AN EMPIRICAL ANALYSIS OF THE EFFECTS OF THE 2007-2008 FINANCIAL CRISIS ON CHANGES IN THE VALUE CREATION OF FIRMS IN INDIVIDUAL INDUSTRIAL SECTORS

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Abstract: *The main goal of this paper to answer the question: what are the factors that influence the value of the firm and how does the influencing force of these factors take shape in the various sectors of ten industries, in the light of the aftermath of the 2007-2008 global financial crisis. Regarding the effects of the crisis, are there any differences among the examined industrial sectors? In this study I examined the validity of my hypothesis with using the available database which I have set according to the related literature reviewed and research objectives. After the literature review I conducted statistical research to answer the research question of this paper. This study proceeds as follow. The first section classifies the firm value drivers based on the related literature. The second part describes the economic crisis, introducing its financial aspects. The next section is the empirical part of the paper, I reveal the database used for my own study. The third part illustrates the panel regression model, the applied method of empirical analysis and the results of the research. Finally, the fourth section includes the concluding remarks. In this paper it is not my purpose to compare the earlier published and already existing research results with my own results.*

1. The Firm's Creation of Value

"The process of value creation is the procurement, management and use of resources with the aim of creating value for the customer." (Chikán& Demeter, 2006, p.3)

Porter (1998), in his theory of the value chain, focuses on the creation of value. In his opinion all companies carry out their activities in order to create value. These activities can be divided into two large groups; primary and support activities. Primary activities are involved in the physical creation of the product and its sale and transfer to the buyer as well as after-sale assistance. Support activities support the primary activities and each other by providing purchased inputs, technology development, and human resources, and various firm wide functions. The generic value chain is seen in the Figure 1. (Porter, 1998, pp.36-43)
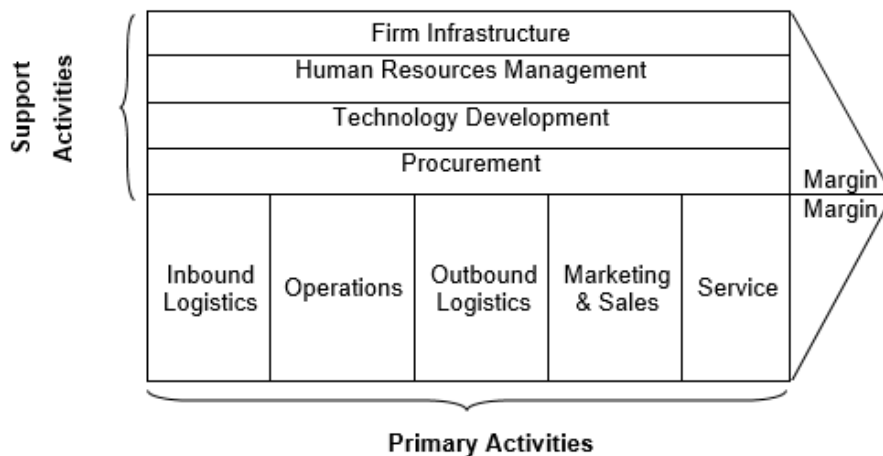
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                    Firm Infrastructure
                Human Resources Management
                   Technology Development
                        Procurement
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Figure 1. The Generic Value Chain
Source: Porter (1998:37)

2. Identifying of Value Drivers

According to Rappaport (1998), the first task of the leaders of the firm is to grow the shareholder value, which can be achieved by creating a strategy and deciding on operative performance criteria.

The shareholder value approach can be considered universal; it can be used for the analysis of strategies and product lines in private and public limited companies and business units. The direct relationship between the analysis of strategy and shareholder value expresses the idea that the business strategies are "converted" to the amount of finance they create. For the operational managers, one of the most important results of the shareholder value-based analysis is that it helps to decide which activities should receive most attention during the operation of the business. The seven value drivers are the macro value drivers according to Rappaport. There are the follows:

1. sales growth rate,
2. operating profit margin,
3. income tax rate,
4. working capital investment,
5. fix capital investment,
6. cost of capital,
7. value growth duration. (Rappaport, 1998, pp.55-56)

To achieve this, the main evaluation characteristics of the system used to measure performance are, at the company level, the shareholder return, at the operative level the shareholder value added and the indicators which predict value, and at the lower organisational level, the key value drivers. (Rappaport, 1998)

Copeland and co-authors (1999) are of the opinion that the firm's value is determined by its ability to generate cash flow and the return of the invested cash flow, and the determining factors of value are referred to as key value drivers. When comparing the firm's performance indicators they emphasise that there are two methods, the entity DCF-model and the several year economic profit model, which correspond to

the achievement of a long term approach and the capital intensive criterion. (Tóth& Herczeg, 2015)

Damodaran (2006) identifies four valuation models:
1. discounted cash flow valuation,
2. relative valuation,
3. contingent claim valuation,
4. asset-based approach.

