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(In)Significance of Financial Indicators as Stock Price Determinants- The Role of Value-Oriented Vs. Traditional Kpis in the Context of Shareholder Return

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ABSTRACT

As comprehensively discussed by prominent authors such as Fama or Schiller, stock return research is ever since its origin of major importance for the academic and business community given that decision-relevant information is analyzed and discussed, which can be used for investment decisions, to guide and improve corporate performance, to upgrade accounting standards, and disclosure requirements. In summary, partly inconclusive results of the past, the faster-changing environment, and the focus on the pharmaceutical industry motivate further research regarding the subject of stock return analysis.

In this regard, this paper provides empirical evidence to the question of which financial indicators are significantly related to stock returns. First, it was theoretically argued that a meaningful indicator of operating and strategic performance should be highly associated with stock returns, given that management decisions that change shareholder wealth should simultaneously cause corresponding stock returns. Based on this assumption, this research analyzed several traditional indicators and EVA (as reported by Bloomberg). Second, the relationship between these financial determinants and stock returns was studied using the data of 29 pharmaceutical companies in a five-year period. Given the dataset's characteristics, a panel regression was the most appropriate method to enlighten the questions of interest. Finally, as a result of this study, empirical evidence shows that several financial indicators such as Equity PS, Turnover PS, or Cash PS are helpful to explain shareholder wealth but only to a very limited extend. Nevertheless, as outlined in the course of this paper, in terms of management control, the advantage of value-oriented indicators should not be denied, as this may contribute to less budgetary slack and better incentive systems.

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1. Introduction

"The farther backward you can look, the farther forward you can see."- W. Churchill

The analysis of stock returns is possibly one of the most research-intense subjects in finance. Fama highlighted already in 1965 in his article "THE BEHAVIOR OF STOCK-MARKET PRICES" the relevance and controversy of this topic for both academic and business circles (Fama, 1965, p. 34). This research field is incredibly comprehensive and demonstrates different priorities over time. The practical relevance of this topic seems irrefutable. By studying predictive regression, for instance, market anomalies and new trading strategies can be identified to outperform the stock market.

In this context, this paper introduces how to understand a company's success and how financial performance is associated with the stock market performance. The research questions of interest are:

I. Which financial indicators offer explanatory power for stock returns in the pharmaceutical industry? (Providing a general overview.)
II. Which financial indicators (profit/loss vs. value) are better to explain the returns of stocks? (Giving specific guidance, e.g., for incentive systems, value reporting)

The objective is to investigate whether a particular financial indicator offers explanatory power in the context of stock returns. The relationship between stock returns and financial metrics is studied using the data of 29 pharmaceutical companies in a seven-year period. The study contributes to the academic literature by looking at a dataset that has not been analyzed before, focusing on the pharmaceutical industry. Additionally, this paper may offer a new perspective on the relevance of fundamentals and thereby suggests a stronger emphasis on the identified measures to further improve the information content of financial (value) reporting as intended by the standard-setting bodies, like the Financial Accounting Standards Board (FASB) of the USA or the International Accounting Standard Board (ISAB) based in Europe.

2. Theoretical Backbone

2.1. Research Review on Stock Returns

In the last few decades, several asset pricing hypotheses, models, and theories emerged aiming to explain what drives stock returns. The capital asset pricing model (CAPM) independently introduced by Sharpe (1964), Lintner (1965), and Mossin (1966), building on a work of Harry Markowitz (1952), was an early attempt to answer the question. It has been demonstrated that expected stock returns are positively and linearly related to the systematic market risk. Markowitz's contribution to the modern theory of finance was awarded in 1990 with the Nobel Prize in Economics "for having developed the theory of portfolio choice." Sharpe "for his contributions to the theory of price formation for financial assets, and Miller "for his fundamental contributions to the theory of corporate finance" (Brown & Walter, 2013, p. 2).

Nowadays, according to various academics, the CAPM has lost ground due to a lack of empirical evidence. The betas are said to not explain adequately differences in average returns (Banz, 1981, p. 3; Miller, 1999, p. 97; Malin, & Veeraraghavan, 2004, p. 156; Artmann et al. 2012, p. 758). These findings consequently motivated researchers to include and test numerous additional variables to analyze stock returns. In order to capture new return patterns, multifactor models have been suggested, of which Fama and French attempts are the most prominent (Artmann et al., 2012, p. 758). Their first model is focused on three factors; besides the *market factor,* they include *the size* and the *value factor*. According to the size effect, small firms seem to earn higher returns than large firms (small-minus-big (SMB) anomaly). Concerning the value factor, firms with high book-to-market ratios appear to earn higher returns on average over long horizons than those with low book-to-market ratios (high-minus-low (HML) anomaly) (Fama & French, 1995; Miller, 1999, p. 98). The momentum factor added in Carhart's 4-factor model describes excess returns of positive over negative momentum stocks (winners-minus-losers (WML) anomaly) (Carhart, 1997; Garyn-Tal & Lauterbach, 2015, p. 12). Artmann et al.

acknowledge the Fama-French 3-factor model and the Carhart 4-factor model as industry standards in modeling stock returns (Artmann et al. 2012, p. 759).

Today, a few years after these publications, academics are still untiringly focused on improving the explanatory power of the presented models with new variables, e.g., 5-factor model (see Fama & French 2015), and from various scientific angles, e.g., accounting perspective (see Biddle et al., 1997; Worthington & West, 2004; Ismail, 2006). To mention a few of these not included in the multifactor models, there are, for instance, studies on *leverage* (see Bhandari, 1988), or *asset growth* (see Cooper et al., 2008), and even *Twitter mood* (see Bollen et al., 2011). In this context, scientific literature has strongly emphasized the impact of investor sentiment (see Lee et al. 1991; Brown & Cliff, 2005; Baker & Wurgler, 2006; 2007). According to Baker and Wurgler, sentiment may cause systematic patterns of mispricing. Investor sentiment is described as the "optimism or pessimism about stocks in general" or "the propensity to speculate." Their findings show that smaller, highly volatile firms in distress, firms with extreme growth potential, and firms without dividends are more affected by investor sentiment than others (Baker & Wurgler, 2006, p. 5 et seqq.). More recently, the focus expanded to the analysis of new data sources such as *Google Trends* and their influence on stock returns (see Damien & Ahmed, 2013; Preis et al., 2010; 2013; Bijl et al., 2016). Bijl et al. investigate if search query data on *company names* can be used to predict weekly stock returns for individual firms. The results show that high Google search volume (GSV) predicts low future returns. The relationship is described as weak but robust and statistically significant. However, the results are inconsistent with previous studies, which find the contrary: a high GSV predicts high future returns for the first weeks with subsequent reversal (see Joseph et al., 2011).

A rather traditional approach to explain stock returns is to focus on financial metrics or key performance indicators (KPIs) that can be directly or indirectly derived from a company's financial statement. A considerable interest concerning the numerous financial indicators is linked to the question of which ones are of major importance, and consequently, influence the demand for a company's stocks and to what extent. In the following, the relevance of such indicators is shortly explained. This, meanwhile, presents the basis of the subsequent hypothesis.

