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THE IMPACT OF THE INTENSITY OF FIRM'S INTANGIBLE ASSETS ON THE VOLATILITY OF THEIR STOCK PRICES

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ABSTRACT

The volatility of share prices is an important variable in most asset pricing models and option pricing formulas.Valuation of volatility of share prices have become a major challenge with the development of the knowledge-driven economy as evidence suggest that not all elements of company wealth are physical in nature.

The purpose of this project entitled “The intensity of the firm’s intangible asset on the volatility of their stock price” is to check if the intensity of intangible assets in a firm’s balance sheet affects the volatility of their stock price. A brief overview of intangible assets is also included in this study.

An OLS regression was run and the results of the entire data set gives a negative correlation between intensity of intangible assets and volatility of stock prices probably due to the fact that the volatility of the firm share prices are driven by uncertainty and expectation of future growth. An industry-grouping regression was carried out, the results shows that for basic pharmaceuticals there is a positive correlation between the intensity of intangible assets and their price volatility while the other three industry groups produce a negative correlation.

The study relies on secondary data of randomly selected fourty (40) publicly traded companies in Europe from four different industry groupings namely: manufacture of basic pharmaceuticals, manufacture of food products and beverages, information technology and manufacture of basic metals.

Keywords: intangible assets, volatility, stock prices

CHAPTER ONE
INTRODUCTION

1.1 Background of study

The rise of intangible assets size and the contribution to corporate growth over the last two decades posed an interesting topic for analysis. The increasing importance of intangible assets and the absence of explicit information about the contribution of intangible to earnings imply strong market incentives for analyst to provide value-added information for high-intangible firms. Goldfinger [1974] suggest that the source of economic value and wealth is no longer the production of material goods but the creation and manipulation of intangible assets.[1]

The increase in information complexity of intangible assets increases the difficulty of forecasting earnings of intangibles-intensive firms.
Chan, Louis K.C., Lakonishok, Josef and Sougiannis, Theodore [1999] suggested that companies engaged in high R&D intensity have a distinctive effect on returns using two groups of stocks. Within the set of growth stocks, R&D-intensive stocks tend to out-perform stocks with little or no R&D. Their tentative investigation of the effects of advertising on returns yields similar results. They provided evidence that R&D intensity is positively associated with return volatility.[2]

The pharmaceutical industry expends billions of dollars yearly on intangibles, all in the pursuit of greater profits. Thus, investors are naturally interested in whether intangible assets and expenditures truly create shareholder value. In a paper by Heiens, Richard A; McGrath,

[1] Journal of Accounting Literature, Vol. 19, 2000, pp. 102-130
[2] Chan, Louis K.C., Lakonishok, Josef and Sougiannis, Theodore , "The Stock Market Valuation of Research and Development (June 1999)

Leanne C; Leach, Robert T [2008], four intangibles, namely advertising, research and development (R&D), goodwill and other intangibles, are investigated to establish their effects on market-adjusted holding period returns (HPR). Their results seem to indicate that of these variables, advertising does in fact seem to have a significant and positive impact on HPR. [3]

There are observations that the stock market behaviour of the so called 'knowledge companies' frequently deviates from that of basic industries. There also exists some evidence supporting a positive correlation between a firm's intangibles and its share market value [Amir and Lev 1996, Lev 1997, Lev and Zarowin 1998]

The increasing importance of intangible assets to investors, analyst and shareholders has increased investment community's needs to understand how companies create and manage their intangible assets, and to know how companies share prices are affected by intangible assets.

1.2 Statement of the problem

The centre of attention of this thesis is to answer the following question:

What is the impact of the intensity of firm's intangible assets on the volatility of their stock prices?

1.3 Purpose of the study

This study aims at

- A brief overview of issues of intangible assets.
- After providing an overview, different type and definitions of intangible asset, testing the impact of the intensity of intangible

[3] Heiens, Richard A; McGrath, Leanne C; Leach, Robert T [2008], Journal of Medical Marketing (2008) 8, 151-158. doi:10.1057/palgrave.jmm.5050131

assets in a firm on the volatility of the firm's share prices will be performed.

