]	-0,003 [-0,02]	0,309 [0,56]	57	59,17%
	E	11,688 [2,54]**		0,267 [5,97]****			0,542 [2,24]**	-0,429 [-0,65]	57	39,28%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 9: Large-Capitalization Companies' 2-Year Window Results (1998-2009)

Time Period	Model	Intercept	REV	EBITDA	pEBITDA	LEV	SP	No of Obs	Adj. R2
2010-2011	A	5,267 [13,65]****	0,637 [12,87]****					88	65,81%
	B	8,560 [34,24]****		0,268 [6,84]****				88	35,22%
	C	0,670 [0,11]	0,636 [12,10]****			0,090 [0,41]	0,647 [0,79]	88	64,95%
	D	0,851 [0,15]	0,646 [12,07]****		-0,356 [-0,99]	0,092 [0,42]	0,659 [0,81]	88	64,94%
	E	9,792 [1,25]		0,254 [6,34]****		0,482 [1,63]	-0,169 [-0,15]	88	34,98%
2012-2013	A	5,679 [14,04]****	0,588 [10,73]****					108	52,08%
	B	9,127 [43,08]****		0,153 [4,30]****				108	14,84%
	C	-1,851 [-0,45]	0,598 [10,82]****			0,011 [0,06]	1,016 [1,85]*	108	52,31%
	D	0,316 [0,08]	0,624 [11,29]****		-0,788 [-2,32]**	0,061 [0,33]	0,799 [1,46]	108	54,25%
	E	1,511 [0,28]		0,158 [4,37]****		-0,198 [-0,80]	1,038 [1,40]	108	14,30%
2014-2015	A	5,199 [19,01]****	0,685 [18,53]****					147	70,31%
	B	9,639 [78,51]****		0,117 [5,71]****				147	18,35%
	C	1,064 [0,11]	0,695 [18,51]****			-0,154 [-1,46]	0,539 [0,43]	147	70,17%
	D	8,132 [0,92]	0,783 [20,73]****		-0,770 [-5,50]****	-0,075 [-0,77]	-0,389 [-0,33]	147	75,24%
	E	-1,028 [-0,06]		0,117 [5,59]****		0,015 [0,09]	1,403 [0,66]	147	16,89%
2016-2017	A	6,841 [25,86]****	0,437 [12,11]****					174	46,01%
	B	9,657 [126,98]****		0,085 [6,32]****				174	18,87%
	C	6,244 [1,58]	0,472 [11,83]****			-0,211 [-2,07]**	0,053 [0,10]	174	46,42%
	D	5,992 [1,51]	0,486 [11,03]****		-0,095 [-0,76]	-0,213 [-2,08]**	0,082 [0,16]	174	46,29%
	E	14,135 [2,96]****		0,081 [5,85]****		0,165 [1,42]	-0,582 [-0,94]	174	18,70%
2018-2019	A	7,953 [34,08]****	0,291 [9,02]****					291	21,98%
	B	9,760 [140,01]****		0,060 [4,89]****				291	7,63%
	C	5,044 [1,18]	0,317 [9,57]****			-0,230 [-2,83]***	0,355 [0,66]	291	23,43%
	D	5,001 [1,16]	0,316 [9,17]****		0,013 [0,11]	-0,232 [-2,78]***	0,359 [0,67]	291	23,17%
	E	5,924 [1,26]		0,068 [5,28]****		-0,165 [-1,83]*	0,487 [0,83]	291	7,95%
2020-2021	A	8,906 [56,20]****	0,183 [7,79]****					471	11,47%
	B	10,074 [283,54]****		0,018 [2,55]**				471	1,36%
	C	4,060 [3,09]****	0,200 [9,09]****			-0,416 [-7,65]****	0,597 [3,78]****	471	22,48%
	D	4,060 [3,08]***	0,200 [8,36]****		0,000 [-0,04]	-0,416 [-7,54]****	0,597 [3,77]****	471	22,31%
	E	5,259 [3,79]****		0,029 [4,41]****		-0,429 [-7,26]****	0,604 [3,59]****	471	12,42%

t-statistics are represented in parenthesis. ****, ***, **, and *, respectfully, indicate significance at 0.5%, 1%, 5%, and 10%, respectively.

Table 10: Large-Capitalization Companies' 2-Year Window Results (2010-2021)

6 Analysis of the Results

6.1. Univariate Models

6.1.1. Value Relevance of the Variables

Under the scope of this paper, we shall only classify a variable as value relevant if it is significant at least at the 5% level.

Revenues constitutes a variable which is always value relevant for Small, Medium and Large-Capitalization software companies independently of the time horizon and period chosen. Both 2 and 5-year time windows present REV as a variable which is always significant for a significance level of 0.5%.

On the other hand, EBITDA is not always value relevant. Although it is always relevant across the three chosen samples in the 5-year time window, there are some 2-year periods in the Small and Mid-Cap samples where it is not value relevant. Hence, EBITDA is not significant in 1998-1999 for Small-Caps, and in the periods of 2008-2009, 2014-2015, and 2020-2021 in the case of Mid-Cap companies. At this stage, it is understandable it is always value relevant in the Large-Cap sample. Nevertheless, it is also important to highlight that the sample for each time window in the Large-Cap sample is relatively smaller than in the other ones, which implies we should be more careful when looking about these results.

It must be mentioned that the results on Revenues are consistent with the time-static literature on the subject of New Economy Companies. On the other hand, the results obtained for EBITDA further support the studies which indicate Earnings are value relevant.

6.1.2. Comparison of the Explanatory Power of the Variables

It is evident from the results of the 5-year time periods that the Revenues variable always has a higher explanatory power than the EBITDA variable. The explanatory power of the variable is conveyed by the R^2 of the model where it is regressed against Market Value. Therefore, the R^2 of Model A is always higher than that of Model B for this time window. The period where they are the closest in relative terms for Small-Capitalization firms is 2005-2009, where model A's R^2 of 36.97% compares with Model B's of 14.94%. If a similar approach is taken with regards to Medium-Capitalization companies, these two variables' explanatory power is the closest in the 2000-2004 time interval. At the time, the model with Revenues explained 14.81% of the variation in the Market Value, while that with EBITDA explained 8.17% of the variation in the Market Value. Finally, if we look at Large-Caps, the relative gap between the R^2 of the model

with REV and that with EBITDA is the smallest also in 2005-2009. In that interval, Model A's R^2 stood at 54.39%. Comparatively, Model B's was of 39.52%.

Once attention is given to the 2-year time window, there are actually two periods where the explanatory power of EBITDA is indeed larger than that of Revenues. That has only happened with the Mid-Cap sample, and in the periods of 2000-2001 and 2010-2011. In the first mentioned time period, Revenues was able to explain 11.51% of the variation in the Market Value, which compared with the 11.89% explained by EBITDA. In the case of the second, the model featuring EBITDA had an R^2 of 19.64%, which was naturally higher than the 11.17% of the model which included Revenues.

It has been thus noticed that once the time horizon is shortened from 5 to 2 years, there are two periods in Mid-Cap companies where the explanatory power of EBITDA surpasses that conveyed by Revenues.

6.1.3. Time-Variability of the Variables' Explanatory Power

6.1.3.1. *Small-Capitalization Companies*

Among this type of firm, there has been a very mild variation in the explanatory power of Revenues across the 5-year window. R^2 lie between 14% and 19% except for the highest value of 36.97% in 2005-2009. A similar scenario may be observed in terms of EBITDA, as the explanatory power mostly lies between 2.5% and 5.5%, with the exception of a peak of 14.94% also during the 2005-2009 period.

Once the horizon shortens to 2-year periods, Revenues show much more time variability. The variable starts by explaining 4.12% and 5.51% of the contemporaneous variation of the Market Value of Software companies in both 1998-1999 and 2000-2001, respectively. After this last period, it jumps to 31.07% in 2002-2003. Revenues' R^2 remains at levels either close to or significantly higher than 30% until 2010-2011, when there is a very steady decline to 19.98%. Over the next three periods – between 2012 and 2017 – the R^2 associated with Revenues sits within the 12%-14% range, before jumping to levels higher than 20% for the last two periods.

EBITDA starts by having a similar pattern as Revenues in the 2-year horizon: it has an extremely weak explanatory power that will slightly climb in the 2002-2003 period. Its peak is reached in 2004-2005, when the R^2 is of 28.41%. The value would remain stable in the following period of 2006-2007, but would significantly decrease to 2008-2009, when it is weak. Ever since 2008-2009, the explanatory power of EBITDA would remain weak with the

exceptions of the 2012-2013 and 2014-2015 periods where it may be considered to be mild, as it lies between around 6.5% and 9%.

Small-Caps' explanatory power of Revenues is not so time variable when the horizon is a 5-year one. Once the shorter 2-year horizon is adopted, the variable is subject to several time variations in terms of its explanatory power. It starts by being weak prior to the dot-com bubble. After the technology crisis, it significantly increases to moderate levels. Although it remains mostly moderate, there are three periods – between 2012 and 2017, where it is mild. Small-Capitalization companies' EBITDA's explanatory profile is quite weak and not time-varying during the 5-year time window, as there is not much variation with the exception of the 2005-2009 period. However, when the time window decreases to 2-years, the pattern is different and it is subject to time varying patterns that may be divided into three or four periods of time.

6.1.3.2. Medium-Capitalization Companies

Revenues of Medium-Capitalization companies have a mild to moderate power during the 5-year time window. Time variability is practically non-existent and R^2 vary within the 11%-18% range. EBITDA's explanatory power is almost not time varying as well. In this case, however, there is a decrease in the explanatory power from mild in 2000-2004, where the R^2 was 8.17% to weak in the following periods, as it is always within the 2.5%-4% range.

Once the time window changes to the 2-year one, REV has some time variability. However, the explanatory power is also significantly more stable than in the Small-Cap sample. A weak explanatory power, in the form of a 6.27% R^2 in 1998-1999, jumps to the mild territory in 2000-2001. From that year onwards, it will vary between the 11%-20% range, with one important exception. Hence, once we disregard the exception, the explanatory power is mostly mild to moderate during the 2002-2019 period. The exception constitutes a big jump to the high moderate R^2 of 26% in 2004-2005. Finally, there is a significant decline in the R^2 associated with Revenues over the last period, 2020-2021, as it declines to 7.27% and may be categorized as weak.

After having analyzed the three previous cases, EBITDA in the shorter 2-year window presents itself as a surprise, given it is largely time-varying. Over the initial five periods, going from 1998 to 2007, the explanatory power oscillates between weak and mild every period. In the following one, 2008-2009, it reaches a stage where it is indeed null. After this null period, it recovers to a solid moderate power in 2010-2011, where R^2 reaches 19.64%. After this period, 2012-2013 has a weak power, and 2014-2015 is once again null. 2016-2017 is mild, with a

10.5% R^2 factor, which is followed by a weak and a null period, respectively, over the last two periods.

Contrarily to the 5-year window where there is no time variability in Revenues, there is some in the 2-year periods. Despite that, there are only three key changes in the explanatory strength, with two of them both in the initial and the last periods. EBITDA, on the contrary, is only subject to time variability from the first to the second periods in the 5-year sample, but is full of different explanatory capabilities in the shorter time window. An initial sloppy 10 years are followed by a hectic last 12 years, as far as explanatory capabilities are concerned.

