

ANALYZING THE SYSTEMATIC RISK OF LOGISTICS SERVICE PROVIDERS: THE INFLUENCE OF MARKET, INDUSTRY AND COMPANY EFFECTS

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ABSTRACT

Purpose

With this paper we want to find out which factors influence beta coefficient of logistics service providers. The systematic risk (beta coefficient, β) of LSPs becomes more and more important for strategic decision making of LSPs, as it helps calculating the cost of capital. The cost of capital is an important factor when assessing LSPs' (future) investments, strategies and performance.

Design/methodology/approach

The impact of macroeconomic (market effects) and microeconomic variables (company effects) on β of 706 quoted LSPs is analyzed by conducting regression analysis. Data from more than 10 years is used. The analyses are made under consideration of the industry sectors in which LSPs are operating in.

Findings

Our results show that the influence of general market conditions on LSPs' β is more significant than the influence of company-specific, microeconomic variables. Nonetheless specific financial characteristics of LSPs affect the explanatory power of market influences.

Research limitations/implications (if applicable)

Detailed financial data required for analyses is only available for quoted LSPs. With our research we point out the importance of systematic risk for the financial evaluation of LSPs and analyze different internal as well as external determinants on β .

Practical implications (if applicable)

The analysis of systematic risk in the context of cost of capital offers valuable information for strategic decisions of LSPs. In dependency on the sector operating in, market conditions and financial characteristics, also non-quoted LSPs can estimate their (future) β and thus their cost of capital.

Original/value

This paper provides detailed analyses of the systematic risk. The information obtained also contributes to the value-based management of LSPs.

Keywords: Systematic risk, market risk, beta coefficient, determinants, logistics service provider.

1. INTRODUCTION

In the consequence of global market developments, increasing outsourcing activities and the quest for efficiency, logistics has become a competitive advantage and key success factor (Bowersox *et al.*, 2007). Logistics service providers (LSPs) perform logistics activities for those companies whose core competency is not logistics (Lieb and Bentz, 2005). To resist in global economy, LSPs have to understand their operating markets, general economic developments and competitors. They have to make several strategic decisions within their competitive environment to achieve profitability, organizational success and pursue growth strategies (Fugate *et al.*, 2008).

Regarding strategic decision making situations of LSPs, financial information of LSPs gains more and more importance. For example, the information may concern the creditworthiness of LSPs or the financial assessment of potential takeover targets (in case of M&A's) or cooperation partners (Häkkinen *et al.*, 2004). Besides of being a measure for performance, the cost of capital is one important decision support on how to invest capital and hence on which strategy to follow. Furthermore, financial controls such as the net present value (NPV) or the economic value added (EVA) help to evaluate potential investments and the outcomes of planned or implemented strategic decisions. Strategic decisions of LSPs concern e.g. market penetration or market development, product development as well as diversification (Ansoff, 1957). Despite the relevance, recent research did not concentrate on financial analysis of LSPs (Hitt *et al.*, 2003). First research efforts have been made by Hofmann and Lampe (2013), Liu and Lyons (2011), Töyli *et al.* (2008), Panayides (2007), Panayides and So (2005) as well as Ellinger *et al.* (2003).

To make financial evaluations and determine financial controls like NPV or EVA, LSPs have to know their cost of capital. The cost of capital is composed of cost of debt and equity and may be seen as the required rate of return on capital invested by shareholders. While calculating the cost of debt is a rather simple task, calculating the cost of equity is faced with some major challenges. An appropriate methodology is the approach of the weighted average cost of capital (WACC) within the context of the capital asset pricing model (CAPM). A key component of the WACC, and focus of this work, is the market or systematic risk of a company respectively (Brigham and Houston, 2011). The systematic risk is also known as beta coefficient (β , in the following the simple term "beta" is used). "Beta is a measure of stock price volatility – that is, the sensitivity of each stock's price to changes in the market. Beta represents the percentage performance of the stock which has historically accompanied a one per cent move in the market" (Levy, 1974, p. 61). The analysis of beta, that is accompanied by stock price analysis of quoted LSPs, may also allow conclusions on the economic frameworks of an industry, general market conditions and company characteristics (Kavussanos and Marcoulis, 1998; King, 1966).

Based on the importance of financial information of LSPs in strategic decision situations and beta as basis for the estimation and calculation of the cost of capital and financial controls, this paper aims to answer the following research question (RQ): *To what extend is the systematic risk of LSPs (beta) dependent on market, industry and company effects?* The analyses shall allow conclusions on the leverage of company and market effects on LSPs' beta and build the basis for further analyses on the composition and determinants of LSPs' cost of capital. The latter is an important factor for assessing LSPs' strategic directions of impact.

To give a first overview, we primarily analyzed the stock price development of quoted LSPs, dependent on market (country the LSPs headquarter is located in), industry (based on

Standard Industrial Classification SIC) and company characteristics (e.g. asset turnover). Figure 1 shows the obvious differences of the stock price development of LSPs since 2000, dependent on the cluster aggregation (countries, SIC codes, level of asset turnover). While classifying LSPs to their headquarters' location (1st graph) does not reveal significant differences in stock price development, classifying LSPs according to industry classification (2nd graph) or level of asset turnover (3rd graph) does. All three graphs have the same underlying values and only differ in assembling the LSPs to different clusters.

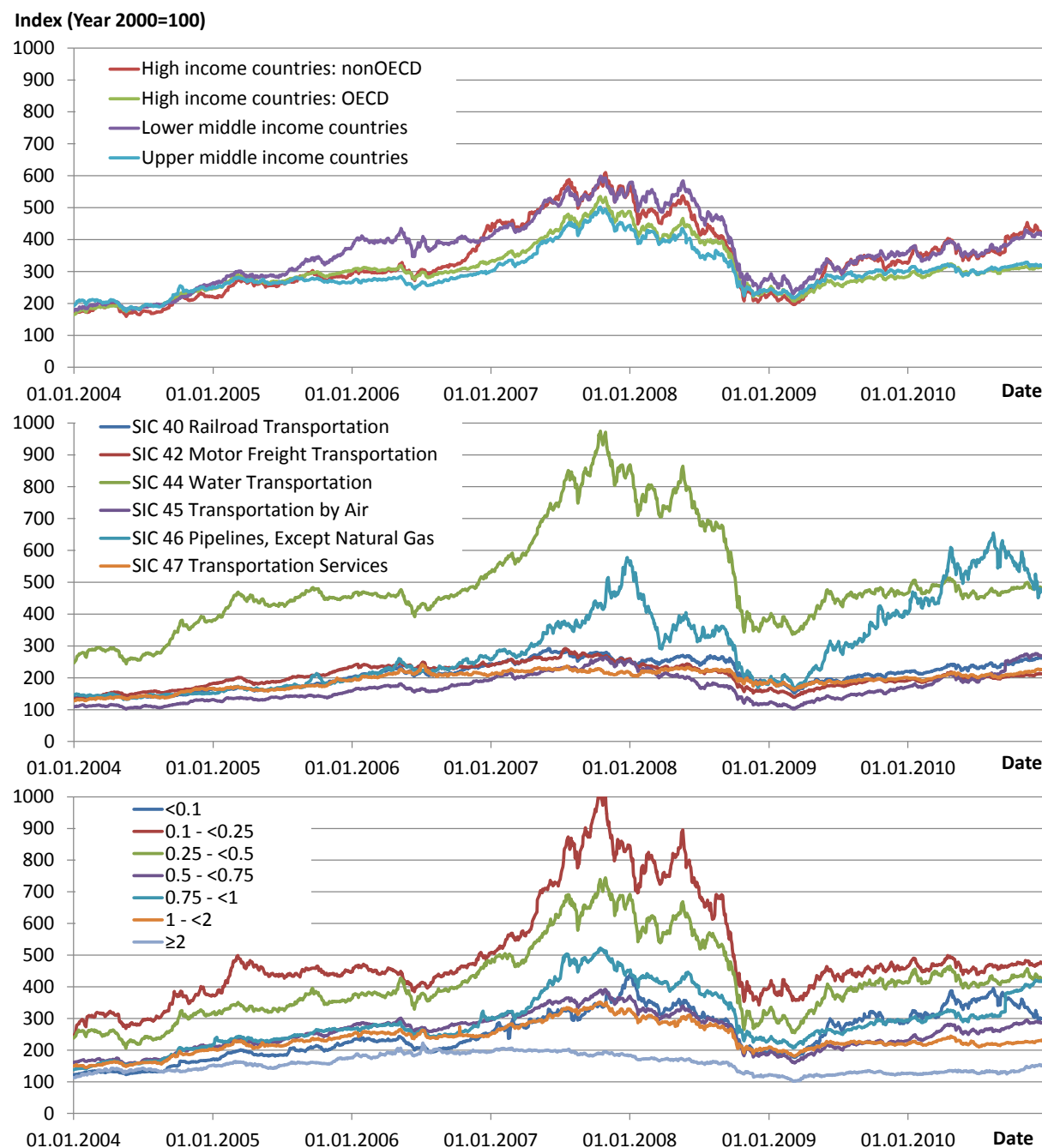


Figure 1. Stock price development of LSPs (2000-2010), clustered by headquarters location (countries' income level), industry classification (SIC code) and asset turnover (annual revenues to total assets)

Note: Only LSPs that have been quoted since January 2000 have been included in analysis (in total 503).