2.2. Functions of Financial Performance Indicators

Financial indicators or KPIs are considered to be imperative controlling instruments since they support essential functions in corporate management by providing information regarding business contexts, objectives, and performance. In principle, KPIs provide the management with a quick overview of the company's operations, whereby not only internal company parameters are portrayed, but also environmental conditions and risks can be displayed. Furthermore, KPIs also support operational and strategical planning and control cycles. Thereby, KPIs serve as a guideline allowing actions to be initiated or decisions to be made based on target-actual analyses.

The following functions of KPIs are summarized based on a short review of scientific essays:

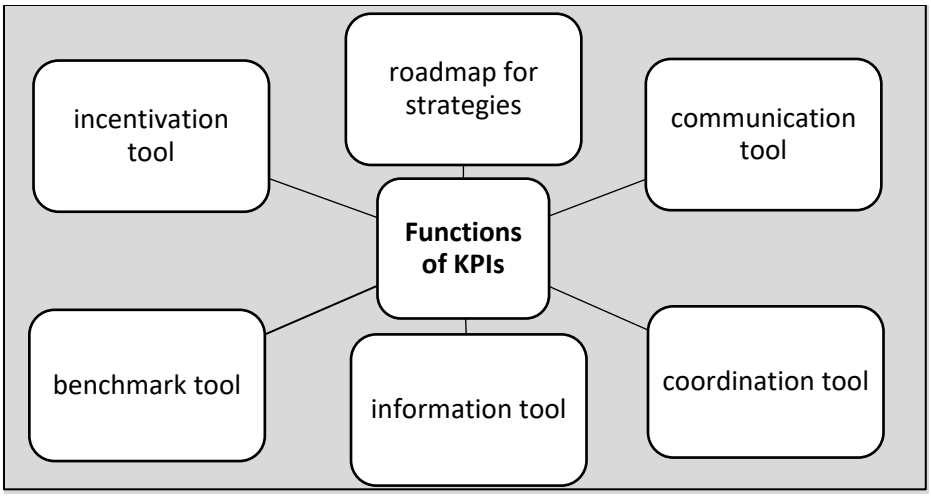

Figure 1. Functions of KPIs
Own illustration, review based on Whittington, 1990, p. 219 et seqq.; see Küpper et al., 2013, p. 476 et seq.; Losbichler et al., 2015, p. 2 et seqq; Yanagi, 2016, p. 330

As summarized in the figure, KPIs can be used in numerous ways. They can support organizations to operationalize strategies and communicate objectives that equally come with the distribution and coordination of resources. Furthermore, information can be derived by evaluating and monitoring the company's financial standing. Finally, benchmarks can be established to be used for incentivization and to align targets across the organization.
Traditional performance indicators are defined as those which are based on pure accounting data. Financial statements are considered the primary source of such information, providing all stakeholders with relevant information about the company. Thereby, traditional indicators offer information regarding the operating performance, such as earnings, liquidity, and other parameters relevant to the success. Assuming the hypothesis that stock prices deviate from these values and only slowly gravitate towards the fundamental values, the analysis of published financial statements may help stock market participants discover values that are not yet reflected in current stock prices.
In a panel survey by Pellens et al. on behalf of the Deutsche Aktieninstitut (DAI), the key parameters for investment decisions used by institutional and private investors have been documented. The latest results for 2018 are as follows (see Pellens et al., 2018):

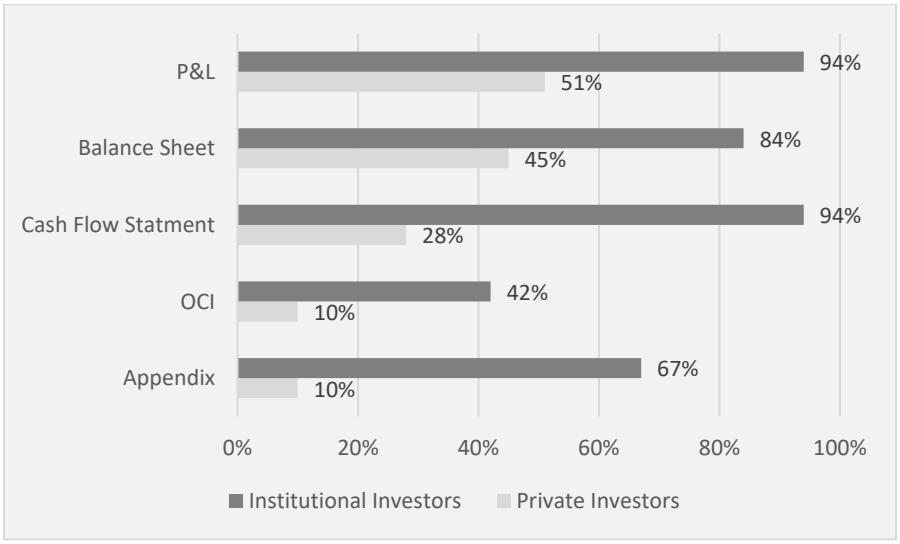

Figure 2. Use Intensity of Annual Report Components
Own illustration based on Pellens et al., 2018, p. 57 et seqq; p. 89 et seqq.)

As illustrated in the graph, 94% of institutional investors base their investment decisions on the cash flow statement and the P&L [2013: 96%; 94%]. The balance sheet intensity is 84% [2013: 85%], followed by the appendix, decreasing from 85% in 2013 to 67% in 2018. The other comprehensive income (OCI) newly recorded since 2018 shows the lowest usage intensity with 42% (ibid).
In a direct comparison, private investors show a significantly lower usage intensity. The most frequently used source for investment decisions is the P&L with 51% [2013: 54%], followed by the balance sheet with a decrease of 10% to 45% [2013: 50%] and after that the cash flow statement with 28% [2013: 30%]. Finally, taillights are OCI and appendix with each 10% [2013: 18%] (ibid).
Despite having only illustrated the financial components of annual reports, it is also worth mentioning that there are many other information sources, which are equally and sometimes even more important to investors. According to Brown et al., institutional investor surveys regularly find that, for instance, industry knowledge is extremely valuable (Brown et al., 2015, p. 3); however, since the focus lies on the annual reports, these aspects are for the time being disregarded.
Based on the above, it is argued that a meaningful indicator of operating and strategic performance should be highly associated with stock returns, given that management decision that change shareholder wealth should simultaneously cause corresponding stock returns. In the following, the pharmaceutical industry is shortly presented, given that each industry may possess specific characteristics that are relevant to consider when analyzing stock returns.