6.1.3.3. Large-Capitalization Companies

Time variability in the Revenues' 5-year window explanatory power is subject to interpretation in the Large-Cap sample. Although it ranges between a lowest R^2 of 35.26% and a highest of 61.8%, it may be said that the explanatory power is always strong. On the other hand, we cannot say the same thing about EBITDA. Even though the explanatory capabilities are mostly moderate, when lying between around 13% and 21%, it is strong in the 2005-2009 period, as it reaches an R^2 factor of 39.52%.

We are faced with a similar issue when considering the smaller 2-year window. Revenues starts among the low portion of the strong explanatory power (c. 35%) from 1998 to 2001. Ever since 2002 and until 2015, it is always among the higher part of the explanatory power, as the R^2 is higher than 50%. After 2018, however, REV's explanatory power declines to 21.98%, where it may thus be considered moderate. It would decline even further in 2020-2021, to a mild 11.47%.

Between the years of 1998 and 2002, EBITDA's explanatory power in the 2-year periods goes from mild to moderate, and from moderate to strong. It remains strong from 2002 until 2011. This decade is followed by a period where it may be considered moderate, as the R^2 is 14.84%. After, it will remain moderate until it declines to a weak 7.63% explanatory power in 2018-2019. Finally, there is a very weak 1.36% R^2 over the last period.

The explanatory power of Revenues is so high that there are practically no relevant time-variability patterns in the longer 5-year intervals. Once the smaller 2-year periods are analyzed, there is some time variability on the edges of the time-periods considered in the window. Similarly, while there are also practically no large signs of time-variability in EBITDA during the wider time window, the situation changes when analyzing smaller intervals, as there are different explanatory dimensions in the initial and final periods.

6.1.3.4. General Comments

There are some general patterns among the results that are common to the three analyzed samples. While the explanatory power of the two variables always increases from the 1998-1999 period to the following one, the jump is even bigger from 2002-2003, with an exception in the case of EBITDA in the Mid-Cap sample. Additionally, apart from both variables in the Large-Cap sample, the explanatory power of both variables also climbs from 2002-2003 to 2004-2005. Also, there is always a decrease in R^2 of both variables to 2008-2009, except for REV in Large-Cap. Finally, both variables are faced with a severe decline in their explanatory role from 2018-2019 to 2020-2021 in all samples.

What is inferred from the previous paragraph is that while the explanatory power of both REV and EBITDA climbed with the arrival of the dot-com crisis, it declined during the global financial crisis as well as the period which featured the coronavirus outbreak. What is more, it has traditionally been the case that the explanatory power of both Model A and Model B has significantly improved in the period after the dot-com crisis, in a sign that they resorted back to the fundamentals after years where valuations were supported by less conventional factors, as it may be seen in the literature.

It is also concluded that time-variability is mostly grasped when concentrating on the smaller time-window. What is more, the time variability patterns are particularly different across Small, Mid and Large-Cap companies. While Small companies have significantly time-varying Revenues and an EBITDA which is not time varying, Mid-Caps are somewhat time-varying in Revenues and very time-varying in terms of its EBITDA. Finally, Large-Caps are less time varying in general, but both REV and LEV verify some characteristics of time-variability.

6.1.4. Relation Between the Independent Variables Revenues and EBITDA and the Market Value

When significant, the coefficients associated with Revenues and EBITDA always lie between 0 and 1. This pattern happens independently of the time window used and on the kind of sample depending on companies' Market Capitalization levels. This information is particularly insightful in the case of the Revenues¹³ variable. As the untransformed values for that variable

¹³ Information on EBITDA is considerably more difficult to assess for statistical reasons. As mentioned by Hand (2000), the degree and type of non-linearity between X and Y is captured by the parameter β . For non-negative values of a variable, X, the relation between X and Y is concave if $0 < \beta < 1$, linear if $\beta = 1$, and convex if $\beta > 1$. When X is negative but log-transformed, the relation between X and Y is concave if $-1 < \beta < 0$, linear if $\beta = -1$, and convex if $\beta < -1$. If $\beta = 0$, then X and Y are unrelated no matter what the sign of X.

are always positive, it may be concluded that the relationship between REV and MV is always a concave one.

6.2. Multivariate Models

6.2.1. Model C

6.2.1.1. *Global Takeaways from the Model*

6.2.1.1.1. *Small-Capitalization Companies*

Once we start by looking at the 5-year time window, both the LEV and the SP variables are simultaneously significant alongside Revenues in the initial two periods, that is, from 2000 to 2009. Hence, for this time horizon, LEV and SP are two market drivers which were taken into account alongside Revenues in the initial 10 years.

Nonetheless, in the smaller 2-year periods, these variables are only contemporaneously significant with Revenues in four periods. The initial three – 2002-2003, 2006-2007, and 2008-2009 – are part of the long period where this also happens in the bigger window, while 2010-2011 is the initial period after the 2005-2009 one. Hence, there are only these four periods, all within a 10 years range, where market participants seem to include firms' Net Debt position as well as the overall Equity Market circumstances in the same framework as Revenues when making their investment decisions in Small-Cap software companies.

6.2.1.1.2. *Medium-Capitalization Companies*

The scenario is a different one in the 5-year window as LEV and SP are significant in all periods. However, once attention is given to the smaller window, there is only important significance over the last two periods of 2018-2019 as well as 2020-2021. Therefore, there are significant differences when the time horizon changes for Mid-Cap companies when these two additional variables are included.

Thus, while investors looking at a longer 5-year horizon seem to consider LEV and SP alongside REV, those who focus on smaller 2-year ones only do so more sporadically. When taking our sample into account, that has only happened from 2018 to 2021.

6.2.1.1.3. *Large-Capitalization Companies*

For the Large-Cap sample, LEV and SP are rarely both significant alongside Revenues. That has only happened once in the 5-year window, in 2000-2005, while it has never happened in

the smaller 2-year periods. Thus, investors do not seem to be concerned with both the Net Debt direction of the company, the overall Equity Market environment as well as Revenues, together at a given point in time, when valuing a Large-Cap software company.

6.2.1.2. *Added-Value of the Model*

6.2.1.2.1. *Small-Capitalization Companies*

Even though all periods where all variables are significant register an increase in the adjusted R^2 vis-à-vis the univariate model, it is particularly high in the 2008-2009 and 2010-2011 intervals.

6.2.1.2.2. *Medium-Capitalization Companies*

While the increase in explanatory power driven by the inclusion of these two new variables is always noticeable in the smaller window, it is particularly identifiable in the larger one, namely in the three initial periods, going from 2000 to 2014. As an example, the adjusted R^2 of 2005-2009 compares with an R^2 of 14.02% in the univariate model.

6.2.1.2.3. *Large-Capitalization Companies*

The adjusted R^2 has an incremental explanatory power of more than 10 percentage points in the only period where all variables are significant, which means that the inclusion of these two independent variables is important in explaining the variation in Market Value.

6.2.1.3. *Net Debt Position's Capacity to Explain the Market Value Across Time*

6.2.1.3.1. *Small-Capitalization Companies*

Although LEV is also significant at the 5% level in the 2010-2014 period, it is only once again, individually from SP, in the smaller window. That will only happen in the 2018-2019 period. This result from the smaller time-periods leads us to believe this leverage indicator, for this sample, is mostly important alongside SP and its relevance is mostly concentrated in the initial half of the considered timeframe.

When significant, the LEV variable always adopts a negative coefficient. This means that, on average and everything else constant, when Revenues increase by 1%, companies with a positive Net Cash position will register a higher percentage increase in their Market Value than those with a positive Net Debt one.

6.2.1.3.2. *Medium-Capitalization Companies*

The LEV variable is also significant in 6 other periods where SP is not. These are: 2004-2005, 2006-2007, 2010-2011, 2012-2013, 2014-2015, and 2016-2017. Hence, it is possible to say that the Net Cash position has, overall, some impact in the valuation of Mid-Cap software companies.

When significant, its coefficient is also negative, which means that the interpretation is exactly the same as before.

6.2.1.3.3. *Large-Capitalization Companies*

Although LEV has rarely coincided with SP in significance, that has not happened because the latter is not an important variable.

While it is significant at the 0.5% level in all 5-year windows but 2010-2014, it has six periods in the smaller 2-year windows where it is also significant. That happens in 2000-2001, 2002-2003, 2004-2005, and 2006-2007, as far as the initial half of the timeframe is considered. Additionally, it is also significant from 2016 to 2019.

This also sustains the idea that the existence or not of Net Debt does play an important role in explaining the Market Value of Large-Cap software companies, which is somehow comparable with the Mid-Cap situation.

When significant, its coefficient is also negative, which means that the interpretation is very similar to the one already made in the Small-Cap case.

6.2.1.4. *Equity Market Environment's Capacity to Explain the Market Value Across Time*

6.2.1.4.1. *Small-Capitalization Companies*

The coefficient associated with SP is also significant in the 2010-2014 5-year period. What is more, if we look at the smaller windows, it is also so in 1998-1999, 2000-2001, and 2002-2003. Therefore, we see it is an important variable to consider when explaining the MV of software companies, particularly important over the initial years of the sample.

As the coefficient associated with the variable is also comprised between 0 and 1, we may conclude that, given the nature of the model, the relationship between SP and MV of Small-Caps is significant, when the variables are significant.

6.2.1.4.2. *Medium-Capitalization Companies*

In the case of Mid-Caps, SP is only significant once when LEV is not. The period is 2008-2009. Thus, we are indicated to say that the overall Equity Market conditions are not so important when considered on a standalone basis, as far as Mid-Capitalization companies are concerned. The behavior of the coefficient associated with SP is similar to the one already described with Small-Caps. Hence, its interpretation shall be the same.

6.2.1.4.3. *Large Capitalization Companies*

SP never shows interesting significance levels when LEV is also significant. Therefore, it may be concluded that it is not an important variable – neither on a standalone not together with LEV – in explaining the MV of Large-Cap software companies.

When significant at a level of at least 5%, the coefficient associated with SP is higher than one. When that happens, the relation between this variable and MV will be convex.

6.2.2. Model D

6.2.2.1. *Global Takeaways from the Model*

6.2.2.1.1. *Small-Capitalization Companies*

Over the 5-year time window, there is one period where pEBITDA is significant at the same time as REV, LEV and SP, and that period takes place in 2005-2009. Hence, the difference between positive and negative EBITDA was a key market force alongside REV, LEV and SP.

Contrarily, when time intervals are shortened to 2 years, there are two periods where pEBITDA joins REV, LEV and SP as a significant variable. The first is 2006-2007, which belongs to the 2005-2009 period, while the second is 2010-2011, which is the immediate next period. Therefore, once shorter intervals are taken into consideration, it is not very common to have pEBITDA as a variable which is a joint market force.

6.2.2.1.2. *Medium-Capitalization Companies*

When we start with longer periods, it is observable that pEBITDA is never significant at the same time as all other explanatory variables. On the other hand, it will be contemporaneously significant alongside REV, LEV and SP in the 2020-2021 once we account for shorter 2-year windows. Thus, under our analysis, pEBITDA is only an important value driver together with Revenues, the Net Cash position and the Equity Market environment in one period in the Mid-Cap case.