This paper is structured as follows: Section 2 gives a brief overview of literature concerned with factors influencing stock price and beta. Based on the literature review, a model for analyses in the context of this paper is derived. Furthermore, methodology and data collection are described. Section 3 presents the results that will be discussed in Section 4. The practical relevance of this work is explained by taking the example of an LSP striving for developing a new market. Section 5 ends up with summarizing results, discussing practical implications as well as limitations and giving an outlook for future research.

2. BACKGROUND AND METHODOLOGY

Literature review

From a statistical point of view, beta or the systematic risk is the slope of the linear regression of stock price returns to the return of a market index (Levy, 1974). Effects influencing stock prices have been analyzed in various studies, as well as effects that directly influence beta. In general, the determinants can be distinguished by company, industry and market effects (Kavussanos and Marcoulis, 1997; King, 1966). Industry effects can for example concern the industry sector a company is operating in; company effects the firm size or profitability of the analyzed company (microeconomic variables). The influence of firm size and equity ratios (that allow also conclusions on a company's profitability) on stock price is amongst others analyzed by Fama and French (2012) and Kavussanos and Marcoulis (1997). Market effects (macroeconomic variables) concern the general market environment or its conditions respectively. The influence of macroeconomic variables on stock price is considered in various disciplines, especially in finance. The influence of macroeconomic variables (e.g. inflation, exchange rate, interest rate, money supply, industrial production, unemployment rate or the oil price) is widely addressed by Fama and French (2012), Elyasiani *et al.* (2011), Abugri (2008), Driesprong *et al.* (2008), Rapach *et al.* (2005), Sadorsky (1999), Huang *et al.* (1996), Kaneko and Lee (1995), Chen *et al.* (1986) and Ross (1973). However, the results of previous analyses do not reveal a homogeneous picture. Dependent on the analyzed period and industry, results vary or may indicate the contrary. Huang *et al.* (1996) for example identify a positive correlation between the oil price development and stock returns for companies of the oil and petroleum sector, but not for the S&P 500 companies.

Regarding direct determinants on beta, recent research has primarily focused on microeconomic variables (company effects). Iqbal and Shah (2012) for example identify a negative correlation between liquidity, leverage, operating efficiency, dividend payout, market value of equity and beta and a positive correlation between profitability, firm size, growth and beta. Hong and Sarkar (2007) focus on the correlation between beta and leverage ratio, earnings volatility, market price of risk, growth options (positive correlation) as well as earnings growth rate, tax rate and investments for expansion (negative correlation). Further analyses, regarding micro- but also macroeconomic variables are e.g. conducted by Martikainen (1991) or Arfaoui and Abaoub (2010).

For the logistics sector or LSPs in particular, the effects of deregulation on systematic risk of the airline industry are analyzed by Allen *et al.* (1990), the oil price effect by Lu and Chen (2010), the impact of operating leverage by Houmes *et al.* (2012).

Theoretical model for analyses

As the literature review has shown, the specific analysis of factors influencing beta of LSPs has only found little attention in recent research. Based on the existing analyses briefly described above, our research focuses on the impact of micro- as well as macroeconomic

variables on LSPs' beta. The theoretical model (based on literature review) for the analyses conducted in this paper is presented in Figure 2. The effects of absolute microeconomic values and ratios related to the asset, capital, liquidity and profitability structure of LSPs on LSPs' beta are analyzed in a first step. The variables have been chosen with reference to our prior work (Hofmann and Lampe, 2013), where the financial structure of LSPs is examined in order to identify differences between LSPs. The results show significant differences especially in the asset, liquidity and profitability structure of LSPs. Hence we also assume different degrees of influence on beta. In a second step, the influence of macroeconomic variables is analyzed. As only little efforts have been made regarding LSPs, we have chosen rather general variables, based on the literature review. For the analyses from step one and two, LSPs will be clustered on the one hand by their industry "sub-sectors", referring to SIC code clusters; on the other hand according to the geographical location of their headquarters (country clusters). Furthermore, all LSPs will be analyzed in one group (all companies).

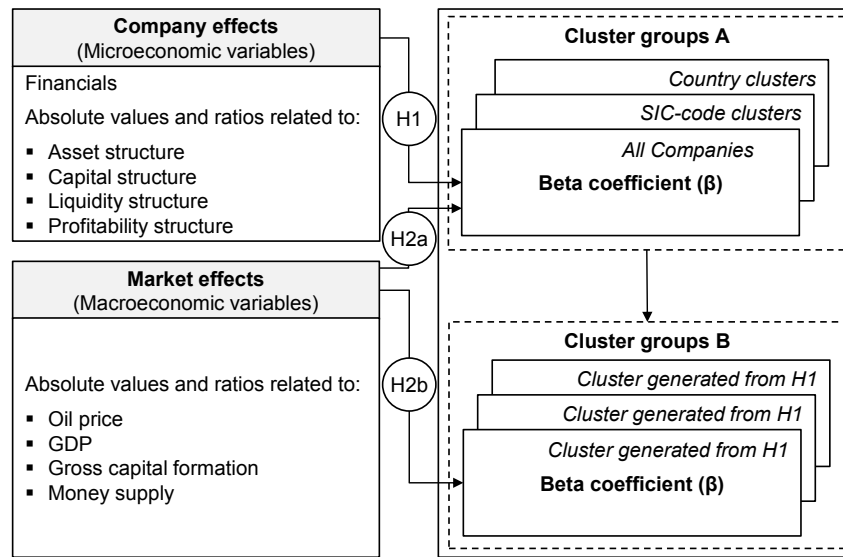


Figure 2. Theoretical model for the analyses of beta coefficient's determinants

In a third step, we cluster LSPs in dependency on the results from step 1. This means that if company-specific characteristics (e.g. the level of asset turnover, see Figure 1, 3rd graph) influence beta, LSPs are classified by these characteristics before the influence of macroeconomic variables is analyzed again.

In summary, we presume the following hypotheses for our analyses (Figure 2). The beta of LSPs is influenced by company effects (H1) and market effects (H2a). Based on the introductory analysis of stock price development, we expect that the significance of influence is dependent on the industry sector of LSPs and not on the country the LSP's headquarter is located in. Furthermore, we assume that microeconomic characteristics of LSPs affect the explanatory power of macroeconomic variables (H2b).

Methodology

In general, the methodology applied in this paper refers to the work of Houmes *et al.* (2012), Kavussanos and Marcoulis (1997), Chen *et al.* (1986), as well as Fama and MacBeth (1973), who all pursue similar approaches. The beta of analyzed LSPs is the slope of the linear regression of stock price returns to the return of a market index (Levy, 1974) or the

covariance of a company's stock price (R_i) and market index (R_m) divided by the variance of the market index (Fama and MacBeth, 1973): $\beta_i = \text{cov}(R_i, R_m) / \sigma^2(R_m)$

Daily stock price and market index data for the time period of five years is used to calculate beta. E.g. calculating beta for the year 2010, daily data from 2006-2010 is used. The S&P 500 index is referred to as market index and the five year spanning, daily stock returns of each analyzed LSP are regressed on the corresponding returns for the S&P 500.

