

An empirical analysis of the connection of accounting information and share prices

Kíra Martin

Corvinus University of Budapest
kira.martin@uni-corvinus.hu

Abstract: The study first reviews the results of major international research projects on the connection of accounting information and market price of companies, then presents experiences of the empirical analysis carried out by the author. The analysis has been done by the author on a data set of the 2005-2009 time period produced by a sample consisting of companies issuing stocks registered at the Budapest Stock Exchange, and used multiple variable statistical data analysis to study the presence, direction and strength of relations of the stock price on the one hand, and the book value of equity and - from the earnings categories - earnings before interest and tax, earnings before taxes and overall earnings on the other hand.

Keywords: equity, earnings, book value, market value, stock price

Introduction

In the past decade, in the international, and then also in the Hungarian professional literature, several studies emerged that were focusing on the difference of the market value and book value of enterprises and the altering - first increasing, then decreasing - measures of this difference. An example of such studies was the research by Boulton - Libert - Samek [2000] that inspected the data of more than 10 000 stock exchange companies between 1978-1998, and found that while the book value of the companies was 95% of the market value at the beginning of the inspected period, it decreased to 28% by the end of the period. A highlight example mentioned is Microsoft, the market value of which company in 1999 was USD 600 billion, whereas its book value was only USD 31,6 billion.

The general research activity focusing on the transformation of the economy and the sweeping of knowledge-based companies, outlined also in the above study, talked about the increasing difference between the market value and book value of companies, which phenomenon they attributed to accounting deficiencies. In the past few years this lead to a number of researches that inspected the value relevance of accounting data in connection with the inspection of the gap between

market value and book value. These researches intended to verify if the relationship between stock prices and the book value and/or the earnings had really weakened in the preceding period. The inspection presented here, concerning the data of Hungarian companies, fits in the series of these researches.

1 Summary of the results of relevant international researches

The definition of value-relevance by Thinggaard – Damkier [2008] is similar to that of other studies to be discussed hereafter: information gained from the financial statement is value-relevant if there is a statistical correlation between the accounting information and the market value or the earnings.

Let us now review the results of a few researches concerning the changes of the gap between companies' market value and book value, and the value-relevance of accounting data!

King – Langli [1998] took the data on the 1982-1996 time period of a total of 14 643 stock exchange companies from three European countries, Germany, Norway and the United Kingdom, and inspected the gap between book value and market value as well as the value-relevance of accounting data (the book value of the equity and the earnings per share). According to data introduced in their studies, the average book value / stock price (BV/P) was 0,41 in Germany, 0,58 in Norway and 0,63 in the United Kingdom. Concerning the value-relevance of accounting data they stated that both the book value and the earnings per share were in significant relation with the stock price. Concerning the difference between the inspected countries they found that book value was more relevant in Germany and Norway, whereas earnings per share was the more relevant factor in the United Kingdom.

Gornik-Tomaszewski – Jermakowicz [2001] inspected 77 stock exchange companies of Poland between 1996-1998 and on the basis of the data of that research the value of the BV/P index was 0,61, which is to be reckoned as relatively low among European countries. Inspecting the book value and the value-relevance of the earnings they concluded that both were in significant and strong relation with stock prices. From the two factors inspected, the explanatory value of book value turned out to be bigger. Inspecting the correlation of the two explanatory variables they found that their correlation was weak, thus they threw out the possibility of multicollinearity. Although in case of loss-making companies the significance of the explanatory value of the book value was restricted, but still, this was the only explanatory variable.

Arce – Mora [2002] carried out an inspection covering a total of 22 436 inspection items from eight European companies in the 1990-1998 time period, according to which the average value of the BV/P_0 rate indicated significant inequalities with respect to the countries involved. The value of the rate was lowest in Germany (0,559), but it was also low in the Netherlands (0,660), and in the United Kingdom (0,670). Higher values were gained concerning the companies of Belgium (0,787), France (0,790), Spain (0,880) and Switzerland (0,892), and the value was highest concerning the stock exchange companies of Italy: 0,995. The latter value means that the average difference between stock prices of companies and their book value was not notable. Along with the rate of book value and market value they also inspected the value-relevance of accounting data (the earnings and the book value of equity). Their study justified the value-relevance of the accounting data. Dividing the sample into two subgroups they also found that in countries using the continental accounting system, where credit institutions play a more important role, the book value was more relevant, having a stronger relation with the stock price, whereas in England and in the Netherlands, where the capital market have more important role in the financing policy of companies, the earnings is the more relevant indicator. From the countries using the continental system, France is an exception, because the relation of the earnings with the stock price is stronger there. Results concerning Belgium and Italy are not significant.