2.3. Industry Characteristics

Worldwide the pharmaceutical industry enjoys an important role which causes much controversy. Yet, the industry is well-recognized for its significant medical breakthroughs and R&D investments, but the industry is criticized for unethical behavior, such as monopolistic pricing (Lakdawalla, 2018, p. 397; Schweitzer & Lu, 2018, p. 1).
Various pharmaceutical topics are frequently discussed in policy and academic circles. Key topics concern the protection of intellectual property (IP), generic competition, drug pricing, R&D priorities, access to drugs (Lakdawalla, 2018, p. 397; Schweitzer & Lu, 2018, p. 1), and drug advertising policies, which deal with the way consumers and physicians receive information (Schweitzer & Lu, 2018, pp. 1-8). The industry is described as highly globalized due to the interconnected world. A further characteristic of the industry is the strong government intervention to ensure the wellbeing of society. New drugs must prove safety and efficacy, which requires a long, costly, and formalized process. Federal regulations examine, for instance, the product quality and quantity, safety protocols, packaging and labeling, communication standards as well as pricing (Martin et al., 2018, p. 87). Due to the burden of regulations, the cost of compliance can make up 25% of a pharmaceutical firm's annual budget (ibid.). Innovation and R&D are the foundation for the success of pharmaceutical companies. Therefore, IP is central to the industry (Schweitzer & Lu, 2018 pp. 1-15; Marques, 2018, p. 171). In general, high development costs are opposing relatively low imitation costs (Lakdawalla, 2018, p. 400).
In the future, the pharmaceutical industry faces new opportunities driven by new technologies. According to Sekhon, biopharmaceuticals' greatest potential lies in gene therapy and genetic engineering (Sekhon, 2010, p. 2). Next to that, the Industry 4.0 prospects optimized value chains and cost-efficacy (see Hofmann & Rüsch, 2017; Ding, 2018). At the same time, the industry must deal with more complex healthcare systems and new barriers in the form of pricing and reimbursement regulations (Schweitzer & Lu, 2018, p. 8). Furthermore, there are challenging market dynamics and new competitors such as the tech giants Google, Facebook, and Amazon (Gautam & Pan, 2016, p. 379; CBInsights, 2017).
A further pivotal change in the pharmaceutical industry can be assumed to be driven by the Covid19 pandemic. The potential changes can only be speculated; however, it appears

reasonable to assume that pharmaceutical drug approval procedures may change concerning the need to develop an antivirus swiftly, which consequently may constitute a new precedent case in the history of drug development.

3. Methodology

3.1. Research Model

Based on previous studies, the analysis of stock returns and their influencing factors can be analyzed by using regression analysis. Regression analysis is a statistical technique for investigating the relationship between variables. As initially explained, this paper aims to investigate the most recent financial data extracted from annual reports over the periods 2012 to 2018. Therefore, observations on the same firms in different periods are analyzed. For this research purpose, panel regression is the most appropriate method and thus further outlined within the course of this paper.

3.2. Dataset

The database consists of a set of figures from the financial statements of 29 constituents listed exclusively in the healthcare sector, which prove coherent industry characteristics. The constituents are chosen from the "Industry Classification Benchmark" (ICB). Each stock is assigned to a specific ICB code, which groups together companies with similar primary revenue sources (see STOXX, 2020). The constituents can be seen in the appendix, Table 5.

Concerning the characteristics of the panel, this is a short and unbalanced dataset, as the scope covers many firms but only a few periods. In a balanced panel, all entities have measurements in all periods; however, due to missing observations, the panel of this thesis is not balanced. As outlined, the original raw data set obtains observations of 29 firms observed over seven years (2012–2018). After removing observations because of missing values, the panel becomes an unbalanced one with a total of 195 observations on still 29 firms. The only exception for missing observations is Argenx SE because the firm was newly listed in 2016.

Furthermore, this is a fixed panel, given that the same individuals are observed for each period. An initial plausibility check of the dataset in Excel® using minima and maxima revealed some major differences within the ranges of descriptive statistics, but following comparison with the corresponding annual reports, the discrepancies are plausible. Thus, there is no reason to assume poor data quality.

3.3. Formation of Hypotheses

3.3.1. Dependent Variable (DV)

As explained by Rappaport, the shareholder return is generated by dividends and increases in share prices (Rappaport, 1999, p. 14). Returns are characterized as the change in the value of an investment over a given period, plus cash payments received during that period.

Meanwhile, in this paper, the dependent variable as a proxy for shareholder return is illustrated as the stock price at the time of the disclosure of the financial reports. In comparison with the TSR described by Rappaport, the dividends are excluded to avoid a conflict with the exogeneity assumption of the ordinary least squares (OLS) regression.

3.3.2. Independent Variables (IVs):

The variables are scaled by the number of outstanding stocks to provide a meaningful comparison. Additionally, there are two control variables: EBIT and EVA, scaled by the total assets of the respective firms.

The null hypothesis (H_0) assumes no relationship between the financial indicators ($H_{1\text{-}n}$) and stock returns.

3.3.2.1.Value Indicator

As portrayed in the literature, EVA is a measure of a company's financial performance, which attempts to capture the true economic profit of a company. If a company's EVA is negative, it means the company is not generating value from the funds invested. Vice versa, a positive EVA shows that a company is creating value. In the following, it is hypothesized that EVA is closely associated with shareholder return. Furthermore, it is assumed that EVA outperforms traditional indicators, given its informative power.

H_1: There is a positive relationship between EVA and stock returns.

3.3.2.2.Traditional Profitability Indicators

All indicators of operating performance that measure profitability are associated with relating to stock returns. Thus, it is hypothesized that the better the performance, the higher is the temptation to buy these stocks, which results in higher market prices and an increased shareholder return over time.

Still to question is which indicator promises the closest relationship with shareholder return. Perhaps it is a GAAP measure that can be directly obtained from the income statement, such as the turnover or NI, or a non-GAAP measure such as EBIT, indicating its earning potential.

H_2: There is a positive relationship between the described profitability indicators and stock returns as equivalent to shareholder returns.

4. Research Results

4.1. Descriptive Analysis

The following table summarizes the main descriptive characteristics of the dataset:

Table 1. *Descriptive Statistics*

Variables	mean	Median	sd	skewness	kurtosis	n
Stock Price	92.538	57.184	10.529	3.598	13.302	198
EVA PS	0.153	0.097	4.819	2.703	15.296	198
Turnover PS	28.549	7.214	47.317	2.431	5.119	198
EBIT PS	4.967	1.778	10.529	3.598	13.302	198
NI PS	3.616	1.210	7.558	3.354	11.334	198
Cash PS	5.137	1.895	9.390	3.155	10.009	198
CF Operation PS	6.086	1.681	12.545	3.436	12.401	198
DPS	2.118	0.466	5.261	3.631	12.610	198
NPM	0.108	0.151	0.371	-6.913	65.351	198
R&D Expense PS	3.478	0.868	7.298	3.519	12.228	198
CF From Investing PS	-4.825	-1.017	12.606	-4.763	27.222	198
CF From Financing PS	-0.770	-0.385	12.453	1.473	16.982	198
Total Assets PS	57.142	16.138	98.521	2.720	6.929	198
Intangible Assets PS	25.388	6.044	50.175	3.362	11.555	198
Goodwill PS	16.213	3.087	36.153	3.614	12.833	198
Debt PS	23.115	4.456	39.992	2.330	5.058	198
Equity PS	25.869	9.641	48.550	3.540	12.780	198
Ebit/Assets	0.094	0.078	0.115	0.721	3.816	198
EVA/Assets	0.006	0.006	0.102	-0.339	3.462	198