To analyze the influence of micro- and macroeconomic variables on beta, multiple linear regression analyses are conducted (for each hypothesis and correspondent clusters), where beta is the dependent variable and the micro- or macroeconomic variables the independent ones. In total, three "sets" of variables have been used for analyses:

- **Microeconomic variables (absolute values, US\$):** cash flow per share, total current assets, total current liabilities, EBIT, EBIT & depreciation, long term debt, net income, net sales or revenue, property plant & equipment (non-current assets), total assets, total capital, total debt, total shareholder's equity.
- **Microeconomic variables (ratios):** (a) *related to asset structure:* intensity of investment (non-current assets/total assets), asset intensity 1 (non-current assets/current assets), continuous intensity (current assets/total assets), asset intensity 2 (current assets/non-current assets), asset turnover (annual revenues/total assets), current asset turnover (annual revenues/current assets); (b) *related to capital structure:* debt to equity ratio (debt/equity), equity ratio (equity/total capital), debt ratio (debt/total capital); (c) *related to liquidity structure:* quick ratio ((current assets - inventories)/current liabilities), current ratio (current assets/current liabilities), cash flow/sales; (d) *related to profitability structure:* return on equity (ROE) (net income/shareholders equity), return on assets (ROA) (net income/total assets), net profit margin(net income/revenues).
- **Macroeconomic variables:** mean oil price (ø of Brent & WTI crude oil, US\$), GDP per capita (US\$), gross capital formation (% of GDP), money and quasi money supply (% of GDP).

For the analyses of the influence of microeconomic variables, data of the year 2010 is used. All LSP-specific data, meaning microeconomic variables and stock prices have been obtained from Thomson Datastream, a financial database that is generally accepted as valid and reliable.

The analyzed LSPs are – besides the analysis of all LSPs in one group – classified by their industry sector and by the geographical location of their headquarters. LSPs with the following primary SIC codes were clustered and analyzed (by 2-place SIC code): SIC 40 Railroad Transportation; SIC 42 Motor Freight Transportation and Warehousing, SIC 44 Water Transportation (except SIC 448, Water Transportation of Passengers); SIC 45 Transportation by Air (except SIC 458 Airports, Flying Fields, and Airport Terminal); SIC 46 Pipelines, Except Natural Gas; SIC 47 Transportation Services (except SIC 473 Arrangement of Passenger Transportation and SIC 474 Rental of Railroad Cars) (U.S. Department of Labor, 2013). The country clusters are based on the World Bank's country classification by income group: High income: nonOECD, high income: OECD, lower middle income, upper middle income. For methodology and assignment of countries see: The World Bank (2013).

For the regression analysis of macroeconomic variables and beta, the period from 2000-2010 is analyzed. Macroeconomic data has been obtained from The World Banks database (except

of the oil price development), for the whole world as well as for the different country clusters. The oil price development is the mean of Brent and WTI crude oil price development (Statista, 2013). For conducting regression analysis, mean value of beta of LSPs has been used for each year – dependent on the correspondent cluster group. Mean beta values of SIC code clusters have been analyzed against the values of macroeconomic variables valid for the whole world, mean beta values of country clusters against the values of macroeconomic variables valid for each country cluster group.

In general, the following regression quotation is used: $\beta = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \dots + \alpha_j X_j + e$ α_0 is the constant term, α_j the regression coefficients, and e an error term. On the contrary to the usual terms of regression quotations where β defines the regression coefficient, in this case α was chosen in order to avoid mixing up beta (systematic risk) and regression coefficient. It has to be noted that in all result tables (Table 1 to Table 3, Annex), standardized regression coefficients are depicted in order to enable a better comparability of coefficients of the same model. Before regression analyses, a correlation analysis of corresponding variables is conducted in order to identify their independency or dependency. The results can be found in the Annex, just as the results of regression analysis regarding SIC code clusters.

Sample selection

LSPs with the appropriate SIC code and being active since at least 2006 have been chosen for the analysis of microeconomic variables. The active period from 2006-2010 is required in order to calculate beta. In total, 760 LSPs from 70 countries have been analyzed. The characteristics of the analyzed LSPs (microeconomic variables) for the year 2010 are depicted in Annex 1.

The characteristics are not given for LSPs classified by the geographical location of their headquarters, because first analyses of stock price development (Figure 1) do not let expect significant differences between the country clusters. For the influence analysis of macroeconomic variables, the period from 2000-2010 is analyzed. For that reason, only LSPs that have been active since at least 1996 (to calculate beta) have been considered, in total 416

3. RESULTS

Microeconomic variables (hypothesis 1)

A correlation analysis of microeconomic variables (absolute and ratios) and beta can be found in Annex 2. The regression analyses of microeconomic variables and beta related to country clusters can be found in Annex 3a. The regression analyses of microeconomic variables (Table 1 and Table 2), both absolute values and ratios, and beta show that there is no uniform “structure” of microeconomic variables influencing LSPs’ beta.

A general structure of LSP’s beta (correlation between variables and “All LSPs”) cannot be derived from absolute microeconomic variables. Regarding the microeconomic ratios, regression coefficients of continuous intensity and asset turnover are highly significant, but the overall explanatory power of the model (coefficient of determination, R^2) is quite low (0.043 which means that only 4.3% of the variance can be explained by all microeconomic ratios). Another picture shows the regression analysis of microeconomic variables and the single LSP clusters (grouped by SIC code or geographical location of LSPs headquarters, for regression analysis related to country clusters, see Annex 3b). The analyses show that there are obvious differences between the analyzed clusters, regarding absolute values as well as ratios. There is no significant set of variables valid for all LSP clusters.

Table 1. Results of regression analysis of beta coefficient and absolute microeconomic variables referring to industry clusters

	All LSPs	SIC 40	SIC 42	SIC 44	SIC 45	SIC 46	SIC 47
R ²	0.261	0.272	0.262	0.151	0.165	0.574	0.847
Absolute (US\$)	Standardized slope of regression (t-value in parentheses)						
(Constant)	(13.656)	(2.319)	(3.251)	(8.470)	(4.443)	(2.793)	(1.318)
Cash flow per share	-0.096 (-1.369)	0.007 (0.047)	-0.102 (-0.978)	-0.226 (-0.916)	-0.015 (-0.168)	-2.002 (-0.766)	0.962 (3.163) ***
Total current assets	0.080 (0.532)	1.976 (1.180)	-0.526 (-0.822)	-1.039 *** (-2.989)	-0.148 (-0.309)	-8.995 (-1.393)	7.646 *** (4.641)
Total current liabilities	-0.281 (-1.130)	-2.717 (-1.465)	-1.565 ** (-2.203)	1.033 (1.435)	-0.025 (-0.023)	3.473 (1.355)	
EBIT	-0.029 (-0.054)	-8.007 (-0.847)	-0.539 (-0.927)	-2.189 (-1.151)	2.216 * (1.722)		-1.085 (-0.198)
EBIT & depreciation	-0.294 (-0.578)	10.909 (1.016)	1.320 ** (2.559)	-1.118 (-0.654)	-3.043 * (-1.866)		-6.281 (-1.337)
Long term debt	-0.408 (-0.482)	-5.570 (-0.717)	-0.434 (-0.257)	1.780 (1.392)	0.673 (0.184)	16.863 (1.165)	3.120 ** (2.526)
Net income	-0.070 (-0.313)	0.554 (0.165)	0.122 (0.422)	0.882 (1.588)	-0.188 (-0.286)	-6.735 (-1.294)	1.245 (0.770)
Net sales or revenues	0.135 (0.936)	-1.520 (-0.774)	1.465 *** (2.793)	-0.318 (-0.816)	0.402 (0.654)	1.202 (0.415)	5.033 *** (4.487)
Operating income	0.329 (1.461)	0.160 (0.074)	-0.487 (-1.141)	1.937 *** (2.840)	-0.089 (-0.230)	15.575 * (1.790)	
Property, plant & equipment	-0.025 (-0.091)	-1.805 (-0.288)	-0.433 (-1.091)	0.343 (0.680)	1.081 (1.580)	-0.316 (-0.037)	0.937 (1.006)
Total assets	0.851 * (1.749)	3.812 (0.366)	0.473 (0.385)	-0.359 (-0.155)	0.200 (0.165)		-16.765 *** (-3.186)
Total capital	0.465 (0.344)		0.580 (0.154)	1.620 (0.670)	0.870 (0.161)		
Total debt	-0.112 (-0.220)	3.067 (0.530)	0.409 (0.473)	-2.116 * (-1.913)	-1.224 (-1.094)	-23.007 (-1.604)	-1.457 (-1.273)
Total shareholder's equity	-0.488 (-0.650)	-1.586 (-0.719)	-0.438 (-0.192)	-0.121 (-0.135)	-0.366 (-0.115)	5.182 ** (2.318)	7.837 *** (3.223)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

The consideration of R² shows that aggregating LSPs to country clusters (or their headquarters locations respectively) is rather not appropriate to explain the correlation between microeconomic variables and beta of LSPs (for detailed results, see Annex 3).

