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Methods for risk premium: Application for agriculture companies in Czech Republic

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Abstract. In business valuation, alternative cost of equity plays an important role considering the risk related to investment. Even a slight change in cost of equity can significantly affect the resulting business value. However, in the Czech Republic, risk premium has not been adequately addressed in terms of methodology. The objective of the paper is to explore the application of selected methods in calculating risk premium, and to select or modify existing methodology for the calculation of risk premium used in agricultural companies. For the purposes of determining the alternative cost of equity, three methods are selected: build up model, CAPM, and Fama and French Three Factor model; internal data of a family farm XY are used. Beta coefficient is calculated on the basis of the input data, and the results of the individual methods are compared. Based on the data of companies operating in the Czech market, the performed analysis suggests that the Build Up model is suitable for expressing alternative cost of equity. The agriculture sector is very specific, as agricultural companies are the first to be affected by the climate change. A follow-up study could be

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focused on the analysis and prediction of the impacts of climate change, with possible emphasis on the importance of weather derivatives for agriculture companies.

Keywords: risk premium, alternative cost of equity, Build Up model, CAPM, Fama and French Three Factor model

JEL Classification: G32, D24

1. INTRODUCTION

In today´s world, all entrepreneurs strive to know the value of their business. With a growing demand for business valuation and the importance of the results for the user, there is an increasing emphasis on the accuracy and thoroughness of such valuation.

Methods commonly used for business valuation include earning-based valuation methods using "going concern" principle. Such methods are based on the assumption that the business being valued will be capable of meeting the needs of its owner in the future, implicitly suggesting that such needs will be satisfied through the generated earnings or free cash flow (Hašková et al., 2019; Vochozka et al., 2019; Stehel et al., 2019). Although auditing of derivative instruments requires more effort, hedging significantly reduces the client's business risk. Ranasinghe, Yi & Zhou (2022) found that the presence of a client business risk premium in audit fees abates when clients reduce their risks (Ranasinghe, Yi & Zhou, 2022).

Alternative costs of equity play an important role in valuation of a business using some of the income-based valuation methods, as they take into consideration the risks associated with investing, specifically with business purchases. Even a slight change in costs of equity in the order of tenths of a per cent may significantly affect the resulting value of the business. Therefore, great emphasis is put on this element of valuation. The main risk to a company is business risk, which represents a complex list of all risks that affect the operation of the business in a given sector. Such risks influence the decision-making of the management, business owners, and potential investors. In the Czech Republic, risk premium is not sufficiently addressed in terms of methodology; therefore, it is important to focus on this topic and bring new perspectives to this issue. Business risk can be specified on the basis of positive and negative aspects of other risks, such as the possibility of negative or positive deviations from the expected or planned results. Another view to alternative cost of equity is the probability of adhering to a set financial plan or expected development of the business in the future. Environmentally friendly use of agricultural land requires attracting significant investment resources at various levels (national, regional and local) (Miceikiene et al., 2022; Mishenin et al., 2021). Due to the low availability of credit, agricultural companies are looking for alternative investment strategies, one of them being investment subsidies in commodity production (Dudnik & Cherdaková, 2021; Devkota et al., 2021; Geseviciene et al., 2021). As Gutkevych and Vikhliaiev (2021) state, it is necessary to make choices and decisions in production, an economic activity that is always burdened with risk (Gutkevych & Vikhliaiev, 2021).

A specific case is companies operating in the agriculture sector, as the agricultural tradition is maintained rather by small family farms, which, however, are negatively affected by the existence of larger corporate agricultural companies, and the family craftsmanship is becoming increasingly difficult to maintain (Vochozka et al., 2017). Less developed countries invest less in agriculture, despite the fact that investing in agriculture is considered to be a strong strategy for the development of a given country (Woo & Lim, 2015). The agriculture sector is very specific mainly because of the fact that farmers influence the overall character of the environment but also participate in the protection of natural ecosystems and landscape. Therefore, a

specific approach and special attention paid to this sector is particularly important. The business risk that agricultural companies have to face is very specific, as it is influenced by external and internal factors of both local and global importance, such as currently a very topical issue of "global warming". Farmers should be able to understand the risk, anticipate potential problems, and deal with the consequences. From the perspective of business risk, it is necessary to capture seasonality and both social and technical factors. Seasonality appears to be the riskiest factor because agricultural crops are dependent on the climatic conditions. If the climatic conditions do not seem to be generally optimistic, the agricultural production should be focused not only on grain harvesting, but also on cattle breeding and milking, which can generate profit if grain harvesting is not profitable in each season. According to Ma, Song and Zhang (2020), negative liquidity risk shows that sellers prefer to compensate buyers when stock prices fall. In addition, portfolio liquidity risk has structurally changed after the reform of the reform of stock ownership structure. Economic technology risk insurance protects farmers against the effects of losses due to some unpredictable or unpredictable phenomena. Agriculture is most affected by these factors, as agricultural production is dependent on weather. Loss in production results in loss of income from the sector. This has several adverse consequences for the economy (Bhatnagar, 2018). Countries have different political, economic, socio-cultural, and technological environments and its conditions for bio-business development, but they are tending to be positive in terms of value-added agricultural bio-business in the context of risk reduction (Greblikaite et al., 2020).

Other natural risks include the changing hydrological specifics of the agricultural landscape as well as changes in pest communities. Various diseases that attack plant tissues and ravage agricultural crops also pose a significant risk (Frýd et al., 2020). The hydrological conditions of the agricultural landscapes are primarily regulated through water management. These changes can be largely attributed to the changes that occur in water management (Fanta, 2019). According to Kutnohorská & Krištůfková (2019), however, the transition to cattle breeding for milk production is not without risk. The amount of profit in this part of the agricultural sector is influenced mainly by buyer bargaining power on the side of consumers but also suppliers. In terms of social factors, it is important to know the buying behaviour of Czech consumers. This is based on social trends, with the majority of Czech consumers preferring organic food and poultry meat. The linear regression model of the agricultural insurance market is based on a time series of 4 selected variables (premiums, value of gross agricultural output, hydrometeorological hazards and the number of agricultural organizations that have insurance contracts). The agricultural insurance model does not contribute to compensate for the consequences of events in the agricultural sector (Kontsevaya et al., 2018).

