Cost of Equity Capital in Agricultural Organizations: Theoretical Approach and Empirical Analysis

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The paper presents the methodology for estimation of the cost of equity capital in agricultural organizations. This methodology consists of two methods: modified CAPM and long-term ROE. The organizations in this sector of industry – family farms and agricultural companies – are family controlled or closely held. Being undiversified investors the owners of such organizations assume total risk, not only systematic one. Considering the undiversification of investors, systematic risk is replaced by total risk in CAPM, and accounting information is used instead of market information. OMXBB index is chosen as a market portfolio. As it is dangerous to rely on one method, long-term ROE is applied as additional method. The cost of equity capital is calculated in all Lithuanian agricultural organizations, in family farms and in agricultural companies. The research results show that modified CAPM is applicable for estimation of cost of equity capital in agricultural companies, but there are some problems with the application of modified CAPM in family farms.

Key words: *cost of equity capital, CAPM, long-term ROE, agricultural organizations.*

JEL classification: *G12, G31, Q14.*

Introduction

The cost of equity capital is the opportunity cost of raising funds through equity. Opportunity cost is the implicit cost associated with the highest-valued alternative opportunity. Abundance of methods and models used for estimation of cost of equity capital causes more problems than facilitates the process of estimation. Even large companies whose shares are traded in the market may have different interpretations of cost of equity capital because it can be estimated using various methods. The results in some cases are still surprising, and the main reason of that is the diversity of factors on which these methods and models are based. The cost of equity capital is used in appraisal of investment projects and valuation of the companies. If too high cost of equity capital is estimated, the project or company will be underestimated, and vice versa. Choosing an appropriate method or model is important both from theoretical and practical point of view.

Another problem arises when the cost of equity capital is estimated in family controlled or closely held business organizations. Such organizations dominate in agricultural sector. The owners of such organizations are exposed to the total risk, not only systematic one, so the most popular CAPM can not be directly applied for estimation of cost of equity capital. Moreover, this method requires market information, while agricultural organizations lack this information. Other methods and models, such as dividend growth method, the APT-based models, the bond yield plus risk premium method also have some limitations in application.

The object of the research is the estimation of cost of equity capital in agricultural organizations.

The aim of the research is to base the methodology for estimation of cost of equity capital in all agricultural organizations and in organizations of different forms: family farms and agricultural companies.

The tasks of the research are as follows: 1) to analyse and synthesize the methods and models of estimation of cost of equity capital, to highlight their advantages and limitations; 2) to base the methodology of estimation of cost of equity capital in agricultural organizations; 3) to estimate the cost of equity capital in all agricultural organizations and in organizations of different forms: family farms and agricultural companies.

Research methods: logical analysis and synthesis, comparison and calculation of ratios and indicators.

Research assumptions and limitations. The historical cost of equity capital is calculated in agricultural sector, so it can not be directly applied for the discounting future cash flows of investment project or business organization. Relatively short research period (2003–2010) causes additional risk in short run. The research period is limited by the lack of information presented in FADN and NASDAQ OMX Baltic.

Literature Review

Adams, Manners, Astrashan et al (2004) state that cost of equity capital always causes problems for business people when turning from theory to practice. Even large, finan-

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cially experienced companies whose shares are publicly traded may have different interpretations of cost of equity capital because it can be estimated using various methods: CAPM (Capital Asset Pricing Model), DCF (Discounted Cash Flow) model and the bond yield plus risk premium model. Although public companies have universally accepted theoretical justification for the use of these methods, results in some cases are still surprising. Different interpretations of cost of equity capital using various methods are caused by different factors on which these methods are based. On the one hand, assuming the basic principle of finance – no additional risk is taken unless compensation with additional return is expected – risk is an important factor in estimation of cost of equity capital. On the other hand, it is a bit dangerous to trust one method.

Agricultural organizations (family farms and agricultural companies) are identified as privately-held (not publicly traded) organizations from the public offering, market liquidity and investment diversification points of view. Various techniques of dividend growth method used for estimation of cost of equity capital (Gebhardt, Lee and Swaminathan, 2001; Claus and Thomas, 2001; Plenborg, 2002; Gode and Mohanram, 2003; Easton, 2004; Dhaliwal, Krull and Li, 2007) require share market price. This factor can not be identified in agricultural organizations, and this is the main reason why dividend growth method is not applicable for estimation of cost of equity capital in privately-held companies and in agricultural organizations: family farms and agricultural companies.