Table 2. Results of regression analysis of beta coefficient and microeconomic ratios variables referring to industry clusters

	All LSPs	SIC 40	SIC 42	SIC 44	SIC 45	SIC 46	SIC 47
R ²	0.043	0.429	0.062	0.117	0.154	0.922	0.558
Ratios	Standardized slope of regression (t-value in parentheses)						
(Constant)	(3.350)	(2.294)	0.674	(1.995)	(2.110)	(0.912)	(-0.596)
Cash flow/sales	0.063 (0.241)	-0.431 * (-1.764)	-0.041 (-0.256)	0.140 (0.302)	-0.194 (-1.424)	0.259 (0.602)	14.057 (1.075)
Quick ratio	-0.584 * (-1.792)	-1.566 * (-1.734)	0.331 (0.624)	-0.572 (-1.001)	-1.089 * (-1.975)	-1.395 (-0.606)	-1.051 (-1.190)
Current ratio	0.636 * (1.951)	1.667 * (1.888)	-0.342 (-0.644)	0.670 (1.173)	1.091 ** (1.988)	1.867 (0.870)	1.293 (1.400)
Intensity of investment	-0.004 (-0.058)	0.165 (0.370)	-0.119 (-0.937)	0.079 (0.834)	-0.116 (-0.693)	-0.412 (-0.582)	0.053 (0.048)
Asset intensity 1	0.089 (1.601)	0.156 (0.326)	-0.028 (-0.229)	0.190 ** (1.985)	0.021 (0.162)	-0.319 (-0.793)	-1.520 (-1.023)
Continuous intensity	-0.231 *** (-3.001)	-0.788 (-1.203)	-0.031 (-0.174)	-0.208 ** (-2.082)	-0.264 (-0.975)	-1.032 (-0.841)	0.282 (0.234)
Asset intensity 2	-0.035	0.355	-0.059	-0.012	-0.101	0.091	-0.092

	All LSPs	SIC 40	SIC 42	SIC 44	SIC 45	SIC 46	SIC 47
R ²	0.043	0.429	0.062	0.117	0.154	0.922	0.558
Ratios	Standardized slope of regression (t-value in parentheses)						
	(-0.796)	(0.837)	(-0.609)	(-0.197)	(-0.848)	(0.212)	(-0.097)
Asset turnover	0.226 *** (2.937)	0.126 (0.268)	0.062 (0.292)	0.028 (0.306)	0.111 (0.428)	0.241 (0.570)	0.157 (0.099)
Current asset turnover	-0.106 (-1.536)	-0.525 (-1.233)	0.148 (0.887)	-0.188 * (1.752)	-0.165 (-0.835)	0.361 (0.822)	1.009 (0.578)
Debt to equity ratio	0.047 (1.196)	-0.111 (-0.590)	0.039 (0.173)	-0.013 (-0.179)	0.157 (1.653)	0.165 (0.718)	0.285 (0.249)
Equity ratio	-0.005 (-0.039)	-1.339 ** (-2.202)	0.048 (0.360)	0.281 (1.030)	-0.367 (-0.935)	-0.166 (-0.354)	0.531 (0.385)
Debt ratio	0.004 (0.030)	-1.432 * (-2.310)	-0.061 (-0.292)	0.295 (1.078)	-0.307 (-0.784)	-0.223 (-0.873)	-0.610 (-0.614)
ROE	0.069 (1.367)	-0.121 (-0.435)	0.058 (0.241)	-0.052 (-0.634)	0.184 (1.183)	0.749 (0.990)	
ROA	0.082 (1.173)	0.127 (0.297)	-0.131 (-1.037)	0.081 (1.074)	0.229 (1.058)	-0.707 (-0.820)	-4.720 (-0.913)
Net profit margin	-0.084 (-0.307)	0.340 (0.919)	0.084 (0.491)	-0.185 (-0.393)	0.155 (0.865)	0.072 (0.188)	-9.042 (-0.673)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

Macroeconomic variables (hypothesis 2a)

Table 3. Results of regression analysis of beta coefficient and macroeconomic variables referring to industry clusters

	ALL	SIC 40	SIC 42	SIC 44	SIC 45	SIC 46	SIC 47
R ²	0.984	0.946	0.959	0.982	0.948	0.978	0.971
Macroeconomic variables	Standardized slope of regression (t-value in parentheses)						
Constant	(2.218)	(-0.994)	(1.595)	(-0.261)	(2.303)	(-0.291)	(-0.801)
Mean oil price	-0.148 (-0.541)	0.197 (0.394)	0.688 (1.583)	0.454 (1.591)	-0.805 (-1.633)	1.266 *** (4.000)	0.240 (0.658)
GDP per capita (US\$)	1.448 *** (4.736)	0.309 (0.553)	0.225 (0.462)	0.194 (0.607)	2.610 *** (4.731)	-1.028 ** (-2.898)	0.399 (0.977)
Gross capital formation (% of GDP)	-0.468 ** (-2.843)	0.544 (1.807)	-0.011 (-0.041)	0.343 * (1.994)	-1.226 *** (-4.126)	0.746 *** (3.905)	0.391 (1.774)
Money and quasi money as % of GDP	-0.329 ** (-3.019)	0.052 (0.262)	-0.400 * (-2.309)	-0.197 (-1.730)	-0.418 * (-2.130)	-0.309 ** (-2.449)	-0.039 (-0.267)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

A correlation analysis of macroeconomic variables can be found in Annex 4. The regression analysis (Table 3) shows that except the mean oil price, macroeconomic variables significantly correlate with LSPs' beta.

On the contrary to first analyses (microeconomic variables), the overall explanatory power of the regression models (R²) is nearly 1 in all models referring to SIC code clusters. As well as in the first analysis, significance of the regression coefficients regarding the country clusters is rather low (see Annex 5).

Combination of micro- and macroeconomic variables (hypothesis 2b)

The overall most significant variables from microeconomic analysis are “total current assets”, “total shareholders' equity”, “net sales or revenue”, “continuous intensity” and “asset turnover”. In a third step, LSPs active since 1996 are now clustered due to their level of total current assets, total shareholders' equity and net sales or revenue by conducting an ABC-analysis. The “continuous intensity” and “asset turnover” clusters are classified based on their ratio-level. Regression analysis of macroeconomic variables and beta, regarding the regrouped clusters based on results of “microeconomic regression analysis” is performed with regard to hypothesis 2b. The explanatory power (R²) of the models is similar to R² resulting

from analyses referring to hypothesis 2a; the correlation coefficients show a high significance. This implies that the determinants of LSPs' beta coefficients depend on the industry sectors the LSPs are operating in and their financial characteristics (the results can be found in Annex 6). This emphasizes the results from our prior work (Hofmann and Lampe, 2013), that shows the financial differences between LSPs operating in different industry sectors.

4. DISCUSSION

Analysis of microeconomic variables

The analysis of microeconomic variables has to be distinguished regarding absolute values (Table 1) or ratios (Table 2) as independent variables. In general it has to be said that the explanatory (R^2) of the regression models analyzing absolute values is higher than that of models analyzing ratios. In both considerations, the regression analyses referring to country clusters show a low R^2 , except the country cluster "High income: nonOECD", that is in the intermediate range. First of all it can be stated that there is no uniform "set of variables" significant influencing beta of all LSPs. This fact can be ascribed to the overall inhomogeneous financial structure of LSPs, as Hofmann and Lampe (2013) have shown. Considering SIC code clusters of LSPs, significant regression coefficients and hence determinants can be identified, regarding absolute values and ratios. Absolute values do not significantly influence SIC 40 cluster (Railroad Transportation), which may be founded in the high variance of the analyzed values within this cluster (Annex 1). The highest explanatory power show the regression analyses of beta of LSPs aggregated to SIC 47 (Transportation Services) and absolute macroeconomic values. This may be reasonable in the general characteristics of the Transportation Services cluster. On the contrary to all other clusters, e.g. the asset intensity 2 (current assets/non-current assets) is very high while the debt ratio is quite low (Annex 1). Hence obvious and remarkable amplitudes in the asset, capital, liquidity and profitability structure seem to influence the significance of regression coefficients of absolute macroeconomic variables influencing beta.

Altogether, microeconomic ratios do not directly influence LSPs' beta, while the explanatory power/significance of absolute values is in most cases higher. The absolute variables are closely related to LSPs' firm size. The poor explanatory power of regression models referring to country clusters could have been expected from introductory stock price analyses that also did not show significant differences between the country clusters. The general financial structure of LSPs regarding the country clusters is relatively heterogeneous, but the LSPs aggregated to the country cluster "High income: nonOECD" show an asset intensity 2 (non-current assets/current assets) that is about twice as of all other clusters. This may explain the higher R^2 of the models referring to this country cluster.