Agriculture as a sector of the national economy is very specific compared to other sectors, and is strongly dependent on weather, availability of labour force, significant fluctuations of CF flow during the fiscal year, government interventions, etc. (Pankova et al., 2020; Rumankova et al., 2020). Auditors work more hours and charge higher hourly fees when auditing public companies than when auditing private companies (Bae, Choi & Lee, 2021). The risk is lower in the audit firm with a higher share of partners and higher annual growth in the number of CPA employees. The risk is higher in auditing companies that show operating losses and high revenue growth. The financial situation and organizational structure of companies affect their independence or professionalism and consequently their litigation Kang et al., 2019).

The objective of this article is the application of selected methods, namely Build Up model, CAPM (capital asset pricing model), and Fama and French Three Factor model, to risk premium focused on agricultural companies in the Czech Republic.

In the introductory part, the agricultural sector is specified as a part of the national economy of the Czech Republic. The following part focuses on published studies and literature dealing with the issues of agriculture and business valuation, and points out three methods used for the calculation of alternative costs of equity: Build Up model, CAPM, and Fama and French Three Factor model. The next chapter specifies

the data and methods used for determining alternative costs of equity, for which the internal data of a family farm XY were used. The fourth part of the article presents the results of the individual methods, which are mutually compared in the Discussion chapter and then compared with the findings of authors that have dealt with this issue, which is followed by the summary of the findings.

2. LITERATURE REVIEW

Agriculture is a very important part of Czech economy and its role in it is irreplaceable. It is a source of both vegetable and animal raw material and is able to satisfy basic human needs (Machová & Vrbka, 2018). This is connected with the efforts for sustainable development of agriculture, which is based on the organization of social and environmental goals (Kolodziejczak & Posta, 2018; Caballero-Morales et al., 2020; Zaburanna et al., 2020). Interventions in the agricultural sector have a major impact on the rural economy (Minárik, 2017). Agricultural companies in the Czech Republic show very positive values especially in the optimal value of assets, acceptable structure of funding, and corresponding economic result (Stehel et al., 2019). The number of agricultural companies that would or would not succeed in competition could be estimated using Kohonen networks, which, however, are quite complex (Horák, 2019). With the development of modern society and new technologies, especially Industry 4.0, there has been a slight decrease in the share of agriculture in GDP (Pimonenko et al., 2021). Nevertheless, Industry 4.0 can bring excellent self-government and improve the working environment (Gray-Hawkins et al., 2019). Despite the mild conservatism given by the character of agricultural production, agricultural companies try to sustain and adapt to new trends, since consumers prefer eco-friendly products (Pimonenko et al., 2020, Ivanov at al., 2021). Some operations are carried out using e-commerce tools, which is one of the most ubiquitous directions of implementing advanced technologies on economic activity (Hu et al., 2019; Roshchyk et al., 2022). In practice, it is common for smaller agricultural companies to opt for a merger with a more competitive company (Krejčová et al., 2017). Moreover, more and more agricultural companies focus on organic farming, which is an alternative to conventional agriculture (Lancaric et al., 2015). Organic farming seeks to protect soil and nature as such by minimizing the use of pesticides and fertilisers, and the use of nanotechnologies may help in this regard. Precision agriculture deals with the integration of agriculture and state-of-the-art technologies. Nanotechnologies focus on detecting nutrients in plant, striving for plant growth and improving their quality (Kamle et al., 2020). Nutrients in plants are dependent on the quantity of agricultural land. Agricultural land can be appropriated; in the case of which, financial compensation needs to be determined. In this regard, the current methodology does not appear to be fair (Junga et al., 2019). Kabourková and Stuchlý (2019) focused on the analysis of the progressive land acquisition for agricultural use in individual EU countries. They concluded that in the years 2007-2017, there was an overall decrease in the acreage of land used for agricultural production in the EU countries, with the largest decline in land use for agricultural production being recorded in Cyprus (by 2.03%) and Austria (by 1.97%). In Greece and Croatia, on the other hand, the share of agricultural land increased by 2.64% and 2.22%, separately. Agricultural companies then try to establish links between rural areas and global and regional markets and use modern technologies and approaches, thus improving the standard of living of the inhabitants (Swaffield et al., 2019). The application of modern trends is associated with the transformations of agricultural companies (merger and acquisition). For carrying out such transformations, knowing the value and price of a given company is crucial. Business valuation is related to the "going concern" principle, which has become one of the basic conditions for economic expansion and subsequent stability at the national and business level (Zeman & Lentner, 2018). If this condition is met, business value using the income-based approach.

The emergence of the income-based approach dates back to the late 1960s and the first half of the 1970s in the USA, where it was proposed as an alternative method to the conventional approach (Napoli, 2017). Determining the value of a selected business is based on emphasizing the limited viability of a business (Vochozka et al., 2019). Nývltová (2016) examined the financial health of agricultural companies in the Czech Republic using e.g. IN 05, Gurcik´s Index, etc.. Entrepreneurship brings also some risks, where a stable development of the stock market tends to reduce the risk, while the development of the banking sector can result in increased instability through capital reduction (Tran & Nguyen, 2020). In the event that the company fails to merge and is already in a worse capital condition, this period can be overcome through a loan. Kučera et al. (2021) dealt with the determination of the optimal debt level of an average agricultural enterprise in the Czech Republic using the difference in the values of the EVA indicators (EVA Entity, EVA Equity). If a company is operating in an economically unstable market it may be exposed to business risk (Çera et al., 2019). In unstable markets, the possibility of control is limited. In addition, in times of instability caused by the Covid pandemic, some forms of risks (particularly, financial and personnel risks) significantly affected business results (Cepel et al., 2020). Business risk is considered uncontrollable (Vochozka et al., 2017); Due to this fact, companies should have risk management in order to reduce the fluctuation in cash flow, which prevents the company from drawing on costly resources of funding and thus eliminates the risk of bankruptcy (Brillinger, 2019). Companies are also influenced by external factors in the form of extraordinary influences shaping the company´s decision-making (Rasheed et al., 2015). Agricultural companies should be able to react to these factors and look at risk from their own perspective. For example, business risk can be seen as a possibility that the assumed objectives set by farmers are different from the results actually achieved. Such differences are mostly caused by adverse weather conditions or extensive pest activity. Recently, water scarcity has become a global problem affecting in particular the agricultural sector (Nguyen et al., 2019). Any investment is associated with risk. Although greater risk aversion usually increases the motivation to document investments, the impact of risk aversion becomes more complex when a business can consider both the timing and size of the project (Kadarova, Janekova & Onofrejova, 2021). Understanding how farmers make their investment decisions and how they adapt their investment behaviour to changing economic conditions, such as price changes, is thus essential (Femenia, Latruffe & Chavas, 2021) Investments in property, plant and equipment significantly affect the company's future production capacity and further development of the company (Lindner et al., 2021). Business development through investment can have many effects on a business. Reputational motives play a secondary role for financial professionals because risk-taking among non-executives has already increased due to intrinsic motives (Xiong & Wang, 2021).