1.4 Significance of the study

The growing and importance of intangible assets to firm value growth in recent years goes to length to support the significance and importance of additional research work on intangible assets.

The study will prove useful to investors, analysts or shareholders who are interested to know how the size of intangible asset in a firm affects the volatility of the firm's stock price.

This study will also serve as a basis for further research and discussions on intangible asset intensity on stock prices.

1.5 Limitation of the study

Data for this study is randomly selected from listed companies of four industry groups (manufacture of basic pharmaceuticals, manufacture of food products and beverages, information technology and manufacture of basic metals) having between eight (8) and ten (10) years of consolidated balance sheet. Thus the results we get are based solely on the data used for this study.

1.6 Layout of the study

The study is divided into five chapters. The first chapter concentrates on the background of the study, statement of the problem, purpose of the study, significance of the study and the limitation of the study. Chapter two gives an overview of intangible assets. That is definition, classification and valuation method. Chapter three includes a review of previous research in this area and the research design. Chapter four, the data sample and the empirical results are stated and chapter five gives a summary and conclusions to the findings.

CHAPTER TWO

OVERVIEW OF INTANGIBLE ASSETS

Intangible assets have been extensively analysed in the economic literature within the frame work of innovation[4]. There is generally no agreement on the economic nature, definition and classification of intangible assets.

2.1 Definition of intangible asset

For simplicity, we define an intangible asset as an asset (something of value) that is non-physical in nature[5]. Corporate intellectual property (items such as patents, trademarks, copyrights, business methodologies), goodwill and brand recognition are all common intangible assets.

In brief, intangible assets are assets that are used in the operation of the business but that have no physical substance and are noncurrent.

It should be noted that the basic for valuation of intangible assets is cost; these assets will appear on the balance sheet at their cost and will only be listed if significant costs are incurred in their acquisition or development.

2.2 Classification of intangible assets

There is no generally accepted classification of intangible assets. However, the six most common categories of intangible assets are suggested accordingly:

- *General*, which means goodwill and others, e.g. advantageous relationships with the government.

[4] Cohen and Levin (1989) provided an extensive review of economic literature published in this area of research until the end of the 1980's.

[5] http://financial-dictionary.thefreedictionary.com/intangible+asset

- *Brand Equity* meaning the capacity of brands to sustain and encourage economic demand and other market capabilities, such as advertising.
- *Intellectual Capital* including trade secrets, internally developed computer software, drawings and other proprietary technology as well as intellectual property (patents, trade names, trademarks, copyrights) which exist because of a complex body of law.
- *Structural Capital* including assembled workforce (the relationship between the business and its employees, training and employee contracts), leadership, organisational capacity for sellable innovation, organisational learning capacity, leaseholds, franchises, licenses and mineral rights.
- *Customer Equity*, which means customer lists and other customer-based intangibles, customer loyalty and satisfaction as well as distribution relationships and agreement.
- *Supplier Relations* including equity interest in suppliers, contracts and supplier reliability

CHAPTER THREE

REVIEW OF PREVIOUS RESEARCH AND RESAERCH DESIGN

3.1 **Review of previous research**

Intangible assets that are accounted for are mostly those whose costs are expensive when incurred such as R&D and advertising.

Lev and Sougiannis (1996) speculated that the excess returns reflect either stock market mispricing, or represent compensation for the extra risk associated with R&D intensive firms. A follow-up study by Lev and Sougiannis (1999) after conducting a series of tests, they conclude that the excess returns are more likely a consequence of additional risk.

Later studies (Lev, Sarath and Sougiannis, 2000; and Penman and Zhang, 2002), however, switch their focus from R&D intensity defined based on the estimated amount of R&D assets to change in R&D assets because observations suggest that it's not the absolute levels of R&D assets that affect the persistence of earnings. These papers document evidence consistent with the hypothesis that the market is, to some extent, fixated on earnings and does not fully understand the impact of R&D accounting on earnings quality.