Own illustration

The extreme values for skewness and kurtosis indicate a violation of the normality assumption (Barton et al., 2013, p. 612). To avoid non-normality and heteroscedasticity, which may occur when some variables are skewed, and others are not, the variables were transformed. While several transformation methods are available, the "bestNormalize" Package in R provides the

most suitable transformation for each variable (Peterson & Peterson, 2017, p. 2). The Box-Cox transformation is used, representing a family of power transformations that incorporates and extends the traditional options to find the optimal normalizing transformation for each variable (see Box & Cox, 1964). As such, Osborne argues that Box-Cox represents a best practice method (Osborne, 2010, p. 1 et seqq.). For a comprehensive review of the "bestNormalize" package and its advantages, see Peterson (2007). The results of the transformation can be obtained in the table below.

Table 2. Descriptive Statistics (after transformation)

Variable	mean	median	sd	skewness	kurtosis	n
EVA PS	0.000	- 0.000	0.999	0.000	- 0.071	198
TURNOVER PS	0.000	- 0.000	0.999	0.000	- 0.071	198
EBIT PS	- 0.000	- 0.036	1.000	0.219	0.415	198
NI PS	0.000	- 0.000	0.999	0.000	- 0.071	198
CASH PS	0.000	- 0.010	1.000	0.139	- 0.573	198
CF OPERATION PS	0.000	- 0.000	0.999	0.000	- 0.071	198
DPS	0.033	- 0.000	0.924	0.420	- 0.515	198
NPM	0.000	- 0.000	0.999	0.000	- 0.071	198
R&D EXPENSE PS	0.003	- 0.000	0.991	0.059	- 0.215	198
CF FROM INVESTING PS	0.000	- 0.000	0.999	0.000	- 0.071	198
CF FROM FINANCING PS	0.000	- 0.000	0.999	0.000	- 0.071	198
TOTAL ASSETS PS	0.000	- 0.000	0.999	0.000	- 0.071	198
INTANGIBLE ASSETS PS	- 0.000	- 0.070	1.000	0.220	- 0.834	198
GOODWILL PS	0.011	- 0.000	0.972	0.173	- 0.385	198
DEBT PS	0.000	- 0.000	0.999	0.000	- 0.071	198
EQUITY PS	- 0.000	0.040	1.000	0.073	- 0.773	198
EBIT/ASSETS	0.000	- 0.000	0.999	0.000	- 0.071	198
EVA/ASSETS	0.000	- 0.000	0.999	0.000	- 0.071	198

Own illustration

4.2. Results - Univariate Panel Regression

In the previous chapters, the research questions and hypotheses were presented, of which the objective was to understand which financial indicators offer explanatory power for stock returns in the pharmaceutical industry and, subsequently, to explain whether traditional or value indicators are better in explaining the stock returns.

Given the different methods of inference available, the hypotheses can be answered from a few angles. In order to avoid limitations in interpretations linked to the OLS diagnostics and in particular concerning the multicollinearity issue, which is present for highly correlating variables (see Figure 4), the univariate regression is chosen. Alternatively, an indirect interpretation of the independent variables is possible by an approximation via the principal component analysis (PCA). The PCA reduces the dimensions of the regression models. Yet, the preferred approach to answer the hypotheses in this paper is to rely on the results of the univariate panel regression illustrated in the following table. Univariate panel regression thereby allows to assess the general goodness of fit and analyze each predictor's individual effect on the DV.

The results of the univariate panel regression are summarized in Table 3. This table also indicates the favored panel model by variable and includes a ranking based on the variation explained by each variable and its significance level. As it can be seen in most cases (14), the random effect model is favored; hence it is assumed that intercepts and slopes of regressors are the same across individuals. The difference among individuals lies in their individual specific errors, not in their intercepts. Meanwhile, for four variables, the fixed-effect model is favored

over random and pooled regression; therefore, there are individual differences in intercepts for these variables, assuming the same slopes and constant variance across individuals.

Table 3. *Univariate Panel Regression and Model Selection*

	IV:	FE (F test)	RE (LM test)	HM- Test	best model	p-value & SE	R^2	Ranking
(1)	EVA PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.146** [ ]	0.040	17
(2)	Turnover PS	Reject H0 (FE)	Reject H0 (RE)	Reject H0 (FE)	FE	0.283*** [0.109]	0.283	3
(3)	EBIT PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.450*** [0.07]	0.150	5
(4)	NI PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.361*** [0.062]	0.146	6
(5)	Cash PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.547*** [0.07]	0.225	4
(6)	CF Operation PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.359*** [0.07]	0.107	8
(7)	DPS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.419*** [0.120]	0.058	13
(8)	NPM	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.284*** [0.049]	0.144	7
(9)	R&D Exp. PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.046*** [0.119]	0.070	12
(10)	CF Investing PS	Reject H0 (FE)	Reject H0 (RE)	Reject H0 (FE)	FE	-0.150*** [0.050]	0.049	15
(11)	CF Financing PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.049 [0.048]	0.000	18
(12)	Total Assets PS	Reject H0 (FE)	Reject H0 (RE)	Reject H0 (FE)	FE	0.812*** [0.088]	0.300	2
(13)	Int. Assets PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.053*** [0.113]	0.101	10
(14)	Goodwill PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.351** [0.114]	0.045	16
(15)	Debt PS	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.296** [0.087]	0.055	14
(16)	Equity PS	Reject H0 (FE)	Reject H0 (RE)	Reject H0 (FE)	FE	0.940*** [0.099]	0.348	1
(17)	Ebit/Assets	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.258*** [0.054]	0.102	9
(18)	EVA/Assets	Reject H0 (FE)	Reject H0 (RE)	Keep H0 (RE)	RE	0.229*** [0.049]	0.098	11

Own illustration

As outlined by Kennedy, the presence of either fixed or random effects is an issue that renders the pooled OLS biased (Kennedy, 2008, p. 282 et seqq.) Regarding the test results of the variable EVA, both fixed and random effects are statistically significant. With an F-Test of F = 27.507, the null hypothesis is rejected in favor of the FE model ($p < .000$). The SSE (sum of squares due to error or residual) decreased from 197 to 37.116, and R^2 increased from .005 to .054. The parameter estimate of the regressor is also different from the one in the pooled OLS. The coefficient of EVA increased from .000 to .153 and is significant at the .05 significance level ($p < .002$). The LM test shows a large chi-squared of 370.52; consequently, the null hypothesis is rejected in favor of the random effect model ($p < .0000$). Also, within the RE model, the parameter estimate of EVA is slightly different from the one in the fixed OLS. The coefficient of EVA decreased to .040, but its statistical significance remains ($p < .002$). Given that both effects have been found, the Hausman specification test was required to compare fixed and random effects. The Hausman test

returns a chi-square of -0.417 (p<.518), hence the chi-squares score is small enough to reject the null hypothesis in favor of the random effect model.
Regarding the regressor EBIT, the Hausman specification test was also required since both effects have been observed. The Hausman test returns a chi-square of 0.003 (p<.950); hence the chi-squares score was again small enough to reject the null hypothesis in favor of the random effect model. The heterogeneity can also be observed in the Scatterplots illustrated in Figure 4.
Concerning the raking, it can be seen that variables such as Total Assets PS, Equity PS, Turnover PS, Cash PS have the highest explanatory power; meanwhile, EVA PS scores only the penultimate place.