Business risk can be further specified by its positive and negative aspects, which are further related to other risks, such as a possibility of positive or negative deviations from expected or planned results. Risk management and flexibility is important for agricultural enterprises which both face the risks common to all businesses and are susceptible to uncertain climatic and weather conditions (Nykolyuk et l., 2021). Another factor taken into consideration in business valuation is a risk premium, which is further classified into systematic and specific risks. Systematic or market risk is a type of risk a company is not able to eliminate due to external factors. In this context, the objective of the company is to reduce potential risk and related crises in the business environment. Companies try to achieve this objective by actively implementing risk management, timely identification and elimination of business risks (Virglerová et al., 2017; Dvorský et al., 2020). This type of risk is addressed by (Šofranková et al., 2017), who, on the basis of two approaches to systematic and unsystematic risk, identified the impact of external and internal risks on company performance and created a three-dimensional EMR (enterprise risk management) model of business risk. Alshubiri (2015) states that the range of market risks represents a negative correlation between the market value of capital and the return on shares due to the changes in risk factors.

The basic equivalent for determining equity risk premium is alternative costs of equity. This indicator is used for business valuation and investment decision-making. Value of alternative costs of equity is mostly estimated using the CAPM or DCF (discounted cash flow) method. CAPM includes coefficient β, which represents a risk factor and may influence the result of this model, as this coefficient is mostly determined individually for each country and sector or even for a company. There is also used an extended version of CAPM – ICAPM, which includes the return on international portfolio of shares, e.g. MSCIP (Herrera et al., 2018). The extended version of CAPM was analysed by its critics, Fama and French, who developed the Fama and French Three Factor model, extending CAPM by two other factors – market value of equity (size factor) and the ratio of book and market value of equity (Rahul & Santhakumar, 2018). The Fama and French Three Factor model was extended to a five-factor model. Its shortcoming, however, is its inability to capture low average return on small-cap stocks (Fama & French, 2015). If CAPM cannot be used, alternative costs of equity can be expressed using the Build Up model, also known as the complex Build Up model. This model captures risk sub-components and can be variously modified without affecting the principle of the model. The Build Up model was used by Dzuričková et al. (2015), who focused on the calculation of costs on issue of shares and further classified the differences between the results of CAPM and the Build Up model. Furthermore, other authors deal with the modifications of these models, such as the Gordon Growth Model or Arbitrage Pricing Theory. The economic environment affects decisions related to the investments of companies that invest in business-market environment (Hötte, 2020). Currently, business-market environment is defined by a short product life cycle (Durst & Zieba, 2020). Arbitrage Pricing Theory (APT) is a multifactor pricing model which is based on the idea that return on assets can be predicted using linear relationship between a number of macroeconomic variables and expected return on assets. Carassaus and Rásonoyi (2020) expose the economic and financial background related to APT and show its importance for both the financial mathematics and the mathematical economics communities. The use of the APT enables taking advantage of any alteration from fair market value. The Arbitrage Pricing Theory shows higher flexibility than the CAPM model. . The CAPM model is used to evaluate portfolios that are also inefficient. The CAPM model expresses the relationship between the expected rate of return and systematic risk. The CAPM is graphically represented by the SML (security market line) drawn on a chart. . The APT model was created as a response to the shortcomings of the CAPM model. For the APT factor model, the degree of risk must be determined.

There are many subjective opinions on valuation as such, as each company operates on a different principle, in a different sector and in a different market. The agricultural sector is particularly specific, and there are few authors dealing with it; therefore, further objective knowledge is necessary. Risk shall be perceived as a part of business, and it is necessary to be aware of its modifications. A question arises whether it is possible to predict all external or internal factors affecting the performance of a company. These factors represent another issue that should be further considered and dealt with.

Based on the literature review and past experience, the Build Up model, CAPM and French Three Factor model were chosen for this research.

3. METHODOLOGY

The calculation methods will be applied to a model family farm located in the South Bohemian region. The company has been in the family for many generations; its business activity was only interrupted several times in the past: in the period of world wars or unfavourable political climate. The modern resumption of its business activity took place in 1989-1990 when the legal form of the business was the association of two entrepreneurs. Initially, the association focused on cereal harvests and the breeding of slaughter cattle, later also dairy cattle. Between 1992-1999, the farm acquired agricultural land as part of the restitution process

and used it for growing various kinds of cereals and extending the scope of its activities. Recently, the model company has adapted to the modern business environment and started to use advanced technologies for its activities, increase the efficiency of production, thus reducing the labour intensity of its operation. The products are sold both to natural persons and large companies operating in the manufacturing industry and specializing in dairy products.