The conference paper by Chambers, Jennings and Thompson provides more compelling evidence supporting the risk explanation and they show that earnings volatility of R&D intensive firms is high, which is consistent with prior findings (see Chan, Lakonishok and Sougiannis, 2000)

Recent finance literature highlights the role of technological change in increasing firm specific and total stock price volatility (Campbell et al. 2001, Shiller 2000, Pastor and Veronesi 2005).

The productivity literature on market value and innovation has already established a positive relationship between a firm's market value, its

R&D intensity and its citation weighted patents (Griliches 1981; Pakes 1985; Hall 1993, Hall, Jaffe and Trajtenberg 2005).

The analysis builds on the empirical work by Mazzucato (2002; 2003) where it is found that stock price volatility is highest during periods in the industry life-cycle when innovation (measured at the industry level) is the most 'competence-destroying'.

Comments have often been made that intangible assets are an important contributor to economic well being; academic research has still a long way to go to quantify their impact (Griliches 1998). One problem is that intangible asset such as R&D outlays, advertising, marketing and human capital, are quite difficult to measure. Academic research has generally employed either company accounts or industry data. Previous work using the former tended to concentrate on research activities alone, due to the lack of data on other forms of intangible investment.

There have been increased attentions in stock price volatility after the "New Economy" period when many high-tech stocks that were considered overvalued experienced a large drop in their share price. This persistent idea of 'knowledge economy' has resulted in even greater stock price volatility although there have been no trend increase in total stock price volatility (Schwert 1989; 2002).

Shiller's work (2000) has shown that 'excess volatility' is highest in periods of technological revolutions when uncertainty is greatest due to increased uncertainty regarding both technology and demand causing investors to be less confident about their own judgments. He claims that the efficient market model greatly underestimates stock price volatility due to the fact that it does not incorporate the social mechanism by which expectations are formed (i.e. animal spirits, herd behaviour, bandwagon effects).

Uncertainty in finance models refers to how expectations about a firm's future growth affect its market valuation (Campbell, Lo and McKinley 19973)[6]. Knight (1921) and Keynes (1973) highlight that technological changes is an example of true uncertainty which cannot be calculated using probabilities like risk but it's a key determinant of a firm's possible future growth.

The work of Pastor and Veronesi (2005) provides interesting insights on the relationship between innovation, uncertainty and volatility of stock prices. They claim that if one includes the effect of uncertainty about a firm's average future profitability into market valuation models, then bubbles can be understood as emerging from rational, not irrational, behaviour about future expected growth. It thus follows from the result in Pastor and Veronesi (2004) that uncertainty about average productivity increases market value. They extend the model to explain why technological revolutions cause the stock prices of innovative firms to be more volatile and experience bubble like patterns. The basic idea is that when a firm introduces a new technology, its stock price rises due to the expectations regarding the positive impact of the new technology on its productivity. Volatility also rises because risk is idiosyncratic when technology is used on a small scale. When the new technology gets adopted throughout the economy, the risk becomes systematic causing the stock price to fall and volatility to decrease. This bubble like behaviour is strongest for those technologies that are the most uncertain.

The study of Mazzucato and Tancioni (2005) reveal that it is not true that more innovative industries are on average more volatile than less innovative ones, at the firm level a positive and significant relationship is found between idiosyncratic risk and R&D intensity.

[6] "The starting point for any financial model is the uncertainty facing investors, and the substance of every financial model involves the impact of uncertainty on the behaviour of investors, and ultimately, on market prices." (Campbell, Lo and MacKinlay, 1997)

My aim is to see whether the degree of excess volatility stock prices are positively correlated with more intangible assets (innovations) as is implied in the works cited above.

3.2 **Research Design**

Prior research finds that firms invest in intangible assets with two purposes: to develop new knowledge and to lean about and benefit from the innovation of others (Mowery, 1983; and Cohen and Levinthal, 1989) Accordingly, we predict that firms (Industry group) with higher intangible assets will have higher volatility of their stock prices.