5. Discussion

5.1. Review of Hypotheses

Concerning the panel regression results, it is observed that the regression coefficients for all variables, except for CF from Financing PS, are not equal to zero and significant at the 0.05 significance level. Furthermore, the hypothesized effect directions have been confirmed for most variables. Hence, the null hypothesis that assumed no relationship between the financial indicators (H_{1-n}) and stock returns can be rejected in most cases.
The proposed hypotheses and the results of which are summarized as follows:

Table 4. *Review of Hypotheses*

	Predictor Variables	**Expected Effect**	**Observed Effect***	Hypotheses
(1)	EVA PS	(+)	(+)	Reject H_0
(2)	Turnover PS	(+)	(+)	Reject H_0
(3)	EBIT PS	(+)	(+)	Reject H_0
(4)	NI PS	(+)	(+)	Reject H_0
(5)	Cash PS	(+)	(+)	Reject H_0
(6)	CF Operation PS	(+)	(+)	Reject H_0
(7)	DPS	(+)	(+)	Reject H_0
(8)	NPM	(+)	(+)	Reject H_0
(9)	R&D Exp. PS	(+)	(+)	Reject H_0
(10)	CF Investing PS	(+)	(-)	Reject H_0
(11)	CF Financing PS	(+)	(+)	Keep H_0
(12)	Total Assets PS	(+)	(+)	Reject H_0
(13)	Int. Assets PS	(+)	(+)	Reject H_0
(14)	Goodwill PS	(+)	(+)	Reject H_0
(15)	Debt PS	(-)	(+)	Reject H_0
(16)	Equity PS	(+)	(+)	Reject H_0
(17)	Ebit/Assets	(+)	(+)	Reject H_0
(18)	EVA/Assets	(+)	(+)	Reject H_0

Own illustration

However, despite the statistical significance, the practical significance relativizes the magnitude of the results. The variables with low explanatory power are of minor importance to explain and predict stock prices in the future. Additionally, the observed multicollinearity suggests that already a few of the analyzed variables account for most of the variability in a stock return model. Additionally, in contrast to the theoretical considerations, the profitability indicator Turnover PS outperforms the efficacy indicator NPM as well as liquidity indicators such as Cash PS and CF from operations PS.
Given the intended comparison of whether value-oriented indicators offer higher explanatory power for shareholder return than the traditional profit/loss indicators, it can be outlined that traditional indicators such as Turnover, EBIT, or NPM are better to explain shareholder return.

The regression results provide sufficient evidence to support this statement. The results thereby i.a. support prior research results of Biddle et al., who find that NI offers higher explanatory power than EVA (see Biddle et al., 1997). Furthermore, the results of O'Hara et al. and Worthington and West 2004 can be supported, who find that earnings are more closely associated with stock performance than cash flow and dividends (see O'Hara et al., 2000; Worthington & West, 2004). Along with Zartab et al. findings, the variable, total assets PS, is considered highly important in explaining stock returns. In terms of profitability measures, the variable turnover outperforms EBIT, Cash Flow, and the others; however, overall, the models presented show only moderate prediction power, also observed by Copeland (see Copeland, 2002).
Regarding the panel findings, it is assumed that the outperformance of traditional indicators is perhaps linked to the fact that these indicators have proved themselves successfully in the past decades. Today, analysts and investors are still paying a lot of attention to these ratios before reaching an investment decision. Traditional indicators offer a huge advantage by looking at each individually before questioning altogether, which is linked to the simplicity of the interpretations. This, in turn, offers a fast capacity for investors to react and may also explain the relevance of multipliers. In this context, the relevance of the traditional indicators can perhaps be declared as a self-fulling prophecy. If traditional ratios are always used for investment decisions, they naturally prove an empirical relationship with stock returns.
This brings us to the limitation of this study. In general, the analysis is subject to several limitations that need to be recognized.

5.2. Limitations

A conceptual limitation is linked to the fact that relevant macroeconomic indicators, such as inflation or political stability, are neglected despite their relevance in assessing stock returns. Furthermore, only quantitative financial information from financial statements was analyzed, whereby other non-quantitative but qualitative determinants were neglected. In total, the financial determinants accounted for approx. 38-41 percent of the total variance in stock prices change and individually around 4 to 34 percent in the univariate regression. This, in turn, leaves a big chunk of variance unexplained, which perhaps is contributed to several non-financial determinants.
In the scientific literature, qualitative determinants are called "soft factors" and cover, for example, the image or reputation of a company, the perception regarding the management quality, investor relations, or the market sentiments (Piwinger & Zerfaß, 2007, p. 263). Given the lacking explanatory power, it can be assumed that their contribution is of high importance for the overall quality of a research model which aims to explain or predict stock returns.
Next to potentially missing quantitative and qualitative determinants to increase the explanatory power of the analysis, there is an additional difficulty that challenges the significance of the results. As mentioned, the demand for a stock can be leveraged by completely irrational factors and arise on the back of speculative bubbles. Those general and company-specific events may have distorting effects on the analysis, which partially restrict this thesis's informative value.
Finally, it can be assumed that there is potentially an issue regarding the time lag between capturing the stock returns and the disclosure of the financial results. In this regard, it is difficult to attribute the financials to a specific announcement period; therefore, it can be suggested for future analysis to use the weighted average principle for capturing the stock returns over the time axis.

6. Conclusion

In summary, partly inconclusive results of the past, the faster-changing environment, and the explicit focus on the pharmaceutical industry motivated further research regarding the subject of stock return analysis. As comprehensively discussed, stock return research is of major importance for the academic and business community since decision-relevant information is analyzed and discussed, which can be used for investment decisions, guide and improve corporate performance, and improve accounting standards and disclosure requirements.

In this regard, this paper provided empirical evidence to the question of which financial indicators are significantly related to stock returns. First, it has been theoretically argued that a meaningful indicator of operating and strategic performance should be highly associated with stock returns, given management decisions that change shareholder wealth should simultaneously cause corresponding stock returns. Based on this assumption, this thesis analyzed several traditional variables, including the value indicator EVA.

However, it appears that EVA does not relate more closely with the stock price, and hence this paper does not suggest the advantage of EVA in explaining shareholder returns. Meanwhile, it can be concluded there are several financial indicators helpful to explain shareholder wealth. Nevertheless, as outlined in the recommendation, in terms of management control, the advantage of value-oriented indicators should not be denied, as this may contribute to less budgetary slack and better incentive systems.