6.2.2.1.3. *Large-Capitalization Companies*

Unlike Mid-Capitalization companies, Large-Caps have all four explanatory variables as coincidentally significant during the 2000-2004 period. Hence, as far as this 5-year period is concerned, investors considered both the existence or not of EBITDA, the direction of the Net Debt position, and the performance of the S&P 500 as important variables alongside Revenues in driving the value of Large-Capitalization software companies.

Once time intervals are shortened, there is also only one period where all variables are significant, and that happens in 2000-2001. This period belongs to the larger 2000-2004 one, which also coincides with the period featuring the dot-com bubble.

6.2.2.2. *Added-Value of the Model*

6.2.2.2.1. *Small-Capitalization Companies*

Independently of the time window considered, the inclusion of pEBITDA has only been relatively important in increasing the adjusted R^2 obtained in Model C in the 2006-2007 period, where Model D's adjusted R^2 of 42.48% compares with the 40.73% of Model C.

6.2.2.2.2. *Medium-Capitalization Companies*

When we proceed to Mid-Caps, we see that even though all explanatory variables are only once coincidentally significant, the inclusion of the extra pEBITDA variable has provided a large increase in the model's explanatory power, when compared with Model C. The adjusted R^2 increases from 9.82% to 13.17% when this variable is added.

6.2.2.2.3. *Large-Capitalization Companies*

When all explanatory variables are significant, the inclusion of the pEBITDA variable proves to be instrumental in all Large-Cap samples. While the increase in explanatory power from Model C to Model D is of close to 5 percentage points in the larger time-window, it almost reaches the 10 percentage points in the smaller 2-year period.

6.2.2.3. *Earnings Direction Alongside Revenues' Capacity to Explain the Market Value Across Time*

6.2.2.3.1. *Small-Capitalization Companies*

Apart from the two previously referred periods where pEBITDA was significant, it is also individually significant in five others: 1998-1999, 2004-2005, 2014-2015, 2018-2019 as well as 2020-2021. It is, thus, noted that this variable had an important capacity to explain the

variation in Market Value during the third part of the period under consideration and in sporadic ones over the initial part of the sample.

The coefficient associated with the pEBITDA variable does not always have the same sign, which means that there are some situations where an increase in Revenues of 1% will actually, all else equal and on average, lead to a higher relative increase in the MV of Small-Cap software companies with positive EBITDA results while, while the contrary is also true in other circumstances.

6.2.2.3.2. *Medium-Capitalization Companies*

In addition to the 2020-2021 period, pEBITDA was also significant in 2010-2011, 2014-2015 and 2016-2017. The main takeaway that can be drawn on this variable in the case of Mid-Caps is that its incorporation in the model proves to be essentially useful over the last 10 years considered.

In that case, the coefficient associated with pEBITDA is negative which means that, on average and everything else constant, firms with negative EBITDA will actually have a higher relative increase in their MV for a 1% increase in Revenues.

6.2.2.3.3. *Large-Capitalization Companies*

In the case of Large-Capitalization companies, pEBITDA is significant in 2010-2014, as far as larger time windows are concerned. When we extend the exercise to the shorter windows, it is also significant in 1998-1999, 2004-2005, 2012-2013 and 2014-2015. These last two periods do coincide with the larger period where it is significant.

When significant, the coefficient associated with pEBITDA is always negative, which means that the interpretation drawn is the same as the one done with Mid-Caps.

It has been possible to observe, over the three samples in terms of Market Capitalization, that the pEBITDA variable has certain moments where it has had an impact in affecting the MV of software companies. It has been the most notorious in the case of Small-Cap companies.

6.2.3. Model E

6.2.3.1. *Global Takeaways from the Model*

6.2.3.1.1. *Small-Capitalizations*

All independent variables present in Model E are significant at least at the 5% level during the 2000-2004 time period. Once we look at the 2-year window frame, they are all significant in 2012-2013, which does not coincide with the 2000-2004 interval.

Therefore, it may be said that there are only two specific points in time, which are also dependent on the chosen time horizon, where LEV and SP are both market forces in driving the MV of Small-Cap software companies.

6.2.3.1.2. *Medium-Capitalizations*

In the case of Mid-Caps, there is also only one 5-year interval where all explanatory variables are significant at least at the 5% interval. That period is 2005-2009. On the other hand, there are no 2-year windows where we may observe the three variables being coincidentally significant. Hence, Mid-Caps do not see their MV being simultaneously explained by these three explanatory variables in the shorter horizon.

6.2.3.1.3. *Large-Capitalizations*

Contrarily to what we have seen until now, the three explanatory variables are never coincidentally significant in the considered 5-year periods. However, they are so in the 2020-2021 2-year period.

Contrarily to what has happened with Mid-Caps, LEV and SP are only taken into account by investors alongside EBITDA in explaining the MV in one 2-year window.

6.2.3.2. *Added-Value of the Model*

6.2.3.2.1. *Small-Capitalizations*

The inclusion of LEV and SP in a model with EBITDA has, in relative terms, led to a considerable increase in the explanatory power of the model in the 2000-2004 period. That happens as Model B's R^2 of 3.92% climbs to an adjusted 5.44%.

Although the increase is not so large in the 2-year interval, it still increases from 6.68% to 8.54%. Thus, when all variables are significant, the inclusion of LEV and SP provides a higher explanatory power to the model.

6.2.3.2.2. *Medium-Capitalizations*

Similarly to what has been mentioned in the Small-Cap case, the inclusion of SP and LEV has given an additional explanatory power during the period where all variables are significant, which in this case takes place in the 2005-2009 period. At the time, Model B's R^2 of 3.84% increases to 6.56%, in adjusted terms, with the inclusion of the LEV and SP variables.

6.2.3.2.3. Large-Capitalizations

Large-Cap companies present the most interesting case. Even though LEV and SP are only coincidentally significant with EBITDA in one period, their contribution to the increase in explanatory power is outstanding. Model B's R^2 of 1.36% will increase to an adjusted one of 12.42% with the inclusion of these two variables. This clearly signals the importance these two factors have had during the 2020-2021 period alongside EBITDA.

6.2.3.3. Net Debt Position's Capacity to Explain Market Value Across Time

6.2.3.3.1. Small-Capitalization Companies

LEV is also significant on a standalone basis in 2015-2019. Additionally, once we look at the smaller horizon, it is also significant in 2002-2003 and 2020-2021. What may be drawn from this information is that although this variable is somehow value relevant in the larger 5-year horizon, its relevance is significantly more reduced in the smaller time period.

When significant, the coefficient associated with LEV is positive, which means that, on average and everything else constant, Small-Cap companies with positive Net Debt will have a higher percentage increase in their MV when compared with companies which hold Cash in net terms when EBITDA increases by 1%.

6.2.3.3.2. Medium-Capitalization Companies

Once we move to Mid-Caps, LEV is also significant over the last two 5-year periods. On the other hand, there are only three additional periods where it is significant in the smaller windows. These are: 2004-2005, 2006-2007, and 2012-2013. It has thus become clear that once we consider smaller time windows, the value relevance of LEV significantly decreases. What is more, its value relevance in the 2-year window is mostly concentrated between 2004 and 2007.

Contrarily to what has been observed with Small-Cap companies, the coefficient associated with LEV is negative, which naturally implies that, on average and holding everything else constant, firms which hold Cash in net terms will have a higher relative increase in their Market Value when EBITDA increases by 1%.

6.2.3.3.3. Large-Capitalization Companies

In the Large-Cap subgroup we can only find a significant LEV in the 2000-2004 period as far as the larger 5-year time window is concerned. While this happens, it is also significant in 2002-2003, 2006-2007, and 2008-2009 in the smaller periods. What this implies is that while 2002-2003 is the only short period that coincides with the larger 2000-2004, the contribution of LEV

in a model with EBITDA in explaining companies' value is rather limited when we are considering Large-Cap corporations.

The coefficient associated with LEV is always positive except for the 2006-2007 interval. Hence, the interpretation to be made shall be the same as in Small-Cap companies with an exception in 2006-2007. Naturally, this last period shall have a similar interpretation to that of made in the case of Mid-Cap firms.

6.2.3.4. Equity Market Environment's Capacity to Explain the Market Value Across Time

6.2.3.4.1. Small-Capitalization Companies

Apart from 2000-2004, SP is also significant in 2010-2014. Once we move to the smaller windows, it is also so in 1998-1999 as well as 2006-2007. What may be concluded is that although this value brings some value relevancy with the 5-year periods, its value significantly reduces when the time window shrinks.

As the coefficient associated with SP is always bounded between 0 and 1 when it is significant, we may conclude that the relation between SP and MV is concave.

6.2.3.4.2. Medium-Capitalization Companies

This variable is only significant at the 5% level individually in 2008-2009. Hence, we can say that apart from that period in the 2-year time horizon and the 2005-2009 period where it coincides in value relevancy with the other variables, it is not an important driver of the valuation of software Mid-Cap companies when considered in the same model as EBITDA.

The coefficient is once again lying between 0 and 1, which means the interpretation to be made is the same as before.

6.2.3.4.3. Large-Capitalization Companies

Large-Caps, in turn, constitute an almost extreme case for the SP variable as it is only significant in 2020-2021 and when considered with LEV. Hence, there is not any time period where it is significant on a standalone basis and, hence, it is not an important explanatory factor of the variation of the MV of Large-Cap companies alongside EBITDA.

When significant, the coefficient associated with SP is once again comprehended between 0 and 1.

6.2.3.5. Comparison with Model C

When we compare Model C and Model D, which are very similar as the explanatory variables are almost the same, we see that LEV and SP are two additional variables which are substantially more relevant in explaining the value of companies when considered with Revenues rather than with EBITDA.

7 Conclusion and Further Research

Our model studied the impact key fundamental financial variables have on Software companies' Market Value. Once we have performed univariate regressions between Revenues and MV, our results show that, independently of the type of company, the time window and the period, REV always constitutes a value relevant variable. That is consistent with several studies in the literature. Ertimur, Livnat and Martikainen (2003), Jegadeesh and Livnat (2006), and Chandra and Ro (2008) suggest that Revenues are an insightful summary measure for valuation purposes for most types of company. Similarly, Trueman, Franco Wong and Zhang (2000), Lev and Zarowin, *The Boundaries of Financial Reporting and How to Extend Them* (1999) and Trautwein and Vorstius (2001) also present similar results, but applied to internet companies. On the other hand, EBITDA is not always a value relevant variable. EBITDA is not an effective variable in explaining the MV of software companies in the case of Small-Caps in 1998-1999, and in the case of Mid-Caps in 2008-2009, 2014-2015, and 2020-2021. Although there was no consensus in the literature on New Economy companies regarding the behavior of Earnings variables, this contradicts most of the existing research, which has not found any evidence that Earnings is value relevant.

Once we compare the explanatory power of the models featuring Revenues with those featuring EBITDA, Revenues almost always presents a higher explanatory power. There are only two small exceptions in the 2-year window Mid-Cap section, where EBITDA presents a higher R^2 in both 2000-2001 and 2010-2011. This is consistent with what has been claimed by Lev and Zarowin (1999) – as technology companies face an uncertain environment and of rapid change, Revenues are an effective explanatory variable. Also, as Lev and Sougiannis (1996) have highlighted, technology companies have larger than usual R&D expenses, which may be expensed. That makes Revenues more effective than Earnings-related variables. Additionally, the innovative approach of these types of companies also makes Revenues more useful when compared to Earnings Chandra, Wasley and Wavmire (2004).

