MPRA

Risk sensitivity indicator as correction factor for cost of capital rate

Michalski, Grzegorz

Wroclaw University of Economics

19 August 2012

Risk sensitivity indicator as correction factor for cost of capital rate[1]

Mgr Grzegorz Michalski, PhD,

Wroclaw University of Economics,

Grzegorz.Michalski@gmail.com

Abstract

Cost of capital rate is a result of risk included in cost of debt rates and cost of equity rates. Generally to estimate cost of capital rates with use of CAPM conception, is used information about general risk indicator, known as beta coefficient and relations between debt and equity rates. Such approach in unmodified version, falsely gives the similar results for enterprises from the same sector and with similar levels of debt to equity relations. In paper is presented risk sensitivity indicator conception which allows to differentiate cost of capital rate between more risk sensitive businesses and less sensitive businesses.

Key words

risk sensitivity, cost of capital, enterprise value, sensitivity indicator

JEL Classification: G32, G31, D24

1.   The individual sensitivity on risk of the enterprise (ISRE, ɰ) indicator

Risky environment impacts of the enterprise readiness to generate added value for its owners. Level of the risk influence depends on the type of business and individual businesses flexibility and risk sensitivity. General rule is known and independent from various economic systems or factors, that higher promised profitability is usually connected with higher risk (Soltes 2004; Zmeskal, Dluhosova 2009; Soltes 2012, Polak 2012). While risk is defined in the paper as probability to have other results as forecasted, when we have to do with more sensitive on risk business, the changes in cost of capital rate are more dramatic with next portion of risk the business face. That idea is illustrated by figure 1.

Figure 1. Relation between risk level and cost of capital, including the sensitivity on risk idea.
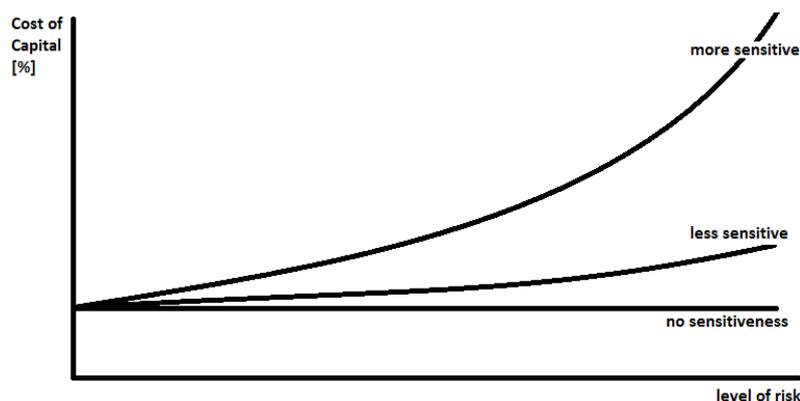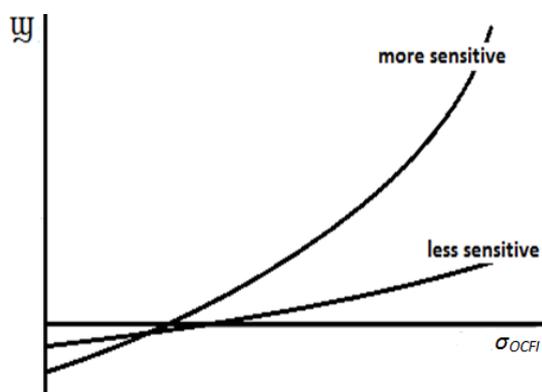
Source: own proposal

As shown at the figure 1, according to claims of the paper, theoretically is possible to face higher level of risk without the effect in cost of capital or with smaller effect in cost of capital rate than in cases.

One from the factors moderating the risk sensitivity is kind of the demand for the enterprise production. Some industries have the comfort of a stable demand for its production, but it is related to the volatility of realized free cash inflows. Paper use the conception of individual sensitivity on risk of the enterprise (*ISRE*, ꜩ). That sensitiveness on risk is different and depends on factors present in enterprise business environment. Risk sensitiveness characterize the internal policy of the managing team preferences and beliefs about future position of the business. Individual sensitivity on risk of the enterprise (*ISRE*, ꜩ) is higher for the enterprises with higher level of the operating cash inflows volatility (σ_{OCFI}) and smaller when that volatility is smaller.

