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ELECTRIC UTILITY INDUSTRY ENTERPRISES RISK SENSITIVITY AND FINANCIAL LIQUIDITY DECISIONS: THE CASE OF ELEKTROWNIA CHORZÓW S.A.[1]

Abstract

Market situation influence enterprise ability to generate value for its owners depending on kind of business and individual enterprise flexibility and risk sensitivity. Enterprise financial liquidity management can reduce risk influence on enterprise results. Electric utility industry from one side have a comfort of stable demand on its production but it is linked with volatility of realized incomes. The paper presents the consequences that can result from operating risk that is related to liquidity policy in the context of electric utility industry firms. An increase in the level of liquid assets in an enterprise increases both net working capital requirements and the costs of holding and managing financial liquidity. Both of these decrease the value of the firm. But not always it works in the same way, it depends on risk sensitivity of the business which differ between branches and individual representatives from each branch. Case study data presents and is an material for discussion about general model presented in first part of the paper. The relation between liquid levels and risk sensitivity is also illustrated by empirical data from electric utility industry empirical data.

Keywords: liquidity, cost of capital, firm value

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1. The model

The hypothesis of the paper is presumption that higher pressure of the general economic situation caused by instability different cycles in surrounding business environment will influence the liquid assets levels in enterprises with different strength. That strength depends on business sensitiveness on risk. More risk sensitive businesses have higher EBIT volatility, smaller total assets that average total assets in their sector, more innovative and original product or target group for its products or services, smaller than average market absorption, smaller size, and other parameters which cause higher risk sensitivity. Electric utility industry in Poland and used in the paper case Elektrownia Chorzów S.A., theoretically should be the opposite. Average high level of total assets, standardized product which are used by wide range of customers, estimated unleveraged betas for electric utility industries is typically near to level 0,45 – 0,49 when average unleveraged betas for whole market are about 0,82 – 0,83 (Damodaran 2012). That levels also confirms general rule governing the indicators influencing the risk sensitivity. According to financial liquidity efficiency model presented by Michalski (Michalski 2012), natural risk sensitivity of the business sector should be linked with its natural liquidity strategy and in the same way natural risk sensitivity of the individual business also should be linked with its natural liquidity strategy. Liquid assets financing has its cost depending on risk linked with financial liquidity strategies used by the financed enterprise. If there is higher risk inn economy, there will also be the higher cost of financing (cost of capital rate go up) and as result enterprise value growth. Enterprise value growth is the driver which is the aim for the managing team of the enterprise, and as the result, the nearest the most effective from enterprise value creation point of view strategy will be realized by the firm. Figure 1 presents the influence of financial liquidity financing strategy choice on the key value indicators and figure 2 shows the influence of financial liquidity investing strategy choice on the key value indicators.

Aggressive		Conservative
-	CR	-
-	CE	-
-	FCF	-
↗	β	↘
↗↘	k_D	↘↗
↗	k_E	↘
↗↘,↗	CC	↗↘,↘
↗↘,↘	ΔV	↗↘,↗

Figure 1: Influence of the financial liquidity financing strategy choice on the key value creating indicators

Source: own proposal (Michalski 2008a).

Choosing between various levels of current assets in relation to sales, we use one from three strategies: restrictive strategy when management use the most risky but the cheapest, the smallest as possible, level of current assets, moderate strategy when management moderate between risk and costs of holding current assets, and flexible strategy when management use the most expensive and rather high levels of current assets wanting to hedge the firm before risk of shortage of current assets.

Restrictive		Flexible
↘	CR	↗
↘	CE	↗
↗↘	FCF	↗↘
↗	β	↘
↗	CC	↘
↗↘,↗	ΔV	↗↘,↘

Figure 2: Influence of the financial liquidity investing strategy choice on the key value creating indicators

Source: own proposal (Michalski 2008b).

Risk sensitivity depends on position of the enterprise in its business branch. If the risk sensitivity should be higher, then more smart is to choose more flexible and more conservative solutions to have better results. It works in opposite direction also, the safe firms with near to monopoly positions can use more restrictive and more aggressive strategies to have better results.

Company's property consists of total assets, i.e. fixed assets and current assets known also as current assets. We can see that property as fixed capital and

current assets also. Generally current assets equal to current assets is defined as a sum of inventory, short term receivables (including all the accounts receivable for deliveries and services regardless of the maturity date) and short-term investments (cash and its equivalents) as well as short-term prepaid expenses (Gentry 1988, Mueller 1953; Graber 1948; Khoury 1999; Cote 1999, Michalski 2008c). Money tied in current assets serve enterprise as protection against risk (Merton 1999, p. 506; Lofthouse 2005; pp. 27–28; Parrino 2008, pp. 224–233, Poteshman 2005, pp. 21–60, Gentry 1988, Michalski 2012) but that money also are considered as an investment. It is because the firm resigns from instant utilization of resources for future benefits (Levy 1999, p. 6; Reilly 1992, p. 6; Fabozzi 1999, p. 214, Gentry 1988, Michalski Michalski 2008d). In that paper the terms: current assets and current assets are treated as approximately equivalent and interchangeable (Michalski 2010).

Current assets level is the effect of processes linked to the production organization or services realization. So, it results from the processes that are operational by nature and therefore correspond to the willingness to produce on time products and services that are probably desired by customers (Baumol 1952, Beck 2005, Beranek 1963, Emery 1988, Gallinger 1986, Holmstrom 2001, Kim 1998, Kim 1978, Gentry 1988, Lyn 1996, Tobin 1958, Stone 1972, Miller 1966, Miller 1996, Myers 1998, Opler 1999, Rutkowski 2000, Michalski 2007). It exerts influence mainly on the inventory level and belongs to the area of interest of operational management (Peterson 1979, pp. 67–69; Michalski 2010, Orlicky 1975, pp. 17–19; Gentry 1988, Plossl 1985, pp. 421–424). Nevertheless, current assets are also the result of active customer winning and maintaining policy (Bougheas 2009, Gentry 1988, Michalski 2009). Such policy is executed by finding an offer and a specific market where the product or service is sold. This policy consequences are reflected in the final products inventory level and accounts receivable in short term.

Among the motivating factors for investing in current assets, one may also mention uncertainty and risk. Due to uncertainty and risk, it is necessary to stock up circumspect (cautionary) cash, material and resources reserves that are inevitable in maintaining the continuity of production and producing final goods.

Many enterprises act in a fast changing environment where the prices of needed materials and resources are subject to constant change. Other factors – like exchange rates for instance, are very changeable, too. It justifies keeping additional cash sources allotted for realization of built-in call options (American type)

by buying the raw materials more cheap than the long term expected equilibrium price would suggest.