When looking at the explanatory power of Revenues and EBITDA across samples and time, we realize it has important time varying characteristics. Although it is significantly more limited in the 5-year window, there are sharp changes in some of the smaller windows.

Small-Caps only show mild signs of time-variation for the 5-year window, while there is none in Mid and Large-Caps when it comes to Revenues. EBITDA is not an important explanatory variable for Small-Caps when looking at the larger window, while Mid-Caps are not time varying after the 2nd period, where the explanatory power is weak. Finally, Large-Caps have mild time variability, with EBITDA having mostly a moderate power in explaining the MV of Software companies.

Once we move to the shorter 2-year windows, it is observable that Revenues are very time-varying in Small-Capitalizations. They have a weak explanatory power prior to the dot-com bubble. It increases to the moderate range in the aftermath of that period. Mid-Caps have a similar pattern, but with less time-variability, while Large-Caps show a more stable behavior with the exception of the last two periods. As far as EBITDA is concerned, time-variable patterns are more noticeable than with Revenues. A weak power in Small-Caps prior to 2000 is followed by a mild to moderate until 2007. After that, it is mostly weak, but with relevant changes, namely in 2014-2015. Mid-Caps, in turn, show a very volatile explanatory power of EBITDA, where very different R^2 values are observable across time. Finally, Large-Caps have three clear periods. The first, from 1998 to 2002, sees EBITDA's explanatory power increase from mild to moderate, and from moderate to strong. The second, from 2002 to 2011 has a strong power, while the final decade is mostly moderate.

On a more macro level, it is clearly observable that these models' explanatory capabilities have a sharp increase in the period which coincides with the dot-com crisis. That increase is prolonged in time and typically follows through later periods. On the contrary, there are declines in R^2 during the global financial crisis as well as during the crisis induced by the coronavirus pandemic.

Once we look at the sign of the coefficients associated with Revenues, we realize that it indicates that there is a concave relation between Revenues and Market Value. On the contrary, there are times where the relation between SP and MV is not concave. Large-Cap companies have a convex relation between these variables in both the 2000-2004 and 2000-2001 periods.

Our models have yielded a negative relation between pEBITDA and MV in both the Mid and Large-Cap sample. This implies that, on average and holding all other factors constant, MV

will increase by a higher percentage value for loss-making companies when compared to the others, for each 1% increase in Revenue. This is somehow supported by the argument presented in the literature by Aggarwal, Bhagat and Rangan (2009) where negative Earnings may constitute a sign of growth opportunities which may be arising. Similarly, Chandra and Ro (2008) mention that Revenue increases are more important for loss-making firms than for positive Earnings companies. On the other hand, there is not a consensus result in our model for Small-Capitalization companies.

Regarding the presence of Net Debt on the Balance Sheet, there is a negative relation between the existence of Net Debt and the Market Value from the Revenue angle. Hence, independently of the size, companies with Net Cash see a higher percentage increase in MV than those which have Net Debt, on average and everything else constant, for a 1% increase in Revenues. On the contrary, except in Mid-Caps, there is an opposite behavior in the model with EBITDA. Hence, on average and everything else constant, when EBITDA increases by 1%, the relative increase in MV will be larger in firms with a Net Debt position than those with a Net Cash one.

Results from Model C, Model D and Model E are important because they let us understand whether these additional variables are considered alongside Revenues and EBITDA as relevant ones in explaining the Market Value of Equity. What is taken away from those results is that the incorporation of those variables is highly time variant and has proven to be more meaningful for the Small-Cap case than for the others. Additionally, its relevance also fades from Model C to Model E.

Let us start with the 5-year time window. All three explanatory variables are jointly significant over the initial 10 periods of Small-Caps, all Mid-Caps, and Large-Caps in 2000-2004 in Model C. Once we move to Model D, Small-Caps only have all variables coincidentally significant in 2005-2009 and Large-Caps in 2000-2004. Finally, Model E only has EBITDA, LEV and SP all significant in Small-Capitalizations in 2000-2004, and in the Mid-Cap case in 2005-2009.

Once we move to a shorter time horizon, this becomes even more noticeable. Model C has five periods where Revenues, LEV and SP are coincident market drivers of the Value of Small-Cap companies, while that only happens in two periods in the Mid-Cap case. On the other hand, it never happens with Large-Caps. When advancing to Model D, the considered variables are only coincidentally value relevant twice for Small-Caps, and once for both Mid-Caps and Large-Caps. At last, Model E only has EBITDA, LEV and SP as contemporaneous relevant drivers one in both Small and Large-Capitalization firms.

What is more, it is also important to notice from the multivariate models that while the model including Revenues mostly has LEV being relevant alongside SP, the latter is a crucial value driver. On the other hand, LEV's explanatory power increases significantly in the model with EBITDA, while SP falls considerably. Furthermore, it is not particularly relevant in explaining the MV alongside EBITDA.

Even though this paper provides important contributions to the literature, there are several angles which may be subject to either improvement or a more profound study in the future. On the one hand, this study only focuses on financial metrics. Thus, it would also be insightful to measure the explanatory power of industry-related measures such as Value-in-Use, Customer Acquisition Cost, or Customer Lifetime Value. On the other hand, it is also true this paper only presents an Earnings variable, EBITDA, without breaking-down its cost components. Hence, a research paper which could accurately survey companies on key expenses such as Research & Development could provide additional insights on the main operational cost components. Additionally, and still in the scope of the variables, it could be adequate to consider an additional layer of analysis. Hence, it would be beneficial if it would be possible to extract quarterly information on Cash-Flow, as then it would be possible to compare the behavior and explanatory power of both Earnings and Cash-Flow.

Finally, future research on this subject could further decouple companies based on their lifecycle stage, particularly taking into account earlier-stages and non-listed companies, as well as based on their business model. In this latter case, it would be interesting to compare Business-to-Business models with Business-to-Consumer, for example, as well as product-based business models with services-based business models.

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Appendix

Appendix 1 : Descriptive Statistics – Untransformed Data

Variable	No of Obs	<i>Data in \$mn</i>				
		Min	Max	Mean	Median	St Dev
All Sample						
MV	6 458	300,010	1 999,910	875,432	749,840	470,061
REV	6 458	0,000	2 222,000	114,370	64,820	470,061
EBITDA	6 458	-2 342,880	819,711	9,371	7,536	54,988
SP	6 458	797,870	4 766,180	1 670,429	1 362,160	765,833
5-year Frequency						
2000-2004						
MV	1 454	300,050	1 990,020	773,796	645,505	429,808
REV	1 454	0,092	1 366,000	84,862	50,705	99,101
EBITDA	1 454	-2 342,880	819,711	4,102	6,797	87,234
SP	1 454	815,290	1 498,580	1 165,157	1 147,390	189,172
2005-2009						
MV	1 456	300,010	1 995,980	843,887	700,950	465,250
REV	1 456	8,155	2 222,000	125,889	73,006	174,498
EBITDA	1 456	-1 408,877	439,600	15,148	11,487	48,730
SP	1 456	797,870	1 526,750	1 236,357	1 270,200	194,987
2010-2014						
MV	1 466	301,310	1 999,910	904,375	812,250	458,822
REV	1 466	0,000	1 207,000	119,536	71,792	163,045
EBITDA	1 466	-621,744	193,300	12,130	8,873	40,417
SP	1 466	1 030,710	2 058,900	1 484,308	1 408,470	301,313
2015-2019						
MV	1 488	300,300	1 996,460	991,754	934,985	501,769
REV	1 488	0,004	1 289,800	134,553	70,981	180,444
EBITDA	1 488	-491,000	189,487	6,881	3,940	35,803
SP	1 488	1 920,030	3 756,070	2 565,451	2 519,360	459,882

Table 11 : Small-Capitalization Companies – Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in \$mn

Variable	No of Obs	Min	Max	Mean	Median	St Dev
2-year Frequency						
1998-1999						
MV	416	300,050	1 982,500	801,206	687,415	426,770
REV	416	0,027	603,330	79,260	41,086	100,756
EBITDA	416	-64,071	87,982	9,338	6,800	20,310
SP	416	1 017,010	1 469,250	1 273,219	1 282,710	132,207
2000-2001						
MV	626	301,690	1 989,430	801,384	659,045	457,183
REV	626	0,092	778,782	73,529	37,971	101,782
EBITDA	626	-2 342,880	819,711	-4,361	2,631	128,396
SP	626	1 040,940	5 243 551,036	1 316,684	1 320,280	155,487
2002-2003						
MV	512	300,740	1 990,020	727,104	614,550	384,621
REV	512	8,021	1 366,000	96,372	62,169	102,757
EBITDA	512	-380,302	321,825	9,189	8,581	34,663
SP	512	815,290	1 147,390	989,969	989,810	110,642
2004-2005						
MV	609	300,050	1 993,660	800,123	662,570	454,662
REV	609	3,521	1 387,800	98,405	63,961	108,617
EBITDA	609	-272,064	179,195	13,842	10,267	20,088
SP	609	1 114,580	1 248,290	1 178,943	1 180,590	45,857
2006-2007						
MV	587	300,220	1 995,980	836,659	662,520	470,636
REV	587	8,155	2 222,000	112,336	63,202	179,508
EBITDA	587	-36,018	200,000	15,014	9,410	22,277
SP	587	1 270,200	1 526,750	1 409,123	1 420,860	89,115
2008-2009						
MV	576	300,010	1 988,190	870,593	757,750	455,070
REV	576	17,060	1 340,000	148,336	83,212	186,850
EBITDA	576	-1 408,877	439,600	15,282	13,481	71,972
SP	576	797,870	1 322,700	1 072,975	1 115,100	173,777
2010-2011						
MV	601	302,500	1 990,350	907,105	830,340	452,678
REV	601	0,000	1 207,000	129,526	75,326	170,870
EBITDA	601	-621,744	188,800	13,137	11,602	53,437
SP	601	1 030,710	1 325,830	1 207,432	1 257,600	96,972
2012-2013						
MV	583	301,310	1 999,910	900,008	796,300	463,947
REV	583	0,006	995,900	117,403	72,880	162,271
EBITDA	583	-270,220	193,300	13,139	7,605	29,684
SP	583	1 362,160	1 848,360	1 537,446	1 440,670	151,670
2014-2015						
MV	568	300,300	1 983,950	962,620	865,960	492,587
REV	568	0,268	1 071,000	107,563	65,716	142,912
EBITDA	568	-121,236	134,200	7,816	4,818	23,771
SP	568	1 872,340	2 067,890	1 994,267	1 972,290	69,929
2016-2017						
MV	481	305,290	1 989,410	1 024,748	1 001,580	485,591
REV	481	0,092	1 249,900	129,199	72,951	166,443
EBITDA	481	-112,901	131,543	8,248	3,980	25,296
SP	481	2 059,740	2 673,610	2 318,920	2 238,830	202,451
2018-2019						
MV	500	301,620	1 996,460	974,036	907,570	504,620
REV	500	0,004	1 289,800	148,714	69,789	204,872
EBITDA	500	-491,000	189,487	4,912	2,802	44,157
SP	500	2 506,850	3 230,780	2 849,567	2 913,980	211,170
2020-2021						
MV	399	300,290	1 981,900	927,006	780,490	503,852
REV	399	0,004	1 126,000	137,987	65,105	193,467
EBITDA	399	-477,000	189,000	5,496	2,544	47,290
SP	399	2 584,590	4 766,180	3 681,140	3 756,070	687,728