Adams, Manners, Astrashan et al (2004) point out that the majority of businessmen have the opinion that in the short-term ROE (Return on Equity) reflects the cost of equity capital. It might be not a bad idea: if future investment reduces ROE, such investment should be rejected. It seems very simple, but the short-term ROE is easy to manipulate. Scientists are of the opinion that the cost of equity capital in long-term should be the target ROE, which depends on the target annual net profit growth and the payments for current needs (dividends, withdrawals). Researchers give logical theoretical justification, and the target ROE is applicable in agricultural organizations.

Statman (1987) shows that a typical standard deviation of the share is about 50 percent, while a diversified portfolio of about 20 percent. For this reason, the family-owned business owner must require to earn more than the investor in a diversified portfolio of publicly traded shares. McConaughy (2009) argues that the owners of typical family-controlled company do not diversify the investments as investors in joint-stock companies do. For that reason they assume total risk, not only systemic one. So, in terms of capital market theory, the cost of equity capital in privately-held companies should be higher than that in the companies whose shares are publicly traded. The question is how much higher? The approaches of Statman (1987) and McConaughy (2009) are similar to that of Damodaran (2002) who indicates the cases when total risk should be measured rather than systemic risk: in the case of private firm valuation for initial public offering; for sale to a publicly traded firm; for sale to another private investor. Though some of the researchers (Cotner and Fletcher (2000); Almisher and Kish (2000)) look for the possibilities to base the calculation of beta coefficients on the accounting information, recently the idea that the investments of the owners of privately-held companies are not diversified, and they assume total, not only systematic risk, has been increasingly supported.

The CAPM, based on capital market theory, is suggested for estimation of cost of equity capital in the private companies. McConaughy (2009) proposes a specific capital market benchmark index, Sharpe ratio, which is used to determine the cost of equity capital in the private company. Both the CAPM and the Fama and French multifactor model measure systemic risk and are suitable only for liquid markets and the investors who diversify their investments. McConaughy (2009) proposes to modify the CAPM: to use the total risk, measured by standard deviation, instead of systemic risk, which is measured by the beta coefficient. When the modified CAPM is used, cost of equity capital depends on the following factors: risk-free rate, market portfolio return, standard deviation of market portfolio return and standard deviation of return of private company.

Muller (2011) finds that, when private equity returns are measured either as the earnings rate or as capital gains, there is a positive and significant influence of exposure on idiosyncratic risk. The researcher simply tests for a positive relation between the return on investing in private equity and the differential amount of idiosyncratic risk. Kerins, Smith and Smith (2004) and Pattitoni, Petracci, Poti et al (2012) state that a fully committed entrepreneur can not diversify the investments, thus his or her opportunity cost of capital depends on total risk. The researchers present the same CAPM based on total, not only systematic risk, as proposed by McConaughy (2009). Pattitoni, Petracci, Poti et al (2012) state that in case of partial-commitment, the entrepreneur's opportunity cost of capital is determined by assuming that the investor holds a two asset portfolio: an investment in the project and an investment in the market portfolio. Since the farmers and the owners of agricultural companies are fully committed investors, their opportunity cost of capital depends on total risk.

One of the main factors in the CAPM is the risk-free rate. Risk-free rate is earned on the investment in the government securities (bills and bonds). According to Damodaran (2002), risk-free asset is the asset that meets two basic criteria. First, it does not have a default risk. Second, it does not have a reinvestment risk. In order to control the risk-free rate effect on the cost of equity capital, Collins and Huang (2011) use the ten-year government bond yield for a specific date. Risk-free rate depends on the maturity of government securities. The ma-

turity of government securities should be as close as possible to the investment horizon. Moon and LeBlanc (2008), studying the market risk premium in the long-term (1928–2004), use a 30-year maturity government bonds as risk-free assets. Scientists choose the longest maturity bonds in order to make the investment horizons as close as possible. Anderson, Byers and Groth (2000) emphasize that in the appraisal of investment projects the most common choice is 10, 20 or 30-year government bonds. This choice is based on the horizon of business investment. Summarizing the approaches to risk-free rates, it can be concluded that there are some problems concerning the reinvestment risk, because only zero coupon government bonds meet this criterion. The first criterion is also important. Recently governmental securities of some EU countries as Portugal and Greece have had a default risk. In such situation the investments in governmental securities are not risk-free and returns on them are not applicable as a factor in CAPM.