Our hypothesis (in alternate form):
Firms (industry group) with higher intangible assets have higher volatility of their stock prices.

We study intangible assets recognized on the firm's balance sheet (BI) and the volatility of stock prices of the firms (S). To examine the intensity of firm's intangible assets and volatility of stock prices, we estimate using the following regression model:

$$S_t = \alpha + \beta BI_t + \varepsilon_t$$

Where $\mathbf{S_t}$ is the volatility of stock prices. It should be noted that we assumed that the price volatility was constant over the ten year period so we calculated the price volatility using price changes for the year 2006.
$\mathbf{BI_t}$ represents the intensity of annual average of booked value of intangible assets on the firm's balance sheet.

From the regression model, a more precise form of the hypothesis is thus stated as;

$H_1: \beta > 0$

The coefficient estimate β of the intangible variable BI inform whether the volatility of the stock prices are related to firm's intangible intensity.

CHAPTER FOUR

SAMPLE DATA AND EMPERICAL RESULTS

4.1 Sample Data

The test of this study requires sample firms (industry group) to have at least ten (10) years of consolidated balance sheet data and the firm should be listed in at least one stock exchange.

The analysis covers a period from 1996 to 2006 and includes a total of 40 firms from four different industry group that have the required financial data available from two secondary sources namely; BVDEP - Amadeus database[7] for consolidated balance sheet and ECOWin database from different stock markets for stock prices. Later in the analysis, data from two firms were dropped due to lack of stock prices data.

Sample firms in this study are taken from the following industry groups: manufacture of basic pharmaceuticals, manufacture of food products and beverages, information technology and manufacture of basic metals.

The data set and descriptive statistics of the variables of interest are shown in Table 1 and Table 2 below. The mean values of BI and stock price volatility are all higher than their medians indicating substantial concentration in a subset of firms with higher intangible assets.