Damodaran (2006, pp.406-407) demonstrates two methods of deducing free cash flow. According to one method, we add together all cash flows which belong to the firm's financers, i.e. the free cash flows due to the owners from their own capital, the capital repayments due to creditors, interest expenditure and newly acquired credit, and the preference payments to preference shareholders. With the other method, we add together all cash flows before redistributing them to resource providers. This latter version appears to be easier to use.

$$FCFF = EBIT * (1 - T) - Net\ Capital\ Expenditures - Change\ in\ non\ cash\ Working\ Capital$$

Damodaran (2006) considers the discounted cash flow-based analysis to be the basis of all methods of analysis, the one on which all others are built. In order to understand and use both the relative and the option-priced models, we must start with the DCF process.

Summarising what can be learnt both theoretically and practically from the above sections, we can state that there is a logical relationship between these processes, starting from Porter's (1998) value chain theory – i.e. that aim of the firm's operation is to create value, so the source of the firm's value creation is its operation –, through Rappaport's (1998) shareholder value network and the concept of maximizing shareholder value – with the help of which we can identify value creators –, through Copeland and co-authors' (1999) key value drivers – which determine the values which are closely related to the firm's ability to generate cash flow –, to Damodaran's (2006) evaluation models – including discounted cash flow-based, relative and option analysis and the asset-based analysis models. On all of these theoretical bases we can establish the factors which create the firm's value.

I. FCFF (Free Cash Flow to Firm)$= EBIT * (1 - T) - Net\ Capital\ Expenditures - Change\ in\ non\ cash\ Working\ Capital$
   a. EBIT (Earnings Before Interest and Taxes)
   b. Tax Rate
   c. Reinvestment$=(Net\ Capital\ Expenditures + Change\ in\ non\ cash\ Working\ Capital)$

II. Invested Capital

III. ROIC (Return on Invested Capital)

$$ROIC = \frac{EBIT(1 - t)}{Invested\ Capital}$$

IV. Net Margin

$$Net\ Margin = Net\ Income\ /\ Sales$$

V. Cost of Capital

Market ROA$= \frac{Net\ Income}{Market\ Values\ of\ Equity + Market\ Value\ of\ Debt}$

VI. Sales Growth Rate

3. The Empirical Analysis of the Role of Factors Influencing Firms' Value

The objective of this article is to answer the question of which factors affect the firm's value, and what changes occurred to drivers related to the value creation of firms in the effects of the 2007-2008 global financial crisis.

With this in mind was analysed a database featuring data from 18 European countries, 10 sectors and 1553 firms in the period between 2004 and 2011, which can be considered a strongly balanced panel, containing few missing observations. The database is found on Aswath Damodaran's website, and several adjustments were made in relation with the database. (http://pages.stern.nyu.edu/~adamodar/, 2014)

The firm value was used for the value of the firm value category, which is the sum of the market capitalization – the best estimate of the market value of equity – and the value of market debt. The factors influencing firm value – as a dependent variable – are those value drivers mentioned above which most determine the value of the firm.

In the case of firm value, EBIT, reinvestment and invested capital, were used natural logarithms of the variables, while the natural logarithms of the revenue difference was used for the sales growth rate, since in this way the distribution of the variables approached a normal distribution.

As a continuation of the empirical research, the specification of the panel model was carried out. The panel model – also referred to as longitudinal data analysis –, accompanied by the use of time series and cross-sectional data, is the most tried and tested method. With the help of the panel model it becomes possible to observe the development over time (time series) of the same firm characteristics (cross-sectional data), since the panel database contains several time periods and several individual category entries (firm, industrial sector, country) in tabular form. (Ramanathan, 2003, pp.498-501)

The next step was to specify the multivariable regression model:

$$LnFV_{i,t} = \alpha + \beta_{lnEBIT}lnEBIT_{i,t} + \beta_{tax}tax_{i,t} + \beta_{lnReinv}lnReinv_{i,t} + \beta_{lnInvC}lnInvC_{i,t}$$
$$+ \beta_{ROIC}ROIC_{i,t} + \beta_{NetM}NetM_{i,t} + \beta_{MROA}MROA_{i,t} + \beta_{dlnRev}dlnRev_{i,t}$$
$$+ u_{i,t} + \varepsilon_i$$

The analysis was prepared with the help of the STATA 11 statistics programme, which is able to produce statistical and econometric calculations and graphic presentations of data.