Dontoh – Radhakrishnan – Ronen [2004] studied the strength of relation between stock prices and accounting data (earnings and the book value of equity) along with the business activity, inspecting data of companies from the United States from the 1983-2000 period and found that the strength of the relation decreased, the cause of which was the increase in non-information-based business activity. Quoting Grossman, non-information-based business activity refers to such stock acquiring and selling transactions the cause of which is not related to the payouts of the stock, but instead, for example, to reallocation of capital between industrial branches, risk preferences, liquidity needs, unanticipated investment opportunities etc. According to their view, the non-information-based business activity distances stock prices from the real (internal) value of the stock, thus weakening the relation of stock prices and accounting data. Their research has shown that the non-information-based business activity is in inverse proportion to the strength of the relation (R^2) between stock prices and accounting information. That is, with the increase of the rate of non-information-based business activity, a decrease could be inspected concerning the strength of relation between stock prices and accounting information. Their study has also shown that this applies especially to companies with high market value / book value rate. On this basis they concluded that in case of companies where the difference between market value and book value is significant, the decrease in the strength of relation between the stock price and the accounting information is much more explainable with the non-information-based business activity than with the disability of accounting data. Based on their survey results they concluded that the real decrease in the value-relevance of the

accounting data shall not be as strong as it was signalled by the change of the relationship.

Hellström [2006] studied the alterations of the rate of market value and book value in a comparative study of Czech and Swedish stock exchange companies and came to very interesting results, compared to researches made so far. Dividing the inspection period of 1994-2001 into two sub-periods (1994-1997 and 1998-2001) he found that during these two cycles the market value / book value (MV / BV) rate decreased from 0,74 to 0,57 in case of companies at the Prague Stock Exchange, whereas it increased from 2,35 to 2,67 in case of companies at the Stockholm Stock Exchange. Most interestingly, in case of the Czech companies the average book value was continually, and increasingly over the average market value, and the value of this index changed in opposite directions in the two countries in the inspected time period. Concerning the statistical connection between accounting data and stock prices Hellström found that the value-relevance of accounting data is lower in the Czech transition economy than in the well developed Swedish economy. According to these results the value-relevance increases as the country progresses in the procedure of transition.

Brimble – Hodgson [2007] found in an inspection of the data of Australian stock exchange companies concerning the 1973-2001 time period that the average BV/P rate was 0,80, which means that similarly to some European countries, but unlike in the United States, the difference in Australia is not outstanding between the book value and the stock prices of companies. Furthermore, their study inspected if the value-relevance of the earnings had decreased during the time period in concern. They found that in Australia the value-relevance had not decreased, and when explaining the alteration of stock prices, the book value (the relevance of which had not decreased either) is less important than the earnings, and than in the United States of America. They concluded that the value-relevance of the accounting data had not decreased, instead, the complexity of the economical environment had increased.

Thinggaard – Damkier [2008] inspected the data referring to the 1983-2001 time period of Danish companies, whether the value-relevance of accounting data had decreased in that period. The results show that the value-relevance of accounting data had not decreased but remained unchanged, both in case of the smaller and the larger companies. Comparing their results with other similar inspections they came to the conclusion that the data they found was in accord with results of other European researches, which also invalidated such statements concerning the decreasing value-relevance that were based on data from the United States.

These above, internationally published examples highlight that the gap between the market value and the book value of the companies is remarkably different in the individual countries, being the largest in the United States of America. Results are also different concerning value-relevance. The most remarkable difference emerges between results from Europe and from the United States: whereas

concerning Europe researchers have not witnessed decrease in the value-relevance of accounting data, concerning the United States they have. The other difference is that in countries using the continental accounting system the book value has more explanatory strength concerning the stock prices, whereas in countries using the anglo-saxon system earnings was the more important. Results of the survey on the Czech companies are outstanding, that is, the value-relevance of accounting data is lower in transition economies.