One of the fundamental questions in use of a modified CAPM is the choice of accounting return necessary for the calculation of standard deviation. The beta coefficient in the traditional CAPM is determined using the return based on the share market prices. The standard deviation in privately-held companies as well as modified CAPM can be determined only by using the return based on the accounting information. The problem arises due to the various return indicators used in the financial theory and practice.

McConaughy (2009) states that there are different approaches to determination of standard deviation. One way is to calculate the standard deviation of returns of a very similar public company or the average standard deviation of returns of few similar public companies. Another approach is to estimate the volatility of private company's cash flows. Volatility of cash flows can be based on the company's past performance and projections, or based on the volatility of cash flows of similar public companies or a combination of the two. McConaughy and Covrig (2007) propose an application of Monte Carlo simulations of cash flows projections to determine the expected volatility for use in a certainty equivalent approach to valuation.

The first and the third ways of calculation of the standard deviation, proposed by McConaughy (2009), are not applicable in agricultural organizations, because there are not public companies in this branch of business in Lithuania. The second way can be applied, but the type of cash flows is the problem. Moreover, the same return indicator must be used for calculation of standard deviation of market portfolio return.

Cotner and Fletcher (2000) raise the question of the cost of capital determination in the private companies when the market based information is absent. Scientists present several possible approximate methods. The essence of the first method is calculation of beta coefficient of the public companies operating in the same branch of business as private company. The second method is applied to calculate the accounting beta of private company. Accounting beta is estimated regressing ROA (Return on Assets) against return on market index. According the researchers, ROA can substitute ROE. Despite the systematic risk approach in estimation of cost of equity capital, the research results by Cotner and Fletcher (2000) are valuable due to the accounting return indicators used for calculation of standard deviation. Almisher and Kish (2000) calculate accounting beta by doing the correlation analysis between the ROA of private companies and all the companies included in the selected market index. Return on the market index is calculated by dividing net profit by total assets of all companies included in the market index. In the investigation of the market and accounting betas Ismail and Kim (1989) use the following variables: net profit to equity, net profit plus depreciation to equity, net profit plus depreciation and deferred taxes to equity and net cash flows to equity, i.e. a number of ratios showing the return on equity.

Nekrasov and Shroff (2009) tested the APT (Arbitrage Pricing Theory) and found three fundamental betas by doing the regression of excess ROE against three factors: market ROE, SMB (Small Cap Factor) portfolio ROE and HML (High minus Low) portfolio ROE. Cohen, Polk and Vuolteenaho (2009) carried out the research and expressed a similar attitude towards risk measured by ROE covariance. Despite the fact that Nekrasov and Shroff (2009) and Cohen, Polk and Vuolteenaho (2009) searched for the accounting based factors influencing the excess return, their research is valuable in estimation of cost of equity capital in privately held companies because the ROE is substituted for market return, measured by the changes of share market prices.

Despite the necessity to use accounting based information rather than market based information in estimation of cost of equity capital in privately held companies, recently an increasing attention has been paid to the interaction of two disciplines: accounting and finance. As Pope (2010) noticed, "an understanding of financial statement numbers and the accounting principles on which they depend – the accounting microstructure – can be important in developing better valuation and asset pricing models and in identifying relevant dimensions of risk. Therefore, finance research can benefit from assimilating recent advances in accounting research. Similarly, accounting research relevant to evaluation and asset pricing can benefit by adopting theoretical perspectives and empirical methods from finance research".

Research Methodology

The idea that the investments of the owners of privately held companies are not diversified and these owners assume total, not only systematic risk, is supported by Statman (1987), Damodaran (2002), McConaughy (2009)

and others. Since all agricultural organizations (family farms and agricultural companies) are privately-held, the modified CAPM, proposed by Kerins, Smith and Smith (2004), McConaughy (2009) and Pattitoni, Petracci, Poti et al (2012) can be applied for estimation of cost of equity capital. McConaughy (2009) suggests the following calculation of the cost of equity capital or required return of the owners of privately-held companies:

$$r_{yu} = r_f + (\frac{STDEV_y}{STDEV_m})(r_m - r_f) \quad (1)$$

where: r_{uy} – cost of equity capital;
r_f – risk-free rate;
$STDEV_y$ – standard deviation of return on investment in privately-held company;
$STDEV_m$ – standard deviation of return on market portfolio;
r_m – return on market portfolio.