Figure 2. Individual sensitivity on risk of the enterprise (ISRE, ꜩ) as function of the operating cash inflows volatility (σ_{OCFI}).

Source: own proposal

Individual sensitivity on risk of the enterprise (*ISRE*, ꜩ) is also an result of quality and value of total assets. Higher level of total assets real value (*TA*) characterizes less sensitive enterprises, smaller level of total assets is generally typical for more sensitive enterprises.

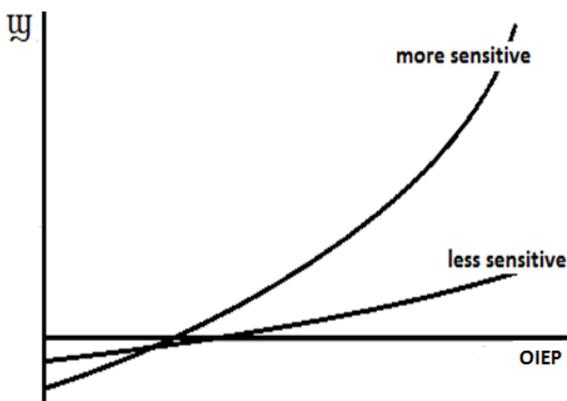*Figure 3. Individual sensitivity on risk of the enterprise (ISRE, ꜩ) as function of the level of total assets real value (TA).*
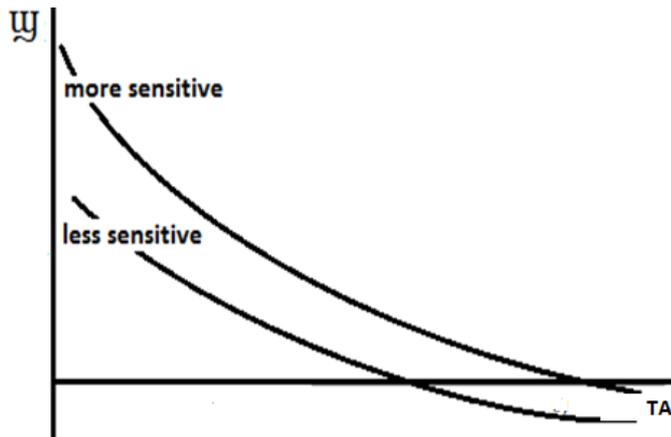
Source: own proposal

Next source of sensitiveness is originality and innovativeness of enterprise product and enterprise product market (*OIEP*). Individual sensitivity on risk of the enterprise (*ISRE*, ɥ) is higher when the enterprise issues high technologically or from other perspective more sophisticated products, and is smaller in opposite case.

Figure 4. Individual sensitivity on risk of the enterprise (ISRE, ɥ) as function of the innovativeness of enterprise product and enterprise product market (OIEP).

Source: own proposal

Similarly the growth of market absorption of enterprise products (*MAEP*) causes the individual sensitivity on risk of the enterprise (*ISRE*, ɥ) decrease.
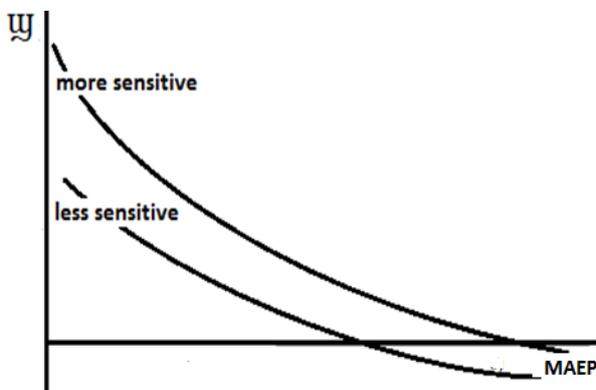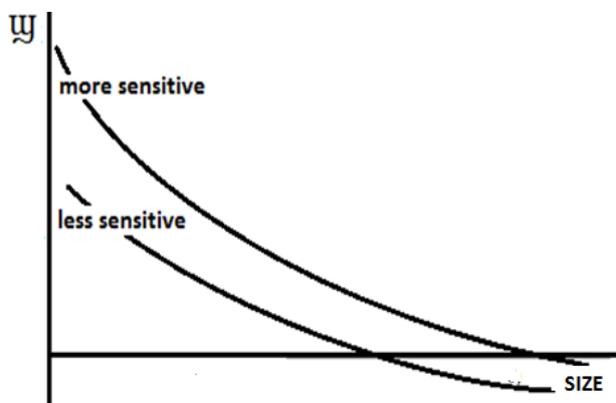
Figure 5. Individual sensitivity on risk of the enterprise (ISRE, ɥ) as function of the innovativeness of market absorption of enterprise products (MAEP).