[7] www.bvdep.com/en/**amadeus**.html

Table 1: Data Set of Project

Company	Intangible Asset	Total Asset	Intangible/Total Asset	Price Volatility	StockExchangeTraded
Astrazeneca Plc (Basic Pharmaceutical)	1522	11764	0.129377763	0.013150493	LSE(SETS)
Bayer Aktiengeselleschaft	7245	37127	0.195141003	0.014604562	XETRA
Fresinius Aktiengeselleschaft	3306	8136	0.406342183	0.013048314	XETRA
Smith & Nephew PLC	221	1212	0.182343234	0.015282613	LSE(SETS)
Bayer Shering Pharma Aktiengeselleschaft	504400	5409140	0.093249574	0.016665435	XETRA
Evotec AG	137821	250159	0.550933606	0.033456488	XETRA
Antisoma PLC	6594	30515	0.216090447	0.039003569	LSE(SETS)
Skyepharma PLC	64247	150131	0.427939599	0.026191733	LSE(SETS)
Merck Kommanditgeselleschaft Auf Aktien	1383344	7284900	0.189891968	0.017488666	XETRA
Sinclair Pharma PLC	26102	35332	0.738763727	0.0258407	LSE(SETS)
Unilever NV (Food products and beverage)	14107753	39100178	0.360810455	0.009810544	Euronext Amsterdam
Heineken NV	775200	8386097	0.092438711	0.011056146	Euronext Amsterdam
Sabmiller PLC	3179	6867	0.462938692	0.014646351	LSE(SETS)
Associated British Food PLC	607	4880	0.124385246	0.009123591	LSE(SETS)
Cadbury Schwepper PLC	3857	7760	0.497036082	0.010524944	LSE(SETS)
Greene King PLC	187620	1322650	0.141851586	0.014953568	LSE(SETS)
HKSCAN OYJ	33060290	373128782	0.088602894	0.018400051	Helsinki Stock Exchange
Diageo PLC	4779	15725	0.30391097	0.008531435	LSE(SETS)
ORKLA ASA	7604400	46956800	0.161944596	0.016537767	Oslo Stock Exchange
Compofrio Alimentacion SA	110551	891797	0.12396431		Madrid Stock Exchange
Deutsche Telekom AG (IT)	44567	119178	0.373953246	0.012280593	XETRA
Industrial and Financial System(IFS) AB	738970	2037580	0.362670423	0.021274515	OMX
Ordina N.V	52604	181929	0.289145766	0.017694054	Euronext Amsterdam
Tarsus Group PLC	24789	35999	0.688602461	0.020529135	LSE(SETS)
Stone Soft OYJ	3820409	39839573	0.095894828	0.025021914	Helsinki Stock Exchange
AND International Publishers N.V	7824	18883	0.414340942	0.02656043	Euronext Amsterdam
Qurius N.V	5282	24181	0.218435962	0.025709186	Euronext Amsterdam
Simac Techniek N.V	10543	90456	0.116553905	0.024717355	Euronext Amsterdam
Phoenix IT Group PLC	20708	47932	0.432028707	0.019780102	LSE(SETS)
Aldata Solution OYJ	7012254	37766078	0.185675992	0.027663995	Helsinki Stock Exchange
Outokumpu OYJ (Basic Metals)	271179	4942664	0.054864947	0.021644641	Helsinki Stock Exchange
Norddeutsche Affinerie AG	25097	888187	0.028256437	0.021488886	Frankfurt SX
Rautaruukki OYJ	86657	2567490	0.033751641	0.026361283	Helsinki Stock Exchange
Höganäs AB	154600	3986200	0.038783804	0.02076389	OMX
Sidenor S.A	2072905	352145846	0.005886496	0.0366327	Athens Stock Exchange
Poujoulat	731	57168	0.012786874		Euronrxt Paris
Etem S.A	1069998	96983742	0.011032756	0.037103958	Athens Stock Exchange
Zwahlen et Mayr S.A	445	76222	0.005838209	0.058314386	Swiss Exchange
Oglesby & Butler Group PLC	313843	6339531	0.049505713	0.038744086	Irish Stock Exchange
Acerinox S.A	23548	2578625	0.009131999	0.013219172	Madrid Stock Exchange

Table 2: Descriptive Statistics of Sample Data

	IA / TA	*Stock Price Volatility*
Mean	0.23100912	0.021679507
Standard Error	0.031700579	0.001685175
Median	0.184009613	0.020154619
Mode	#N/A	#N/A
Standard Deviat	0.195415496	0.010388118
Sample Varianc	0.038187216	0.000107913
Kurtosis	0.085494659	2.86273831
Skewness	0.884435395	1.419778016
Range	0.732925517	0.049782951
Minimum	0.005838209	0.008531435
Maximum	0.738763727	0.058314386
Sum	8.778346571	0.82382125
Count	38	38

***BI = IA / TA**

4.2 Empirical Results

The regression analysis was done using both Microsoft excel and SPSS software. Both software give identical results which is shown on Table 3 below.

The coefficient of intangible assets to total asset, BI (-.011, p=0.221) seems to be unrelated to volatility of stock prices which is also indicated by the standardized beta (β= -0.203). That is, the results show that the coefficient for the Intangible intensity is not statistically significant

The R-squared is 0.041; meaning that approximately 4.1% of the variability of stock price volatility (S_t) is accounted for by the variables in the model.

Table3: Statistics summary of OLS regression.

Regression result of St on BI_t								
Dependent variable: S_t								
	Coeff	**Std Error**	**Standardized Beta**	**t Stat**	**Sig**	**F-value**	**R Square**	**Adj R^2**
α	.024	.003		9.261	.000	1.551	.041	.015
BI_t	-.011	.009	-.203	-1.246	.221			

The negative correlation established between intensity of intangible assets and volatility of stock prices obtained in this result counter works prior research on non-booked degree of intangible assets. The negative sign of the coefficient of beta (β) at the first sight seems to be the opposite direction to what we would expect. This negative association may be due to the fact that;

- There seem to be little or no significant impact of booked intangible asset on the volatility of the firm share prices which are driven by uncertainty and expectation of future growth.
- One could also argue that it is costs on R&D and marketing (advertising) which eventually will be generating intangible asset, but

they are not booked as such to have a positive impact on the volatility of share prices, not when these costs are recognized as intangible asset, some times with quite conservative/ precautious application of accounting principles. Thus the book value of intangible assets is always lower that the actual value of the intangible asset.