Agriculture is very specific due to the natural conditions directly affecting this sector. Natural conditions are one of the reasons why farmers combine crop and animal production, trying to choose the portfolio of their activities that would balance possible risks. The text presents the determination of alternative costs of equity that would reflect the specificities of the agriculture sector by means of business risk premium represented by several modifications of the calculation. Subsequently, the results of the selected methods (the Build Up model, CAPM, and Fama and French Three Factors model) will be compared. The resulting values will be arranged in a summary table. For the purposes of the valuation, company XY provided historical financial data. In order to achieve the most accurate results possible, the monitored period will be defined for the year 2016, as all necessary data are available for this period, which could be published with a delay. First, alternative costs of equity will be determined using the Build Up model according to Formula 1 below.

$$r_e = r_f + r_{pod} + r_{finstab} + r_{LA}, \quad (1)$$

The data for processing individual variables of the Build Up model will be obtained from publicly available resources, specifically from the portal of the Czech Ministry of Industry and Trade (MIT), which deals with the financial analysis of the Czech Republic (CR) business sector and provides for an overview of the economic data processed by individual sectors. The model company falls under the section "T10_2 Institutional enterprises" included in the resident national economy. The variables will be taken from the financial analysis carried out for business sector in the year 2016, specifically for the Q1-Q4 of 2016. Risk-free rate of return will be determined on the basis of 10-year government bond yield (Maastricht criteria) released by the Czech National Bank (www.cnb.cz, 2020) as of 2016.

Subsequently, CAPM will be used for calculating alternative costs of equity according to Formula 2 below.

$$r_e = r_f + \beta * \left[E(R_m) - r_f\right], \quad (2)$$

where:

r_f is risk-free return,

E (Rm) is average yield of market portfolio,

β is market risk rate of asset X.

The data for processing the individual variables will be obtained from publicly available sources. The values of market variables displayed in the constant E (Rm), specifically the rating considered for the Czech Republic and the cost of capital considered for the agricultural sector will be taken from Damodaran´s internet portal (Damodaran, 2020). Currently the variables for 2016 have been processed. In order to ensure the correct results, these data will be used. Risk-free rate of return will be determined on the basis of the 10-year government bond yield (Maastricht criteria) released by the Czech National Bank (www.cnb.cz, 2020) as of 2016.

The beta coefficient will be calculated according to Formula 3 below, where the financial data of the company XY will be used.

$$\beta_z = \beta_n * \left[1 + (1 - d) * \frac{CK}{VK}\right], \tag{3}$$

where:

β_n is β of equity with zero debt,

d *is income tax rate,*

CK/VK is a ratio of debt capital and equity in market values.

Finally, the Fama and French Three Factor model will be used to determine the value of equity according to Formula 4 below.

$$r_e = r_f + \beta_m * RP_m + \beta_{SMB} * RP_{SMB} + \beta_{HML} * RP_{HML}, \tag{4}$$

where:

r_f is risk-free rate of return,

β_m is market coefficient in the Fama and French 3 Factor Model regression,

RP_m is expected market risk premium,

β_{SMB} is coefficient Small Minus Big in the Fama and French 3 Factor Model regression,

RP_{SMB} is expected SMB risk premium estimated as a difference between past average annual portfolio yields with small and large capitalization,

β_{HML} is coefficient High Minus Low in the Fama and French 3 Factor Model regression,

RPHML is expected MHL risk premium estimated as a difference between past average annual income from shares with high book value to market value ratio and low book value to market value ratio.

The Fama and French Three Factor model will be processed using the data obtained from a publication by (De Janvry & Sadoulet, 2020), who deal with determining costs of equity for individual sectors. In order to achieve the most accurate results possible, data specifically determined for the agricultural sector will be used. Moreover, in accordance with Fama and French (1997), the average value of annual risk premium will be considered in the calculation. The value of risk-free rate of return will be taken from the calculation performed for the Build Up model.

The resulting equity values will be further addressed in the Discussion part.

4. EMPIRICAL RESULTS AND DISCUSSION

In the introductory part, the value of risk-free rate of return was determined and set as default for all three selected methods. The yield of 10-year government bonds (Maastricht criterion) is released by the Czech National Bank using a system of time series ARAD (Brillinger et al., 2019). In the monitored period, it was 0.53 %.

Subsequently, the value of alternative costs of equity was determined using the Build Up model. The values of the individual variables were taken from the analytical materials of the Ministry of Industry and

Trade, specifically from the financial analysis carried out for the business sector in the year 2016, section T10_2 Institutional enterprises, period 1st-4th Q 2016, presented in Table 1.

Table 1

Individual variables for calculating (re) according to MIT

T10_2 Institutional enterprises	1st-4th Q 2016
Business Risk Premium	3.68%
Premium for financial stability	0.34%
Premium for company size	2.66%

Source: www.mpo.cz (2020).

The determined values were used in Formula 1.

$$r_e = 0.53\% + 3.68\% + 0.34\% + 2.66\% = \mathbf{7.21\%} \quad (5)$$

Alternative costs of equity determined using the Build Up model were 7.21 %. For the application of CAPM, internal historical data of company XY were used. The data are shown in Table 2 Internal historical data of company XY.

Table 2

Internal historical data of company XY

Year	Debt capital	Equity
2012	CZK 23,542,977.00	CZK 10,223,190.00
2013	CZK 22,673,104.00	CZK 7,430,386.00
2014	CZK 19,238,922.81	CZK 8,981,987.19
2015	CZK 18,958,173.38	CZK 5,721,354.62
2016	CZK 16,592,212.05	CZK 6,269,797.95
In total	**CZK 101,005,389.24**	**CZK 38,626,715.76**

Source: Own research.

Subsequently, the value of beta coefficient (levered beta) in accordance with Formula 3; the value for unlevered beta for the agricultural sector was taken from Damodaran´s internet portal (Damodaran, 2020), section "Archived data" – levered and unlevered beta by sectors, released in January 2017. The variable d represents corporate tax (19% in the CR).

$$\beta_z = 0.33 * \left(1 + (1 - 0.19) * \frac{101{,}005{,}389.24\ CZK}{38{,}626{,}715.76\ CZK}\right) = \mathbf{1.02} \quad (6)$$

Using Formula 3, the beta coefficient was set at 1.02. For the calculation of CAPM, there were used variables taken from Damodaran´s internet portal (Damodaran, 2020), where risk premium for the agricultural sector was taken from the section "Archived data" – costs of equity by sectors, released in January 2017, and the rating for the Czech Republic was taken from the section "Archived data" – risk premium for other markets, released in January 2017. The individual variables are shown in Table 3.