Source: own proposal

Sometimes is believed that bigger enterprises are less risky and smaller have higher risk level. In presented here approach, individual sensitivity on risk of the enterprise (*ISRE*, ɰ) is influenced by enterprise size (*SIZE*), but the size risk is not directly transferred on enterprise but is moderated through the individual sensitivity on risk of the enterprise (*ISRE*, ɰ). When the enterprise is greater, the smaller is the sensitivity and the smaller enterprise is more sensitive.

Figure 6. Individual sensitivity on risk of the enterprise (ISRE, ɰ) as function of the enterprise size (SIZE).

Source: own proposal

Next indicators influencing the enterprise sensitiveness, are linked with short-term financing policy (D_S/D_L) and short-term investment policy (*CA/CR*). Individual sensitivity on risk of the enterprise (*ISRE*, ɰ) is higher in more restrictive policies and smaller in more flexible policies in managing the enterprise financial cash and near cash liquid investments. Individual sensitivity on risk of the enterprise (*ISRE*, ɰ) is greater when the enterprise uses more aggressive policy and smaller when that policy is more conservative.

Figure 7. Individual sensitivity on risk of the enterprise (ISRE, ɰ) as function of the short-term financing policy (D_S/D_L).
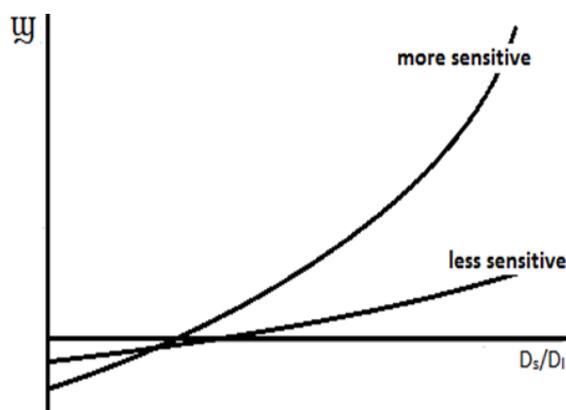
Source: own proposal

Figure 8. Individual sensitivity on risk of the enterprise (ISRE, ɰ) as function of the short-term investment policy (CA/CR).
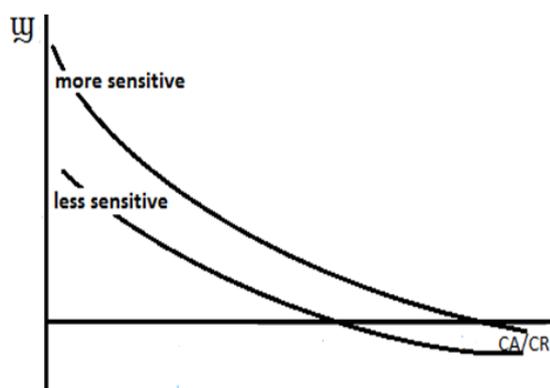
Source: own proposal