Analysis of macroeconomic variables

Accordant to the analysis of microeconomic variables, there is no uniform "set of variables" significantly influencing beta of all LSPs. But in general, explanatory power (R^2) of the regression models analyzing macroeconomic variables as independent variables is very high, also for country clusters. On the contrary to SIC code clusters, significance of regression coefficients of the country clusters is lower. The overall economic development (GDP per capita), the gross capital formation and the money or quasi money supply are highly correlating with beta in general (see Annex 4) and show in most cases also very significant correlation coefficients (Table 3). The mean oil price only significantly influences beta of LSPs aggregated to the SIC 46 cluster, meaning companies that are "primarily engaged in the

pipeline transportation of petroleum” (U.S. Department of Labor, 2013). On the contrary to regression analysis of beta and microeconomic variables, beta of LSPs being part of the Transportation Services cluster (SIC 47), is not significantly influenced by macroeconomic variables. This may also be ascribed to the specific financial characteristics of this cluster. Accordant to all previous analyses, the beta of the Railroad Transportation cluster (SIC 40) is neither significantly influenced by macroeconomic variables, which also may be founded in the high variance of the analyzed values within this cluster (see Section “Analysis of macroeconomic variables” and Annex 1).

To sum up, macroeconomic variables seem to have a more significant influence on LSPs’ beta, while differences between the analyzed clusters have to be regarded. While the location of LSPs headquarter does not have a very significant impact on beta, the industry sector of the LSPs and hence some observable differences in general financial structure of LSPs does.

Analysis of micro- and macroeconomic variables

In fact regression analysis of beta and microeconomic variables does not bring out high explanatory models with high significant regression coefficients, but a certain connection of microeconomic variables, beta and financial characteristics (microeconomic variables) of LSPs cannot be denied. The LSPs of the different SIC code clusters have different financial structures. This leads to the assumption that the extent of influence of macroeconomic variables on LSPs’ beta can also be explained by clustering LSPs due to their financial characteristics and not due to their industry sector operating in (Annex 6). This presumption can also be based on our prior work (Hofmann and Lampe, 2013) that showed the differences of the financial structure of quoted LSPs, dependent on their industry sector operating in. Nonetheless, financial characteristics of LSPs within a SIC code cluster still have a relatively high variance, which is why clustering LSPs based on their financial characteristics seems appropriate for further analyses.

The results show that clusters dependent on the financial characteristics of LSPs are definitely suitable for explaining differences in the extent of influence of macroeconomic variables on LSPs’ beta. Hereby it has to be considered that general economic variables referring to GDP, capital formation and money supply do have a higher impact on beta than the mean oil price.

Relation to previous research

Results of previous research do not reveal consistent results. Chan *et al.* (1985) show that macroeconomic factors in general do not significantly influence stock price. Hence a direct correlation to beta can be eliminated. On the contrary to Flannery and Protopapadakis (2002) who, to their surprise, could not show a correlation of stock prices and GNP (that is directly correlated to GDP), we found out that beta and hence stock price of LSPs is highly correlated to GDP. This may be ascribed to the derived demand for logistics services, linked to the overall economic development. According to e.g. Fama (1981) and Geske and Roll (1983), we also identified a negative correlation between stock price and money supply (related to inflation), because it signals “a chain of events which results in a higher rate of monetary expansions” (Geske and Roll, 1983, p. 1). This correlation does not seem to be logistics-specific, despite of differences between LSP clusters. A highly significant correlation between mean oil price and beta of all LSPs did not result from our analyses. But the strong positive correlation between oil price and beta of the Pipeline sector underlines the results of Faff and Brailsford (1999) as well as Sadorsky (1999). It is not surprising that the Pipeline sector’s beta is highly significant correlated to mean oil price, as oil is their main good of handling and not “simply a means to the end” as in the other clusters.

Referring to the microeconomic variables that in general do not show such a high significance as the macroeconomic variables, our results largely correspond to those of Iqbal and Shah (2012), who analyzed the influence of microeconomic variables on systematic risk in general. While they find a negative correlation between liquidity and beta, which is also shown in the analysis of quick ratio and beta (Table 2); the current ratio (not excluding inventories) shows a positive correlation to beta. This in turn underlines e.g. results from Jensen (1986) who argues that increasing liquidity leads to increasing agency cost of cash flows and hence systematic risk. Summarizing the findings from microeconomic analyses and existing literature, the results do not show a uniform structure, as previous research has shown (for details, see among others Iqbal and Shah (2012), Hong and Sarkar (2007) and Martikainen (1991)).

Relation so strategic decisions of LSPs

Taking the example of an LSP that would be offering primarily transportation services, owning a transport fleet and operating in country A. This LSP wants to expand its business by offering transportation services in country B. In general, the LSP has two options to pursue its target. Option 1: to buy or enlarge the transportation fleet and offer transportation services on its own behalf. Option 2: to establish cooperation with an LSP that is already offering transportation services in country B. Referring to the results (Section 3), the choice of option 1 or 2 would have different implications on beta and cost of capital. Deciding for option 1 would lead to higher total assets (for enlarging the transportation fleet). As regression analysis of absolute microeconomic variables and beta shows (Table 1), increasing total assets lead to a higher beta, which implies higher cost of capital. This correlation is associated with a lower continuous intensity (current assets/total assets), which also leads to a higher beta. The higher beta implies that the share price would develop more closely to the stock market. This could mean higher returns for stakeholders in case of a positive market development, but on the contrary high losses in case of a negative market development. Deciding for option 2 would not have a direct influence on the total asset structure and hence beta would not be influenced by a change of total assets or continuous intensity. Since not only microeconomic variables do influence beta, the LSP also would have to look at macroeconomic variables when making its strategic decision. If the LSP is in general intended to reduce its cost of capital and the volatility of its share price to market development, the economic climate of the country the LSP wants to expand in is no less important (Table 2). Economies tending to be rather less developed could enable a lower beta (in the future, after having made a decision). The lower the GDP and the higher the inflation as well as the gross capital formation, the lower beta. If the LSP is for example choosing option 1 but does not want its cost of capital increasing too much, the choice of the market to develop could have a contradictory influence on beta than the changing microeconomic variables.

5. CONCLUSION

The analyses of the influence of micro- and macroeconomic variables on LSPs' beta have shown that the influence of market effects is much more significant than of company effects. Furthermore, clear differences can be observed regarding the industry sector (SIC codes) LSPs are operating in. The results directly answer the overall research question of this paper. On this basis it can be derived that hypothesis 1 (the beta of LSPs is influenced by company effects) is only partly confirmed, while the regression analyses of LSPs' betas and macroeconomic variables definitely confirms hypothesis 2a (the beta of LSPs is influenced by market effects). Nonetheless, microeconomic variables and hence the financial characteristics

of LSPs affect the explanatory power of macroeconomic variables, what has been shown by classifying LSPs in dependency of their financial characteristics. This also confirms hypothesis 2b.

The beta coefficient is one of the central components for the calculation of an LSPs' cost of capital. To assess possible future investments or strategies, information about the economic potential and associated risk is indispensable (Jacobs and Shivdasani, 2012). The cost of capital offers important information referring to capital expenditure: using the capital for current needs, saving capital for future needs or investing. In praxis, this means that "the cost of capital is the hurdle rate we apply to decisions such as investing in or disinvesting from the economic cycle. Generating returns greater than the cost of capital creates value" (Groth and Anderson, 1997, p. 476). Using the WACC to calculate LSPs' cost of capital, persons responsible have to "set the hurdle rate higher (lower) for projects of greater (less) risk than reflected in the WACC" (Groth and Anderson, 1997, p. 477).

The formula on how to calculate the WACC is not the focus of this work. Simplified it can be said that the higher the beta, the higher the WACC, assuming that all other variables remain constant. For analyzed LSPs this implies that e.g., the higher the asset turnover or the lower the continuous intensity, the higher beta (Table 2); or the higher the GDP or the lower the gross capital formation, the higher beta (Table 3). According to the results of analyses in Section 3, LSPs can make conclusions on the dependency of their beta on micro- or macroeconomic variables. This is also underlined by the example at the end of Section 4, linked to strategic decision making of LSPs. The results also allow non-quoted LSPs to estimate their beta. Summarizing it can be derived that the cost of capital of LSPs are influenced by micro- and macroeconomic variables. But it has to be regarded that the results are not valid for all LSPs, there are obvious differences between the analyzed LSP clusters.