Company's relationships with suppliers of materials, resources and services that are necessary to produce and sell final products usually result in adjourning the payments. Such situation creates Accounts payable and employees (who are to some extent internal services providers). Similarly, enterprise charged with obligatory payments will eventually face tax burdens. We will call both categories of obligations the non financial current obligations in order to differentiate between them and current obligations that result from taking on financial obligations, e.g. short term debt.

Required payments postponement exerts impact on reducing the demand for these company's resources that are engaged in current asset financing. Current assets reduced by non financial current obligations (non financial short term obligations) are called net current assets. Net current assets are the resources invested by the company in current assets equated with the capital tied in these assets.

Change	Indicator	Change
↗	β	↘
↗	CC	↘
↗↘	CURRAT	↘↗
↗↘	QUIRAT	↘↗
↗↘	CASRAT	↘↗
↗↘	NLB	↘↗
↗↘	LNITY	↘↗
↗↘	CLI	↘↗
↗↘	LAMBDA*	↘↗

CURRAT – current ratio, QUIRAT – quick ratio, CASRAT – cash ratio; NLB – net liquid balance to total assets; LNITY – static liquidity indicator (Nita 2011); CLI – comprehensive liquidity index; Lambda – modified lambda liquidity indicator (Lambda = (Liquidity static reserve + OCF) / (OCF at risk)).

Figure 3: The expected change in financial liquidity measures indicators after changes in risk and rate of the cost of capital indicators.

Source: own proposal (Michalski 2010).

After the risk indicator β go up (at Figure 3 the arrow in the first left column), at least two sources of change are influenced in firms. First, the higher cost of capital make the investment in current assets more costly, so it works up to make current assets levels smaller. In the same time, the higher risk in general, cause the

managing team of the firms to think more conservative and more flexible about the liquidity levels. It is a part of their risk sensitivity feelings about general situation in the firm. That is illustrated by the couple of arrows in different destinations (the first up, and the second down) but it is not true that both influences are the same, almost always the one of them is stronger than the other.

Net current assets (as a synonym for net current assets), i.e. current assets reduced by non financial current liabilities, are the sources tied by the firm during its realization of operational cycle (Michalski 2008b). If it is required by the character of business, sources tied in current assets may be quite huge sums. This paper aims at analyzing the influence of investment in net current assets on enterprise value represented by a sum of future free cash flows discounted by the cost of financing the enterprise and next reflecting on the difference between investments in net current assets and operational investments in fixed assets in terms of their effects on enterprise value growth.

Current assets investment strategies are the set of criteria and specific code of conduct revolved around attaining multiplication of owners wealth. Company's management implement such strategies into practice while making the crucial decisions concerning obtaining sources for financing current and future needs and defining ways and directions of utilization of these sources, taking into consideration at the same time: opportunities, limitations and business environment that are known to the board today (Michalski 2008a). The same set of strategies come in consequence of market conditions and personal inclinations of the board members who are representatives of the owners (first of all – their attitude to risk). Based on this attitude, the board defines appropriate structure of current assets and financing sources. It is possible to apply one of the three current assets financing strategies (or their variations): aggressive, compromise or conservative.

Aggressive strategy consists in the significant part of the enterprise fixed demand and the whole enterprise variable demand on liquidity-linked financing sources coming from short term financing.

2. Financial liquidity financing strategy to risk relation

There is a relationship between the three above mentioned approaches based on the relation between expected benefit and risk. In case of capital providers for companies that have introduced this specific strategy it is usually linked with

diversified claims to the rate of return from the amount of capital invested in the enterprise (Michalski 2008c). The connection of these claims with the chosen way of financing may be insignificant (as it is shown on figure 4 or in variant 1 of the example). Nevertheless, it also might be important to such a considerable degree that it will have an effect on the choice of strategy (figures 5 and 6).

Example

The aim of the example (it is modified example previously presented in Michalski 2012) is to show how changes in liquid assets policies can influence the financial efficiency of the firm. In the example managing team is pondering over the choice of current assets financing strategy. The question it want to answer is: what is the best, from firm maximization point of view, liquidity strategy?

Equity/engaged capital ratio is 50% {E/(E+D) = 50%}. Anticipated average annual sales revenues (CR) are 2000 in basic cases. Forecasted earnings before interest and taxes (EBIT) will amount to about 60% of sales revenues (CR). Fixed assets (FA) will be going for around 70% of CR, current assets (CA) will be constituting almost 35% of forecasted sales revenues (CR), property renewing will be close to its use (NCE = CAPEX), and changes in relations of net current assets constituents will be close to zero and might be omitted (ΔNWC = 0). The company may implement one of the three current assets financing strategies: the conservative one with such a relation of long run debt to short run debt that ($D_s/D_l = 0,2$), Compromise one ($D_s/(D_l) = 0,8$) or the aggressive one ($D_s/(D_l) = 3$). Accounts payable will be equal to 50% of current assets.

It is necessary to consider the influence of each strategy on the cost of enterprise financing capital rate and on enterprise value.

In the first variant, one must assume that capital providers seriously consider while defining their claims to rates of return the current assets financing strategy chosen by the company they invested in.

Let us also assume that the correction factor ɯ function graph connected with strategy choice is even and linear (Figure 4).

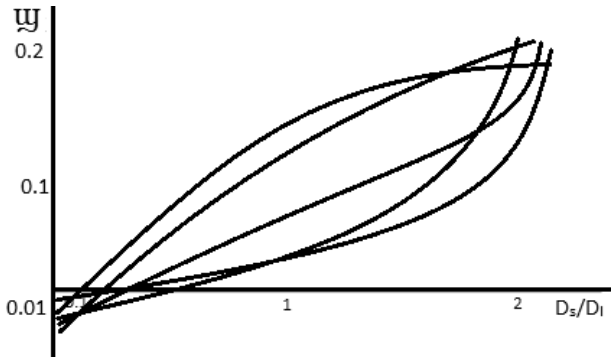


Figure 4: Some possible shapes of correction factor ψ line as a function of D_s/D_l.

Source: Hypothetical data (Michalski 2012).

Variant ψ_1. We assume here that capital providers take into consideration the company's current assets financing strategy while defining their claims as regards the rates of return. Aggressive strategy is perceived as more risky and therefore depending on investors risk sensitivity level, they tend to ascribe to the financed company applying aggressive strategy an additional expected risk premium. To put it simply, let us assume that ascribing the additional risk premium for applied current assets financing strategy is reflected in the value of β coefficient. For each strategy, the β coefficient will be corrected by the corrective coefficient ψ corresponding to that specific strategy in relation to the situation $D_s/D_l = 0$. Risk free rate is 4,5%, rate of return on market portfolio is 11% (ERP = 6,5%).