Enterprise works in actual economic environment (*ENV*). More sensitive are enterprises operating in more unstable conditions. The hypothesis verified in the paper is presumption about relation of pressure of the general economic environment caused by instability different cycles in surrounding business environment and the financial liquidity policies realized by enterprises. The strength of that influence depends on business sensitiveness on risk. More risk sensitive businesses have higher operating cash inflows *OCFI* 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. Risk sensitivity depends on position of the enterprise in its business branch (*PEBB*). 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 enterprise with strong, less sensitive positions can use more restrictive and more aggressive policies to have more enterprise value building results. So, finally individual sensitivity on risk of the enterprise (*ISRE*, ɥ), could be presented as function of mentioned above indicators:

$$ɥ = f(CA/CR, D_S/D_L, SIZE, MAEP, TA, \sigma_{OCFI}, OIEP, ENV, PEBB, …) \tag{1}$$

That indicator is used to calculate cost of capital rate:

$$CoC = f(k_{rf}, k_m, ɥ, \beta, k_{dL}, k_{dS}), \tag{2}$$

Where: k_{rf} – risk free rate, k_m – average rate of return from average investment at the considered economy, ɥ - **individual sensitivity on risk of the enterprise (ISRE)**, β – raw risk coefficient including the systematic operational and systematic financial risk estimations, k_{dL} – cost rate of long term debt, k_{dS} – cost rate of short term debt.

The way of including the information about the risk sensitivity could be based on CAPM based philosophy or at models using other approaches (Zmeskal, Dluhosova 2009; Dluhosova et.al. 2006). Here is used modified CAPM basing proposal.

2. FREE CASH FLOW GENERATION IN INDIVIDUAL SENSITIVITY OF RISK MODEL

Table 1 and table 2 present the way of generating free cash flow in enterprise in the case of various policies in managing of liquidity levels. Table 2 contains the data for the most sensitive on risk enterprise and the result of it is the most effective choice with the most safe flexible and conservative managing of liquidity. Table 1 presents the same case for the most restrictive on risk enterprise. The case include adaptation of case from Michalski (2011).

Table 1. Free cash flow generation in the resistant on risk enterprise with small level of sensitivity on risk. The best restrictive-aggressive case.

Current assets investment and financing strategy	Res-Agg	Δ	Res-Con	Δ	Fle-Agg	Δ	Fle-Con
{γ} maximal outlets possibilities	9840		9840		9840		9840

	Restrictive & Aggressive	Δ	Restrictive & Conservative	Δ	Flex&Aggr	Δ	Flex&Cons
{δ} market absorption	19680		19680		19680		19680
{ε} availability of stocks	9053		9053		9053		9053
{ζ} derived demand	8000		8000		8904		8904
{ι} availability of infrastructure	8880		8880		9883		9883
{μ} production possibilities	9679		9679		10773		10773
Expected Cash Revenues (CR)	8000	-	8000	↗	8904	-	8904
Fixed assets (FA)	7200	-	7200	↗	7930,296	-	7930
Current assets (CA)	2240	-	2240	↗	4808	-	4808
Total assets (TA) = Total liabilities (TL)	9440	-	9440	↗	12739	-	12739
Accounts payable (AP)	1344	-	1344	↗	2885	-	2885
Capital invested (E+D_l+D_s)	8096	-	8096	↗	9854	-	9854
Equity (E)	4048	-	4048	↗	4927	-	4927
Long-term debt (D_l)	2277	↗	3373	↘	2771	↗	4106
Short-term debt (D_s)	1771	↘	675	↗	2156	↘	821
EBIT share in CR	0,15	-	0,15	↘	0,04	-	0,04
Earnings before interests and taxes (EBIT)	1200	-	1200	↘	356	-	356
Net operating profit after taxes (NOPAT)	972	-	972	↘	289	-	289
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	972	-	972	↘	289	-	289
Initial Free Cash Flows in year 0 (FCF_o)	-8096	-	-8096	↘	-9854	-	-9854
Individual sensitivity on risk of the enterprise (*ISRE*, ҷ),	0,6	-	0,6	↘	0	-	0
Cost of equity rate (k_e)	6,63%	-	6,63%	↘	4,90%	-	4,90%
Long-term debt rate (k_{dl})	5,35%	-	5,35%	↘	4,10%	-	4,10%
Short-term debt rate (k_{ds})	4,71%	-	4,71%	↘	3,70%	-	3,70%
Cost of capital (CoC)	5,37%	↘	5,44%	↘	4,04%	↗	4,08%
Firm value growth (ΔV)	**9999**	↗	9766	↘	-2706	↗	-2783
CURRAT	0,72	↗	1,11	↘	0,95	↗	1,30
QUIRAT	0,24	↗	0,38	↘	0,32	↗	0,44
CASRAT {cash/(AP+Dk)}	0,03	↗	0,04	-	0,04	↗	0,05
CASHRT {cash/(TA-cash)}	0,01	-	0,01	↗	0,02	-	0,02