Discussing this research approach, some limitations have to be considered. Only quoted LSPs have been integrated in analyses whose primary SIC code refers to one of the SIC codes mentioned in Section 2. Every company can be described by more than one SIC code when it is active in more than the "primary" industry. Hence, not all potential LSPs might have been identified. In addition, beta has been calculated using daily stock data for five years. The time period used for calculating beta varies in general between 2 to 10 years. Hence, another time period for calculation could influence the results, just as the choice of another market index than the S&P 500. As previous works have shown, results of analyzing beta's determinants are also dependent on time period under consideration and industry sector (Huang *et al.*, 1996).

The limitations mentioned also lead to implications for future research. Furthermore, future research could integrate the WACC or cost of capital respectively into quantitative analyses to investigate further determinants of cost of capital. Additionally, it would be very interesting to add "classic" time series of logistics parameters like ton-kilometers or number of picks etc. into analyses. This data would have to be collected by interviews or surveys from (ideally) quoted LSPs in order to link the financial with "classical" logistical information. This could lead to new suggestions for strategic decisions of LSPs – focusing on financial and non-financial information as well, which is a requirement for successful strategic decision making (Rajesh *et al.*, 2012).

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Annex 1: Characteristics of analyzed LSPs in 2010

Cluster (SIC)	ALL LSPs	SIC 40	SIC 42	SIC 44	SIC 45	SIC 46	SIC 47
Cluster description		Railroad Transportation	Motor Freight Transportation	Water Transportation	Transportation by Air	Pipeline, Except Natural Gas	Transportation Services
Number of LSPs	760	48	187	337	140	23	25
Beta	0.32 (0.63)	0.38 (0.50)	0.18 (0.45)	0.33 (0.73)	0.41 (0.61)	0.38 (0.28)	0.52 (0.48)
Absolute (1000 US\$)	Mean value (standard deviation in parentheses)						
Cash flow per share	9.21 (107.45)	6.54 (18.71)	1.46 (57.74)	12.11 (138.86)	8.24 (67.11)	48.33 (199.66)	0.75 (1.18)
Total current assets	611'463 (1'673'788)	833'810 (1'221'419)	214'594 (529'906)	427'359 (1'247'787)	1'457'307 (2'826'401)	1'046'246 (2'890'201)	440'570 (714'312)
Total current liabilities	561'216 (1'643'365)	1'123'661 (2'246'278)	179'729 (441'518)	308'133 (947'317)	1'524'440 (2'967'761)	568'284 (1'150'455)	294'013 (496'098)
EBIT	158'989 (663'820)	620'750 (1'189'785)	35'612 (75'501)	106'245 (620'160)	265'244 (765'348)	379'730 (1'221'440)	76'518 (160'361)
EBIT & depreciation	269'234 (978'624)	949'368 (1'807'999)	64'433 (121'863)	178'426 (924'607)	503'247 (1'082'513)	538'949 (1'702'025)	99'178 (178'178)
Long term debt	816'868 (2'557'209)	2'901'161 (6'860'048)	159'940 (454'107)	586'662 (1'537'707)	1'502'034 (2'741'534)	1'730'225 (3'943'672)	42'301 (78'686)
Net income	84'968 (386'495)	309'690 (652'096)	18'608 (59'577)	55'049 (295'080)	149'305 (550'644)	228'952 (806'471)	43'835 (99'740)
Net sales/revenue	1'789'260 (5'430'791)	3'000'226 (5'448'536)	717'058 (1'692'502)	1'031'210 (3'942'464)	4'438'789 (9'514'687)	2'950'100 (6'064'315)	1'645'841 (2'536'230)
Operating income	144'827 (630'634)	621'057 (1'157'978)	33'306 (71'129)	94'772 (608'884)	220'337 (670'597)	367'708 (1'142'348)	79'751 (160'997)
Property, plant & equipment	1'569'333 (4'911'056)	6'646'942 (13'332'655)	367'438 (893'623)	1'018'166 (2'918'269)	2'699'078 (4'690'264)	3'154'995 (8'232'728)	147'637 (252'629)
Total assets	2'579'179 (7'092'887)	8'168'849 (15'160'763)	710'062 (1'488'464)	1'739'855 (4'803'834)	5'085'045 (9'367'922)	4'669'999 (11'247'478)	802'815 (1'328'270)
Total capital	1'734'691 (4'769'033)	5'786'458 (11'049'612)	466'030 (1'029'773)	1'355'365 (3'668'587)	2'788'102 (4'672'656)	3'800'373 (9'332'690)	474'392 (808'711)
Total debt	973'137 (2'883'166)	3'241'108 (7'462'934)	215'592 (527'176)	705'274 (1'765'481)	1'848'680 (3'352'426)	1'830'115 (4'062'999)	87'670 (165'016)
Total shareholder's equity	872'530 (2'466'281)	2'840'442 (4'861'755)	298'170 (659'711)	706'458 (2'123'467)	1'238'929 (2'542'922)	1'984'269 (5'183'103)	413'981 (734'967)
Ratios	Mean value (standard deviation in parentheses)						
Cash flow/sales	8.85 (188.13)	19.47 (14.36)	8.84 (23.05)	7.14 (279.85)	9.86 (14.31)	24.66 (23.85)	-7.73 (69.83)
Quick ratio	1.81 (4.25)	2.08 (2.11)	1.55 (3.42)	2.10 (5.65)	1.51 (1.55)	1.55 (1.56)	1.28 (1.02)
Current ratio	2.09 (4.65)	2.37 (2.27)	1.78 (3.51)	2.41 (6.27)	1.76 (1.62)	1.79 (1.58)	1.65 (1.07)
Intensity of investment	0.54 (0.26)	0.68 (0.20)	0.49 (0.24)	0.60 (0.24)	0.48 (0.24)	0.59 (0.28)	0.27 (0.27)
Asset intensity 1	4.44 (9.71)	5.97 (4.66)	2.72 (3.78)	5.83 (12.79)	2.57 (5.44)	6.38 (6.64)	3.74 (14.36)
Continuous intensity	0.31 (0.20)	0.20 (0.17)	0.34 (0.18)	0.27 (0.19)	0.37 (0.20)	0.24 (0.25)	0.53 (0.23)
Asset intensity 2	2.06 (6.90)	0.49 (1.00)	2.50 (9.59)	1.47 (5.53)	2.91 (7.08)	0.95 (1.90)	6.10 (6.15)
Asset turnover	0.84 (0.85)	0.55 (0.34)	1.09 (0.88)	0.52 (0.48)	1.17 (0.94)	0.51 (0.50)	2.33 (1.61)
Current asset turnover	2.93 (2.12)	3.39 (2.00)	3.34 (2.02)	2.36 (2.14)	3.28 (1.63)	3.05 (2.35)	4.70 (2.62)
Debt to equity ratio	0.81 (12.48)	1.21 (1.88)	0.79 (2.07)	0.22 (18.21)	2.10 (5.73)	0.95 (3.99)	0.87 (2.09)
Equity ratio	0.79 (3.64)	0.57 (0.26)	0.71 (0.33)	0.93 (5.37)	0.66 (1.49)	0.61 (0.29)	0.81 (0.25)
Debt ratio	0.32 (4.61)	0.51 (0.35)	0.60 (1.92)	0.08 (6.68)	0.44 (1.62)	0.51 (0.44)	0.29 (0.35)
ROE	0.11 (1.18)	0.05 (0.21)	0.07 (0.56)	0.06 (0.78)	0.17 (1.80)	0.04 (0.15)	0.90 (3.57)
ROA	0.00 (0.33)	0.03 (0.05)	0.00 (0.25)	0.02 (0.10)	-0.03 (0.53)	0.03 (0.05)	-0.16 (0.99)
Net profit margin	-0.03 (1.98)	0.06 (0.17)	0.05 (0.54)	-0.09 (2.84)	0.02 (0.13)	0.04 (0.14)	-0.50 (2.63)