2 Summary of the results of the empirical research carried out on the Hungarian sample

2.1 The inspected population and the database

My research on the connection of accounting information and stock price have been carried out concerning those companies introduced to the Budapest Stock Exchange and issuing shares in the 2005-2009 time period. Due to the low number of stock exchange companies, sampling was unnecessary and I had the opportunity to carry out a complete examination. It was a general requirement for all members of the population to be registered at the stock exchange during the total period of inspection, and to prepare their financial statement in accord with the International Financial Reporting Standards so as to gain a population that is homogenous with respect to the accounting rules applied. Due to their accounting characteristics, monetary enterprises did not fall into the circle of the inspected population. As a result of the above procedure, the complete examination comprised a total of 26 inspection units. This might be a problem concerning statistical stability, thus at the interpretation of the results of the inspection this fact had to be kept in mind.

I calculated the market value data as a product of the closing stock prices on 31st December of the consecutive years with the share mass covering the total base capital, thus I gained the total market value of the company. I used the equity value on each 31st December as book value.

Concerning the earnings the inspection covered three sub-categories, thus I had the opportunity to inspect the effect of these earnings categories on the relations in focus. The earnings categories included are: earnings before interests and tax (EBIT), earnings before taxes and overall earnings. Concerning the earnings data I carried out the calculations for all companies with the earnings of the individual business years.

In case of two inspection units the business year differed from the calendar year. In case of these companies I used the earnings values belonging to the balance sheet date closest to 31st December, because this way I could inspect the earnings of full

business years in a manner that provided the largest possible overlap between the altered business year and the calendar year.

2.2 Methods applied

In this research I tested the existence, direction, strength and nature of the relation of the book value and the earnings with the market value. For the analysis of the relation of the above metric variables I used the method of correlation-analysis, within which I also defined the Pearson and the partial correlation coefficient values for the five balance sheet dates of the inspected period. When carrying out the calculations concerning the relationship of the earnings and the market value, I involved results of the three earnings categories separately. In the calculation of the partial correlation coefficient, data of the earnings categories were used individually and together as controlled variables in the inspection of the relationship of book value and market value, whereas the book value was used as controlling variable at the analysis of the relationship of the earnings and the market value.

2.3 Research findings

I summarized the correlation coefficients of the relation of the book value and the market value for the whole population in Table 1. The significance level of the value with light grey background is above 1% but below 5% significance level. All other correlation coefficient values had a significance level below 1%.

Based on the calculations carried out it can be stated that there has been a significant strong positive correlation¹ between the book value and the market value all along the five years of the inspection period. This is signalled by the positive value of the Pearson's linear correlation coefficient that is close to 1, which took the value of 0,990 on 31.12.2005, and did not show remarkable alterations in the consecutive years. It took the value of 0,993 on 31.12.2006, 0,969 on 31.12.2007, 0,977 on 31.12.2008 and 0,974 on 31.12.2009. All of these correlation coefficients indicated 0% significance level.

The value of the partial correlation coefficients did not show so strong relation and I experienced remarkable alterations of them during the inspection period. However, a positive and at least moderate correlation has remained in all

¹The usual interpretation of the correlation coefficient (r) values is the following: the indication of the coefficient shows the direction of the correlation, whereas the value shows its strength. The $r=1$ means perfect positive, function-like and linear relation, the $0,7 \leq r < 1$ means strong positive relation, the $0,2 \leq r < 0,7$ means moderate positive relation, and the $0 < r < 0,2$ value means weak positive connection. On the usual interpretation of correlation coefficients see also: Sajtos-Mitev [2007], pp. 205.

occasions, the controlled variables could thus only partially explain the strength of the relations of the book value and the market value. The direction of changes between the consecutive years was in accord with the change direction of the Person's correlation coefficient, thus the values indicating the strength of the relations increase between 31.12.2005 and 31.12.2006, decreased between 31.12.2006 and 31.12.2007, increased again by 31.12.2008 and decrease again by 31.12.2009. There were two correlation coefficient values standing out: the partial correlation coefficient of 31.12.2008 with the overall earnings as controlled variable, and when the total of earnings categories was used together as controlled variable. In these cases the level of significance also declined.