As mentioned in the Literature Review, risk-free asset should meet three criteria. Two of them – absence of default risk and absence of reinvestment risk – are presented by Domadoran (2002) and the third criterion – closeness of the horizon of business investments and maturity of government bonds – is supported by Anderson, Byers and Groth (2000), Moon and LeBlanc (2008) and Collins and Huang (2011). Since the Lithuanian Government bonds are of very different maturity during the research period and 8-year bonds are not issued each year in Lithuanian market, the arithmetic average of yields of the longest maturity bonds is considered as an estimate for risk-free rate. The range of maturity of bonds is from 3 to 11 years during the research period.

Before measuring the $STDEV_y$ in agriculture it is important to choose the right measure of return based on accounting information. The researchers present two basic approaches to return as a substitute for market return: ROA and ROE. In this work the approach of Ismail and Kim (1989), Nekrasov and Shroff (2009) and Cohen, Polk and Vuolteenaho (2009) is supported – ROE is substituted for market return. The main reason is that ROE represents the return earned by the owners, and standard deviation of ROE – total risk (both business and financial) assumed by them. Traditionally, ROE is measured as net profit to equity ratio. Since Business Accounting Standards (BAS) are different for family farms, agricultural companies and non-agricultural companies, the calculations of ROE also differ. In family farms ROE is calculated as farm gross profit plus subsidies to equity ratio. Farm net profit includes family remuneration. In agricultural companies ROE is calculated as gross profit plus subsidies to equity ratio. Agricultural organization did not pay profit or income tax during the research period. Equity includes grants and subsidies in the balance sheet. Using annual ROE data, an arithmetic average and standard deviation are calculated during the research period.

The problem also arises in choosing an appropriate market index as a market portfolio. Bodnar, Dumas and Marston (2003) define global market integration as a function of the portfolio choices of a company's stockholders. They conclude that integration prevails when a company's stockholders hold globally diversified portfolios, while segmentation prevails when a company's stockholders are located and invest in the home country. According to Mishra and O'Brien (2005), for emerging market stocks the choice between the local or global market indexes makes a substantial difference in CAPM estimates. Their approach is supported by Bruner, Li, Kritzman et al (2008), who confirm that the choice of market portfolio is much more important for emerging market stocks than for developed market stocks. The choice of the market portfolio to be used in the regression – the home country or global index – depends on the level of global market integration. On the one hand, the farmers and the owners of agricultural companies are located and invest in the home country, on the other hand, Lithuanian securities exchange market has high regional integration with Latvian and Estonian securities exchange markets. For these reasons, the modified CAPM is applied using both local and regional market indexes as market portfolios.

Local market index is OMX Vilnius (OMXV). It is "an all-share index which includes all the shares listed on the Main and Secondary lists on the NASDAQ OMX Vilnius with exception of the shares of the companies where a single shareholder controls at least 90% of the outstanding shares. The aim of the index is to reflect the current status and changes on the Vilnius market" (NASDAQ OMX…). Regional market index is OMX Baltic Benchmark (OMXBB). This "benchmark index is available on the Baltic level. The index consists of a portfolio of the largest and most traded shares, representing all sectors available on the NASDAQ OMX Baltic Market. The index serves as an indicator of the overall trend in the market and is intended to offer a cost effective index that an investor can fully replicate. The composition of the index is revised on a semi-annual basis to ensure that it offers high investability and low transaction costs. The weight of the constituent stocks is based on the market value adjusted by the free float, which means that only the part of the share capital that is considered available for trading is included in the index" (NASDAQ OMX…).

OMXV index includes shares of 33 companies listed on the Main and Secondary lists, and OMXBB index includes shares of 29 companies representing all sectors available on the NASDAQ OMX Baltic Market. ROE of listed companies is calculated as net profit to equity ratio. The data of financial reports is used to calculate annual ROE, an arithmetic average and standard deviation of each company and all companies in each year during the research period.

As reliance on one method while estimating a cost of equity capital is a bit dangerous, it is important to decide which method could be additionally applied for privately held companies. As mentioned earlier, various techniques

of dividend growth method used for estimation of cost of equity capital require share market price. The APT-based models change over time and are different considering the economic conditions and features of the companies. The research on testing APT sometimes gives very controversial results. The bond yield plus risk premium model requires issue of bonds and credit rating of a company.