Annex 2a: Correlation of absolute microeconomic variables

Correlation coefficient (Significance (2-tailed))	Beta coefficient	Cash flow per share	Total current assets	Total current liabilities	EBIT	EBIT & depreciation	Long term debt	Net income	Net sales or revenues	Operating income	Property, plant & equipment	Total assets	Total capital	Total debt	Total shareholder's equity
Beta coefficient	1	-.006 (0.871)	.196** (0.000)	.183** (0.000)	.137** (0.000)	.153** (0.000)	.171** (0.000)	.115** (0.002)	.196** (0.000)	.150** (0.000)	.175** (0.000)	.203** (0.000)	.172** (0.000)	.168** (0.000)	.148** (0.000)
Cash flow per share		1	.351** (0.000)	.250** (0.000)	.388** (0.000)	.475** (0.000)	.271** (0.000)	.220** (0.000)	.340** (0.000)	.621** (0.000)	.360** (0.000)	.367** (0.000)	.426** (0.000)	.264** (0.000)	.500** (0.000)
Total current assets			1	.899** (0.000)	.347** (0.000)	.533** (0.000)	.695** (0.000)	.187** (0.000)	.922** (0.000)	.591** (0.000)	.684** (0.000)	.865** (0.000)	.765** (0.000)	.707** (0.000)	.710** (0.000)
Total current liabilities				1	.344** .000	.539** .000	.775** .000	.196** .000	.903** .000	.519** .000	.737** .000	.885** .000	.766** .000	.805** .000	.640** .000
EBIT					1	.962** (0.000)	.403** (0.000)	.959** (0.000)	.387** (0.000)	.699** (0.000)	.463** (0.000)	.455** (0.000)	.614** (0.000)	.397** (0.000)	.732** (0.000)
EBIT & depreciation						1	.597** (0.000)	.861** (0.000)	.574** (0.000)	.813** (0.000)	.660** (0.000)	.662** (0.000)	.784** (0.000)	.592** (0.000)	.853** (0.000)
Long term debt							1	.222** (0.000)	.683** (0.000)	.643** (0.000)	.939** (0.000)	.923** (0.000)	.922** (0.000)	.994** (0.000)	.705** (0.000)
Net income								1	.209** (0.000)	.481** (0.000)	.256** (0.000)	.251** (0.000)	.433** (0.000)	.218** (0.000)	.581** (0.000)
Net sales or revenues									1	.639** (0.000)	.686** (0.000)	.851** (0.000)	.739** (0.000)	.694** (0.000)	.680** (0.000)
Operating income										1	.770** (0.000)	.753** (0.000)	.789** (0.000)	.630** (0.000)	.811** (0.000)
Property, plant & equipment											1	.946** (0.000)	.947** (0.000)	.931** (0.000)	.815** (0.000)
Total assets												1	.949** (0.000)	.924** (0.000)	.831** (0.000)
Total capital													1	.914** (0.000)	.924** (0.000)
Total debt														1	.696** (0.000)
Total shareholder's equity															1

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

Annex 2b: Correlation of microeconomic ratios

Correlation coefficient (Significance (2-tailed))	Beta coefficient	Cash flow/sales	Quick ratio	Current ratio	Intensity of investment	Asset intensity 1	Continuous intensity	Asset intensity 2	Asset turnover	Current asset turnover	Debt to equity ratio	Equity ratio	Debt ratio	ROE	ROA	Net profit margin
Beta coefficient	1	-.005	.045	.053	.096**	.072	-.112**	-.059	.014	.077*	.034	-.031	.025	.021	.056	-.007
		(0.885)	(0.227)	(0.153)	(0.009)	(0.051)	(0.002)	(0.111)	(0.695)	(0.035)	(0.352)	(0.396)	(0.499)	(0.573)	(0.124)	(0.844)
Cash flow/sales		1	.007	.007	.078*	.068	-.005	-.010	-.004	.029	.005	-.006	.007	-.057	.166**	.963**
			(0.840)	(0.858)	(0.031)	(0.061)	(0.899)	(0.793)	(0.904)	(0.419)	(0.894)	(0.859)	(0.840)	(0.117)	(0.000)	(0.000)
Quick ratio			1	.993**	.043	-.005	-.010	-.023	-.024	.004	.010	-.012	.012	.003	-.001	.005
				(0.000)	(0.242)	(0.893)	(0.780)	(0.538)	(0.504)	(0.918)	(0.795)	(0.736)	(0.751)	(0.944)	(0.971)	(0.891)
Current ratio				1	.043	-.004	-.010	-.022	-.021	.005	.011	-.011	.010	.003	-.001	.004
					(0.242)	(0.911)	(0.783)	(0.552)	(0.562)	(0.883)	(0.765)	(0.771)	(0.794)	(0.935)	(0.975)	(0.911)
Intensity of investment					1	.440**	-.764**	-.484**	-.484**	.143**	.008	-.070	.053	-.087*	-.008	.046
						(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.834)	(0.051)	(0.143)	(0.015)	(0.818)	(0.207)
Asset intensity 1						1	-.413**	-.127**	-.245**	.446**	.014	-.026	.025	-.041	-.068	.039
							(0.000)	(0.000)	(0.000)	(0.000)	(0.693)	(0.471)	(0.483)	(0.256)	(0.060)	(0.283)
Continuous intensity							1	.457**	.603**	-.136**	-.010	.096**	-.078*	.058	.062	.030
								(0.000)	(0.000)	(0.000)	(0.788)	(0.008)	(0.030)	(0.109)	(0.085)	(0.414)
Asset intensity 2								1	.357**	-.010	-.004	.015	-.009	.080*	.017	.005
									(0.000)	(0.784)	(0.912)	(0.681)	(0.804)	(0.027)	(0.636)	(0.891)
Asset turnover									1	.486**	-.020	-.015	.023	.044	.061	.024
										(0.000)	(0.574)	(0.673)	(0.530)	(0.225)	(0.088)	(0.512)
Current asset turnover										1	-.029	-.055	.061	.009	.070	.038
											(0.418)	(0.126)	(0.093)	(0.813)	(0.054)	(0.299)
Debt to equity ratio											1	-.006	-.009	-.226**	.007	.004
												(0.875)	(0.801)	(0.000)	(0.838)	(0.918)
Equity ratio												1	-.957**	-.011	.005	-.003
													(0.000)	(0.768)	(0.886)	(0.941)
Debt ratio													1	-.024	-.001	.004
														(0.497)	(0.982)	(0.910)
ROE														1	-.233**	-.154**
															(0.000)	(0.000)
ROA															1	.329**
																(0.000)
Net profit margin																1

** Correlation is significant at 0.01 level (2-tailed).* Correlation is significant at 0.05 level (2-tailed).

Annex 3: Regression analyses of microeconomic variables and beta coefficient related to country clusters

Country cluster (Headquarters location)				
	High income: non OECD	High income: OECD	Lower middle income	Upper middle income
R ²	0.496	0.089	0.032	0.259
Absolute (US\$)	Standardized slope of regression (t-value in parentheses)			
(Constant)	(4.556)	(12.676)	(0.829)	(3.224)
Cash flow per share	0.199 * (2.246)	-0.169 (-1.254)	-0.028 (-0.166)	-0.113 (-1.078)
Total current assets	-2.475 *** (-4.712)	0.413 (1.622)	0.177 (0.344)	-0.620 (-1.173)
Total current liabilities	2.120 (1.065)	-0.485 (-1.229)	0.082 (0.031)	0.687 (0.890)
EBIT	-4.892 (-5.174)	0.358 (0.351)	0.801 (0.512)	1.038 (0.585)
EBIT & depreciation	4.365 *** (4.036)	-0.207 (-0.263)	-0.723 (-0.470)	1.002 (0.508)
Long term debt	6.299 (1.284)	-0.299 (-0.192)	1.531 (0.423)	3.050 * (1.762)
Net income	-0.860 (-1.342)	-0.328 (-0.692)	-0.200 (-0.170)	-1.902 *** (-3.496)
Net sales or revenues	-0.735 (-1.200)	-0.158 (-0.603)	-0.187 (-0.251)	0.690 ** (2.365)
Operating income	3.352 (4.818)	0.288 (0.783)	-0.100 (-0.220)	-0.725 (-1.337)
Property, plant & equipment	-1.783 *** (-3.112)	-0.202 (-0.454)	0.225 (0.238)	-1.517 (-1.232)
Total assets	-8.909 (-1.427)	1.223 * (1.723)	0.900 (0.168)	-4.227 (-1.098)
Total capital	4.506 (0.878)	1.607 (0.635)	-2.342 (-0.288)	-1.276 (-0.371)
Total debt	-4.882 (-1.025)	-1.012 (-1.222)	-0.672 (-0.209)	0.102 (0.081)
Total shareholder's equity	4.164 * (1.809)	-1.171 (-0.865)	0.906 (0.309)	4.447 *** (3.221)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