The enterprise is a representative of the sector for which the non-leveraged risk coefficient $\beta_u = 0{,}45$. On the basis of Hamada relation, could be estimated the equity cost rate that is financing that enterprise in case of each of the three strategies in the first variant.

$$\beta_l^* = \beta_u \cdot (1+(1–T) \cdot (D/E)) \cdot (1 + \psi)$$

Where: T – effective tax rate, D – enterprise financing capital coming from creditors (D_s+D_l), E – enterprise financing capital coming from owners, β_u – risk coefficient linked with assets maintained by the firm (for an enterprise that has not applied the system of financing by creditors capital), β_l – leveraged and corrected risk coefficient for an enterprise that applying the system of financing by creditors capital (both the financial and operational risks are included); ψ – risk sensitivity indicator.

Thanks to that information, could be calculated cost of equity rates for each variant.

$$k_e = \beta_l^* \cdot (k_m - k_{RF}) + k_{RF}$$

Where: *k* – rate of return expected by capital donors and at the same time (from company's perspective) – enterprise cost of financing capital rate, k_e – for capital coming from owners (cost of equity rate), k_m – for average rate of return on typical investment on the market, k_{RF} – for risk free rate of return whose approximation is an average profitability of treasury bills in the country where the investment is made.

Table 1 presents the calculated indicators for each hypothetical strategy.

Table 1

Cost of capital and changes in enterprise value depending on the choice of strategy, the best conservative case.

	Aggressive	Δ	Compromise	Δ	Conservative
Sales revenues (CR)	2000		2000,00		2000,00
Fixed assets (FA)	1400		1400,00		1400,00
Current assets (CA)	700		700,00		700,00
Total assets (TA) = Total liabilities (TL)	2100		2100,00		2100,00
(AP)	350		350,00		350,00
Engaged capital (E+D)	1750		1750,00		1750,00
Equity (E)	875		875,00		875,00
Long term debt (D_l)	218,75	↗	486,11	↗	729,17
Short term debt (D_s)	656,25	↘	388,89	↘	145,83
Earnings before interest and taxes (EBIT)	1200		1200		1200
Net operational profit after taxation (NOPAT)	972		972		972
Free cash flows from 1 to n period ($FCF_{1..n}$)	972		972		972
Free cash flows in 0 (FCF_o)	–1750		–1750		–1750
Risk premium correction factor ш	0,14	↘	0,07	↘	–0,007
Complete risk coefficient β_l^*	0,92853	↘	0,871515	↘	0,8087985
Equity cost (k_e)	10,54%	↘	10,16%	↘	9,76%
Cost of long term debt (k_{dl})	9,51%	↘	9,20%	↘	8,86%
Cost of short term debt (k_{ds})	9,00%	↘	8,72%	↘	8,42%
Cost of capital financing enterprise (CoC)	8,96%	↘	8,72%	↘	8,44%
Enterprise value growth (ΔV)	9094	↗	9394	↗	9769

Source: Hypothetical data (Michalski 2011).

As it is shown in the table, cost of enterprise financing capital rates are different for different approaches to current assets financing. The lowest rate is observed in conservative strategy. That results in the highest expected growth of enterprises value calculated with perpetuity assumption:

$$\Delta V = FCF_0 + (FCF_{1...n}/CoC)$$

In the variant ψ_2, there is possible assumption that capital providers while defining their claims to rates of return take into consideration the company's current assets financing strategy to a lesser extent. Obviously, the aggressive strategy is perceived as more risky and therefore, depending on their risk sensitivity, they tend to ascribe an additional risk premium for an enterprise that implemented this type of strategy.

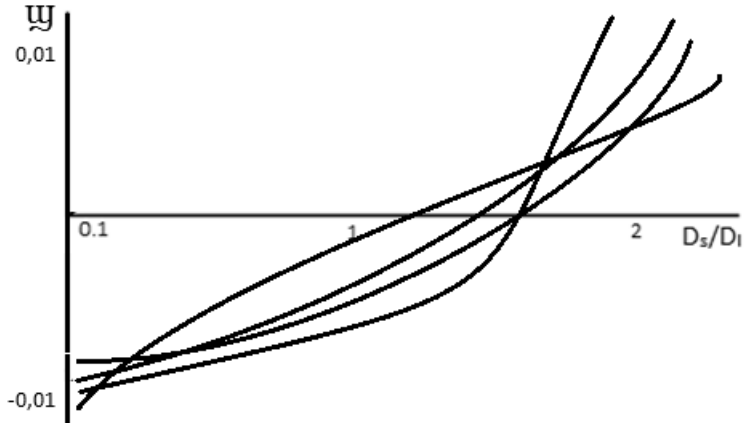


Figure 5: Hypothetical correction line depending on the D_s/D_l relation in the second variant ψ_2

Source: Hypothetical data (Michalski 2012).

For each strategy, the firm risk premium is differ than previously.

For each hypothetical strategy the firma value growth and cost rate *CoC* will be on another level (calculations in the table below).

Table 2

Cost of capital and changes in enterprise value depending on the choice of strategy in variant $ш_2$, the best aggressive case.

	Aggressive	Δ	Compromise	Δ	Conservative
Sales revenues (CR)	2000,00		2000,00		2000,00
Fixed assets (FA)	1400,00		1400,00		1400,00
Current assets (CA)	700,00		700,00		700,00
Total assets (TA) = Total liabilities (TL)	2100,00		2100,00		2100,00
Accounts payable (AP)	350,00		350,00		350,00
Engaged capital (E+D)	1750,00		1750,00		1750,00
Equity (E)	875,00		875,00		875,00
Long term debt (D_l)	218,75	↗	486,11	↗	729,17
Short term debt (D_s)	656,25	↘	388,89	↘	145,83
Earnings before interest and taxes (EBIT)	1200,00		1200,00		1200,00
Net operational profit after taxation (NOPAT)	972,00		972,00		972,00
Free cash flows from 1 to n ($FCF_{1..n}$)	972,00		972,00		972,00
Free cash flows in 0 (FCF_o)	–1750,00		–1750,00		–1750,00
Risk premium correction ш	0,014	↘	0,007	↘	–0,007
Complete risk coefficient β_l^*	0,83	↘	0,82	↘	0,81
Equity cost (k_e)	9,87%	↘	9,83%	↘	9,76%
Long term debt cost (k_{dl})	8,96%	↘	8,93%	↘	8,86%
Short term debt cost (k_{ds})	8,50%	↘	8,47%	↘	8,42%
Capital cost of capital financing the enterprise (CoC)	8,42%	↗	8,45%	↘	8,44%
Enterprise value growth (ΔV)	9790	↘	9755	↗	9769

Source: Hypothetical data (Michalski 2011).