Table 12: Small-Capitalization Companies – Descriptive Statistics (2-Year Windows)

<i>Data in \$mn</i>						
Variable	No of Obs	Min	Max	Mean	Median	St Dev
All Sample						
MV	3 754	2 001,080	9 988,850	4 622,277	4 061,700	2 125,467
REV	3 754	1,347	41 407,000	584,773	265,458	1 794,140
EBITDA	3 754	-2 936,000	11 874,000	95,613	48,102	454,477
SP	3 754	797,870	4 766,180	2 091,276	1 940,130	961,659
5-year Frequency						
2000-2004						
MV	442	2 001,080	9 945,190	4 442,847	3 948,720	1 982,010
REV	442	1,667	5 762,000	573,364	300,262	844,668
EBITDA	442	-125,811	1 116,153	89,128	64,467	120,348
SP	442	815,290	1 498,580	1 168,730	1 147,390	199,131
2005-2009						
MV	525	2 005,240	9 970,980	4 626,220	4 129,910	2 098,327
REV	525	34,118	5 623,000	682,026	373,587	859,655
EBITDA	525	-902,380	1 120,600	115,617	82,172	150,285
SP	525	797,870	1 526,750	1 238,434	1 270,200	197,018
2010-2014						
MV	853	2 002,530	9 988,850	4 565,614	3 998,940	2 098,857
REV	853	14,624	10 218,000	587,545	273,882	1 015,116
EBITDA	853	-2 508,000	6 664,000	116,982	59,102	429,476
SP	853	1 030,710	2 058,900	1 554,365	1 440,670	310,102
2015-2019						
MV	1 192	2 011,160	9 985,450	4 694,354	4 029,690	2 234,306
REV	1 192	42,750	41 397,000	620,628	246,138	2 599,622
EBITDA	1 192	-921,000	11 874,000	106,085	34,397	682,745
SP	1 192	1 920,030	3 230,780	2 520,562	2 519,360	375,538

Table 13: Medium-Capitalization Companies – Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in \$mn

Variable	No of Obs	Min	Max	Mean	Median	St Dev
2-year Frequency						
1998-1999						
MV	177	2 001,920	9 855,560	4 387,675	3 778,940	2 149,189
REV	177	1,347	2 067,000	342,129	225,897	450,108
EBITDA	177	-168,480	849,013	82,413	55,663	123,868
SP	177	1 017,010	1 469,250	1 266,367	1 282,710	139,544
2000-2001						
MV	199	2 001,080	9 945,190	4 321,423	3 698,530	1 898,375
REV	199	1,667	2 897,100	413,029	229,093	543,145
EBITDA	199	-91,700	909,080	71,214	53,809	96,230
SP	199	1 040,940	1 498,580	1 324,292	1 436,510	158,526
2002-2003						
MV	151	2 007,010	9 928,880	4 614,035	4 047,340	2 065,536
REV	151	27,182	5 762,000	743,651	333,139	1 038,434
EBITDA	151	-125,811	1 116,153	110,467	82,965	152,400
SP	151	815,290	1 147,390	976,584	989,810	114,070
2004-2005						
MV	180	2 020,950	9 908,240	4 489,156	3 946,500	2 044,671
REV	180	28,849	5 238,000	619,069	317,636	884,304
EBITDA	180	-46,491	588,755	103,818	69,229	119,777
SP	180	1 114,580	1 248,290	1 180,285	1 185,960	47,029
2006-2007						
MV	213	2 005,240	9 970,980	4 818,970	4 513,250	2 194,574
REV	213	34,118	3 883,500	618,331	361,400	715,865
EBITDA	213	-254,972	1 120,600	102,403	75,952	133,573
SP	213	1 270,200	1 526,750	1 413,178	1 420,860	88,210
2008-2009						
MV	224	2 005,510	9 864,670	4 470,237	3 927,170	2 004,798
REV	224	67,653	5 623,000	776,201	427,400	992,748
EBITDA	224	-902,380	833,565	128,313	95,079	169,008
SP	224	797,870	1 322,700	1 081,696	1 115,100	171,579
2010-2011						
MV	275	2 007,430	9 988,850	4 672,732	4 106,820	2 237,600
REV	275	59,671	6 439,000	674,297	315,830	990,151
EBITDA	275	-112,544	3 278,000	137,441	74,495	303,298
SP	275	1 030,710	1 325,830	1 213,396	1 257,600	95,129
2012-2013						
MV	359	2 012,140	9 912,980	4 541,119	3 991,220	1 969,714
REV	359	32,178	10 218,000	635,956	277,131	1 232,098
EBITDA	359	-2 508,000	6 664,000	137,854	53,889	599,990
SP	359	1 362,160	1 848,360	1 564,012	1 569,190	160,742
2014-2015						
MV	419	2 002,530	9 872,510	4 662,672	4 079,620	2 178,527
REV	419	14,624	3 329,000	415,330	250,957	493,735
EBITDA	419	-395,000	573,000	57,449	41,452	94,220
SP	419	1 872,340	2 067,890	1 995,525	2 043,940	69,587
2016-2017						
MV	437	2 021,180	9 812,760	4 593,052	3 813,580	2 272,880
REV	437	64,878	27 860,000	727,727	285,887	2 577,441
EBITDA	437	-205,088	8 646,000	144,527	49,584	722,345
SP	437	2 059,740	2 673,610	2 329,185	2 362,720	203,206
2018-2019						
MV	555	2 011,160	9 985,450	4 710,005	4 165,230	2 208,600
REV	555	42,750	41 397,000	603,935	210,477	3 032,189
EBITDA	555	-921,000	11 874,000	93,195	18,234	765,661
SP	555	2 506,850	3 230,780	2 849,082	2 913,980	211,025
2020-2021						
MV	565	2 002,000	9 969,080	4 765,955	4 325,310	2 044,993
REV	565	39,351	41 407,000	499,517	166,054	2 060,813
EBITDA	565	-2 936,000	4 026,000	31,880	11,824	262,487
SP	565	2 584,590	4 766,180	3 768,785	3 756,070	659,893

Table 14: Medium-Capitalization Companies – Descriptive Statistics (2-Year Windows)

<i>Data in \$mn</i>						
Variable	No of Obs	Min	Max	Mean	Median	St Dev
All Sample						
MV	1 631	10 005,170	199 564,900	37 818,019	18 319,910	43 627,558
REV	1 631	2,797	110 328,000	3 609,541	977,096	8 100,851
EBITDA	1 631	-6 536,820	38 759,000	800,672	219,862	1 968,661
SP	1 631	797,870	4 766,180	2 492,324	2 506,850	1 100,146
5-year Frequency						
2000-2004						
MV	146	10 012,920	198 587,000	40 139,373	18 046,730	46 879,954
REV	146	18,144	27 671,000	3 857,426	823,000	6 919,575
EBITDA	146	-166,000	5 848,000	750,259	193,870	1 210,872
SP	146	815,290	1 498,580	1 203,498	1 160,330	183,685
2005-2009						
MV	161	10 076,570	172 929,800	53 378,719	20 240,040	51 599,656
REV	161	342,925	28 866,000	5 978,013	2 689,673	7 745,070
EBITDA	161	-6 536,820	7 727,000	1 356,526	553,000	1 874,635
SP	161	797,870	1 526,750	1 254,126	1 270,200	194,720
2010-2014						
MV	268	10 005,170	199 564,900	43 028,339	16 236,450	55 354,416
REV	268	211,964	29 019,000	3 779,959	1 221,843	5 721,878
EBITDA	268	-109,071	8 347,000	1 066,699	375,798	1 664,671
SP	268	1 030,710	2 058,900	1 548,094	1 440,670	313,782
2015-2019						
MV	540	10 006,120	196 251,400	34 878,154	17 091,385	42 668,954
REV	540	153,037	51 696,000	3 390,667	957,670	6 415,177
EBITDA	540	-437,105	38 759,000	796,668	206,822	2 221,128

Table 15: Large-Capitalization Companies – Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in \$mn

Variable	No of Obs	Min	Max	Mean	Median	St Dev
2-year Frequency						
1998-1999						
MV	45	10 182,460	170 150,800	37 181,809	18 889,850	43 266,272
REV	45	2,797	25 131,000	3 193,083	1 122,000	6 546,232
EBITDA	45	-647,000	6 719,000	700,330	157,404	1 450,391
SP	45	1 017,010	1 469,250	1 303,339	1 286,370	145,434
2000-2001						
MV	74	10 102,260	198 587,000	36 746,240	19 819,110	44 488,923
REV	74	18,144	22 826,000	2 627,265	479,398	5 365,972
EBITDA	74	-127,000	4 519,000	561,689	134,475	1 015,649
SP	74	1 040,940	1 498,580	1 331,945	1 320,280	144,100
2002-2003						
MV	42	10 012,920	176 084,800	46 635,251	16 938,020	50 342,421
REV	42	197,159	25 913,000	5 511,594	1 707,437	8 176,759
EBITDA	42	-166,000	5 141,000	990,394	417,997	1 335,747
SP	42	815,290	1 147,390	1 011,485	995,970	109,067
2004-2005						
MV	61	10 076,570	162 724,100	40 445,710	16 351,280	44 280,560
REV	61	403,713	27 671,000	4 561,981	1 501,152	7 490,458
EBITDA	61	-67,000	6 486,000	949,544	288,556	1 438,129
SP	61	1 114,580	1 248,290	1 183,742	1 191,330	44,744
2006-2007						
MV	73	10 143,780	164 017,900	48 251,809	17 725,890	49 834,976
REV	73	342,925	28 866,000	4 931,745	1 400,338	7 273,989
EBITDA	73	-20,486	7 040,000	1 121,469	496,000	1 480,816
SP	73	1 270,200	1 526,750	1 413,504	1 420,860	90,043
2008-2009						
MV	57	10 427,260	172 929,800	66 435,955	31 627,430	56 881,725
REV	57	697,507	27 230,000	8 095,467	5 453,000	8 323,866
EBITDA	57	-6 536,820	7 727,000	1 841,888	869,000	2 383,605
SP	57	797,870	1 322,700	1 073,414	1 115,100	173,560
2010-2011						
MV	88	10 164,080	198 963,900	47 365,602	15 601,950	58 049,156
REV	88	268,934	29 019,000	5 098,948	1 350,798	6 946,472
EBITDA	88	-40,000	8 293,000	1 313,004	394,151	1 783,705
SP	88	1 030,710	1 325,830	1 216,546	1 257,600	94,978
2012-2013						
MV	108	10 005,170	199 564,900	34 789,463	17 103,485	46 859,143
REV	108	250,492	14 514,000	2 842,584	1 195,658	4 032,382
EBITDA	108	-88,622	5 796,000	826,395	383,610	1 328,627
SP	108	1 362,160	1 848,360	1 537,952	1 440,670	161,135
2014-2015						
MV	147	10 061,750	197 479,600	47 768,090	15 919,920	59 286,440
REV	147	211,964	24 364,000	3 549,860	1 162,158	5 879,693
EBITDA	147	-305,950	8 347,000	1 059,904	296,247	1 833,254
SP	147	1 872,340	2 067,890	1 998,672	2 043,940	69,359
2016-2017						
MV	174	10 011,640	195 720,300	32 918,841	16 337,470	40 308,750
REV	174	181,671	22 542,000	3 357,977	1 006,000	5 565,054
EBITDA	174	-437,105	5 753,000	632,569	208,368	1 105,450
SP	174	2 059,740	2 673,610	2 355,821	2 362,720	205,016
2018-2019						
MV	291	10 006,120	196 251,400	33 300,946	17 609,310	39 624,543
REV	291	153,037	51 696,000	3 375,138	895,800	7 029,056
EBITDA	291	-329,935	38 759,000	843,326	196,976	2 761,627
SP	291	2 506,850	3 230,780	2 864,700	2 913,980	208,085
2020-2021						
MV	471	10 113,050	190 449,500	32 246,046	20 876,130	29 522,605
REV	471	110,524	110 328,000	2 916,857	672,000	10 958,081
EBITDA	471	-580,350	31 704,000	489,101	120,616	2 029,338
SP	471	2 584,590	4 766,180	3 860,307	3 972,890	621,321