Source: Hypothetical data (Michalski 2012)

Table 2. Free cash flow generation in the sensitive on risk enterprise. The best flexible & conservative case.

Current assets investment and financing strategy	Restrictive & Aggressive	Δ	Restrictive & Conservative	Δ	Flex&Aggr	Δ	Flex&Cons
{γ} maximal outlets possibilities	9840		9840		9840		9840
{δ} market absorption	19680		19680		19680		19680
{ε} availability of stocks	9053		9052		9053		9053
{ζ} derived demand	8000		8000		8904		8904
{ι} availability of infrastructure	8880		8880		9883		9883
{μ} production possibilities	9679		9679		10773		10773
Expected Cash Revenues (CR)	8000	-	8000	↗	8904	-	8904
Fixed assets (FA)	7200	-	7200	↗	7930	-	7930

Current assets (CA)	2240	-	2240	↗	4808	-	4808
Total assets (TA) = Total liabilities (TL)	9440	-	9440	↗	12739	-	12739
Accounts payable (AP)	1344	-	1344	↗	2885	-	2885
Capital invested (E+D_l+D_s)	8096	-	8096	↗	9854	-	9854
Equity (E)	6477	-	6477	↗	7883	-	7883
Long-term debt (D_l)	911	↗	1349	↘	1109	↗	1642
Short-term debt (D_s)	708	↘	270	↗	862	↘	329
EBIT share in CR	0,4	-	0,4	↘	0,29	-	0,29
Earnings before interests and taxes (EBIT)	3200	-	3200	↘	2582	-	2582
Net operating profit after taxes (NOPAT)	2592	-	2592	↘	2092	-	2092
Free Cash Flows in 1 to n periods ($FCF_{1..n}$)	2592	-	2592	↘	2092	-	2092
Initial Free Cash Flows in year 0 (FCF_o)	-8096	-	-8096	↘	-9854	-	-9854
Individual sensitivity on risk of the enterprise (*ISRE*, ш)	1,05	↘	1,	↗	0,323	↘	0,105
Cost of capital (CoC)	5,39%	↘	5,35%	↘	4,16%	↘	3,81%
Firm value growth (ΔV)	40011	↗	40390	↘	40377	↗	44984
CURRAT	1,09	↗	1,39	↘	1,28	↗	1,50
QUIRAT	0,37	↗	0,47	↘	0,44	↗	0,51
CASRAT {cash/(AP+Dk)}	0,04	↗	0,06	-	0,05	↗	0,06
CASHRT {cash/(TA-cash)}	0,01	-	0,01	↗	0,02	-	0,02

Source: Hypothetical data (Michalski 2012)

3. CONCLUSIONS

Data used in the paper case study, confirms the model expectations. Presented in table 3 in comparison to results collected in next tables and presented in figure 9 levels of financial liquidity measures shows that presented in initial part of the paper, illustrated in example, and expected by our model relation probably exists.

Table 9. Liquidity indicators for Polish enterprises in 2008-2010.

-	CURRAT	QUIRAT	CASRAT	NLB	LNITY	CLI	LAMBDA*
2008 (3611*)	1,47	1,04	0,14	-0,32	0,91	0,54	1,74
2009 (3470*)	1,74	1,28	0,27	-0,18	1	0,85	2,43
2010 (3530*)	1,74	1,28	0,25	-0,19	1	0,82	2,48

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)), * - size of population.
Source: own calculations (Michalski 2011, MPB 2012).