As it is shown in table 2, taking into consideration the risk premium resulting from implementation of a certain current assets financing strategy has an additional impact on the enterprise financing capital. Enterprise financing capital cost rates are different for different approaches to current assets financing. In this variant, the lowest level is observed in aggressive strategy. As a consequence, the highest enterprise value growth is characteristic for this type of strategy.

In the third $ш_3$ variant, we also assume that capital providers to a lesser extent consider while defining their claims to rates of return the current assets financing strategy chosen by the company they invested in.

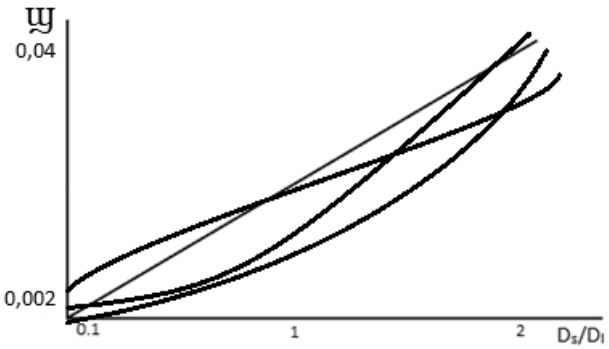


Figure 6: Hypothetical correction lines depending on the D_k/D_d relation in the ψ_3 variant

Source: Hypothetical data (Michalski 2012).

For ψ_3 case, conservative strategy, the firm risk premium is again different.

For each strategy in ψ_3 case, the enterprise value expected change and capital cost rate will be on another level (calculations in Table 3).

Table 3

Cost of capital and changes in enterprise value depending on the choice of strategy in the ψ_3 variant, the best compromise case.

	Aggressive	Δ	Compromise	Δ	Consevative
1	2	3	4	5	6
Sales revenues (CR)	2000		2000		2000
Fixed assets (FA)	1400		1400		1400
Current assets (CA)	700		700		700
Total assets (TA) = Total liabilities (TL)	2100		2100		2100
Accounts payable (AP)	350		350		350
Engaged capital (E+D)	1750		1750		1750
Equity (E)	875		875		875
Long term debt (D_l)	218,75	↗	486	↗	729
Short term debt (D_s)	656,25	↘	389	↘	146
Earnings before interest and taxes (EBIT)	1200		1200		1200
Net operational profit after taxation (NOPAT)	972		972		972
Free cash flows from 1 to n ($FCF_{1..n}$)	972		972		972
Free cash flows from 0 (FCF_o)	–1750		–1750		–1750
Risk premium correction ψ	0,0384	↘	0,0128	↘	0,0016
Complete risk coefficient β_l^*	0,846	↘	0,825	↘	0,816
Equity cost (k_e)	10,00%	↘	9,86%	↘	9,80%

1	2	3	4	5	6
Lon term debt cost (k_{dl})	9,06%	↘	8,95%	↘	8,90%
Short term debt cost (k_{ds})	8,60%	↘	8,49%	↘	8,45%
Enterprise financing capital cost (CoC)	8,53%	↘	8,47%	↗	8,48%
Enterprise value growth (ΔV)	9649	↗	9721	↘	9718

Source: Hypothetical data (Michalski 2011).

As it is shown in table 3, taking into consideration the risk premium resulting from implementation of a certain current assets financing strategy has an additional impact on the enterprise financing capital. Enterprise financing capital cost rates are different for different approaches to current assets financing. In this variant, the lowest level is observed in aggressive strategy. As a consequence, the highest enterprise value growth is characteristic for this type of strategy.

3. Financial liquidity investment strategies and cost of financing

Next it is necessary to consider the influence of each strategy of investment in the current assets on the rate of cost of capital financing enterprise and that influence on the enterprise value.

In the first variant, one must assume that capital providers seriously consider while defining their claims to rates of return the current assets investment strategy chosen by the company they invested in.

Let us also assume that the correction ϥ function graph connected with strategy choice could be even and linear (Figure 7).

Variant $ϥ_1$. Is assumed assume here that capital providers take into consideration the company's current assets investment strategy while defining their claims as regards the rates of return. Restrictive strategy is perceived as more risky and therefore depending on investors risk sensitivity level, they tend to ascribe to the financed company applying restrictive strategy an additional expected risk premium. The additional risk premium for applied current assets investment strategy is reflected in the value of β risk coefficient. For each strategy, the β risk coefficient will be corrected by the corrective coefficient ϥ corresponding to that specific strategy in relation to the CA/CR situation.

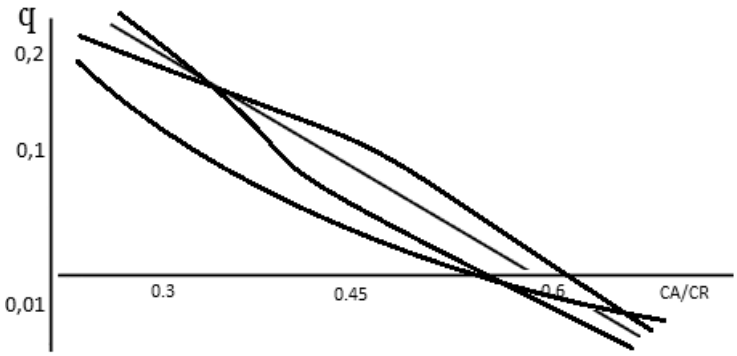


Figure 7: The hypothetical shape of line of correction q as a function of CA/CR in the q_1 variant.

Source: Hypothetical data (Michalski 2012).

Estimation the equity cost rate that is financing that enterprise in case of each of the three strategies in the q 1 variant is presented in the table 4.

Table 4

Cost of capital and changes in enterprise value depending on the choice of current assets investment strategy, the best restrictive case.

Current assets investment strategy	Restrictive	Δ	Moderate	Δ	Flexible
1	2	3	4	5	6
{γ} maximal outlets possibilities	2460		2460		2460
{δ} market absorption	4920		4920		4920
{ε} availability of stocks	2263,2		2263,2		2263,2
{ζ} derived demand	2000		2100		2226
{ι} availability of infrastructure	2220		2331		2471
{μ} production possibilities	2419,8		2540,79		2693
Expected Cash Revenues (CR)	2000	↗	2100	↗	2226
Fixed assets (FA)	1400	↗	1449	↗	1509,9
Current assets (CA)	300	↗	735	↗	1224,3
Total assets (TA) = Total liabilities (TL)	1700	↗	2184	↗	2734,2
Accounts payable (AP)	150	↗	367,5	↗	612,2
Capital invested ($E+D_l+D_s$)	1550	↗	1816,5	↗	2122
Equity (E)	775	↗	908,25	↗	1061
Long-term debt (D_l)	431	↗	504,6	↗	589,5
Short-term debt (D_s)	344	↗	403,7	↗	471,7
EBIT share in CR	0,6	↘	0,55	↘	0,49
Earnings before interests and taxes (EBIT)	1200	↘	1155	↘	1090,74