Table 16: Large-Capitalization Companies – Descriptive Statistics (2-Year Windows)

Appendix 2: Descriptive Statistics – Transformed Data

<i>Data in logs</i>									
Variable	No of Obs	No of Comp	Min	Max	Mean	Median	St Dev	Skewness	Kurtosis
All Sample									
MV	6 458	466	5,704	7,601	6,628	6,620	0,547	0,037	-1,204
REV	6 458	466	0,000	7,707	4,235	4,187	1,008	-0,184	1,461
EBITDA	6 458	466	-7,760	6,710	1,408	2,144	2,246	-0,956	0,036
pEBITDA	6 458	466	0,000	1,000	0,758	1,000	0,428	-1,205	-0,548
LEV	6 458	466	0,000	1,000	0,253	0,000	0,435	1,137	-0,706
SP	6 458	466	6,682	8,469	7,338	7,217	0,387	0,837	0,035
5-year Frequency									
2000-2004									
MV	1 454	221	5,704	7,596	6,510	6,470	0,526	0,295	-1,025
REV	1 454	221	0,088	7,220	3,977	3,946	1,001	-0,202	0,454
EBITDA	1 454	221	-7,760	6,710	1,204	2,054	2,279	-0,995	0,177
pEBITDA	1 454	221	0,000	1,000	0,746	1,000	0,436	-1,129	-0,727
LEV	1 454	221	0,000	1,000	0,158	0,000	0,365	1,875	1,519
SP	1 454	221	6,704	7,312	7,047	7,045	0,163	-0,110	-0,514
2005-2009									
MV	1 456	170	5,704	7,599	6,590	6,552	0,545	0,154	-1,176
REV	1 456	170	2,214	7,707	4,390	4,304	0,888	0,496	0,217
EBITDA	1 456	170	-7,251	6,088	2,193	2,525	1,627	-1,791	4,562
pEBITDA	1 456	170	0,000	1,000	0,908	1,000	0,289	-2,826	5,992
LEV	1 456	170	0,000	1,000	0,284	0,000	0,451	0,957	-1,085
SP	1 456	170	6,682	7,331	7,106	7,147	0,170	-0,892	0,173
2010-2014									
MV	1 466	185	5,708	7,601	6,672	6,700	0,531	-0,099	-1,122
REV	1 466	185	0,000	7,097	4,318	4,288	0,957	-0,345	3,369
EBITDA	1 466	185	-6,434	5,269	1,690	2,290	2,098	-1,144	0,737
pEBITDA	1 466	185	0,000	1,000	0,805	1,000	0,396	-1,540	0,374
LEV	1 466	185	0,000	1,000	0,272	0,000	0,445	1,025	-0,951
SP	1 466	185	6,938	7,630	7,283	7,250	0,199	0,218	-1,036
2015-2019									
MV	1 267	159	5,705	7,599	6,769	6,860	0,555	-0,286	-1,196
REV	1 267	159	0,004	7,163	4,409	4,273	0,960	-0,067	2,123
EBITDA	1 267	159	-6,198	5,250	0,715	1,602	2,552	-0,329	-1,248
pEBITDA	1 267	159	0,000	1,000	0,606	1,000	0,489	-0,435	-1,814
LEV	1 267	159	0,000	1,000	0,302	0,000	0,459	0,862	-1,259
SP	1 267	159	7,560	8,080	7,797	7,793	0,153	0,141	-1,266

Table 17: Small-Capitalization Companies Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
1998-1999									
MV	416	123	5,704	7,592	6,551	6,533	0,520	0,154	-1,016
REV	416	123	0,027	6,404	3,744	3,740	1,177	-0,083	-0,283
EBITDA	416	123	-4,175	4,488	1,268	2,054	2,111	-0,772	-0,491
pEBITDA	416	123	0,000	1,000	0,736	1,000	0,442	-1,072	-0,855
LEV	416	123	0,000	1,000	0,180	0,000	0,385	1,669	0,790
SP	416	123	6,925	7,293	7,144	7,157	0,106	-0,367	-0,492
2000-2001									
MV	626	178	5,709	7,596	6,535	6,491	0,546	0,281	-1,125
REV	626	178	0,088	6,659	3,682	3,663	1,139	-0,056	0,143
EBITDA	626	178	-7,760	6,710	0,468	1,289	2,505	-0,453	-0,657
pEBITDA	626	178	0,000	1,000	0,607	1,000	0,489	-0,439	-1,813
LEV	626	178	0,000	1,000	0,142	0,000	0,350	2,054	2,227
SP	626	178	6,948	7,312	7,176	7,186	0,121	-0,395	-1,263
2002-2003									
MV	512	120	5,706	7,596	6,464	6,421	0,492	0,337	-0,852
REV	512	120	2,200	7,220	4,207	4,146	0,851	0,208	-0,513
EBITDA	512	120	-5,944	5,777	1,577	2,260	2,117	-1,358	1,172
pEBITDA	512	120	0,000	1,000	0,820	1,000	0,384	-1,674	0,804
LEV	512	120	0,000	1,000	0,152	0,000	0,360	1,941	1,773
SP	512	120	6,704	7,045	6,891	6,898	0,113	-0,170	-1,169
2004-2005									
MV	609	121	5,704	7,598	6,532	6,496	0,551	0,230	-1,154
REV	609	121	1,509	7,236	4,242	4,174	0,805	0,410	0,147
EBITDA	609	121	-5,610	5,194	2,165	2,422	1,419	-1,732	3,949
pEBITDA	609	121	0,000	1,000	0,918	1,000	0,275	-3,052	7,339
LEV	609	121	0,000	1,000	0,204	0,000	0,403	1,476	0,178
SP	609	121	7,016	7,130	7,072	7,074	0,039	-0,055	-1,404
2006-2007									
MV	587	125	5,705	7,599	6,577	6,496	0,550	0,208	-1,196
REV	587	125	2,214	7,707	4,242	4,162	0,908	0,548	0,362
EBITDA	587	125	-3,611	5,303	2,059	2,343	1,511	-1,223	1,751
pEBITDA	587	125	0,000	1,000	0,896	1,000	0,305	-2,603	4,790
LEV	587	125	0,000	1,000	0,249	0,000	0,433	1,166	-0,644
SP	587	125	7,147	7,331	7,249	7,259	0,064	-0,331	-1,322
2008-2009									
MV	576	108	5,704	7,595	6,633	6,630	0,525	0,064	-1,111
REV	576	108	2,894	7,201	4,585	4,433	0,851	0,592	0,212
EBITDA	576	108	-7,251	6,088	2,285	2,673	1,852	-2,107	5,387
pEBITDA	576	108	0,000	1,000	0,905	1,000	0,294	-2,760	5,638
LEV	576	108	0,000	1,000	0,359	0,000	0,480	0,588	-1,660
SP	576	108	6,682	7,187	6,965	7,017	0,166	-0,244	-1,171

Table 18: Small-Capitalization Companies Descriptive Statistics (2-Year Windows – 1998-2009)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
2010-2011									
MV	601	117	5,712	7,596	6,677	6,722	0,530	-0,160	-1,106
REV	601	117	0,000	7,097	4,416	4,335	0,929	-0,253	3,701
EBITDA	601	117	-6,434	5,246	2,133	2,534	1,841	-1,896	4,537
pEBITDA	601	117	0,000	1,000	0,890	1,000	0,313	-2,502	-0,994
LEV	601	117	0,000	1,000	0,308	0,000	0,462	0,835	-1,308
SP	601	117	6,938	7,190	7,093	7,137	0,082	-0,475	-0,858
2012-2013									
MV	583	127	5,708	7,601	6,666	6,680	0,532	-0,035	-1,158
REV	583	127	0,006	6,905	4,281	4,302	0,988	-0,405	3,090
EBITDA	583	127	-5,603	5,269	1,861	2,152	2,085	-0,963	0,239
pEBITDA	583	127	0,000	1,000	0,794	1,000	0,405	-1,459	0,129
LEV	583	127	0,000	1,000	0,268	0,000	0,443	1,053	-0,895
SP	583	127	7,217	7,522	7,333	7,273	0,096	0,598	-0,783
2014-2015									
MV	568	115	5,705	7,593	6,728	6,764	0,548	-0,174	-1,118
REV	568	115	0,237	6,977	4,269	4,200	0,882	-0,197	3,352
EBITDA	568	115	-4,806	4,907	0,861	1,761	0,548	-0,174	-1,118
pEBITDA	568	115	0,000	1,000	0,636	1,000	0,482	-0,565	-1,687
LEV	568	115	0,000	1,000	0,222	0,000	0,416	1,343	-0,198
SP	568	115	7,535	7,634	7,597	7,587	0,035	-0,467	-1,213
2016-2017									
MV	481	102	5,721	7,596	6,803	6,909	0,532	-0,360	-1,087
REV	481	102	0,088	7,132	4,432	4,303	0,900	-0,051	2,607
EBITDA	481	102	-4,735	4,887	0,788	1,605	2,464	-0,332	-1,293
pEBITDA	481	102	0,000	1,000	0,620	1,000	0,486	-0,494	-1,763
LEV	481	102	0,000	1,000	0,283	0,000	0,451	0,968	-1,068
SP	481	102	7,630	7,891	7,745	7,714	0,086	0,238	-1,192
2018-2019									
MV	500	110	5,709	7,599	6,729	6,811	0,573	-0,218	-1,322
REV	500	110	0,004	7,163	4,421	4,260	1,081	-0,148	1,465
EBITDA	500	110	-6,198	5,250	0,578	1,335	2,656	-0,273	-1,197
pEBITDA	500	110	0,000	1,000	0,582	1,000	0,494	-0,334	-1,896
LEV	500	110	0,000	1,000	0,358	0,000	0,480	0,594	-1,654
SP	500	110	7,827	8,080	7,952	7,977	0,074	-0,038	-0,652
2020-2021									
MV	399	97	5,705	7,592	6,675	6,660	0,573	-0,050	-1,283
REV	399	97	0,004	7,027	4,258	4,191	1,223	-0,468	1,527
EBITDA	399	97	-6,170	5,247	0,603	1,265	2,590	-0,263	-1,090
pEBITDA	399	97	0,000	1,000	0,589	1,000	0,493	-0,363	-1,878
LEV	399	97	0,000	1,000	0,331	0,000	0,471	0,722	-1,486
SP	399	97	7,857	8,469	8,193	8,231	0,194	-0,393	-0,966