Table 3

Values of selected variables

Variable	Value
Premium of CR 2016 – according to "Moody's rating"	0.81%
Risk premium for agricultural sector	7.09%

Source: Damodaran (2020).

The determined values were used in Formula 2.

$$r_e = 0.53\% + 1.02 * (0.81\% + 7.09\% - 0.53\%) = \mathbf{8.05\%} \quad (7)$$

Alternative costs of equity determined using CAPM were 8.05%. Afterwards, the value of alternative costs of equity was determined using Formula 4, where first, the variables for average values of annual risk premium were determined according to Fama and French (1997, p. 156), as shown in Table 4.

Table 4

Average values of annual premium

Variable	Value
RP(m)	5.16%
RP(SBM)	3.24%
RP(HML)	5.40%

Source: Fama and French (1997).

Furthermore, the variables specifically for the agricultural sector were determined according to Fama and French (1997, p. 157). The variables are shown in Table 5.

Table 5

Variables for agricultural sector

Variable	Value
Bm	0.85
βSBM	0.71
βHML	-0.02

Source: Fama and French (1997).

The determined values were used for Formula 4.

$$\mathrm{r_e} = 0.0053 + 0.85 * 0.0516 + 0.71 * 0.0324 + (-0.02) * 0.054 = \mathbf{7.11\%} \quad (8)$$

According to the Fama and French Three Factor model, alternative costs of equity were set at 7.11%.

The following part of this article will discuss the individual results of calculating alternative costs of equity for Czech agriculture sector. The results are shown in the summary table below (Table 6). Own interpretation.

Table 6

Summary of resulting values

Method	Value
Build Up model	**7.21%**
CAPM	**8.05%**
Fama and French Three Factor model	**7.11%**

Source: Own research.

As follows from the above table, the resulting alternative costs of equity determined by the three methods range from 7.11% to 8.05%. The following text further analyses the differences identified and the calculation parameters of the methods.

The connecting parameter in the calculation of the three methods is risk-free rate of return. Risk-free rate of return for all three methods was determined at the same level as a 10-year government bond yield of the CR. The same approach for determining risk-free rate of return is given by alternative costs of equity at the same moment, in the same currency (CZK), in the same geographical area, and with the same investment opportunities. This indicates that the difference in the results is given by a different view of business risk and including other parameters in calculating alternative costs of equity.

Alternative costs of equity determined using the Build Up model are 7.21%. This model is based on the identification and evaluation of individual risks. In the case of the Build Up model, the identified risks were expressed using 2016 financial data of the Czech corporate sector released by the Ministry of Industry and Trade, which, as a national authority, collects and evaluates the data from enterprises. Individual premiums and risks are defined separately for each sector of the national economy, including the specification of intervals and thresholds for the input parameters.

Another method used for the purposes of this article is CAPM. Unlike the Build Up model, CAPM includes beta coefficient, which express the investment sensitivity to the market. This coefficient was determined on the basis of own calculation, where the internal data of Company XY set at 1.02 were considered, which means that in the case of a unit change in the stock index, this change will be 1.02 times stronger for return and rate of the selected investment. According to CAPM, alternative costs of equity are 8.05%. This model is based on the assumption of ideal capital markets. The calculation included variables based on the analysis published on Damodaran´s websites (Damodaran, 2020), where the individual variables are processed on the basis of publicly available data. The companies analysed are usually listed on a selected stock exchange. In this model, the territory factor is expressed by the Country Risk Premium based on the rating of a given country. Thanks to this, CAPM includes business risks as well as market, territorial, and social (political) risks, thus providing a broader view of the national market in which a given company operates. From the author´s point of view, there could be certain collision of duplicated consideration of country risks that are partially considered in the risk-free rate of return (e. g. (country debt).

The last model addressed is the Fama and French Three Factor model, according to which the alternative costs of equity are 7.11%. This model is an extension of the CAPM by the factor of company size and financial risk. Therefore, some shortcomings of CAPM are reduced. . However, Fama and French include American capital markets in their model, which should be taken into account when considering the applicability of the model in the Czech market. Another possible shortcoming of this model is the fact that the determination of the input values is based on the research by Fama and French (2015), without any further updating of the data. Not updating the input data on the market significantly limits its applicability only to companies operating in the sectors that have not undergone any significant changes, including the agricultural sector. The analysis shows that the Build Up model appears to be suitable for expressing

alternative costs of equity, as it is based on the data of the companies operating on the Czech market and on the analysis of the model company´s individual risks. The Fama and French Three Factor model was modified to the Five Factor model, and both these models were applied to the Turkish stock market. The results of these methods show that the Five Factor model by Fama and French (2015) is the most suitable model for the Turkish market. However, the results were not positive for the African stock market, as the models capture only partially the returns of a given market; therefore, these methods should be applied very carefully to the African market (Kolodziejczak & Posta, 2018).

It can be stated that CAPM is most widely used in various sectors of foreign markets. For example, alternative costs of equity for companies operating in Brazilian infrastructure were 11.97% in the period 2002-2014, where 49 companies were included in the calculation (Ministry of Industry and Trade of the Czech Republic). The results of CAPM for the EU industry sector are less accurate than for the USA or GB industry sector due to large time variability of the risk burden of non-negotiable factors (Šofránková et al., 2017).

5. CONCLUSION

The objective of the article was the application of selected risk premium methods to the agricultural companies in the CR using three methods: the Build Up model, CAPM, and Fama and French Three Factor model. First, the Build Up model was used, providing the result of 7.21 %. To obtain this result, the data released by the Ministry of Trade and Industry of the CR specifically for the agriculture sector were used. This method could be applied to other sectors in the CR as well. The alternative costs of equity determined by CAPM were 8.05 %. This model can be used only under the assumption that capital markets are ideal and the conditions for all investors are identical. In this model, it is possible to use the value of beta coefficient determined on the basis of own calculation. In this article, the value determined on the basis of the internal data of Company XY was 1.02. Subsequently, Fama and French Three Factor model was used. The value determined using this model was 7.11 %. Here, it is necessary to consider the suitability of this model for the Czech market. The differences in the results were explained in the Discussion part. The objective of the article was thus achieved. Currently, other variants of these methods are applied for determining the alternative costs of equity, e. g. the APT model. The agriculture sector is very specific, as agriculture companies are the first to be affected by the impacts of climate changes. This article could be followed by the analysis and prediction of the impacts of climate changes, which could be also considered in the combination with the importance of weather derivatives for agricultural companies. Furthermore, the issue of possible duplication of selected risks in CAPM could be another topic for a detailed discussion of experts in the given field.