According to Adams, Manners, Astrashan et al (2004), if future investment reduces ROE, such investment should be rejected. Their approach is based on a long-term or target ROE, which depends on the growth of target annual net profit and the payments for current needs (dividends, withdrawals). These researchers reject short-term ROE as it is easy to manipulate. The manipulation with growth of target annual net profit and the payments for current needs is also easy. The latter opinion is partly supported by Adams, Manners, Astrashan et al (2004), who recognize the difficulties arising in targeting net profit growth and the payments for current needs. They also state that recognizing a firm's cost of equity as its ROE can to some extent facilitate interdependence in goal setting.

So, first of all, the owner's required rate of return must comply with the risk, and secondly – it should be no less than long-term ROE. Estimation of long-term ROE as arithmetic average during the long period is suggested.

Research Results

Applying the CAPM, first of all a risk-free rate is estimated. As mentioned in the methodology, the longest maturity of the Lithuanian Government bonds is from 3 to 11 years during the research period. An arithmetic average of maturity is 6.51 years, so a bit shorter than the research period. The Lithuanian Government bonds do not have default risk, but they have reinvestment risk because they are coupon bonds. Figure 1 shows that the Lithuanian Government bonds' yield changes from 3.26 to 7.63 during the research period. Risk-free rate (an average yield) is estimated to be 4.79 %. It was a slightly lower (4.1 %) during the economic growth period (2003–2007). In comparison, Pattitoni, Petracci, Poti et al (2012) to assess how owner's commitment to a firm influences the firm cost of capital (A Euro-Mediterranean perspective) use EMU Government Bond Index (10 years) yield during 2003–2007 which is in average is 4% as an estimate for r_f. This comparison shows the impact of common economic and monetary policy in EU countries on the return on risk-free investment.

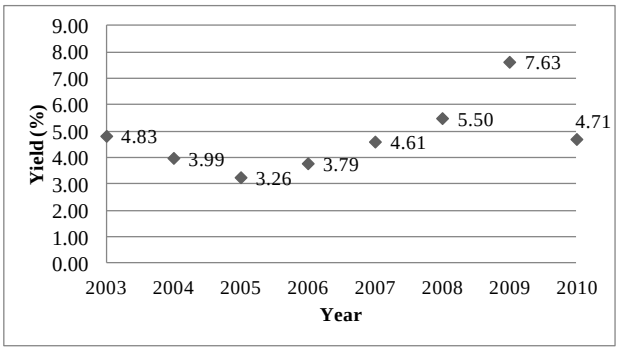

Figure 1. Average Yields of the Lithuanian Government Bonds (3–11 Years Maturity)
Source: the data of Bank of Lithuania

Average ROE and standard deviations of ROE of market portfolio are calculated using both OMXV and OMXBB indexes. OMXV index is rejected as an appropriate for CAPM because average ROE is lower than risk-free rate (4.63<4.79). As Garvey (2001) emphasizes, the expected market return r_m must be higher than r_f.

ROE and standard deviations of the companies included in OMXBB index are presented in the Table 1.

Table 1. ROE and Standard Deviations of the Companies included in OMXBB Index

Abbreviations of the Title of the Company	ROE (%)								Average ROE (%)	Standard Deviation of ROE (%)
	2010	2009	2008	2007	2006	2005	2004	2003		
1	2	3	4	5	6	7	8	9	10	11
APG1L	11.9	-17.2	14.5	28.4	26.2	17.4	13.7	13.6	13.6	13.9
IVL1L	26.2	-93.4	-51.5	28.7	20.5	11.4	17.9	4.2	-4.5	44.1
KNF1L	5.7	8.4	6.8	2.2	3.2	2.6	4.7	6.3	5.0	2.2
LDJ1L	7.7	4.8	3.4	5.4	3.1	2.5	11.2	14.4	6.6	4.3
PTR1L	15	-15.2	27.3	36.6	25	28.1	9.3	4	16.3	16.7
PZV1L	12.6	9.8	-3	21	15	13.4	13	14.2	12.0	6.8
RSU1L	13.6	8.1	-10.5	14.7	6.7	10.8	14.2	7.5	8.1	8.2
SAB1L	-11.3	-14	5.4	9.1	22.6	8.2	12.1	7.4	4.9	12.1
SNG1L	-8.5	-128.5	-34.7	-12.5	-11.4	14.6	15.4	29.3	-17.0	49.4
TEO1L	15.9	16.5	15.4	15.2	11.8	7.6	3	-3.2	10.3	7.2
UKB1L	-7.8	-17.2	9.3	15	11.3	8.4	5.2	0.5	3.1	10.8
VBL1L	38.3	34.7	25.9	6.4	-20.3	9.7	22.5	22.5	17.5	18.8
ZMP1L	15.9	10.6	-3.9	25.2	17.5	16.2	15.8	7.1	13.1	8.6
GRD1R	12.2	7.0	18.9	18.4	20.9	18.3	2.8	12.0	13.8	6.4