1	2	3	4	5	6
Net operating profit after taxes (NOPAT)	972	↘	935,6	↘	883,5
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	↘	935,6	↘	883,5
Initial Free Cash Flows in year 0 (FCF_o)	–1550	↘	–1816,5	↘	–2122
Risk Premium correction ϥ	0,14	↘	0,07	↘	–0,007
Leveraged and corrected complete risk coefficient β_l^*	0,929	↘	0,872	↘	0,809
Cost of equity rate (k_e)	10,54%	↘	10,16%	↘	9,76%
Long-term debt rate (k_{dl})	9,51%	↘	9,20%	↘	8,86%
Short-term debt rate (k_{ds})	9,00%	↘	8,72%	↘	8,42%
Cost of capital (CoC)	9,03%	↘	8,72%	↘	8,39%
Firm value growth (ΔV)	9218	↘	8909	↘	8411

Source: Hypothetical data (Michalski 2011).

Expected cash revenues are a function of {γ} maximal outlets possibilities, {δ} market absorption, {ε} availability of stocks, {ζ} derived demand, {ι} availability of infrastructure, {μ} production possibilities, and other similar constraints. As it is shown in the table, rates of the cost of capital financing the firm are different for different approaches to current assets investment. The lowest rate is observed in flexible strategy because that strategy is linked with the smallest level of risk but the highest firm value growth is linked with restrictive strategy of investment in net current assets.

In the next, $ϥ_2$ variant, is assumed that capital providers while defining their claims to rates of return take into consideration the company's net working investment strategy to a lesser extent. Obviously, the restrictive strategy is perceived as more risky than moderate and flexible. Depending on their risk sensitivity, they tend to ascribe an additional risk premium for an enterprise that implemented this type of strategy. As presented on Figure 8., investors in $ϥ_2$ variant, have stronger risk sensitivity than in $ϥ_1$ situation.

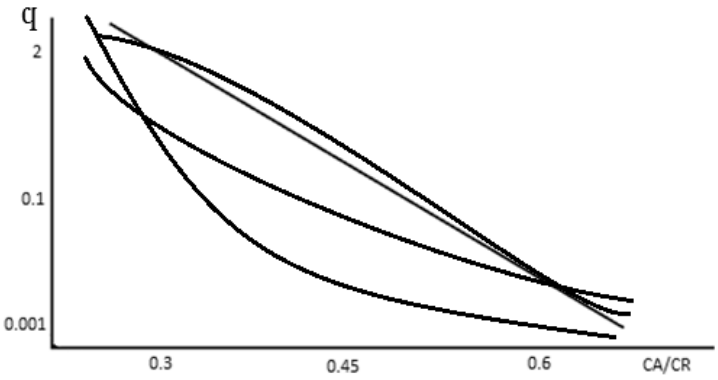


Figure 8: The hypothetical shape of line of correction ɳ as a function of CA/CR in the $ɳ_2$ variant.

Source: Hypothetical data.

In the table 5. There are calculations for variant $ɳ_2$. For each strategy the cost of capital rate *CoC* will be on another level.

Table 5

Cost of capital and changes in enterprise value depending on the choice of strategy of investment in current assets in variant $ɳ_2$, the best moderate case.

Current assets investment strategy	Restrictive	Δ	Moderate	Δ	Flexible
1	2	3	4	5	6
{γ} maximal outlets possibilities	2460		2460		2460
{δ} market absorption	4920		4920		4920
{ε} availability of stocks	2263,2		2263,2		2263,2
{ζ} derived demand	2000		2100		2226
{ι} availability of infrastructure	2220		2331		2471
{μ} production possibilities	2419,8		2540,8		2693
Expected Cash Revenues (CR)	2000	↗	2100	↗	2226
Fixed assets (FA)	1400	↗	1449	↗	1510
Current assets (CA)	300	↗	735	↗	1224
Total assets (TA) = Total liabilities (TL)	1700	↗	2184	↗	2734
Accounts payable (AP)	150	↗	367,5	↗	612
Capital invested ($E+D_l+D_s$)	1550	↗	1816,5	↗	2122
Equity (E)	775	↗	908,3	↗	1061
Long-term debt (D_l)	431	↗	504,6	↗	589,5
Short-term debt (D_s)	344	↗	403,7	↗	471,6
EBIT share in CR	0,6	↘	0,55	↘	0,49

1	2	3	4	5	6
Earnings before interests and taxes (EBIT)	1200	↘	1155	↘	1091
Net operating profit after taxes (NOPAT)	972	↘	935,6	↘	884
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	↘	935,6	↘	884
Initial Free Cash Flows in year 0 (FCF_o)	–1550	↘	–1816,5	↘	–2122
Risk Premium correction ϥ	0,6	↘	0,03	↘	0
Leveraged and corrected Complete risk coefficient β_l^*	1,3032	↘	0,8389	↘	0,8145
Cost of equity rate (k_e)	12,97%	↘	9,95%	↘	9,79%
Long-term debt rate (k_{dl})	11,53%	↘	9,03%	↘	8,89%
Short-term debt rate (k_{ds})	10,81%	↘	8,56%	↘	8,44%
Cost of capital (CoC)	11,03%	↘	8,55%	↘	8,42%
Firm value growth (ΔV)	7266	↗	9127	↘	8373

Source: Hypothetical data (Michalski 2011).

As it is shown in table 5, taking into consideration the risk premium resulting from implementation of a certain current assets strategy has an additional impact on the enterprise financing capital and its rate. Enterprise financing capital cost rates are different for different approaches to current assets investment. In this variant $ϥ_2$, similarly as to the variant $ϥ_1$ presented in table 4., the lowest level of cost of capital is observed in flexible strategy. But, the highest enterprise value growth is characteristic for moderate strategy.

In the third, $ϥ_3$ variant. The restrictive and moderate strategies are more risky than flexible. Depending on their risk sensitivity, they tend to ascribe an additional risk premium for an enterprise that implemented this type of strategy. As presented on Figure 9., investors in $ϥ_3$ variant, have stronger risk sensitivity than in $ϥ_1$ and $ϥ_2$ situations.

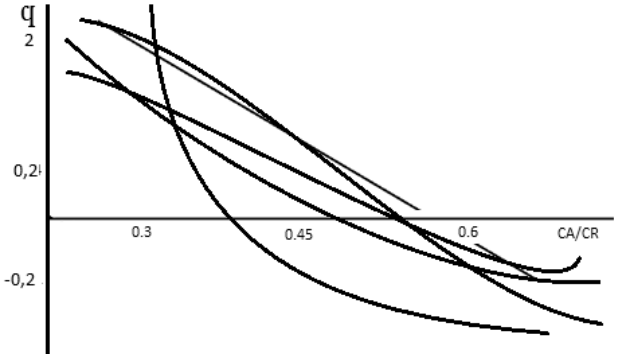


Figure 9: The hypothetical shapes of line of correction ϥ as a function of CA/CR in the $ϥ_3$ variant.