I restructured this panel database so that it would be able to examine the changes caused by the crisis in the different industrial sectors. Consequently, I examined the sectors separately. The earlier researches were published in my previous article. (Kiss, 2015)

In my current research I examine how the 2007-2008 financial crisis affected the relationship between firm value and value drivers. To do this I used a random effect panel regression model, in such a form that alongside the predictors, I introduced the effect of the years as a "time dummy" variables into the model, and also inserted the one-year delayed dependent variable into the independent variables, which assisted me in analysing of impacts. The three most significant effects of the panel regression results are contained the Table 1.

It is characteristic of the **financial sector** that among the factors affecting the value of firm, the firm value in the preceding period, the LnEBIT and the sales growth rate can be considered to be significant and to have a positive effect. The other

independent variables have no effect on the dependent variable. Among the different years in this sector, 2008 had the greatest negative influence, while 2005 had a positive effect on value; the other years were not significant. Analysing the cross effects, it is clear that the multiplication of the LnEBIT*2008 time dummy variable had a negative effect, while the multiplication of LnInvested capital and the 2008 time dummy variable had a positive effect on firm value.

Table 1: Results of panel regression between 2004 and 2011 in the different industrial all sectors

	Financial sector	Energy sector	IT sector
	lnFirm_V	lnFirm_V	lnFirm_V
	Coef.	Coef.	Coef.
lnFirm_V L1.	0.4038***	0.3455***	0.4381***
lnEBIT	0.3711***	0.4122***	0.2884***
Tax_r	0.0126 ns.	-0.0328 ns.	0.0071 ns.
lnReinv	0.0787 ns.	0.0935*	0.1029***
lnInv_C	0.0372 ns.	0.0595 ns.	0.0897***
ROIC	0.0747 ns.	0.0084 ns.	0.0186**
Net_M	0.0027 ns.	0.0233 ns.	1.1144***
MROA	-0.9676 ns.	-4.4935***	-1.7851***
dlnRev	0.2620***	0.2286***	0.2993***
Dummy of 2005	0.3260**	0.4321***	0.4966***
Dummy of 2006	0.0890 ns.	0.1807*	0.5059***
Dummy of 2007	0.0893 ns.	0.1981**	0.2015***
Dummy of 2008	-2.8200***	-2.6032***	-1.5875***
Dummy of 2009	0.0828 ns.	0.2665***	0.4853***
Dummy of 2010	-0.0760 ns.	0.0902 ns.	0.4417***
Dummy of 2011	omitted	omitted	omitted
lnEBIT*2008 dummy	-0.3305**	-0.3619***	-0.1942**
Tax_r*2008 dummy	0.9401 ns.	0.2875 ns.	-0.1357 ns.
lnReinv*2008 dummy	-0.0518 ns.	-0.1873***	-0.1599***
lnInv_C*2008 dummy	0.5392***	0.6293***	0.4374***
ROIC*2008 dummy	-0.0229 ns.	3.5956***	1.3911***
Net_M*2008 dummy	0.5173 ns.	-0.4445 ns	-0.2263 ns.
MROA*2008 dummy	-1.5253 ns.	1.1746 ns.	-0.3142 ns.
dlnRev*2008 dummy	-0.0024 ns.	0.0651 ns.	0.0949 ns.
cons.	2.1550***	2.2856***	1.4417***
R^2 overall	0.9334	0.9448	0.8973
R^2 within	0.7772	0.7979	0.6868
R^2 between	0.9493	0.9571	0.941
Wald (chi^2)	7942.81***	23001.48***	6916.08***
Number of observations	210	232	607

Source: own calculation
Note: At the levels of significances *** 1 %, ** 5 %, * a 10% respectively

For the **energy sector** it can be stated that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment and the sales growth rate can be considered to be significant, and to have a positive effect, and

the return on the assets taken at market value is also significant, but has a negative effect. The other independent variables have no effect on the dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it can be observed that the multiplications of the LnEBIT*2008 time dummy variable, and the LnReinvestment*2008 time dummy variable have a negative effect, while the multiplications of the LnInvested capital and the ROIC 2008 time dummy variables have a positive effect on value.

The characteristics of the **IT sector** include the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested capital, the ROIC, the net margin and the sales growth rate can be considered to be significant, and to have a positive effect, and the return on the assets taken at market value is also significant, but has a negative effect. The tax rate has no effect on dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnEBIT*2008 time dummy variable, and the LnReinvestment*2008 time dummy variable have a negative effect, while the multiplications of the LnInvested capital and the ROIC 2008 time dummy variables have a positive effect on value.