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REFERENCES

Alshubiri, F. (2015). Measurement the Impact of Financial and Business Risk on Performance: Evidence of Industrial Sector of Oman. *Asian Social Science,* 11(22), 26-32.

Bae, G. S., Choi, S. U., & Lee, J. E. (2021). Auditors' Response to Auditor Business Risk: An Analysis Using Public and Private Companies. AUDITING: *A Journal of Practice & Theory,* 40(4), 27-51. https://doi.org/10.2308/AJPT-19-102

Bhatnagar, A. (2018). Perception of Farmers Towards Agriculture Insurance Schemes. *Pacific Business Review International*, 10(10), 53-56.

Brillinger, A., Els, C., Schäfer, B., & Bender, B. (2019). Business Model Risk and Uncertainty Factors: Toward Building and Maintaining Profitable and Sustainable Business Models. *Business Horizons*, 63(1), 121-130.

Caballero-Morales, S.O., Cordero-Guridi, J.J., Alvarez-Tamayo, R.I., & Cuautle-Gutiérrez, L. (2020). Education 4.0 to Support Entrepreneurship, Social Development and Education in Emerging Economies. *International Journal of Entrepreneurial Knowledge*, 8(2), 89-100. https://dx.doi.org/10.37335/ijek.v8i2.119

Carassus, L., & Rásonyi, M. (2020). Risk-Neutral Pricing for Arbitrage Pricing Theory. *J Optim Theory Appl.* 186, 248–263. https://doi.org/10.1007/s10957-020-01699-6

Cepel, M., Gavurova, B., Dvorsky, J., & Belas, J. (2020).The impact of the COVID-19 crisis on the perception of business risk in the SME segment. *Journal of International Studies, 13*(3), 248-263. doi:10.14254/2071-8330.2020/13-3/16

Çera, G., Belás, J., & Strnad, Z. (2019). Important Factors which Predict Entrepreneur's Perception in Business Risk. *Problems and Perspectives in Management*, 17(2), 415-429.

CNB. (2020). Time Series Database. Retrieved from https://www.cnb.cz/cnb/STAT.ARADY_PKG.VYSTUP?p_period=12&p_sort=2&p_des=50&p_sestuid=375&p_uka=1&p_strid=AEBA&p_od=200004&p_do=202003&p_lang=CS&p_format=0&p_decsep=%2C375&p_uka=1&p_strid=AEBA&p_od=200004&p_do=202003&p_lang=CS&p_format=0&p_decsep=%2C

Damodaran, A. (2020). Damodaran Online. Retrieved from http://pages.stern.nyu.edu/~adamodar/

De Janvry, A., & Sadoulet, E. (2020). Using Agriculture for Development: Supply – and Demand-side Approaches. *World Development*, 133.

Devkota, N., Paudel, U.R., Hamarneh, I., & Bhandari, U. (2021). Rethinking Westernization in Destination: Tourists' Perception of a Touristic City. *Journal of Tourism and Services*, 23(12), 1-25.

Dudnik, A. V., & Cherdakova, T. A. (2021). Investment strategies for increasing the agribusiness competitiveness. *Economy of Region,* 17(2), 632–643. https://doi.org/10.17059/ekon.reg.2021-2-20

Durst, S., & Zieba, M. (2020). Knowledge Risks Inherent in Business Sustainability. *Journal of Cleaner Production*, 251, 1-10.

Dvorský, J., Petráková, Z., & Fialová, V. (2020). Perception of Business Risks by Entrepreneurs According to Experience with the Business Failure. *International Journal of Entrepreneurial Knowledge*, 8 (1), 76-88. https://dx.doi.org/10.37335/ijek.v8i1.104

Dzuričková, J., Fabinyová, R., & Mihalcová, B. (2014). The opportunity cost of equity capital. In 2nd Global Conference on Business, Economic, Management and Tourism, Czech Republic.

Fama, E. F, & French, K. R. (1997). Industry Costs of Equity. *Journal of Financial Economics,* 43, 153-193.

Fama, E. F., & French, K. R. (2015). A Five-factor Asset Pricing Model. *Journal of Financial Economics,* 116(1), 1-22.

Fanta, M. (2019). Water Management in the Czech Republic: Transformation, Restructuralization, and Comparison of the Current State of the Branch with the State in 1993. *Littera Scripta,* 12(1), 16-27.

Femenia, F., Latruffe, L., & Chavas, J.-P. (2021). Responsiveness of farm investment to price changes: Evidence from the French Crop Sector. *Applied Economics,* 53(34), 3972–3983. https://doi.org/10.1080/00036846.2021.1890686

Frýd, L., Machová, V., Horák, J., & Pardal P. (2020). The Wage Impact on the Net Value-added in the Agricultural Sector. *Littea Scripta,* 13(1), 186-193.

Gesevičienė, K., Miceikienė, A., & Rivza, B. (2020). Aplinkos apsaugos subsidijų reikšmė klimato kaitos valdymo kontekste: teorinis požiūris. *Management Theory and Studies for Rural Business and Infrastructure Development*, *42*(3), 259-269.

Gray-Hawkins, M., Michálková, L., Šuleř, P., & Zhuravleva, N. (2019). Real-time Process Monitoring in Industry 4.0 Manufacturing Systems: Sensing, Smart, and Sustainable Technologies. *Economics, Management, and Financial Markets*, 14(4), 30-36.

Greblikaitė, J., Astrovienė, J., & Montvydaitė, D. (2020). Value-added agricultural bio-business development in European countries. *Vadybos mokslas ir studijos-kaimo verslų ir jų infrastruktūros plėtrai*, *42*(3), 235-247.