The values of the coefficient indicated alterations when I changed the earnings category to be used as controlled variable. As a summary, the earnings before interests and tax and the earnings before taxes had a stronger effect on the relationship of the book value and the market value than the overall earnings. This is indicated by the fact that when the overall earnings was the controlled variable, the values of the partial correlation coefficient differed less from the values of the linear correlation coefficient than in those cases when the earnings before interests and tax or the earnings before taxes was used as controlled variable.

This alteration of the results gained is a consequence of the multicollinearity between the variables, because the book value correlated most strongly with the earnings before interests and tax and less with the overall earnings, but even the latter meant a strong positive correlation. Since the earnings categories are built on one another, strong positive connection could be found between the individual earnings values, too, as the earnings before interests and tax is a determining component of the other two earnings values. In the majority of cases inspected, the profitability of the business activity of enterprises was massively determined by the temporary success of the business activity, which is indicated in the earnings before interests and tax. Alterations in the values of the other earnings categories mostly reflected the value of this, which lead to a decreasing explanatory strength of the earnings categories concerning the strength of the relation between the book value and the market value, as we move farther from the earnings before interests and tax. This is justified by the research finding that the significant strong positive correlation of the book value and the earnings before taxes to the overall earnings lost its significance when I calculated a partial correlation coefficient for these variables while using the earnings before interests and tax as controlling variable.

To eliminate the effect of the multicollinearity between the earnings categories I carried out a calculation of a partial correlation coefficient in a way that I used all three earnings categories as controlled variables.

along with the altering verification of the overall earnings the book value and the market value indicated strong positive correlation and a significance level between 0-1%, excepting the ate of 31.12.2008. The value of the partial correlation coefficient was 0,769 by 31.12.2005, 0,891 by 31.12.2006, 0,818 by 31.12.2007

and 0,893 by 31.12.2008. There was a significant difference at the coefficient value calculated for 31.12.2008, the value indicating moderate positive correlation was 0,493, and the significance level also took the worse value of 1,2%. This was the only date when the overall earnings had the strongest correlation with the book value, the effect of which was reflected in the value of the partial correlation coefficient.

Along with the altering control of the earnings before taxes, I obtained only moderate positive correlation for the book value and the market value for 31.12.2005 and for 31.12.2009, but all partial correlation coefficients indicated 0% significance level. The value of the coefficient was 0,600 by 31.12.2005, 0,862 by 31.12.2006, 0,715 by 31.12.2007, 0,753 by 31.12.2008 and 0,697 by 31.12.2009.

When I used the earnings before interests and tax as controlled variable for the calculation of the partial correlation coefficient, I obtained a moderate positive correlation also for 31.12.2007. In this case there are only two dates (31.12.2006 and 31.12.2008) indicating strong positive correlation between the book value and the market value, but even in this case all partial correlation coefficients have a significance level between 0-1%.

The value of the coefficient was 0,631 by 31.12.2005, 0,870 by the same date of 2006, 0,539 by that of 2007, 0,799 by that of 2008 and 0,657 by that of 2009.

The partial correlation coefficient values calculated this way are (excepting the value for 31.12.2007) very similar to those calculated with the use of the earnings before taxes as controlled variable. 31.12.2007 was the only date where I experienced that the earnings before interests and tax is in stronger correlation with the market value than with the book value. The partial correlation coefficient calculated with the use of the book value as controlling variable indicate significant correlation between the market value and the earnings before interests and tax only at this individual date. This is why the earnings before interests and tax have such a big explanatory strength concerning the relationship of the book value and the market value.

During the 2007 business year there was a significant increase in the market value of most of the companies involved in the inspection, and the amount of earnings before interests and tax superseded in most cases that of the previous year. This parallel increase may cause the above discussed effect on the correlation coefficients, but it certainly does not mean cause and effect relationship of the alterations of the two values.