Figure 9. Liquidity indicators for Polish firms
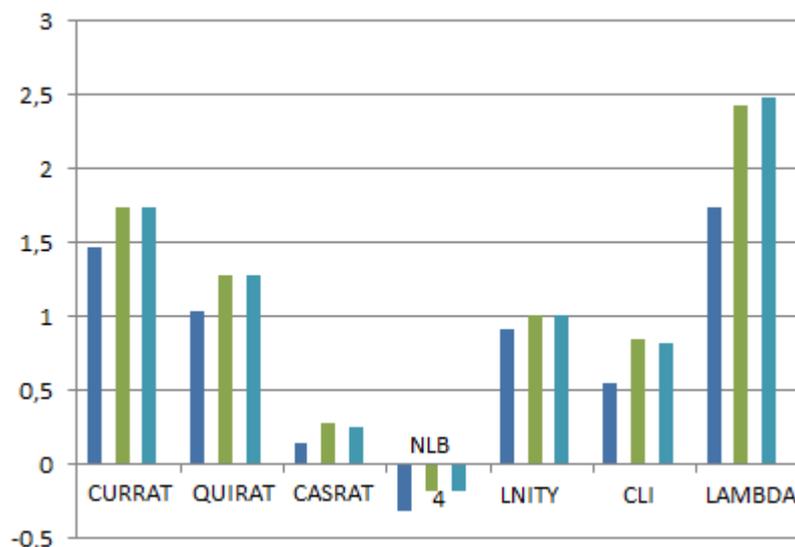
Source: own calculations (Michalski 2011, MPB 2012).

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.

Table 10. Liquidity indicators for **whole Polish economy** *in 2003-2010.*

General (whole Polish economy)	2003	2004	2005	2006	2007	2008	2009	2010
CURRAT (>30000*)	1,33	1,43	1,52	1,55	1,67	1,74	1,43	1,72
QUIRAT (>30000*)	0,97	1,03	1,07	1,10	1,19	1,23	1,11	1,23
CASRAT (>30000*)	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, * - size of population.
Source: own calculations (Dudycz 2012, Michalski 2011, MPB 2012).

Table 11. Dynamics of liquidity indicators in Polish enterprises in 2003-2010.

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%	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 for 2003-2010 years suggests that for Polish enterprises managing teams risk sensitivity grows and it is illustrated by growing liquidity indicators, what is linked with model suggestion about greater risk sensitivity influence on more flexible and more conservative solutions.

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.

In this paper, was 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.

References

[1] Baumol W.J., The Transactions Demand for Cash: An Inventory Theoretic Approach, Quarterly Journal of Economics", nr 66, listopad 1952, s. 545-556.

[2] Beck S.E., D.R. Stockman, Money as Real Options in a Cash-in-Advance Economy, Economics Letters, 2005, vol. 87, s. 337-345.

[3] Beranek W., Analysis for Financial Decisions, R. D. IRWIN, Homewood 1963.

[4] Bougheas S., Mateut S., Mizen, P., *Corporate trade credit and inventories: New evidence of a trade-off from accounts payable and receivable*, Journal of Banking & Finance, vol. 33, no. 2, 2009, s. 300-307.

[5] Cote J.M., C.K. Latham, *The Merchandising Ratio: A Comprehensive Measure of Current assets Strategy,* Issues in Accounting Education, vol. 14, no. 2, May 1999, s. 255-267.

[6] Damodaran database: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/data.html (last visit: 2012.08.27)

[7] Dudycz database: http://rachunkowosc.com.pl/wskazniki_sektorowe (last visit: 2012.08.27)

[8] Dluhosova, D. et. al., 2006, Finanční řízení a rozhodování podniku: analýza, investování, oceňování, riziko, flexibilita, Ekopress, Prague.

[9] Emery G.W., Positive Theories of Trade Credit, Advances in Current assets Management, JAI Press, vol. 1, 1988, s. 115-130.

[10] Fabozzi F.J., *Investment Management*, Prentice Hall, Upper Saddle River 1999.