Following the results obtained above, an industry-wise regression is run on the same data and the results are shown on table 4, table 5, table 6 and table 7 below.

Table 4: Statistics summary of OLS regression for Basic Pharmaceutical

Regression result of St on BI_t for Basic Pharmaceutical								
Dependent variable: S_t								
	Coeff	**Std Error**	**Standardized Beta**	**t Stat**	**Sig**	**F-value**	**R Square**	**Adj R^2**
α	.016	.005		3.017	.017	1.817	.186	.083
BI_t	.019	.014	.430	1.348	.215			

From table 4 above, coefficient of intangible assets to total asset, BI (0.019, p=0.215) for the manufacture of basic pharmaceuticals seems to be related to volatility of stock prices which is also indicated by the standardized beta (β= 0.430). This positive correlation supports previous research on the fact that there is a positive relation between the intensity of intangible assets and the volatility of their stock prices for pharmaceutical firm probably due to the high level of R&D in this industry.

The results of the regression from the other three industry group namely manufacture of food product and beverages, information technology and manufacture of basic metals all have a negative relation between the intensity of intangible assets and the volatility of their stock prices with beta value of -0.318, -0.415 and -0.348 respectively. These negative coefficients seems to be opposite the direction we expected and this might be due to the fact that there is

little or no significant impact of booked intangible asset on the volatility of the firm share prices.

Table 5: Statistics summary of OLS regression for Food product and beverage

Regression result of St on BI_t for Food Products and Beverages								
Dependent variable: S_t								
	Coeff	**Std Error**	**Standardized Beta**	**t Stat**	**Sig**	**F-value**	**R Square**	**Adj R^2**
α	.014	.002		6.217	.000	.787	.101	-.027
BI_t	-.007	.008	-.318	-.887	.405			

Table 6: Statistics summary of OLS regression for Information Technology

Regression result of St on BI_t for Information Technology								
Dependent variable: S_t								
	Coeff	**Std Error**	**Standardized Beta**	**t Stat**	**Sig**	**F-value**	**R Square**	**Adj R^2**
α	.026	.003		8.269	3.438	1.662	.172	.069
BI_t	-.011	.009	-.415	-1.289	.233			

Table 7: Statistics summary of OLS regression for production of Basic Metals

Regression result of St on BI_t for Basic Metals								
Dependent variable: S_t								
	Coeff	**Std Error**	**Standardized Beta**	**t Stat**	**Sig**	**F-value**	**R Square**	**Adj R^2**
α	.037	.008		4.589	.003	.970	.122	-.004
BI_t	-.249	.253	-.349	-.985	.357			

CHAPTER FIVE
SUMMARY AND CONCLUSIONS

In this study, I have given an overview of intangible assets and I examine the relation between the intensity of book value intangible assets of 38 firms and the volatility of their stock prices.

The study shows a negative correlation between the intensity on firm's intangible assets and the volatility of their stock prices which opposes my initial prediction and previous studies in this area. This negative association is probably due to that fact that the data for intangible assets used in this study are book values which are lower than the actual value and additionally, averaging over a period between 8 and 10 years might have contributed to the counter intuitive results.

Based on industry groups, I examine the relation between the intensity of book value of intangible assets of four industry groups and the volatility of their stock prices. Consistent with this prediction, I find a positive correlation between the pharmaceutical industry book value of intangible assets and the volatility of their stock prices which is supported by previous studies in this area. The impact of uncertainty and expectation on the behaviour of investors in this industry due to the high level of R&D going on in this industry also contribute to this result.

The other three industry groups did not give any different results from the main result of this study.