Source: Hypothetical data (Michalski 2012).

In the table 6. There are calculations for variant $ϥ_3$. For each strategy the cost of capital rate *CoC* will be on another level.

Table 6

Cost of capital and changes in enterprise value depending on the choice of strategy of investment in current assets in the $ϥ_3$ variant, the best flexible case.

Current assets investment strategy	Restrictive	Δ	Moderate	Δ	Flexible
1	2	3	4	5	6
{γ} maximal outlets possibilities	2460		2460		2460
{δ} market absorption	4920		4920		4920
{ε} availability of stocks	2263,2		2263,2		2263,2
{ζ} derived demand	2000		2100		2226
{ι} availability of infrastructure	2220		2331		2471
{μ} production possibilities	2419,8		2540,8		2693
Expected Cash Revenues (CR)	2000	↗	2100	↗	2226
Fixed assets (FA)	1400	↗	1449	↗	1510
Current assets (CA)	300	↗	735	↗	1224
Total assets (TA) = Total liabilities (TL)	1700	↗	2184	↗	2734
Accounts payable (AP)	150	↗	367,5	↗	612
Capital invested ($E+D_l+D_s$)	1550	↗	1816,5	↗	2122
Equity (E)	775	↗	908,25	↗	1061
Long-term debt (D_l)	431	↗	505	↗	590
Short-term debt (D_s)	344	↗	404	↗	472
EBIT share in CR	0,6	↘	0,55	↘	0,49
Earnings before interests and taxes (EBIT)	1200	↘	1155	↘	1091

1	2	3	4	5	6
Net operating profit after taxes (NOPAT)	972	↘	936	↘	884
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	↘	936	↘	884
Initial Free Cash Flows in year 0 (FCF_o)	–1550	↘	–1817	↘	–2122
Risk Premium correction Ч	1,5	↘	0,15	↘	–0,15
Leveraged and corrected Complete risk coefficient β_l^*	2,0363	↘	0,9367	↘	0,6923
Cost of equity rate (k_e)	17,74%	↘	10,59%	↘	9,00%
Long-term debt rate (k_{dl})	15,49%	↘	9,55%	↘	8,24%
Short-term debt rate (k_{ds})	14,36%	↘	9,04%	↘	7,85%
Cost of capital (CoC)	14,94%	↘	9,07%	↘	7,77%
Firm value growth (ΔV)	4957	↗	8498	↗	9254

Source: Hypothetical data (Michalski 2011).

As it is shown in table 6, taking into consideration the risk premium resulting from implementation of a certain current assets investment strategy has an additional impact on the cost of capital. Enterprise financing capital cost rates are different for different approaches to current assets investment strategy. In this $Ч_3$ variant, the lowest level of the cost of capital is observed in flexible strategy. But as a consequence, the highest enterprise value growth is characteristic also for this type of strategy, what is differ to results from variants $Ч_1$ and $Ч_2$. Here we have the highest level of risk sensitivity and as consequence the firm management wanting to maximize the firm value need to prefer more safe solution like flexible strategy.

4. Liquid assets investment-financing strategies and cost of financing

Last part of our consideration is influence of each current assets strategy both from investment and financing perspective and their influence on cost of financing and that influence on the enterprise value.

$ЧЩ_1$ variant. In the first $ЧЩ_1$ variant, capital suppliers risk sensitivity is on the smallest level. That situation is presented in table 7.

Table 7

Cost of capital and changes in enterprise value depending on the choice of current assets investment and financing strategies, the best restrictive-conservative case.

Current assets investment and financing strategy	Res-Agg	Δ	Res-Con	Δ	Fle-Agg	Δ	Fle--Con
{γ} maximal outlets possibilities	2460		2460		2460		2460
{δ} market absorption	4920		4920		4920		4920
{ε} availability of stocks	2263,2		2263,2		2263,2		2263,2
{ζ} derived demand	2000		2000		2226		2226
{ι} availability of infrastructure	2220		2220		2471		2471
{μ} production possibilities	2419,8		2419,8		2693		2693
Expected Cash Revenues (CR)	2000	–	2000	↗	2226	–	2226
Fixed assets (FA)	1400	–	1400	↗	1510	–	1510
Current assets (CA)	300	–	300	↗	1224	–	1224
Total assets (TA) = Total liabilities (TL)	1700	–	1700	↗	2734	–	2734
Accounts payable (AP)	150	–	150	↗	612,15	–	612,15
Capital invested ($E+D_l+D_s$)	1550	–	1550	↗	2122	–	2122
Equity (E)	775	–	775	↗	1061	–	1061
Long-term debt (D_l)	194	↗	646	↘	265	↗	884
Short-term debt (D_s)	581	↘	129	↗	796	↘	177
EBIT share in CR	0,6	–	0,6	↘	0,49	–	0,49
Earnings before interests and taxes (EBIT)	1200	–	1200	↘	1091	–	1091
Net operating profit after taxes (NOPAT)	972	–	972	↘	884	–	884
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	–	972	↘	884	–	884
Initial Free Cash Flows in year 0 (FCF_o)	–1550	–	–1550	↘	–2122	–	–2122
Ψ+Ч risk Premium correction	0,198	↘	0,1402	–↗	0,14018	↘	0,0099
Leveraged and corrected Complete risk coefficient β_l^*	0,9758	↘	0,9287	–↗	0,9287	↘	0,8226
Cost of equity rate (k_e)	10,84%	↘	10,54%	↗	10,54%	↘	9,85%
Long-term debt rate (k_{dl})	9,76%	↘	9,51%	↗	9,51%	↘	8,94%
Short-term debt rate (k_{ds})	9,23%	↘	9,00%	↗	9,00%	↘	8,48%
Cost of capital (CoC)	9,21%	↘	9,09%	↘	8,96%	↘	8,51%
Firm value growth (ΔV)	9002	↗	9149	↘	7734	↗	8257

Source: Hypothetical data (Michalski 2011)

As it is shown in the table 7, rates of the cost of capital financing the firm are different for different approaches to current assets investment. The lowest CC rate is observed in flexible-conservative strategy because that strategy is linked with the smallest level of risk but the highest firm value growth is linked with

restrictive-aggressive strategy because in variant ЩЧ$_1$ we have the firm with the smallest level of risk sensitivity.

In the next, ЩЧ$_2$ variant, capital suppliers risk sensitivity is on the moderate level. That situation is presented in table 8.