Table 19: Small-Capitalization Companies Descriptive Statistics (2-Year Windows – 2010-2021)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
All Sample									
MV	3 754	238	7,601	9,209	8,337	8,309	0,450	0,167	-1,070
REV	3 754	238	0,298	10,631	5,662	5,581	1,038	0,430	1,695
EBITDA	3 754	238	-7,985	9,382	2,724	3,894	3,021	-1,247	0,358
pEBITDA	3 754	238	0,000	1,000	0,802	1,000	0,399	-1,515	0,295
LEV	3 754	238	0,000	1,000	0,342	0,000	0,474	0,669	-1,554
SP	3 754	238	6,682	8,469	7,546	7,570	0,443	0,207	-0,954
5-year Frequency									
2000-2004									
MV	442	65	7,601	9,205	8,306	8,281	0,427	0,232	-0,867
REV	442	65	0,511	8,659	5,680	5,705	1,222	-0,530	1,477
EBITDA	442	65	-4,843	7,019	3,500	4,182	2,322	-2,061	3,811
pEBITDA	442	65	0,000	1,000	0,907	1,000	0,290	-2,817	5,964
LEV	442	65	0,000	1,000	0,267	0,000	0,443	1,057	-0,886
SP	442	65	6,704	7,312	7,049	7,045	0,173	-0,158	-0,694
2005-2009									
MV	525	54	7,604	9,207	8,340	8,326	0,446	0,129	-1,046
REV	525	54	3,530	8,635	6,045	5,923	0,917	0,525	0,273
EBITDA	525	54	-6,806	7,023	4,105	4,421	1,841	-3,276	13,231
pEBITDA	525	54	0,000	1,000	0,960	1,000	0,196	-4,708	20,245
LEV	525	54	0,000	1,000	0,274	0,000	0,447	1,015	-0,974
SP	525	54	6,682	7,331	7,108	7,147	0,171	-0,875	0,106
2010-2014									
MV	853	98	7,602	9,209	8,324	8,294	0,451	0,163	-1,122
REV	853	98	2,683	9,232	5,750	5,613	1,007	0,684	0,526
EBITDA	853	98	-7,828	8,805	3,336	4,096	2,535	-1,738	2,655
pEBITDA	853	98	0,000	1,000	0,875	1,000	0,331	-2,266	3,141
LEV	853	98	0,000	1,000	0,301	0,000	0,459	0,868	-1,250
SP	853	98	6,938	7,630	7,329	7,273	0,202	-0,069	-1,192
2015-2019									
MV	1 192	136	7,606	9,209	8,345	8,301	0,467	0,185	-1,168
REV	1 192	136	3,755	10,631	5,624	5,506	0,949	1,157	3,203
EBITDA	1 192	136	-6,827	9,382	2,160	3,567	3,232	-0,838	-0,646
pEBITDA	1 192	136	0,000	1,000	0,736	1,000	0,441	-1,071	-0,855
LEV	1 192	136	0,000	1,000	0,405	0,000	0,491	0,387	-1,854
SP	1 192	136	7,560	8,080	7,821	7,832	0,150	-0,066	-1,224

Table 20: Medium-Capitalization Companies Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
1998-1999									
MV	177	55	7,602	9,196	8,278	8,237	0,460	0,345	-0,935
REV	177	55	0,298	7,634	5,176	5,420	1,261	-0,686	1,341
EBITDA	177	55	-5,133	6,745	3,188	4,037	2,579	-1,679	1,987
pEBITDA	177	55	0,000	1,000	0,859	1,000	0,349	-2,078	2,344
LEV	177	55	0,000	1,000	0,164	0,000	0,371	1,832	1,372
SP	177	55	6,925	7,293	7,138	7,157	0,112	-0,283	-0,719
2000-2001									
MV	199	58	7,601	9,205	8,282	8,216	0,420	0,257	-0,920
REV	199	58	0,511	7,971	5,258	5,434	1,378	-0,525	0,389
EBITDA	199	58	-4,529	6,814	3,088	4,004	2,496	-1,588	1,611
pEBITDA	199	58	0,000	1,000	0,869	1,000	0,338	-2,209	2,907
LEV	199	58	0,000	1,000	0,256	0,000	0,438	1,125	-0,742
SP	199	58	6,948	7,312	7,181	7,270	0,124	-0,561	-1,132
2002-2003									
MV	151	32	7,604	9,203	8,341	8,306	0,439	0,134	-0,967
REV	151	32	3,303	8,659	6,101	5,809	0,921	0,652	1,103
EBITDA	151	32	-4,843	7,019	3,771	4,430	2,383	-2,471	5,829
pEBITDA	151	32	0,000	1,000	0,921	1,000	0,271	-3,141	7,971
LEV	151	32	0,000	1,000	0,278	0,000	0,450	1,000	-1,013
SP	151	32	6,704	7,045	6,877	6,898	0,117	0,013	-1,284
2004-2005									
MV	180	36	7,611	9,201	8,315	8,281	0,429	0,304	-0,745
REV	180	36	3,362	8,564	5,894	5,761	0,967	0,371	0,972
EBITDA	180	36	-3,861	6,380	4,068	4,252	1,448	-2,745	12,525
pEBITDA	180	36	0,000	1,000	0,978	1,000	0,148	-6,537	41,191
LEV	180	36	0,000	1,000	0,272	0,000	0,446	1,032	-0,945
SP	180	36	7,016	7,130	7,073	7,078	0,040	-0,063	-1,450
2006-2007									
MV	213	42	7,604	9,207	8,376	8,415	0,463	-0,006	-1,121
REV	213	42	3,530	8,264	5,979	5,890	0,909	0,391	-0,007
EBITDA	213	42	-5,545	7,023	4,028	4,343	1,716	-3,357	14,627
pEBITDA	213	42	0,000	1,000	0,962	1,000	0,191	-4,899	22,210
LEV	213	42	0,000	1,000	0,277	0,000	0,449	1,004	-1,002
SP	213	42	7,147	7,331	7,252	7,259	0,063	-0,395	-1,233
2008-2009									
MV	224	42	7,604	9,197	8,311	8,276	0,433	0,198	-0,964
REV	224	42	4,214	8,635	6,172	6,058	0,897	0,786	0,309
EBITDA	224	42	-6,806	6,727	4,144	4,565	2,124	-3,156	10,824
pEBITDA	224	42	0,000	1,000	0,946	1,000	0,226	-3,992	14,062
LEV	224	42	0,000	1,000	0,272	0,000	0,446	1,030	-0,948
SP	224	42	6,682	7,187	6,973	7,017	0,163	-0,327	-1,087

Table 21: Medium-Capitalization Companies Descriptive Statistics (2-Year Windows – 1998-2009)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
2010-2011									
MV	275	52	7,605	9,209	8,336	8,320	0,478	0,101	-1,208
REV	275	52	4,089	8,770	5,934	5,755	0,980	0,734	0,331
EBITDA	275	52	-4,732	8,095	4,142	4,324	1,619	-2,563	10,388
pEBITDA	275	52	0,000	1,000	0,964	1,000	0,188	-4,981	22,975
LEV	275	52	0,000	1,000	0,291	0,000	0,455	0,926	-1,151
SP	275	52	6,938	7,190	7,098	7,137	0,080	-0,540	-0,748
2012-2013									
MV	359	68	7,607	9,202	8,332	8,292	0,421	0,188	-0,989
REV	359	68	3,471	9,232	5,723	5,624	1,083	0,711	0,404
EBITDA	359	68	-7,828	8,805	3,096	4,005	2,770	-1,408	1,498
pEBITDA	359	68	0,000	1,000	0,838	1,000	0,369	-1,847	1,419
LEV	359	68	0,000	1,000	0,262	0,000	0,440	1,088	-0,821
SP	359	68	7,217	7,522	7,350	7,358	0,101	0,367	-1,079
2014-2015									
MV	419	80	7,602	9,198	8,339	8,314	0,467	0,104	-1,235
REV	419	80	2,683	8,110	5,621	5,525	0,856	0,421	0,248
EBITDA	419	80	-5,981	6,353	2,649	3,748	2,952	-1,399	0,606
pEBITDA	419	80	0,000	1,000	0,811	1,000	0,392	-1,598	0,557
LEV	419	80	0,000	1,000	0,394	0,000	0,489	0,436	-1,818
SP	419	80	7,535	7,634	7,598	7,623	0,035	-0,516	-1,142
2016-2017									
MV	437	82	7,611	9,191	8,318	8,246	0,473	0,314	-1,158
REV	437	82	4,173	10,235	5,816	5,656	0,931	1,279	3,601
EBITDA	437	82	-5,328	9,065	2,835	3,924	2,964	-1,227	0,446
pEBITDA	437	82	0,000	1,000	0,812	1,000	0,391	-1,606	0,581
LEV	437	82	0,000	1,000	0,430	0,000	0,496	0,283	-1,929
SP	437	82	7,630	7,891	7,750	7,768	0,087	0,181	-1,219
2018-2019									
MV	555	108	7,606	9,209	8,351	8,335	0,461	0,162	-1,124
REV	555	108	3,755	10,631	5,452	5,349	0,969	1,406	4,227
EBITDA	555	108	-6,827	9,382	1,479	2,957	0,487	-0,455	-1,192
pEBITDA	555	108	0,000	1,000	0,652	1,000	0,477	-0,641	-1,595
LEV	555	108	0,000	1,000	0,384	0,000	0,487	0,479	-1,777
SP	555	108	7,827	8,080	7,952	7,977	0,074	-0,026	-0,625
2020-2021									
MV	565	118	7,602	9,207	8,379	8,372	0,425	0,061	-0,930
REV	565	118	3,673	10,631	5,393	5,112	0,995	1,262	2,063
EBITDA	565	118	-7,985	8,301	0,956	2,551	3,581	-0,300	-1,429
pEBITDA	565	118	0,000	1,000	0,584	1,000	0,493	-0,342	-1,890
LEV	565	118	0,000	1,000	0,444	0,000	0,497	0,225	-1,956
SP	565	118	7,857	8,469	8,218	8,231	8,231	-0,583	0,185