Gutkevych, S., & Vikhliaiev, M. (2021). Risks in the Investing. *Baltic Journal of Economic Studies*, 7(3), 82-87. https://doi.org/10.30525/2256-0742/2021-7-3-82-87

Hašková, S., Šuleř, P., Machová, V., & Krulický, T. (2019). Determining the Price of the Business Share of a Business in a Group. *Ad Alta: Journal of Interdisciplinary Research,* 9(2), 60-70.

Herrera, H., Herrera, F., & Markov, K. (2018). Switching International Capital Asset Pricing Model, an Emerging Market Case: Mexico. *Journal of Emerging Market Finance,* 17(1), 96-129.

Horák, J. (2019). Using Artificial Intelligence to Analyse Businesses in Agriculture Industry. In SHS Web of Conferences: Innovative Economic Symposium - Milestones and Trends of World Economy. China.

Hötte, K. (2020). How to Accelerate Green Technology Diffusion? Directed Technological Change in the Presence of Coevolving Absorptive Capacity. *Energy Economics*, 85.

Hu, X., Ocloo, C. E., Akaba, S., & Worwui-Brown, D. (2019). Effects of business to business e-commerce adoption on competitive advantage of small and medium-sized manufacturing enterprises. *Economics and Sociology, 12*(1), 80- 99. doi:10.14254/2071-789X.2019/12-1/4

Ivanov, V., Shevchenko, O., Marynin, A., Stabnikov, V., Gubenia, O., Stabnikova, O., Shevchenko, A., Gavva, O. & Saliuk, A. 2021. Trends and expected benefits of the breaking edge food technologies in 2021-2030. *Ukrainian Food Journal*, 10(1), 7–36. https://doi.org/10.24263/2304-974X-2021-10-1-3.

Junga, P., Vrbka, J., & Krulický, T. (2019). Determining Financial Compensation in the Case of Agricultural Land Expropriation – New Methodology. *Ad Alta: Journal of Interdisciplinary Research,* 9(2), 101-106.

Kabourková, K., & Stuchlý, J. (2019). Structural Development of Utilised Agricultural Area in EU Countries Subsidy Policy of the Czech Republic. *Littera Scripta,* 12(2), 161-176.

Kadarova, J., Janekova, J., & Onofrejova, D. (2021). Maximizing the profitability on investment by optimizing the production program. *MM Science Journal,* 2021(4), 4913–4917. https://doi.org/10.17973/mmsj.2021_10_2021035

Durst, S. & Zieba, M. (2020). Knowledge risks inherent in business sustainability. *In Journal of cleaner production*, 251, 1-10.

Kamle, M., Mahato, D. K., Devi, S., Soni, R., Tripathi, V., Mishra, A. K., & Kumar, P. (2020). Nanotechnological Interventions for Plant Health Improvement and Sustainable Agriculture. 3 *Biotech*, 10 (4).

Kang, M., Lee, H. - Y., Mande, V., & Woo, Y. - S. (2019). Audit Firm Attributes and Auditor Litigation Risk. *Abacus,* 55(4), 639-675. https://doi.org/10.1111/abac.12171

Kolodziejczak, M., & Posta, W. (2018). Changes in the Use of Production Services in Agriculture in the Context of Meeting the Targets for Sustainable Agricultural Development. In 7th International Scientific Conference on Determinants of Regional Development. Poland.

Kontsevaya, S., Zaruk, N., Galkin, M., Telegina, G., Mirontseva, A., & Makunina, I. (2018). Analysis of the Agricultural Insurance Market with Regard to state support in Russia. Agrarian Perspectives XXVII – Food Safety – Food Security, 106 – 112. ISSN 1213-7960

Krejčová, K., Glaserová, J., Otavová, M., & Mášová, S. (2017). Mergers of Agricultural Enterprises in the Czech Republic. In EFS 2017: Proceedings of the 14th International Scientific Conference. Czech Republic.

Kučera, J., Vochozka, M., & Rowland, Z. (2021). The Ideal Debt Ratio of an Agricultural Enterprise. *Sustainability*, 13 (9).

Kutnohorská, O., & Krištůfková, J. (2019). Application of Porter's Five Force Model to the Czech Dairy Industry after the Abolition of Milk Quota. *Littera Scripta,* 12 (1), 89-102.

Lancaric, D., Kozáková, J., Toth, M., & Savov, R. (2014). Comparison of Production Factors in Organic and Conventional Farming in Slovakia. In 9th International Conference on Applied Business Research. Chile.

Lindner, F., Kirchler, M., Rosenkranz, S., & Weitzel, U. (2021). Social Motives and risk-taking in investment decisions. *Journal of Economic Dynamics and Control*, 127, 104116. https://doi.org/10.1016/j.jedc.2021.104116

Ma, X., Song, P., & Zhang, X. (2020). The Structural Changes of Liquidity Risk, and Liquidity Risk Premium in China Stock Market. *Emerging Markets Finance and Trade,* 56(14), 3507-3521. https://doi.org/10.1080/1540496X.2019.1601554

Machová, V., & Vrbka, J. (2018). Value Generators for Businesses in Agriculture. In 12th International Days of Statistics and Economics Conference Proceedings. Czech Republic.

Marques-Perez, I., Guaita-Pradas, I., & Pérez-Salas, J.-L. (2017). Discounting in agro-industrial complex. A methodological proposal for risk premium. *Spanish Journal of Agricultural Research,* 15(1). https://doi.org/10.5424/sjar/2017151-10225

Minárik, P. (2017). Institutional Environment and Agricultural Production in Post-Communist Central European Countries. *Littera Scripta,* 10 (1), 88-101.

Miceikienė, A., Verulidze, V., & Kuklierius, M. (2022). The Role of environmental taxes in bioeconomy development: cases of Lithuania and Georgia. *Vadybos mokslas ir studijos-kaimo verslų ir jų infrastruktūros plėtrai*, *44*(1), 61-71.

Mishenin, Y., Marekha, I., Yarova, I., Kovalova, O., & Pizniak, T. (2022). Optimizing a portfolio of Agri-Environmental Investments. Agricultural and Resource Economics*: International Scientific E-Journal*, 8(1), 115–132. https://doi.org/10.51599/are.2022.08.01.06

MPO. (2020). Analytical Materials. Retrieved from https://www.mpo.cz/cz/rozcestnik/analyticke-materialy-a-statistiky/analyticke-materialy/

Napoli, G. (2017). Housing Affordability in Metropolitan Areas. The Application of a Combination of the Ratio Income and Residual Income Approaches to Two Case Studies in Sicily, Italy. Buildings, 7(4), 1-19.