Continuation of the Table 1.

1	2	3	4	5	6	7	8	9	10	11
MRK1T	0.8	5.2	14.5	27.3	36.6	40.0	41.1	39.8	25.7	16.6
OLF1R	17.1	13.8	-9.8	2.1	5.8	6.6	-8.9	-3.6	2.9	9.9
SAF1R	20.0	-18.7	-6.0	1.9	18.2	20.8	56.6	50.6	17.9	26.0
TKM1T	12.9	-12.2	4.5	21.7	22.3	9.3	15.3	15.2	11.1	11.1
TVEAT	22.4	24.4	23.1	22.5	21.5	16.4	17.3	11.6	19.9	4.4
VSS1R	7.5	0.1	1.8	0.2	2.5	4.4	7.1	3.3	3.4	2.8
AVERAGE	11.1	-8.0	2.9	14.5	12.7	13.1	14.3	14.4	9.4	8.0

Source: the data of NASDAQ OMX Baltic

OMXBB index includes only 21 companies as 8 companies listed later than 2003. Average ROE of the companies varies from -17.0 % to 25.7 % and standard deviations of ROE varies from 2.2 % to 49.4 % during the research period. ROE and standard deviation of ROE of OMXBB index are 9.4 % and 8.0 %, accordingly. Change of economic situation during the research period has caused very high fluctuations of ROE. 2003–2007 was the period of fast growth in the economy, and the economic crisis started in 2008. Baltic market risk premium (excess return) considering the Lithuanian Government bonds' yield is 4.6 % (9.4–4.8) per annum. In comparison, Baltic market risk premium and standard deviation were 9.7 % and 0.8 % during the economic growth period (2003–2007). The excess returns per unit of total risk of market portfolio were 0.6 % (4.6/8.0) during the research period and 12.1 % (9.7/0.8) during the economic growth period! Different results given in comparable analysis show that the estimation of cost of equity capital requires the longest possible research period, because it is very sensitive to macroeconomic changes.

ROE and standard deviations in all Lithuanian agricultural organizations, in family farms and in agricultural companies are presented in the Table 2.

Table 2. ROE and Standard Deviations in Lithuanian Agricultural Organizations

	ROE (%)								Average ROE (%)	Standard Deviation of ROE (%)
	2010	2009	2008	2007	2006	2005	2004	2003		
In all Agricultural Organizations	8.1	6.6	14.3	20.2	8.8	13.1	9.6	2.2	10.4	5.4
In Family Farms	15.3	17.6	19.9	24.3	22.2	19.8	22.3	16.6	19.7	3.1
In Agricultural Companies	6.5	4.9	12.9	19.4	6.5	11.7	7.2	-0.5	8.6	6.0

Source: the data of FADN Survey Results, Lithuanian Institute of Agrarian Economics

ROE and standard deviation of ROE total in agriculture are 10.4 % and 5.4 %, accordingly. Considering risk-free rate of 4.8 %, excess return per unit of total risk is 1.0 % (5.6/5.4) during the research period. The efficiency in agriculture is higher than the efficiency of investments in the Baltic market. At first sight it causes surprise, because OMXBB index as market portfolio is the best diversified one, but the demand of products from agricultural sector is not highly sensitive to macroeconomic changes. This is one of the reasons why excess returns per unit of total risk are very similar. Another reason for low sensitivity is large subsidies. Average ROE in agricultural companies is lower 11.1 percentage points if compared with that in family farms. Moreover, the risk is more diversified in family farms. Considering risk-free rate, excess return per unit of total risk is 4.8 % (14.9/3.1) in family firms during the research period. According to the data presented above, historical cost of equity in all agricultural organizations, in family farms and in agricultural companies is 7.9 %, 6.6 % and 8.2%, accordingly:

$$r_{yu} = 4.8 + (\frac{5.4}{8.0})(9.4 - 4.8) = 7.9$$

$$r_{yu} = 4.8 + (\frac{3.1}{8.0})(9.4 - 4.8) = 6.6$$

$$r_{yu} = 4.8 + (\frac{6.0}{8.0})(9.4 - 4.8) = 8.2$$

The research results show that the cost of equity capital or required rate of return (7.9 %) of the owners' of agricultural organizations is significantly lower than the realized rate of return (10.4 %). Different results are received in the case of agricultural companies: required rate of return (8.2 %) is slightly lower than the realized rate of return (8.6 %). The application of modified CAPM causes some problems in family farms. As mentioned earlier, family farms earn very high excess return per unit of total risk. One of the main reasons of too high ROE considering assumed risk in family farms could be deliberate or non-deliberate mistakes made in financial accounting, i.e. poor quality of accounting. In such situation we can't support the approach that the CAPM, modified by

McConaughy (2009), is applicable for estimation of cost of equity capital in family farms.

As presented in methodology, the owners' required rate of return must comply with the risk, and should be no less than long-term ROE. The cost of equity capital in agriculture based on two methods – modified CAPM and long-term ROE – is presented in the Table 3. The presented data shows that the cost of equity capital is 10.4 %, 19.7 % and 8.6 % in agriculture generally, in family farms and in agricultural companies. As mentioned in the assumption and limitations of the research, the cost of equity capital is historical cost, and can be directly applied for the discounting future cash flows of agricultural investment project or business organization only if the risk in the future is the same as it is at present.

Table 3. Cost of Equity Capital in Lithuanian Agricultural Organizations

	Cost of Equity Capital (%) based on		
	Modified CAPM	Long-term ROE	Both Methods
In all Agricultural Organizations	7.9	10.4	10.4
In Family Farms	6.6	19.7	19.7
In Agricultural Companies	8.2	8.6	8.6

The following possible directions of the future research are: 1) testing the modified CAPM for particular agricultural company or family farm; 2) testing the modified CAPM for agriculture in the EU; 3) looking for better market index as market portfolio.

Conclusions

Wide range of methods and models used for estimation of cost of equity capital causes the problem of their application, because they are based on different factors, require market or accounting information, have different limitations of application. Agricultural organizations – family farms and agricultural companies – are family controlled or closely held. The owners of such organizations assume total risk, not only systematic one, because they are undiversified investors. Since they assume total risk, the modified CAPM is proposed for estimation of cost of equity capital. In such model beta coefficient is replaced by the ratio of standard deviation of ROE in agriculture to standard deviation of ROE of market portfolio.

A long-term ROE is proposed as additional method for estimation of cost of equity capital in agricultural organizations. When two methods are used for estimation, cost of equity capital should be calculated using CAPM, but it should not be less than long-term ROE. Such proposition is based on two reasons: cost of capital or required rate of return must meet the level of risk and to be not less than the realized ROE during the long-period. The latter is based on the idea that if future investment reduces ROE, such investment should be rejected because it reduces value of the organization.

Average ROE and standard deviations of ROE of market portfolio are calculated using both OMXV and OMXBB indexes. OMXV index is rejected as an appropriate for CAPM because average ROE is lower than risk-free rate.

When the modified CAPM is applied, historical cost of equity in agriculture generally, in family farms and in agricultural companies is 7.9 %, 6.6% and 8.2%, accordingly. The research results show that modified CAPM is applicable for estimation of cost of equity capital in agricultural companies. There are some problems with the modified CAPM application in family farms. Family farms earn very high excess return per unit of total risk. One of the main reasons of too high ROE considering assumed risk in family farms could be poor quality of financial accounting, i.e. not all costs are accounted.

The required rate of return should be not less than long-term ROE, so the historical cost of equity capital based on two methods – modified CAPM and long-term ROE – is 10.4 %, 19.7 % and 8.6 % in all agricultural organizations, in family farms and in agricultural organizations.

The research results also support the idea that the estimation of cost of equity capital requires the longest possible research period, because it is very sensitive to macroeconomic changes.

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