Table 22: Medium-Capitalization Companies Descriptive Statistics (2-Year Windows – 2010-2021)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
All Sample									
MV	1 631	99	9,211	12,204	10,118	9,816	0,824	1,085	0,059
REV	1 631	99	1,029	11,611	7,114	6,885	1,337	0,621	0,565
EBITDA	1 631	99	-8,785	10,565	4,327	5,398	3,775	-1,482	1,113
pEBITDA	1 631	99	0,000	1,000	0,847	1,000	0,360	-1,933	1,739
LEV	1 631	99	0,000	1,000	0,356	0,000	0,479	0,601	-1,641
SP	1 631	99	6,682	8,469	7,717	7,827	0,468	-0,182	-1,125
5-year Frequency									
2000-2004									
MV	146	21	9,212	12,199	10,136	9,801	0,880	0,987	-0,270
REV	146	21	2,898	10,228	7,028	6,713	1,570	0,302	-0,228
EBITDA	146	21	-5,118	8,674	5,040	5,272	2,971	-2,164	4,679
pEBITDA	146	21	0,000	1,000	0,918	1,000	0,276	-3,074	7,553
LEV	146	21	0,000	1,000	0,356	0,000	0,481	0,607	-1,654
SP	146	21	6,704	7,312	7,081	7,056	0,155	-0,274	-0,376
2005-2009									
MV	161	15	9,218	12,061	10,382	9,915	1,011	0,408	-1,553
REV	161	15	5,838	10,270	7,911	7,897	1,270	0,339	-1,083
EBITDA	161	15	-8,785	8,953	6,321	6,317	2,026	-3,730	23,236
pEBITDA	161	15	0,000	1,000	0,981	1,000	0,136	-7,187	50,270
LEV	161	15	0,000	1,000	0,323	0,000	0,469	0,764	-1,434
SP	161	15	6,682	7,331	7,121	7,147	0,168	-0,986	0,487
2010-2014									
MV	268	25	9,211	12,204	10,104	9,695	0,944	1,217	0,000
REV	268	25	5,356	10,276	7,445	7,108	1,158	0,859	-0,234
EBITDA	268	25	-4,701	9,030	5,605	5,932	2,480	-2,218	6,503
pEBITDA	268	25	0,000	1,000	0,955	1,000	0,207	-4,427	17,732
LEV	268	25	0,000	1,000	0,134	0,000	0,342	2,157	2,672
SP	268	25	6,938	7,630	7,324	7,273	0,203	0,022	-1,215
2015-2019									
MV	540	51	9,211	12,187	10,042	9,746	0,794	1,331	0,770
REV	540	51	5,031	10,853	7,190	6,864	1,219	0,934	0,219
EBITDA	540	51	-6,082	10,565	4,347	5,337	3,723	-1,506	1,179
pEBITDA	540	51	0,000	1,000	0,848	1,000	0,359	-1,946	1,792
LEV	540	51	0,000	1,000	0,380	0,000	0,486	0,497	-1,759
SP	540	51	7,560	8,080	7,847	7,879	0,148	-0,304	-1,066

Table 23: Large-Capitalization Companies Descriptive Statistics (Entire Sample & 5-Year Windows)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
1998-1999									
MV	45	19	9,228	12,044	10,097	9,846	0,843	1,047	0,077
REV	45	19	1,029	10,132	6,518	7,023	1,974	-0,445	0,817
EBITDA	45	19	-6,474	8,813	4,443	5,065	3,534	-1,790	2,738
pEBITDA	45	19	0,000	1,000	0,867	1,000	0,344	-2,232	3,120
LEV	45	19	0,000	1,000	0,444	0,000	0,503	0,231	-2,039
SP	45	19	6,925	7,293	7,166	7,160	0,115	-0,546	-0,628
2000-2001									
MV	74	18	9,221	12,199	10,109	9,894	0,792	1,235	0,825
REV	74	18	2,898	10,036	6,565	6,173	1,596	0,370	-0,139
EBITDA	74	18	-4,852	8,416	4,336	4,909	3,453	4,909	1,905
pEBITDA	74	18	0,000	1,000	0,865	1,000	0,344	-2,179	2,823
LEV	74	18	0,000	1,000	0,338	0,000	0,476	0,700	-1,553
SP	74	18	6,948	7,312	7,188	7,186	0,112	-0,545	-0,939
2002-2003									
MV	42	11	9,212	12,079	10,229	9,735	1,004	1,004	-1,218
REV	42	11	5,284	10,163	7,566	7,441	1,472	0,448	-0,874
EBITDA	42	11	-5,118	8,545	5,823	6,023	2,184	-3,019	14,918
pEBITDA	42	11	0,000	1,000	0,976	1,000	0,154	-6,481	42,000
LEV	42	11	0,000	1,000	0,381	0,000	0,492	0,509	-1,831
SP	42	11	6,704	7,045	6,913	6,904	0,110	-0,444	-0,855
2004-2005									
MV	61	12	9,218	12,000	10,153	9,702	0,893	0,910	-0,700
REV	61	12	6,001	10,228	7,507	7,314	1,257	0,851	-0,230
EBITDA	61	12	-4,220	8,778	5,858	5,668	2,069	-3,059	13,615
pEBITDA	61	12	0,000	1,000	0,967	1,000	0,180	-5,380	27,863
LEV	61	12	0,000	1,000	0,328	0,000	0,473	0,752	-1,484
SP	61	12	7,016	7,130	7,076	7,083	0,038	-0,264	-1,267
2006-2007									
MV	73	13	9,225	12,008	10,255	9,783	1,014	0,603	-1,407
REV	73	13	5,838	10,270	7,702	7,244	1,236	0,498	-0,693
EBITDA	73	13	-3,067	8,860	6,188	6,209	1,656	-2,359	12,551
pEBITDA	73	13	0,000	1,000	0,986	1,000	0,117	-8,544	73,000
LEV	73	13	0,000	1,000	0,370	0,000	0,486	0,551	-1,746
SP	73	13	7,147	7,331	7,252	7,259	0,064	-0,374	-1,299
2008-2009									
MV	57	11	9,252	12,061	10,627	10,362	1,046	0,042	-1,768
REV	57	11	6,548	10,212	8,349	8,604	1,242	-0,018	-1,489
EBITDA	57	11	-8,785	8,953	6,652	6,768	2,439	-4,635	28,930
pEBITDA	57	11	0,000	1,000	0,982	1,000	0,132	-7,550	57,000
LEV	57	11	0,000	1,000	0,281	0,000	0,453	1,003	-1,032
SP	57	11	6,682	7,187	6,965	7,017	0,166	-0,296	-1,105

Table 24: Large-Capitalization Companies Descriptive Statistics (2-Year Windows – 1998-2009)

Data in logs

Variable	No of Obs	No of Comp	Minimum	Maximum	Mean	Median	St Dev	Skewness	Kurtosis
2-year Frequency									
2010-2011									
MV	88	17	9,227	12,201	10,162	9,655	1,012	1,053	-0,610
REV	88	17	5,594	10,276	7,683	7,208	1,289	0,604	-1,067
EBITDA	88	17	-3,714	9,023	5,971	5,979	2,239	-2,042	6,326
pEBITDA	88	17	0,000	1,000	0,966	1,000	0,183	-5,225	25,883
LEV	88	17	0,000	1,000	0,102	0,000	0,305	2,671	5,253
SP	88	17	6,938	7,190	7,101	7,137	0,080	-0,618	-0,653
2012-2013									
MV	108	21	9,211	12,204	9,981	9,747	0,824	1,605	1,494
REV	108	21	5,523	9,583	7,322	7,086	1,012	0,949	0,390
EBITDA	108	21	-4,496	8,665	5,596	5,952	2,080	-2,331	8,744
pEBITDA	108	21	0,000	1,000	0,972	1,000	0,165	-5,828	32,572
LEV	108	21	0,000	1,000	0,102	0,000	0,304	2,670	5,225
SP	108	21	7,217	7,522	7,333	7,273	0,101	0,666	-0,835
2014-2015									
MV	147	23	9,216	12,193	10,201	9,675	0,981	1,002	-0,429
REV	147	23	5,356	10,101	7,302	7,058	1,201	0,879	0,061
EBITDA	147	23	-5,727	9,030	4,818	5,695	3,604	-1,683	2,012
pEBITDA	147	23	0,000	1,000	0,878	1,000	0,329	-2,327	3,463
LEV	147	23	0,000	1,000	0,238	0,000	0,427	1,243	-0,463
SP	147	23	7,535	7,634	7,600	7,623	0,035	-0,569	-1,103
2016-2017									
MV	174	30	9,212	12,184	10,000	9,701	0,778	1,348	0,938
REV	174	30	5,202	10,023	7,235	6,914	1,208	0,909	-0,059
EBITDA	174	30	-6,082	8,658	4,030	5,344	3,967	-1,295	0,334
pEBITDA	174	30	0,000	1,000	0,816	1,000	0,389	-1,646	0,718
LEV	174	30	0,000	1,000	0,333	0,000	0,473	0,713	-1,509
SP	174	30	7,630	7,891	7,761	7,768	0,087	0,011	-1,233
2018-2019									
MV	291	48	9,211	12,187	10,029	9,776	0,758	1,394	1,029
REV	291	48	5,031	10,853	7,143	6,798	1,223	0,991	0,518
EBITDA	291	48	-5,802	10,565	4,502	5,288	3,504	-1,683	2,032
pEBITDA	291	48	0,000	1,000	0,869	1,000	0,338	-2,204	2,878
LEV	291	48	0,000	1,000	0,440	0,000	0,497	0,244	-1,954
SP	291	48	7,827	8,080	7,958	7,977	0,073	-0,065	-0,555
2020-2021									
MV	471	76	9,222	12,157	10,121	9,946	0,664	0,877	0,205
REV	471	76	4,705	11,611	6,648	6,510	1,231	1,398	2,694
EBITDA	471	76	-6,365	10,364	2,663	4,801	6,063	-0,751	-0,966
pEBITDA	471	76	0,000	1,000	0,715	1,000	0,452	-0,958	-1,086
LEV	471	76	0,000	1,000	0,459	0,000	0,499	0,167	-1,981
SP	471	76	7,857	8,469	8,245	8,287	0,171	-0,732	-0,232

Table 25: Large-Capitalization Companies Descriptive Statistics (2-Year Windows – 2010-2021)

Variable	MV	REV	EBITDA	SP
MV	1,000			
REV	0,476	1,000		
EBITDA	0,321	0,597	1,000	
SP	0,128	0,750	-0,192	1,000

Table 26: Small-Capitalization Companies' Spearman Correlation Matrix

Variable	MV	REV	EBITDA	SP
MV	1,000			
REV	0,348	1,000		
EBITDA	0,317	0,697	1,000	
SP	0,044	-0,227	-0,347	1,000

Table 27: Medium-Capitalization Companies' Spearman Correlation Matrix

Variable	MV	REV	EBITDA	SP
MV	1,000			
REV	0,466	1,000		
EBITDA	0,373	0,850	1,000	
SP	0,054	-0,268	-0,322	1,000

Table 28: Large-Capitalization Companies' Spearman Correlation Matrix

Variable	pEBITDA	LEV
MV	0,064	0,120
REV	0,288	0,388
EBITDA	0,889	0,247
SP	-0,235	0,070
pEBITDA	1,000	
LEV	0,141	1,000

Table 29: Small-Capitalization Companies' Pearson Correlation Matrix

Variable	pEBITDA	LEV
MV	0,019	-0,031
REV	0,350	0,323
EBITDA	0,927	0,226
SP	-0,321	0,150
pEBITDA	1,000	
LEV	0,189	1,000

Table 30: Medium-Capitalization Companies' Pearson Correlation Matrix

Variable	pEBITDA	LEV
MV	0,120	0,005
REV	0,392	0,218
EBITDA	0,923	0,138
SP	-0,244	0,168
pEBITDA	1,000	
LEV	0,106	1,000

Table 31: Large-Capitalization Companies' Pearson Correlation Matrix