Country cluster (Headquarters location)				
	High income: non OECD	High income: OECD	Lower middle income	Upper middle income
R ²	0.289	0.074	0.063	0.088
Ratios	Standardized slope of regression (t-value in parentheses)			
(Constant)	(2.453)	(2.733)	(0.575)	-(0.025)
Cash flow/sales	-0.166 (-0.875)	0.226 (1.149)	-0.238 (-0.820)	0.691 (0.928)
Quick ratio	-4.633 (-1.590)	-0.867 * -1.660	0.264 0.385	-1.192 ** (-2.583)
Current ratio	4.887 * (1.676)	0.885 * (1.696)	-0.295 (-0.428)	1.300 *** (2.823)
Intensity of investment	0.061 (0.322)	-0.009 (-0.094)	0.053 (0.172)	0.100 (0.786)
Asset intensity 1	0.304 (1.278)	0.148 (1.638)	-0.062 (-0.275)	-0.141 (-1.222)
Continuous intensity	-0.181 (-0.815)	-0.309 ** (-2.368)	-0.036 (-0.096)	-0.004 (-0.023)
Asset intensity 2	-0.050 (-0.363)	-0.090 (-1.478)	-0.075 (-0.278)	0.099 (0.904)
Asset turnover	0.072 (0.329)	0.384 *** (3.074)	0.175 (0.549)	-0.161 (-1.084)
Current asset turnover	-0.166 (-0.607)	-0.239 ** (-2.350)	-0.291 (-1.069)	0.154 (1.040)
Debt to equity ratio	-0.132 (-0.608)	0.093 (1.639)	0.049 (0.360)	0.132 (1.038)
Equity ratio	-0.719 * (-1.860)	0.008 (0.090)	-0.071 (-0.245)	-0.037 (-0.053)
Debt ratio	-0.563 (-1.650)	0.054 (0.610)	-0.026 (-0.088)	-0.016 (-0.022)
ROE	-0.130 (-0.629)	0.179 * (1.911)	0.178 (0.892)	0.143 (0.639)
ROA	0.073 (0.290)	0.426 ** (2.555)	-0.241 (-0.916)	0.104 (0.818)
Net profit margin	0.236 (0.864)	-0.448 * (-1.788)	0.245 (0.763)	-0.821 (-1.074)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

Annex 4: Correlation of microeconomic variables

Correlation coefficient (Significance (2-tailed))	Beta coefficient	Mean oil price	GDP per capita (US\$)	Gross capital formation (% of GDP)	Money and quasi money (% of GDP)
Beta coefficient	1	.888** (0.000)	.969** (0.000)	-0.313 (0.349)	.835** (0.001)
Mean oil price		1	.956** (0.000)	.057 (0.867)	.705* (0.015)
GDP per capita (US\$)			1	-.170 (0.618)	.841** (0.001)
Gross capital formation (% of GDP)				1	-.577 (0.063)
Money and quasi money (% of GDP)					1

**Correlation is significant at 0.01 level (2-tailed). *Correlation is significant at 0.05 level (2-tailed).

Annex 5: Regression analyses of macroeconomic variables and beta coefficient related to country clusters

	Country clusters (Headquarters location)			
	High income: nonOECD	High income: OECD	Lower middle income	Upper middle income
R ²	0.938	0.975	0.961	0.884
Macroeconomic variables	Standardized slope of regression (t-value in parentheses)			
Constant	(-0.056)	-(0.168)	(-1.520)	(-3.630)
Mean oil price	2.135 (1.079)	0.297 (1.050)	0.288 (0.924)	1.118 (1.168)
GDP per capita (US\$)	-1.538 (-0.548)	0.339 (1.347)	0.482 (1.128)	-2.290 ** (-2.074)
Gross capital formation (% of GDP)	-0.102 (-0.082)	-0.147 (-1.123)	-0.084 (-0.345)	1.134 ** (1.979)
Money and quasi money as % of GDP	1.318 (1.395)	0.319 (1.674)	0.325 (1.026)	1.163 ** (2.026)

***significant at 1% level, **significant at 5% level, *significant at 10% level.

Annex 6: Results of regression analysis of beta coefficient and macroeconomic variables referring to clusters dependent on financial characteristics of LSPs

Total current assets (TCA) clusters				Shareholders' equity (SE) clusters			
	High TCA	Middle TCA	Low TCA	High SE	Middle SE	Low SE	Negative SE
R ²	0.946	0.975	0.962	0.980	0.961	0.965	0.903
Macroeconomic variables	Standardized slope of regression (t-value in parentheses)						
Constant	(2.408)	(-0.427)	(-0.023)	(0.213)	(2.207)	(0.467)	(-0.894)
Brent & WTI (mean)	-0.624 (-1.245)	0.043 (0.127)	0.695 (1.664)	0.441 (1.435)	-0.551 (-1.300)	0.790 * (1.947)	-2.013 ** (-3.003)
GDP per capita (current US\$)	2.389 *** (4.253)	0.729 (1.903)	-0.130 (-0.278)	0.243 (0.707)	2.180 *** (4.594)	-0.173 (-0.382)	3.250 *** (4.331)
Gross capital formation (% GDP)	-0.467 * (-2.338)	-0.092 (-0.677)	-0.225 (-1.355)	-0.203 (-1.656)	-0.397 * (-2.352)	-0.303 (-1.874)	0.490 (1.834)
Money and quasi money (% GDP)	-1.167 *** (-3.858)	0.218 (1.055)	0.424 (1.683)	0.302 (1.632)	-0.948 *** (-3.708)	0.346 (1.415)	-0.506 (-1.251)
Net sales or revenues (NS_R) clusters				Continuous intensity (CI) clusters			
	High NS_R	Middle NS_R	Low NS_R	CI <0.1	CI ≥0.1 and <0.25	CI ≥0.25 and <0.5	CI ≥0.5 and <1
R ²	0.947	0.976	0.965	0.973	0.978	0.951	0.928
Macroeconomic variables	Standardized slope of regression (t-value in parentheses)						
Constant	(2.393)	(-0.049)	(-0.143)	(-0.114)	(-1.037)	(2.702)	(-0.921)
Brent&WTI (mean)	-0.616 (-1.244)	0.051 (0.153)	0.563 (1.392)	0.298 (0.839)	0.513 (1.598)	-0.582 (-1.224)	0.375 (0.649)
GDP per capita (current US\$)	2.368 *** (4.266)	0.833 * (2.238)	0.013 (0.029)	0.465 (1.169)	-0.016 (-0.043)	2.341 *** (4.400)	0.086 (0.133)
Gross capital formation (% GDP)	-0.468 * (-2.371)	-0.103 (-0.776)	-0.205 (-1.271)	-0.160 (-1.128)	-0.085 (-0.661)	-0.506 ** (-2.671)	0.016 (0.070)
Money and quasi money (% GDP)	-1.148 *** (-3.841)	0.094 (0.470)	0.412 (1.691)	0.222 (1.034)	0.544 ** (2.809)	-1.165 *** (-4.066)	0.581 (1.670)
Asset turnover clusters							
	Asset turnover <0.1	Asset turnover ≥0.1 and <0.25	Asset turnover ≥0.25 and <0.5	Asset turnover ≥0.5 and <0.75	Asset turnover ≥0.75 and <1	Asset turnover ≥1 and <2	Asset turnover ≥2
R ²	0.880	0.964	0.980	0.972	0.924	0.978	0.900
Macroeconomic variables	Standardized slope of regression (t-value in parentheses)						
Constant	(-4.279)	(-0.453)	(-0.144)	(0.623)	(2.396)	(1.633)	(-0.585)
Brent&WTI (mean)	0.836 (1.118)	0.128 (0.315)	0.334 (1.094)	0.969 ** (2.708)	-0.836 (-1.408)	0.021 (0.065)	0.321 (0.473)
GDP per capita (current US\$)	-2.484 ** (-2.967)	0.633 (1.388)	0.374 (1.094)	-0.466 (-1.163)	2.779 *** (4.180)	1.027 ** (2.864)	0.253 (0.332)
Gross capital formation (% GDP)	0.919 ** (3.085)	-0.103 (-0.634)	-0.180 (-1.481)	-0.336 * (-2.360)	-0.509 * (-2.152)	-0.305 * (-2.390)	0.017 (0.064)
Money and quasi money (% GDP)	2.657 *** (5.894)	0.227 (0.924)	0.278 (1.511)	0.460 * (2.132)	-1.472 *** (-4.111)	-0.162 (-0.841)	0.444 (1.083)

***significant at 1% level, **significant at 5% level, *significant at 10% level.