Last but not least, with a final reference to the theoretical backbone of this paper, the different schools of thought help to explain and understand the roots of stock return. Some economists argue that stock movements are exclusively explained by the information that is transmitted to the market. Thus, they have tried to put forward theories such as the EMH to explain stock return movements. A second school, the behavioral finance discipline, argues that volatility is linked to investor reactions driven by psychological or social beliefs, which exert a greater influence on the markets. Both perspectives offer practical implications to understand the stock market better, and hence in this paper, it can be concluded that these theories likely complement each other.

References

Artmann, S., Finter, P., & Kempf, A. (2012). Determinants of expected stock returns: large sample evidence from the German market. Journal of Business Finance & Accounting, 39(5-6), 758-784.

Baker, M., & Wurgler, J. (2006). Investor sentiment and the cross-section of stock returns. The journal of Finance, 61(4), 1645-1680.

Baker, M., & Wurgler, J. (2007). Investor sentiment in the stock market. Journal of economic perspectives, 21(2), 129-152.

Banz, R. W. (1981). The relationship between return and market value of common stocks. Journal of financial economics, 9(1), 3-18.

Barton, S. J., Crozier, S. R., Lillycrop, K. A., Godfrey, K. M., & Inskip, H. M. (2013). Correction of unexpected distributions of P values from analysis of whole genome arrays by rectifying violation of statistical assumptions. BMC genomics, 14(1), 161.

Bhandari, L. C. (1988). Debt/equity ratio and expected common stock returns: Empirical evidence. The journal of finance, 43(2), 507-528.

Biddle, G. C., Bowen, R. M., & Wallace, J. S. (1997). Does EVA® beat earnings? Evidence on associations with stock returns and firm values. Journal of accounting and economics, 24(3), 301-336.

Bijl, L., Kringhaug, G., Molnár, P., & Sandvik, E. (2016). Google searches and stock returns. International Review of Financial Analysis, 45, 150-156.

Bollen, J., Mao, H., & Zeng, X. (2011). Twitter mood predicts the stock market. Journal of computational science, 2(1), 1-8.

Box, G. E., & Cox, D. R. (1964). An analysis of transformations. Journal of the Royal Statistical Society: Series B (Methodological), 26(2), 211-243.

Brown, G. W., & Cliff, M. T. (2005). Investor sentiment and asset valuation. The Journal of Business, 78(2), 405-440.

Brown, J. L., Evans III, J. H., & Moser, D. V. (2009). Agency theory and participative budgeting experiments. Journal of Management Accounting Research, 21(1), 317-345.

Brown, P., & Walter, T. S. (2013). The CAPM: Theoretical validity, empirical intractability and practical applications.

Brown, L. D., Call, A. C., Clement, M. B., & Sharp, N. Y. (2015). Inside the "black box" of sell-side financial analysts. Journal of Accounting Research, 53(1), 1-47.

Carhart, Mark M. "On persistence in mutual fund performance." The Journal of finance 52, no. 1 (1997): 57-82.

Cooper, M. J., Gulen, H., & Schill, M. J. (2008). Asset growth and the cross-section of stock returns. The Journal of Finance, 63(4), 1609-1651.

Copeland, T. E. (2002). What do practitioners want?. Journal of Applied Finance, 12(1), 5-12.

Damien, C., & Ahmed, B. H. A. (2013). Predicting financial markets with Google Trends and not so random keywords (No. hal-00851637).

Ding, B. (2018). Pharma industry 4.0: Literature review and research opportunities in sustainable pharmaceutical supply chains. Process Safety and Environmental Protection, 119, 115-130.

Fama, E. F. (1965). The behavior of stock-market prices. The journal of Business, 38(1), 34-105.

Fama, E. F. (1970). Efficient market hypothesis: A review of theory and empirical work. Journal of Finance, 25(2), 28-30.

Fama, E. F., & French, AK. R. (1995). Size and book-to-market factors in earnings and returns. The journal of finance, 50(1), 131-155.

Fama, E. F., & French, K. R. (2015). A five-factor asset pricing model. Journal of financial economics, 116(1), 1-22.

Garyn-Tal, S., & Lauterbach, B. (2015). The formulation of the four-factor model when a considerable proportion of firms is dual-listed. Emerging Markets Review, 24, 1-12.

Gautam, A., & Pan, X. (2016). The changing model of big pharma: impact of key trends. Drug discovery today, 21(3), 379-384.

Hausman, J. A. (1978). Specification tests in econometrics. Econometrica: Journal of the econometric society, 1251-1271.

Hofmann, E., & Rüsch, M. (2017). Industry 4.0 and the current status as well as future prospects on logistics. Computers in Industry, 89, 23-34.

Ismail, A. (2006). Is economic value added more associated with stock return than accounting earnings? The UK evidence. International Journal of Managerial Finance, 2(4), 343-353.

Joseph, K., Wintoki, M. B., & Zhang, Z. (2011). Forecasting abnormal stock returns and trading volume using investor sentiment: Evidence from online search. International Journal of Forecasting, 27(4), 1116-1127.

Kennedy, P. (2003). A guide to econometrics. MIT press.

Küpper, H. U., Friedl, G., Hofmann, C., Hofmann, Y., & Pedell, B. (2013). Konzeption, Aufgaben und Instrumente, 5. Aufl., Stuttgart.

Lakdawalla, D. N. (2018). Economics of the pharmaceutical industry. Journal of Economic Literature, 56(2), 397-449.

Lee, C. M., Shleifer, A., & Thaler, R. H. (1991). Investor sentiment and the closed-end fund puzzle. The journal of finance, 46(1), 75-109.

Lintner, J. (1965). The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. The Review of Economics and Statistics, 13-37.

Losbichler, H., Eisl, C., & Engelbrechtsmüller, C. (Eds.). (2015). Handbuch der betriebswirtschaftlichen Kennzahlen: Key Performance Indicators für die erfolgreiche Steuerung von Unternehmen. Linde Verlag GmbH.

Malin, M., & Veeraraghavan, M. (2004). On the robustness of the Fama and French multifactor model: evidence from France, Germany, and the United Kingdom. International Journal of Business and Economics, 3(2), 155.

Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, 7(1), 77-91.

Martin, K. D., Josephson, B. W., Vadakkepatt, G. G., & Johnson, J. L. (2018). Political Management, Research and Development, and Advertising Capital in the Pharmaceutical Industry: A Good Prognosis?. Journal of Marketing, 82(3), 87-107

Miller, M. H. (1999). The history of finance. The Journal of Portfolio Management, 25(4), 95-101

Mossin, J. (1966). Equilibrium in a capital asset market. Econometrica: Journal of the econometric society, 768-783.

O'Hara, H. T., Lazdowski, C., Moldovean, C., & Samuelson, S. T. (2000). Financial indicators of stock price performance. American Business Review, 18(1), 90.