[11] Gallinger G., A. J. Ifflander, Monitoring Accounts Receivable Using Variance Analysis Financial Management, 1986, 69-76.

[12] Gentry J. A. (1988), State of the Art of Short-Run Financial Management, Financial Management, Vol. 17, No. 2, pp. 41-57.

[13] Graber P.J., *Assets*, The Accounting Review, vol. 23, no. 1, Jan. 1948, s. 12-16.

[14] Holmstrom B., J. Tirole, LAPM: a liquidity-based asset pricing model, Journal of Finance, 2001, vol. 56, s. 1837-1867 {WP6673, National Bureau of Economic Research, Cambridge, 1998}.

[15] Khoury N.T., K.V. Smith, P.I. MacKay, *Comparing Current assets Practices in Canada, the United States and Australia,* Revue Canadienne des Sciences de l'Administration, vol. 16, no. 1, Mar. 1999, s. 53-57.

[16] Kim C-S., D. C. Mauer, A. E. Sherman, The Determinants of Corporate Liquidity: Theory and Evidence, Journal of Financial and Quantitative Analysis, vol. 33, nr 3, 1998.

[17] Kim Y. H., J. C. Atkins, Evaluating Investments in Accounts Receivable: A Wealth Maximizing Framework, Journal of Finance, vol. 33, nr 2, 1978, s. 403-412.

[18] Levy H., D. Gunthorpe, *Introduction do Investments*, South-Western College Publishing, Cincinnati 1999.

[19] Lofthouse S., *Investment Management*, Wiley, Chichester 2005.

[20] Lyn E. O., G. J. Papaioannou, Liquidity and the Financing Policy of the Firm: an Empirical Test, Advances in Capital Management, Londyn 1996, vol. 3, s. 65-83.

[21] Merton R.C, A.F. Perold, *Theory of Risk Capital in Financial Firms*, w: D.H. Chew, *The New Corporate Finance. Where Theory Meets Practice,* McGraw-Hill, Boston 1999.

[22] Michalski G. (2008a), Operational risk in current assets investment decisions: Portfolio management approach in accounts receivable. Agricultural Economics–Zemedelska Ekonomika, ISSN: 0139-570X, 54 (1): 12–19

[23] Michalski G. (2008b), Corporate inventory management with value maximization in view, Agricultural Economics-Zemedelska Ekonomika, ISSN: 0139-570X, Volume: 54 Issue: 5 Pages: 187-192.

[24] Michalski G. (2009), Inventory management optimization as part of operational risk management, Economic Computation and Economic Cybernetics Studies and Research, ISSN: 0424-267X, Volume: 43 Issue: 4, Pages: 213-222

[25]   Michalski G. (2011), Financial Analysis in the Firm: A Value-Based Liquidity Framework (May 12, 2011). Available at SSRN: http://ssrn.com/abstract=1839367 or http://dx.doi.org/10.2139/ssrn.1839367, pp. 177-262.

[26]   Michalski G. (2007), Portfolio management approach in trade credit decision making, Romanian Journal of Economic Forecasting, ISSN 1582-6163, Volume: 8 Issue: 3 Pages: 42-53.

[27]   Michalski G. (2008d), Value-based inventory management, Romanian Journal of Economic Forecasting, ISSN 1582-6163, Volume: 9 Issue: 1 Pages: 82-90.

[28]   Michalski G. (2012), Financial liquidity management in relation to risk sensitivity: Polish firms case, Quantitative Methods in Economics, Vydavatelstvo EKONOM, ISBN978-80-225-3426-0, Bratislava, p. 141-160.

[29]   Michalski G. (2008c), Decreasing operating risk in accounts receivable mangement: influence of the factoring on the firm value, Culik, M., Managing and Modelling of Financial Risk, Pages: 130-137.

[30]   MPB (2012): Monitor Polski B, Data source for Polish enterprises, ISSN: 1233-4502, Michalski, Grzegorz Marek, Financial Analysis in the Firm: A Value-Based Liquidity Framework (May 12, 2011). Available at SSRN: http://ssrn.com/abstract=1839367 or http://dx.doi.org/10.2139/ssrn.1839367, pp. 177-262.