Nguyen, H. Q., Korbee, D., Ho, H. L., Weger, J., Hoa, P. T. T., Duyen, N. T. T., Luan, P. D. M. H., Luu, T. T., Thao, D. H. P., Trang, N. T. T., Hermans, L., Evers, J., Wyatt, A., Nguyen, X. Q. C., & Phi, H. L. (2019). Farmer Adoptability for Livelihood Transformations in the Mekong Delta: A Case in Ben Tre Province. *Journal of Environmental Planning and Management,* 62 (9), 1603-1618.

Nykolyuk, O., Skydan, O., & Pyvovar, P. (2021). Assessment of the relationship between farm size and flexibility: the case of Ukraine. *Management Theory and Studies for Rural Business and Infrastructure Development*, *43*(1), 21-37.

Nývltová, K. (2016). Risk Areas of the Financial Health Assessment in Agriculture. In 25th International Scientific Conference on Agrarian Perspectives – Global and European Challenges for Food Production, Agribusiness and the Rural Economy. Czech Republic.

Pánková, L., Aulová, R. and Jarolímek, J. (2020) Economic Aspects of Precision Agriculture Systems, *AGRIS on-line Papers in Economics and Informatics*, 12(3), 59-67. ISSN 1804-1930. DOI 10.7160/aol.2020.120306.

Pimonenko, T., Bilan, Y., Horák, J., Starchenko, L., & Gajda, W. (2020). Green Brand of Companies and Greenwashing under Sustainable Development Goals. *Sustainability,* 12 (4).

Pimonenko, T., & Lyulyov, O., Us, Y. (2021). Cointegration between Economic, Ecological and Tourism Development. *Journal of Tourism and Services*, 23(12), 169-180.

Rahul, R., & Santhakumar, S. (2018). A Six – Factor Asset Pricing Model. *Borsa Istanbul Review,* 18 (3), 205-2017.

Ranasinghe, T., Yi, L., & Zhou, L. (2022) Do auditors charge a client business risk premium? Evidence from audit fees and derivative hedging in the U.S. oil and gas industry. Review of Accounting Studies. https://doi.org/10.1007/s11142-021-09665-x

Rasheed, S., Wang, C. F., Yaqub, F., & Memon, S. (2015). Risk Leveling in Business Environments – a Novel Approach for Macro Risk Management. *Journal of Industrial Engineering and Management*, 8(3), 738-762.

Rumánková, L., Kuzmenko, E., Benešová, I., Smutka, L. and Laputková, A. (2020) Animal Husbandry Export Measures Productivity: What is the Position of the Czech Republic?, *AGRIS on-line Papers in Economics and Informatics*, 12(4), 93-110. DOI 10.7160/aol.2020.120407.

Roshchyk, I., Oliinyk, O., Mishchuk, H., Bilan, Y. (2022). IT Products, E-Commerce, and Growth: Analysis of Links in Emerging Market. *Transformations in Business & Economics, 21*(1), 209-227.

Šofránková, B., Kiseláková, D., & Horváthová, J. (2017). Actual Questions of Risk Management in Models Affecting Enterprise Performance. *Ekonomicky Casopis,* 65(7), 644-667.

Stehel, V., Hejda, J., & Vochozka, M. (2019). Use of Objectivized Value in Business Valuation. *Ad Alta: Journal of Interdisciplinary Research*, 9(2), 333-338.

Stehel, V., Horák, J., & Vochozka, M. (2019). Prediction of Institutional Sector Development and Analysis of Enterprises Active in Agriculture. *E+M Ekonomie a Management,* 22(4), 103-118.

Swaffield, S., Corry, C., Opdam, P., McWilliam, W., & Primdahl, J. (2019). Connecting Business with the Agricultural Landscape: Business Strategies for Sustainable Rural Development. *Business Strategy and the Environment,* 28(7), 1357-1369.

Tran, S. H., & Nguyen, L. T. (2020). Financial Development, Business Cycle and Bank Risk in South East Asian Countries. *Journal of Asian Finance, Economics and Business,* 7(3), 127-135.

Virglerová, Z., Homolka, L., Smrčka, L., Lazányi, K., & Klieštik, T. (2017). Key Determinants of the Quality of Business Environment of SMEs in the Czech Republic. *E+M Ekonomie a Management,* 20(2), 87-101.

Vochozka, M., Maroušková, A., & Šuleř, P. (2017). Economic, Environmental and Moral Acceptance of Renewable Energy: a Case Study – the Agricultural Biogas Plant at Pěčín. *Science and Engineering Ethics,* 24(1), 299-305.

Vochozka, M., Rowland, Z., & Šuleř, P. (2019). The Specifics of Valuating a Business with a Limited Lifespan. *Ad Alta: Journal of Interdisciplinary Research,* 9(2), 339-345.

Vochozka, M., Stehel, V., & Rowland, Z. (2019). Determining Development of Business Value over Time with the Identification of Factors. *Ad Alta: Journal of Interdisciplinary Research,* 9(2), 358-363.

Woo, S., & Lim, H. (2015). Audit Risk, Business Risk, and Auditors' Efforts in Korea. *Asian Social Science,* 11(18), 144-152.

Xiong, G., & Wang, L. (2021). Factors and economic evaluation of Transnational Investment Risks. *Discrete Dynamics in Nature and Society*, 2021, 1–9. https://doi.org/10.1155/2021/1030183

Zaburanna, L.; Tarasiuk.; H, Mostenska.; T, Laguta,Y.; Bilan, S (2020). Assessment of the development level of corporate social responsibility of a company. *Ukrainian Food Journal, 9(3),* 691-705. https://doi.org/10.24263/2304-974X-2020-9-3-16.

Zeman, Z., & Lentner, C. (2018). The Changing Role of Going Concern Assumption Supporting Management Decisions after Financial Crisis. *Polish Journal of Management Studies,* 18(1), 428-441.