After the one-by-one elimination of the effect of each individual earnings category on the relationship of the book value and the market value, I defined the partial correlation coefficient values along with the parallel control of the three earnings categories. The coefficient values gained this way show clearly, without the

influencing effect of the value of the earnings the relationship of the book value and the market value.

The obtained correlation coefficient values indicated strong positive correlation along with a 0-0,2% significance level, with the exception of the value for 31.12.2008. The value of the coefficient was 0,841 by 31.12.2005, 0,901 by 31.12.2006, 0,726 by 31.12.2007, 0,601 by 31.12.2008 and 0,971 by 31.12.2009.

The strength of the correlation increased during the inspected time period, as indicated by the difference of the values calculated for 31.12.2005 and 31.12.2009. The values of the partial correlation coefficient were less and less behind the Pearson's correlation values, and as a result, by 31.12.2009 the linear and the partial correlation coefficient values were almost identical. This indicates that the effect of the earnings variables on the correlation between the book value and the market value decreased during the inspected time period.

There is one differing result concerning the above presented trends: strong fallbacks could be measured in the strength of the controlled correlation on 31.12.2007 and 31.12.2008, which were the result of significant changes concerning the market value. By 31.12.2007 the market value of the majority of inspected companies (22 enterprises) had significantly increased, whereas no change of this extent could be experienced in their book value. Due to the economic crisis, there was a significant decrease in the market value of 25 inspected companies by 31.12.2008, which decrease did not affect the book values.

As a summary of all the above, there was a significant strong positive relationship between the book value and the market value of the total of the inspected companies during the inspected time period, which correlation weakened, but remained significant even if I used the earnings categories as controlled variables.

Correlation coefficient	31.12. 2005	31.12. 2006	31.12. 2007	31.12. 2008	31.12. 2009
Pearson's	0,990	0,993	0,969	0,977	0,974
Partial (EBIT)	0,631	0,870	0,539	0,799	0,657
Partial (Earnings before taxes)	0,600	0,862	0,715	0,753	0,697
Partial (Overall earnings)	0,769	0,891	0,818	0,493	0,893
Partial (All earnings)	0,841	0,901	0,726	0,601	0,971

Table 1

Correlation coefficients of the book value and the market value for the whole population

I summarized the values of the correlation coefficients of the individual earnings values and the market value, calculated for the total population in Table 2. The significance level of the value with light grey background is above 1% but below 5% significance level. The significance levels of the values with dark grey background are above 5%, thus these correlation coefficient values shall not be reckoned as significant. All other correlation coefficient values had a significance level below 1%.

In view of the whole population of the inspection it can be stated that there have been significant strong positive correlation all along the time period inspected, between all three individual earnings categories and the market value. This is signalled by the positive values of the Pearson's linear correlation coefficient that are close to 1, and did not show significant alterations by the earnings categories involved.

During the time period of the inspection the direction of changes of the linear correlation coefficients between the consecutive years was opposite to the direction of changes of the correlation coefficient calculated on the relationship of the book value and the market value. As a result, concerning all three earnings categories, the values indicating the strength of relationship decreased between 31.12.2005 and 31.12.2006, then increased by 31.12.2007, decreased again by 31.12.2008 and increased again by 31.12.2009. There is only one correlation coefficient value standing out, the Pearson's correlation coefficient of 31.12.2009 for the case when I inspected the correlation of the overall earnings and the market value, but the cause of this was that the coefficient value calculated for 31.12.2008 did not show as big fallback compared to the previous year as I could experience in case of the other two earnings categories. It can be stated as a summary that during the inspected period the strength of relationship between all of the three earnings categories and the market value fell back, although the relations still remained very strong and positive.

The linear correlation coefficient denominated for the relationship of the overall earnings and the market value was 0,985 on 31.12.2005 and did not show significant alteration in the consecutive years. It took the value of 0,965 on 31.12.2006, 0,982 on 31.12.2007, 0,974 on 31.12.2008 and 0,952 on 31.12.2009. All of these correlation coefficients indicated 0% significance level.

The linear correlation coefficient denominated for the relationship of the earnings before taxes and the market value was 0,988 on 31.12.2005 and did not show significant alteration in the consecutive years. It took the value of 0,973 on 31.12.2006, 0,983 on 31.12.2007, 0,950 on 31.12.2008 and 0,968 on 31.12.2009. All of these correlation coefficients also indicated 0% significance level.