[31]   Michalski G. (2010), Planning optimal from the firm value creation perspective. Levels of operating cash investment, Romanian Journal of Economic Forecasting, vol: 13 iss: 1 pp.198-214.

[32]   Michalski G. (2012), Financial liquidity management in relation to risk sensitivity: Polish firms case, Quantitative Methods in Economics, Vydavatelstvo EKONOM, ISBN978-80-225-3426-0, Bratislava, p. 141-160.

[33]   MONEY database: http://www.money.pl/pieniadze/bony/przetargi/ (last visit: 2012.04.27)

[34]   Miller M.H., D. Orr, A Model of the Demand for Money by Firms, Quarterly Journal of Economics, 1966, nr 80, s. 413-435.

[35]   Miller T. W., B. K. Stone, The Value of Short-Term Cash Flow Forecasting Systems, Advances in Current assets Management, JAI Press Inc., Londyn 1996, vol. 3, s. 3-63.

[36]   Mueller F.W., *Corporate Current assets and Liquidity*, The Journal of Business of the University of Chicago, vol. 26, no. 3, Jul. 1953, s. 157-172.

[37]   Myers S. C., R. G. Rajan, The Paradox of Liquidity, Quarterly Journal of Economics 113, nr 3, Cambridge, 1998, s. 733-771.

[38]   Nita B., Syntetyczny wskaźnik płynności finansowej w ujęciu statycznym w kontekście zapotrzebowania na kapitał obrotowy netto, PN UE we Wrocławiu nr 182, Wrocław 2011, s. 373.

[39]   Opler T., R. Stulz, R. Williamson, The determinants and implications of corporate cash holdings, Journal of Financial Economics, vol. 52, no. 1, 1999, s. 3-46.

[40]   Orlicky J., *Material Requirements Planning*, McGraw-Hill, New York 1975.

[41]   Parrino R., D.S. Kidwell, *Fundamentals of Corporate Finance*, Wiley, New York 2008.

[42]   Peterson R., E.A. Silver, *Decision Systems for Inventory Management and Production Planning*, Wiley, New York 1979.

[43]   Plossl G.W., *Production and Inventory Control, Principles and Techniques*, Prentice Hall, Englewood Cliffs 1985.

[44]   Polak P., Sirpal R., Hamdan M., Post-Crisis Emerging Role of the Treasurer, European Journal of Scientific Research, Vol. 86 No. 3, 2012, pp.319-339.

[45]   Poteshman A., R. Parrino, M. Weisbach, *Measuring Investment Distortions when Risk-Averse Managers Decide Whether to Undertake Risky Project*, Financial Management, vol. 34, Spring 2005, s. 21-60.

[46]   Riddick L., T. Whited, 2009, The corporate propensity to save, *Journal of Finance,* 64, 1729-1766.

[47]   Reilly F.K., *Investments*, The Dryden Press, Fort Worth 1992.

[48]   Soltes V., 2004, Duration of coupon bonds as a criterion of the price sensibility of bonds with regards to the change of interest rates (Durácia kupónovej obligácie ako kritérium cenovej citlivosti obligácie vzhľadom na zmenu úrokových sadzieb in Slovak), EKONOMICKY CASOPIS, 52/2004(1), pp. 108-114.

[49]   Soltes V., 2012, Paradigms of Changes in the 21th Century - Quest for Configurations in Mosaic, Ekonomicky Casopis, 60/2004(4), pp. 428-429.

[50]   Stone B. K., The Use of Forecasts and Smoothing in Control - Limit Models for Cash Management, Financial Management, 1972, s. 72-84.

[51]   Tobin J., Liquidity Preference as Behavior Toward Risk, Review of Economic Studies, 1958 r. nr 25, s. 65-86.

[52] Zmeskal, Z.; Dluhosova, D., 2009, *Company Financial Performance Prediction On Economic Value Added Measure By Simulation Methodology,* 27th International Conference on Mathematical Methods in Economics, Mathematical Methods in Economics 2009, p. 352-358.