Osborne, J. W. (2010). Improving your data transformations: Applying the Box-Cox transformation. Practical Assessment, Research & Evaluation, 15(12), 1-9.

Pellens, B., Schmidt, A. & Ahlich K. (2018). Verhalten und Präferenzen deutscher Aktionäre. Frankfurt am: Deutsches Aktieninstitut.

Peterson, R. A., & Peterson, M. R. A. (2017). Package 'bestNormalize'.

Piwinger, M., & Zerfaß, A. (Eds.). (2007). Handbuch Unternehmenskommunikation. Springer-Verlag.

Preis, T., Reith, D., & Stanley, H. E. (2010). Complex dynamics of our economic life on different scales: insights from search engine query data. Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences, 368(1933), 5707-5719.

Preis, T., Moat, H. S., & Stanley, H. E. (2013). Quantifying trading behavior in financial markets using Google Trends. Scientific reports, 3, 1684.

Rappaport, A. (1999). Creating shareholder value: a guide for managers and investors. Simon and Schuster.

Schweitzer, S. O., & Lu, Z. J. (2018). Pharmaceutical Economics and Policy: Perspectives, Promises, and Problems.

Sekhon, B. S. (2010). Biopharmaceuticals: an overview. Thai J. Pharm. Sci, 34(34), 1-19.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. The journal of finance, 19(3), 425-442.

Worthington, A. C., & West, T. (2004). Australian evidence concerning the information content of economic value-added. Australian Journal of Management, 29(2), 201-223.

Yalagi, M. S., Ranjitha, K., & Krishnan, K. IMPORTANCE OF KEY PERFORMANCE INDICATORS MEASUREMENT.

Zartab, S., Fatemi, S. F., & Radmanesh, R. (2013). Fundamentals and stock return in pharmaceutical companies: a panel data model of Iranian industry. Iranian Journal of Pharmaceutical Sciences, 9(1), 55-60.

Internet/ Electronic Sources

Peterson, R. A., (2007). Using the bestNormalize Package: https://cran.rproject.org/web/packages/bestNormalize/vignettes/bestNormalize.html [accessed 2020-04-11, 22:30 CET].

Stoxx (2020). STOXX Index Methodology Guide. https://www.stoxx.com/document/Indices/Common/Indexguide/stoxx_index_guide.pdf [accessed 2020-01-04, 21:30 CET].

Appendix

Table 5. *Dataset*

	Ticker	Company name	Country	Mkt. CAP €BIL. (2018)
1	ARGX BB	ARGENX SE	Netherlands	€ 3,065
2	AZN LN	ASTRAZENECA PLC	UK	€ 82,821
3	BAYN GY	BAYER AG-REG	Germany	€ 56,475
4	DPH LN	DECHRA PHARMACEUTICALS PLC	UK	€ 3,065
5	ERF FP	EUROFINS SCIENTIFIC	Luxembourg	€ 5,787
6	EVT GY	EVOTEC SE	Germany	€ 2,588
7	GLPG NA	GALAPAGOS NV	Belgium	€ 4,388
8	GMAB DC	GENMAB A/S	Denmark	€ 8,793
9	GXI GY	GERRESHEIMER AG	Germany	€ 1,980
10	GSK LN	GLAXOSMITHKLINE PLC	UK	€ 82,395
11	GRF SQ	GRIFOLS SA	Spain	€ 15,658
12	LUN DC	H LUNDBECK A/S	Denmark	€ 7,597
13	HIK LN	HIKMA PHARMACEUTICALS PLC	UK	€ 4,612
14	IPN FP	IPSEN	France	€ 9,458
15	LONN SE	LONZA GROUP AG-REG	Switzerland	€ 16,802
16	MRK GY	MERCK KGAA	Germany	€ 39,121
17	MOR GY	MORPHOSYS AG	Germany	€ 2,807
18	NOVN SE	NOVARTIS AG-REG	Switzerland	€ 172,257
19	NOVOB DC	NOVO NORDISK A/S-B	Denmark	€ 95,518
20	ORNBV FH	ORION OYJ-CLASS B	Finland	€ 4,260
21	QIA GY	QIAGEN N.V.	Germany	€ 9,576
22	REC IM	RECORDATI SPA	Italy	€ 6,178
23	ROG SE	ROCHE HOLDING AG	Switzerland	€ 184,778
24	SAN FP	SANOFI	France	€ 94,234
25	DIM FP	SARTORIUS STEDIM BIOTECH	France	€ 8,052
26	SOBI SS	SWEDISH ORPHAN BIOVITRUM AB	Sweden	€ 5,123
27	TECN SE	TECAN GROUP AG-REG	Switzerland	€ 1,995
28	UCB BB	UCB SA	Belgium	€ 13,868
29	VIFN SE	VIFOR PHARMA AG	Switzerland	€ 6,159

Own illustration

Table 6. *OLS Assumptions by Variable*

Assumptions	**i.**	**ii.**	**iii.**	**iv.**	**vi.**	**(vii.)**
H_0 Hypotheses	**Linearity**	**Mean 0**	**Homoscedasticity**	**No autocorrelation**	**No correlation**	**Normality**
Objective (H_0)	**Keep**	**Keep**	**Keep**	**Keep**	**Keep**	**Keep**
Sig. level	**0.01**	**-**	**0.05**	**0.05**		**0.05**
IV PS	**p-value**	**Mean**	**p-value**	**p-value**	**p-value**	**p-value**
EVA PS	Keep H_0	Keep H_0	Keep H_0	Reject H_0	Keep H_0	Keep H_0
Turnover PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
EBIT PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
NI PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
Cash PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
CF Operation PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
DPS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
NPM	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Keep H_0
R&D Exp. PS	Reject H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
CF Investing PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
CF Financing PS	Reject H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Keep H_0
Total Assets PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
Int. Assets PS	Reject H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
Goodwill PS	Reject H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Keep H_0
Debt PS	Reject H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Keep H_0
Equity PS	Keep H_0	Keep H_0	Reject H_0	Reject H_0	Keep H_0	Reject H_0
Ebit/Assets	Keep H_0	Keep H_0	Keep H_0	Reject H_0	Keep H_0	Keep H_0
EVA/Assets	Keep H_0	Keep H_0	Keep H_0	Reject H_0	Keep H_0	Keep H_0