The characteristics of the **basic consumer goods sector** include the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested capital, the ROIC, the net margin and the sales growth rate can be considered to be significant, and to have a positive effect, and the return on the assets taken at market value is also significant, but has a negative effect. The tax rate has no effect on dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnEBIT*2008 time dummy variable, the LnReinvestment*2008 time dummy, and the net margin*2008 time dummy variables have a negative effect, while the multiplications of the LnInvested capital and the ROIC 2008 time dummy variables have a positive effect on firm value.

The characteristics of the **raw materials sector** include the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested capital, the ROIC and the sales growth rate can be considered to be significant, and to have a positive effect, while the tax rate and the return on the assets taken at market value have a negative effect on the dependent variable. The LnReinvestment and the net margin have no effect on dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnEBIT*2008 time dummy variable and the LnReinvestment*2008 time dummy have a negative effect, while the tax rate, the LnInvested capital and the net margin multiplied by the 2008 time dummy have a positive effect on firm value.

Among the characteristics of the **health services sector** is the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnInvested capital, the net margin and the sales growth rate can be considered significant, and have a positive effect, and the return on the assets taken at market value is also significant, but has a negative effect. The other variables have no effect on the dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnEBIT*2008 time dummy variable, the net margin*2008 time

dummy, the MROA*2008 time dummy, the net margin*2008 time dummy and the sales growth rate*2008 time dummy have a negative effect, while the multiplications of the LnInvested capital and the ROIC 2008 time dummy have a positive effect on firm value.

The characteristics of the **public works sector** include the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested capital, and the sales growth rate can be considered to be significant, and to have a positive effect, while the tax rate is also significant, but has a negative effect. The ROIC, net margin and the return on assets taken at market value have no effect on the dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the tax rate*2008 time dummy variable, the LnInvested Capital*2008 time dummy and the net margin*2008 time dummy have a positive effect, while the multiplication of the sales growth rate with the 2008 time dummy has a negative effect on the firm's value.

The characteristics of the **industrial sector** include the fact that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested capital, the ROIC, the net margin and the sales growth rate can be considered to be significant, and to have a positive effect on dependent variable, while the return on assets taken at market value have a negative effect. The tax rate has no effect on the dependent variable. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnEBIT*2008 time dummy, and the LnReinvestment*2008 time dummy have a negative effect, while the multiplications of the LnInvested Capital, the ROIC and the sales growth rate with the 2008 time dummy have a positive effect on the firm's value.

For the **consumer goods sector** it can be stated that all factors affecting firm value are significant. The firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested Capital, the ROIC, the net margin and the sales growth rate have a positive effect, while the tax rate and the return on the assets taken at market value have a negative effect. 2008 had a negative effect on firm value, while the other years had a positive effect. Analysing the cross effects it is noticeable that the multiplications of the LnReinvestment*2008 time dummy variable and the MROA*2008 time dummy variable have a negative effect, while the multiplication of the ROIC with the 2008 time dummy variable has a positive effect on the firm's value.

For the **telecommunications services sector** it can be stated that among the factors affecting firm value, the firm value of the preceding period, the LnEBIT, the LnReinvestment, the LnInvested Capital, the ROIC, the net margin and the sales growth rate can be considered to be significant and to have a positive effect on dependent variable. The tax rate and the return on the assets taken at market value have a negative effect on dependent variable. This is the only sector where the panel regression carried out does not support the negative significance of the year 2008 on the dependent variable, since its effect on firm value is significantly positive, as in the other years. Analysing the cross effects it can be observed that the multiplications of the LnEBIT*2008 time dummy and the tax rate 2008* time dummy have a positive effect on the firm's value, while the multiplication of the return on the assets taken at market value with the 2008 time dummy has a negative effect on the its value.

4. Conclusions

On the basis of the results it can be said that among the 10 sectors, it was in the financial sector that there was felt the greatest negative effect in the year 2008, i.e. this was the worst affected sector. The next sectors in the list were the energy sector and information technology, followed by basic consumer goods, raw materials, the health services sector, and then public works and industrial, and finally, consumer goods. On the basis of the regressions it can be stated that the year 2008 had no significant effect on the business value of the telecommunications sector.

If we look at the sectors to see what effect the individual value-creating factors have on business value, we can see that there are differences between the sectors and between the individual sectors and the cross-sectoral branches. While in the regression model which included all sectors (see Kiss, 2016) all the value-creating factors had a significant effect on the dependent variable, the significant effect was not characteristic when examining the individual sectors one by one.

Summarising the analysis of the variables following the effects of the crisis in the 10 industrial sectors, I formulated the following: Examining the effects of the 2007-2008 financial crisis in individual industrial sectors also shows that, with the exception of the telecommunications sector, 2008 was the year of the crisis in all sectors. The crisis was felt most keenly in the financial sector. Among the factors influencing value many predictors lost significance, and only in the consumer goods sector did all independent variables have a significant effect on firm value.

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