The study can be a first step towards a more broad understanding of the effect of book value of intangible assets on the volatility of share prices.

Future studies should consider all intangible assets and should not only focus on R&D and advertising. It should also look at the behaviour of investors with respect to general intangible assets as investor's behaviour is a major factor of stock price volatility.

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APPENDIX

Table 6: Data set sorted by Intensity of Intangible assets

Company	Intangible Asset	Total Asset	Intangible/Total Asset	StockExchangeTraded
Sinclair Pharma PLC	26102	35332	0.738763727	LSE(SETS)
Tarsus Group PLC	24789	35999	0.688602461	LSE(SETS)
Evotec AG	137821	250159	0.550933606	XETRA
Cadbury Schwepper PLC	3857	7760	0.497036082	LSE(SETS)
Sabmiller PLC	3179	6867	0.462938692	LSE(SETS)
Phoenix IT Group PLC	20708	47932	0.432028707	LSE(SETS)
Skyepharma PLC	64247	150131	0.427939599	XETRA
AND International Publishers N.V	7824	18883	0.414340942	Euronext Amsterdam
Fresinius Aktiengeselleschaft	3306	8136	0.406342183	XETRA
Deutsche Telekom AG (**IT**)	44567	119178	0.373953246	XETRA
Industrial and Financial System(IFS) A	738970	2037580	0.362670423	OMX
Unilever NV (**Food products and bev**	14107753	39100178	0.360810455	Euronext Amsterdam
Diageo PLC	4779	15725	0.30391097	LSE(SETS)
Ordina N.V	52604	181929	0.289145766	Euronext Amsterdam
Qurius N.V	5282	24181	0.218435962	Euronext Amsterdam
Antisoma PLC	6594	30515	0.216090447	LSE(SETS)
Bayer Aktiengeselleschaft	7245	37127	0.195141003	XETRA
Merck Kommanditgeselleschaft Auf Ak	1383344	7284900	0.189891968	XETRA
Aldata Solution OYJ	7012254	37766078	0.185675992	Helsinki Stock Exchange
Smith & Nephew PLC	221	1212	0.182343234	LSE(SETS)
ORKLA ASA	7604400	46956800	0.161944596	Oslo Stock Exchange
Greene King PLC	187620	1322650	0.141851586	LSE(SETS)
Astrazeneca Plc (Basic **Pharmaceutic**	1522	11764	0.129377763	LSE(SETS)
Associated British Food PLC	607	4880	0.124385246	LSE(SETS)
Compofrio Alimentacion SA	110551	891797	0.12396431	Madrid Stock Exchange
Simac Techniek N.V	10543	90456	0.116553905	Euronext Amsterdam
Stone Soft OYJ	3820409	39839573	0.095894828	Helsinki Stock Exchange
Bayer Shering Pharma Aktiengesellesc	504400	5409140	0.093249574	XETRA
Heineken NV	775200	8386097	0.092438711	Euronext Amsterdam
HKSCAN OYJ	33060290	373128782	0.088602894	Helsinki Stock Exchange
Outokumpu OYJ (Basic Metals)	271179	4942664	0.054864947	Helsinki Stock Exchange
Oglesby & Butler Group PLC	313843	6339531	0.049505713	Irish Stock Exchange
Höganäs AB	154600	3986200	0.038783804	OMX
Rautaruukki OYJ	86657	2567490	0.033751641	Helsinki Stock Exchange
Norddeutsche Affinerie AG	25097	888187	0.028256437	Frankfurt SX
Poujoulat	731	57168	0.012786874	Euronrxt Paris
Etem S.A	1069998	96983742	0.011032756	Athens Stock Exchange
Acerinox S.A	23548	2578625	0.009131999	Madrid Stock Exchange
Sidenor S.A	2072905	352145846	0.005886496	Athens Stock Exchange
Zwahlen et Mayr S.A	445	76222	0.005838209	Swiss Exchange

Figure 1: Graph of sorted data set by intensity of intangible assets