Table 8

Cost of capital and changes in enterprise value depending on the choice of current assets investment and financing strategies, the best flexible-aggressive case.

Current assets investment and financing strategy	Res-Agg	Δ	Res-Con	Δ	Fle--Agg	Δ	Fle-Con
{γ} maximal outlets possibilities	2460		2460		2460		2460
{δ} market absorption	4920		4920		4920		4920
{ε} availability of stocks	2263,2		2263,2		2263,2		2263,2
{ζ} derived demand	2000		2000		2226		2226
{ι} availability of infrastructure	2220		2220		2471		2471
{μ} production possibilities	2419,8		2419,8		2693		2693
Expected Cash Revenues (CR)	2000	–	2000	↗	2226	–	2226
Fixed assets (FA)	1400	–	1400	↗	1510	–	1510
Current assets (CA)	300	–	300	↗	1224	–	1224
Total assets (TA) = Total liabilities (TL)	1700	–	1700	↗	2734	–	2734
Accounts payable (AP)	150	–	150	↗	612	–	612
Capital invested ($E+D_l+D_s$)	1550	–	1550	↗	2122	–	2122
Equity (E)	775	–	775	↗	1061	–	1061
Long-term debt (D_l)	194	↗	646	↘	265	↗	884
Short-term debt (D_s)	581	↘	129	↗	796	↘	177
EBIT share in CR	0,6	–	0,6	↘	0,49	–	0,49
Earnings before interests and taxes (EBIT)	1200	–	1200	↘	1091	–	1091
Net operating profit after taxes (NOPAT)	972	–	972	↘	884	–	884
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	–	972	↘	884	–	884
Initial Free Cash Flows in year 0 (FCF_o)	–1550	–	–1550	↘	–2122	–	–2122
ЩЧ risk Premium correction	0,6	↘	0,6	↘	0,014	↘	0,007
Leveraged and corrected Complete risk coefficient β_l^*	1,3033	↘	1,3032	↘	0,826	↘	0,8202
Cost of equity rate (k_e)	12,97%	↘	12,97%	↘	9,87%	↘	9,83%
Long-term debt rate (k_{dl})	11,53%	↘	11,53%	↘	8,96%	↘	8,93%
Short-term debt rate (k_{ds})	10,81%	↘	10,81%	↘	8,50%	↘	8,47%
Cost of capital (CoC)	10,94%	↗	11,11%	↘	8,42%	↗	8,50%
Firm value growth (ΔV)	7337	↘	7201	↗	8368	↘	8273

Source: Hypothetical data (Michalski 2011).

As it is shown in the table 8, rates of the cost of capital financing the firm are different for different approaches to current assets investment. The lowest CoC rate is observed in flexible-aggressive strategy because that strategy is linked with the smallest level of risk and highest level of cheaper short term debt also the highest firm value growth is linked with flexible-aggressive strategy because in variant $ЦЧ_2$ we have the firm with the moderate level of risk sensitivity so previously noted as better restrictive-aggressive is here too risky.

5. Empirical data from Polish electric utility industry enterprises

Data used in the paper case study, confirms the model expectations. Presented in table 10 in comparison to results collected in table 12 and presented in figure 10 levels of financial liquidity measures shows that presented at figures 1, 2 and 3, illustrated in example, and expected by our model relation probably exists.

Table 10

Liquidity indicators in Elektrownia Chorzów S.A. in 2003–2010.

–	2003	2004	2005	2006	2007	2008	2009	2010
CURRAT	1,76	0,37	0,50	0,58	0,41	0,66	0,68	8,01
QUIRAT	1,72	0,31	0,47	0,53	0,38	0,61	0,64	7,94
CASRAT	0,17	0,02	0,28	0,07	0,08	0,04	0,02	7,18
NLB	0,01	0,00	0,04	0,01	0,01	0,00	0,00	0,39
LNITY	1,16	1,04	0,67	0,97	0,94	0,93	1,16	–41,50
CLI	0,68	–0,23	0,40	0,81	–0,05	0,37	0,24	14,33
LAMBDA*	2,79	–0,59	9,74	3,40	2,40	3,22	4,94	5,72

Where: CURRAT – current ratio, QUIRAT – quick ratio, CASRAT – cash ratio; NLB – net liquid balance to total assets; LNITY – static liquidity indicator (Nita 2011); CLI – comprehensive liquidity index; Lambda – modified lambda liquidity indicator (Lambda = (Liquidity static reserve + OCF) / (OCF at risk)).

Source: own calculations.

Table 11

Dynamics of liquidity indicators in Elektrownia Chorzów S.A. in 2003–2010.

Δ	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010
1	2	3	4	5	6	7	8
CURRAT	–79,09%	36,27%	15,72%	–29,61%	62,55%	2,84%	1070,96%
QUIRAT	–81,81%	51,48%	12,22%	–28,34%	60,66%	3,82%	1148,70%
CASRAT	–86,42%	1159,58%	–73,74%	6,51%	–50,14%	–41,86%	31021,02%

1	2	3	4	5	6	7	8
NLB	–68,26%	1833,94%	–85,69%	49,80%	–58,93%	3,91%	9354,48%
LNITY	–9,93%	–35,71%	44,38%	–2,62%	–1,84%	24,85%	–3686,17%
CLI	–133,49%	–278,23%	100,15%	–105,87%	–889,86%	–35,63%	5850,36%
LAMBDA*	–121,28%	–1743,71%	–65,13%	–29,26%	33,82%	53,67%	15,74%

Source: own calculations (Michalski 2011, MPB 2012).

According to the model discussed in previous part of the paper, the liquidity strategies changes should be connected with general level of risk in Polish firms situation. As illustrated by data in table 12 in contexts of table 10, Elektrownia Chorzów S.A. have smaller levels of financial liquidity indicators than average enterprise from its industry, typical as expected by model.

Table 12

Liquidity indicators in Polish electric utility industry and whole Polish economy in 2003–2010.

Polish electric utility industry	2003	2004	2005	2006	2007	2008	2009	2010
CURRAT	1,34	1,31	1,28	1,43	1,38	1,34	1,72	1,47
QUIRAT	1,12	1,06	1,05	1,19	1,12	1,04	1,21	1,19
CASRAT	0,19	0,21	0,21	0,36	0,33	0,26	0,31	0,36
General (whole Polish economy)	2003	2004	2005	2006	2007	2008	2009	2010
CURRAT	1,33	1,43	1,52	1,55	1,67	1,74	1,43	1,72
QUIRAT	0,97	1,03	1,07	1,10	1,19	1,23	1,11	1,23
CASRAT	0,17	0,20	0,22	0,23	0,29	0,31	0,30	0,32

Where: CURRAT – current ratio, QUIRAT – quick ratio, CASRAT – cash ratio

Source: own calculations (Dudycz 2012, Michalski 2011, MPB 2012).