The Pearson's correlation coefficient denominated for the relationship of the earnings before interests and tax and the market value was 0,983 on 31.12.2005 and did not show significant alteration in the consecutive years. It took the value of 0,974 on 31.12.2006, 0,984 on 31.12.2007, 0,934 on 31.12.2008 and 0,960 on

31.12.2009 All of these correlation coefficients also indicated 0% significance level.

The value of the partial correlation coefficients calculated while using the book value as controlling variable did not show so strong relation and were in several cases non-significant. However, a positive and at least moderate correlation has remained in all such occasions when the significance level of the value of the coefficient stayed below 1%. This indicates that the book value as controlling variable provided partial explanation for the strength of the relationship between the inspected earnings category and the market value.

Concerning the overall earnings and the market value it can be stated that the relationship was significant on three dates. There was a moderate positive (0,626) correlation on 31.12.2005 and strong positive correlation on 31.12.2007 and 31.12.2009 (0,899 and 0,797). The partial correlation coefficients indicated a significance level around 0% on these dates. On 31.12.2006 the value of the coefficient was not significant, and the 0,410 coefficient value calculated for 31.12.2008 also indicated a significance level of almost 5%.

The correlation between the earnings before taxes and the market value was significant on only two dates. On 31.12.2007 the partial correlation coefficient took the value of 0,853 showing strong positive correlation, whereas on 31.12.2009 it took the 0,609 value, which means moderate positive correlation. Both coefficients indicated a significance level around 0%. On 31.12.2005 the coefficient indicated moderately strong relation (0,495) and approximated the border of significance with a 1,2% significance value. The coefficient values calculated for 31.12.2006 and 31.12.2008 were not significant.

The partial correlation coefficient measuring the strength of relation between the earnings before interests and tax and the market value was only significant at one date: on 31.12.2007 it took the 0,789 value at 0% significance level. Values gained for all the other inspected dates were all unreliable.

Values of the partial correlation coefficients calculated for the whole population between the individual earnings categories and the market value only proved significant on one date. This date was 31.12.2007, when I obtained strong positive correlation for all earnings categories and at 0% significance level. On this date a considerable decline could be inspected regarding the strong positive correlation of the individual earnings categories with the book value, which was also reflected in the high values of the partial correlation coefficients.

Contrary to the above, the coefficient values calculated for 31.12.2006 were non-significant for all earnings categories and all took negative values. At the majority of inspected companies the market value increased more or less in both years. Concerning the overall earnings, one third of the companies were loss-making in 2006, whereas in 2007 only three companies closed with negative earnings. This fact might have contributed to such alterations of the correlation values as well as

to the loss of significance in case of the coefficients calculated for 31.12.2006. The situation was quite similar in 2008, when the ratio of loss-making companies raised high again, which influenced the values of the correlation coefficients and their significance adversely.

Based on the above, it can be concluded that there has been a strong positive correlation during the inspected time period between the individual earnings categories and the market value, which correlation weakened and in most cases lost its significance whenever I included the book value as a controlled variable.

Earnings category	Correlation coefficient	31.12. 2005	31.12. 2006	31.12. 2007	31.12. 2008	31.12. 2009
Earnings before interests and	Pearson's	0,983	0,974	0,984	0,934	0,960
	Partial (book	0,126	-0,377	0,789	0,007	0,373
Earnings before taxes	Pearson's	0,988	0,973	0,983	0,950	0,968
	Partial (book	0,495	-0,233	0,853	0,272	0,609
Overall earnings	Pearson's	0,985	0,965	0,982	0,974	0,952
	Partial (book	0,626	-0,110	0,899	0,410	0,797

Table 2.

Correlation coefficients of the earnings and the market value for the total population

Conclusions

Based on the results of the research it can be concluded that in case of the Hungarian companies, similarly to results of surveys made on European samples, no strong decrease could be found concerning the value-relevance. Furthermore, in Hungary, just as in other countries using the continental accounting system, the book value has the greater explanatory strength concerning the market value.

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