Own illustration

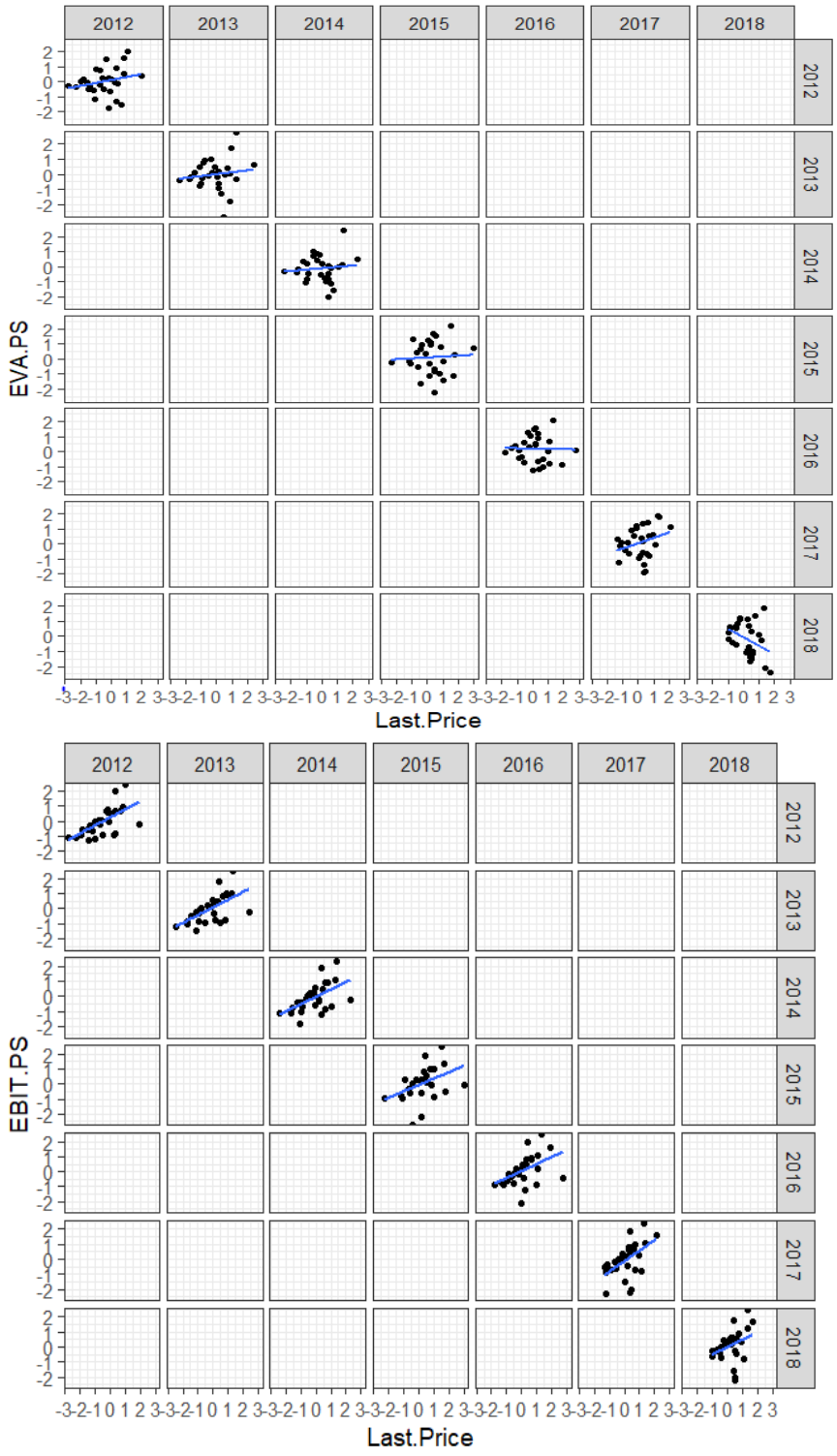

Figure 3. Scatterplot (Stock Price ~ EVA and EBIT by Year)
Own illustration

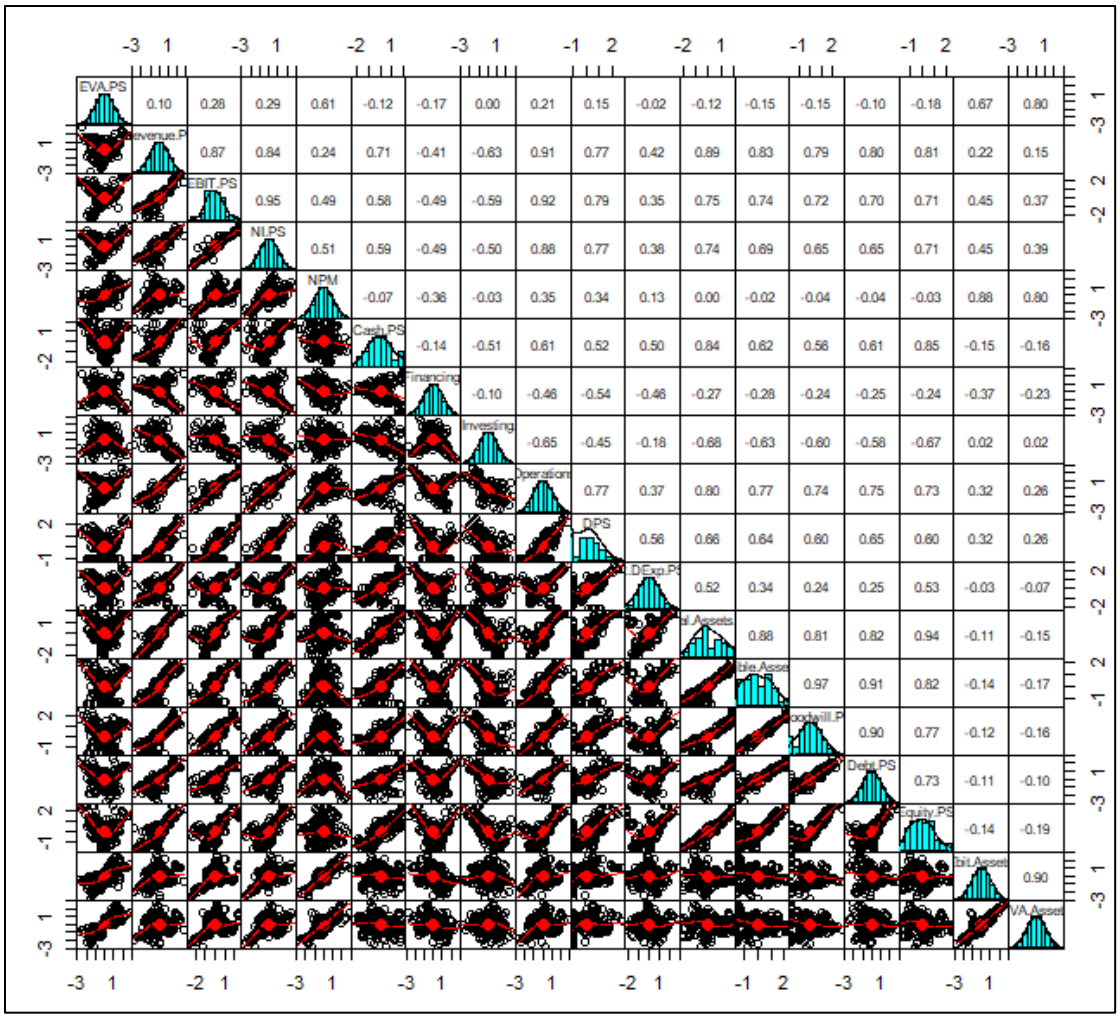

Figure 4. Scatterplot and Correlation Coefficients
Own illustration