Table 13

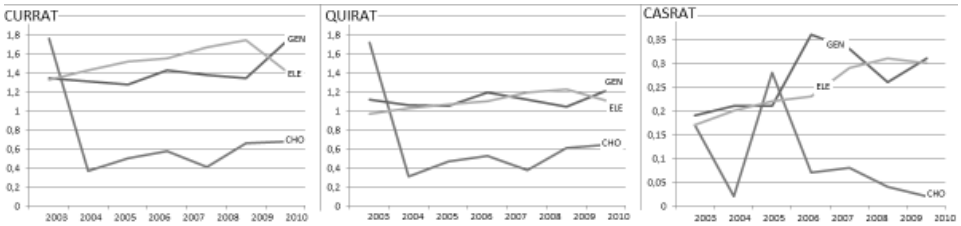
Dynamics of liquidity indicators in Polish electric utility industry and whole Polish economy in 2003–2010.

Polish electric utility industry	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010
1	2	3	4	5	6	7	8
CURRAT	–2,24%	–2,29%	11,72%	–3,50%	–2,90%	28,36%	–14,53%
QUIRAT	–5,36%	–0,94%	13,33%	–5,88%	–7,14%	16,35%	–1,65%
CASHRAT	10,53%	0,00%	71,43%	–8,33%	–21,21%	19,23%	16,13%

1	2	3	4	5	6	7	8
General (whole Polish economy)	2003–2004	2004–2005	2005–2006	2006–2007	2007–2008	2008–2009	2009–2010
CURRAT	7,52%	6,29%	1,97%	7,74%	4,19%	–17,82%	20,28%
QUIRAT	6,19%	3,88%	2,80%	8,18%	3,36%	–9,76%	10,81%
CASHRAT	17,65%	10,00%	4,55%	26,09%	6,90%	–3,23%	6,67%

Source: own calculations (Dudycz 2012, Michalski 2011, MPB 2012).

The empirical data from Polish enterprises from electric utility industry for 2003–2010 years not necessary suggests that for Polish electric utility industry managing teams risk sensitivity has stronger influence on current assets investment policy than raw cost of capital. The reason why the general data could give us such suggestion has simple explanation, that used in paper data is from EKD40 branch in which are not only similar to Elektrownia Chorzów S.A. firms, but also far from main stream of electric utility industry enterprises.



Pearson	CURRAT	QUIRAT	CASRAT
cho-ele	0,169373	0,415086	0,452682
ele-gen	–0,08565	0,123139	0,685936
gen-cho	0,372478	0,398236	0,447002

Where: cho-ele means Pearson correlation between data of Elektrownia Chorzów S.A. and EKD40 electric utility industry enterprises in Poland for 2003–2010, ele-gen means Pearson correlation between data of EKD40 electric utility industry enterprises in Poland and general data from all Polish enterprises representation for 2003-2010; gen-cho means Pearson correlation between data of general data from all Polish enterprises representation and Elektrownia Chorzów S.A. for 2003–2010

Figure 10: Financial liquidity measures CURRAT, QUIRAT, CASRAT, for Elektrownia Chorzów S.A. and EKD40 electric utility industry enterprises in Poland for 2003–2010 with Pearson correlation between them and general data from all Polish enterprises.

Source: own calculations (Dudycz 2012, Michalski 2011, MPB 2012).

6. Summary and conclusions

Depending on the business type that the given enterprise is doing, sensibility to current assets financing method risk might vary a lot. Character of business also determines the best strategy that should be chosen whether it will be the conservative strategy (situation closer to the first variant) or aggressive one (situation closer to the first variant) or maybe some of the transitional variants similar to the Compromise strategy. The best choice is that with the adequate cost of financing and highest enterprise value growth. This depends on the structure of financing costs. The lower the financing cost, the higher effectiveness of enterprises activity measured by the growth of its value. The enterprise choosing between various solutions in current assets needs to decide what level of risk is acceptable for her owners and capital suppliers. It was shown in solutions presented in that paper. If the risk sensitivity is higher, will be preferred more safe solution. That choice results with cost of financing consequences. In this paper, we considered that relation between risk and expected benefits from the current assets decision and its results on financing costs for the firm. The empirical data from Polish firms for 2003–2010 years confirms the presented financial liquidity investment efficiency model assumptions. Future studies should concern at searching new cases testing the model usefulness and identifying the constraints of that model explanations if that exists.

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WRAŻLIWOŚĆ NA RYZYKO W PRZEDSIĘBIORSTWACH PRZEMYSŁU ENERGETYCZNEGO I WYNIKAJĄCE Z NIEJ DECYZJE W ZAKRESIE ZARZĄDZANIA PŁYNNOŚCIĄ FINANSOWĄ. PRZYKŁAD ELEKTROWNI CHORZÓW SA

Streszczenie

Ogólna sytuacja rynkowa ma wpływ na zdolność przedsiębiorstwa na generowanie wartości dla jego właścicieli. Ta zdolność jest również zależna od rodzaju prowadzonego biznesu, w tym od indywidualnej elastyczności przedsiębiorstwa i wrażliwości na ryzyko. Podejście do zarządzania płynnością finansową w przedsiębiorstwie może wpływać i redukować negatywny wpływ ryzyka na wyniki przedsiębiorstwa. Przedsiębiorstwa działające w przemyśle energetycznym z jednej strony zazwyczaj mają do czynienia z komfortem płynącym ze stabilnych poziomów generalnego popytu na energię, z drugiej – ich działalność równocześnie jest związana ze zmiennością realizowanych wpływów. Artykuł przedstawia konsekwencje, jakie mogą wypływać z ryzyka operacyjnego powiązanego z podejściem do zarządzania płynnością finansową w kontekście przedsiębiorstw z sektora energetycznego.

Wzrost poziomu płynnych aktywów w przedsiębiorstwie pociąga za sobą zarówno wzrost zapotrzebowania na zamrożony w przedsiębiorstwie pieniądz w kapitale pracującym netto, jak i na koszt utrzymywania oraz zarządzania płynnością finansową. Oba z nich zmniejszą wartość przedsiębiorstwa. Jednakże nie zawsze jest to jedyny wpływ. Zaobserwowano, że w zależności od wrażliwości przedsiębiorstwa na ryzyko, różniącego się między branżami i indywidualnymi przedsiębiorstwami, różnią się spodziewane efekty końcowe. Studium przypadku przedstawione w artykule dotyczy przedsiębiorstwa z branży energetycznej i ilustruje te oddziaływania.

Słowa kluczowe: płynność finansowa, koszt kapitału, wartość przedsiębiorstwa