Determination of the risk premium for the environment of the Czech Republic based on a comparison of the established rating from rating agencies and the model from Damodaran

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Abstract

This paper describes the general methods of the risk premium calculation and compares them with Damodaran approaches and the rating assigned by specialized agencies. The determination of the risk premium represents the amount of money that an investor obtains when taking the risk of an investment in a particular market. The simplest option for obtaining a risk premium appears to be the risk premium assigned by the credit rating agencies. However, there is currently a plethora of such agencies in the market and the investor must ensure that they will take the right decision. In the analysis of different methodologies in the methodological part of the paper, the most appropriate model for determining the risk premium for the Czech environment is identified. In the discussion of the results, the weaknesses of each method are described in more detail to identify the recommended method for the Czech Republic. In the conclusion of this conference paper, a modification of the risk premium calculation is proposed to obtain more accurate results.

Keywords: Damodaran, risk premium, credit rating, rating agency, investor

Introduction

We understand the risk premium as a bonus paid to investors for being willing to take some risk. In the recent years, various studies have tried to identify whether or not investment can be diversified. Page and Panariello (2018) look in more detail at situations where risk diversification does not yield the desired results. When the amount of risk premium is determined for investors, you should always bear in mind that this is historical data. For this data to be meaningful in the future, you must presume that the investor has the same

approach to risk as in the past. Investors make investment decisions by comparing the investment cost against the expected return on that investment. This includes a bonus for the risk assumed in the form of a risk premium which is influenced by the level of risk in the Czech Republic. To determine the level of risk, the credit rating assigned by the credit rating agencies following the Damodaran example is used to determine risk for a specific country based on data drawn from research carried out in the past. However, this method of calculation is not appropriate for the Czech capital market as Damodaran considers the US capital market with AAA rating. The aim of this paper is to identify the most appropriate alternative for calculation of the risk premium applied in the Czech environment.

The risk premium is an important measure of the value of financial investments. According to Horvath (2020), the risk premium of developed countries is significantly different from developing countries. In view of potential risks, risks are more severe in developed countries as opposed to developing countries where these are idiosyncratic. According to Finta and Aboura (2020), a financial crisis in one market may cause the global investors to simultaneously reassess risk in other markets. Lampérière et al. (2016) identify the risk premium as one of the pillars of modern finance theory.

Several methods can be used to calculate the risk premium. Othieno and Biekpe (2019) say that 5 common estimating methods can be used to calculate ERP (Equity risk premium):

- Historical estimation
- Demand estimation
- Offering method
- Approach-based survey
- Implied ERP estimation

Fassas and Papadamou (2018) refer to the risk premium as the uncertainty of return variance which leads to variance of the risk premium. These variations are then understood as differences between statistical and risk-neutral expectations. A credit rating is used to assess the risk premium incurred in investing. In the recent years, the level of risks of a particular country is determined from credit ratings set by the special credit rating agencies. This credit rating is used and recognised worldwide. For investment in riskier countries, investors can use the credit rating to more easily estimate the level of risk taken and thus determine the risk premium. According to Pleßner and Blaschke (2019), almost all financial market companies in the UnitedStates are rated by Standars and Poor´s, Moody´s or Fitch. In their study, they focused on ratings in recent years in order to understand the current position of these rating agencies. Damodaran (2020) uses the local currency ratings, specifically Moody's, to estimate the premium for a long-term stock. However, some countries do not have a rating from Moody's, but there is a rating determined by S&P (De Moor et al., 2018). Bartels (2019) compares the world-renowned credit rating agencies with smaller credit rating agencies that are more independent in their credit ratings.

To calculate the risk premium, it is necessary to determine how risky a given asset is relative to other assets. CAMP (Capital Assets Pricing Model) can be used for the calculation. This model is based on the capital market. To calculate the risk premium, the beta coefficient must

be used. This coefficient shows the change in return on the firm's stock which is dependent on the change in the capital market. The CAMP model relies on complete insurance and ignores the risks associated with the consumption of illiquid assets. These risks are non-marketable and therefore uninsurable against risk. According to Semenyuk (2016), the CAPM model cannot be used to estimate the capital cost for developing countries precisely because of the lower level of liquidity and capitalization. Therefore, this should be taken into account when the CAPM model is used to determine the risk premium. The so-called beta coefficient is used for calculation of the risk premium based on the CAPM model. Hrdý and Pláničková (2019) point out that determining the beta coefficient is by far more complicated and requires access to the market data. On the other hand, Gonzales (2018) reminds that the beta coefficient is an important measure of the systematic and undiversified risk that must be assumed by investors.

Chien and Naknoi (2015) explain the global capital market imbalances. They also point out about the higher participation rate in the US stock market than in the rest of the world. Aye, Deale and Gupta (2016) remind that widely used macroeconomic and technical predictors may not adequately capture the dynamics of the risk premium. In this context, they focus on a predictor to help explain the equity market.

The CAPM model can be used to calculate the risk premium, but it is often based on unrealistic assumptions. The most criticized factor is the way risk is measured using variance. For financial investments, this method of determining risk is inappropriate because the variance reflects the probability of loss. Also, the CAPM model relies on the symmetry of investor assumptions and investor rationality. The beta coefficient is only related to one specific stock, so the result cannot be taken across the board, but only in relation to the portfolio. The way the credit rating agencies determine the credit rating can also be considered insufficient. Credit rating agencies determine ratings on the assumption that all known risks have been assessed. However, these credit ratings can still be criticized because the rating scales are not structured well enough to distinguish between countries in detail. Some countries can achieve the same credit rating scale and yet exhibit different market conditions.

Methods and Data

Several common techniques can be used to calculate the risk premium. One of the most common methods is to use the credit ratings that shareholders take from credit rating agencies.

Credit Ratings

Damodaran (2020) uses Moody's credit ratings to determine the sovereign rating. Moody's ratings are illustrated below with respect to future comparison of ratings with Damodaran.

Tab. 1:Moody's Credit Rating Scale

Credit Rating Groups	Total ERP	Country RP	Moody´s Agency
Investment Group			
Aaa	5.81%	0.00%	Germany, Netherlands, Austria, USA, Switzerland, Finland, Norway, Denmark, Sweden, New Zealand, Canada, Singapore, Australia, Luxembourg
Aa1	6.41%	0.60%	Belgium
Aa2	6.56	0.75	Kuwait, France, Korea, United Kingdom
Aa3	6.71	0.90%	Taiwan, Saudi Arabia, Chile, **Czech Republic**, Hong Kong
A1	6.86%	1.05%	Estonia, Israel, Japan, China
A2	7.09%	1.28%	Poland, Ireland
A3	7.61%	1.80%	Malaysia, S. Africa, Malta, Slovakia
Baa1	8.21%	2.40%	Mexico, Lithuania
Baa2	8.66%	2.85%	Kazakhstan, Latvia, Spain
Baa3	9.11%	3.30%	Croatia, India, Bulgaria, Romania, Iceland, Hungary, Portugal, Italy
	Speculative Grades		
Ba1	9.56%	3.75%	Slovenia, Russia
Ba2	10.31%	4.50%	Indonesia, Brazil
Ba3	11.21%	5.40%	Egypt
B1	12.56%	6.75%	Mongolia, Vietnam, Turkey
B2	14.06%	8.25%	Turkmenistan, Bosnia and Herzegovina, Ukraine
B3	15.56%	9.75%	Pakistan, Cyprus
Caa1	17.06%	11.25%	Cuba, Moldova, Argentina
Caa2	19.31%	13.50%	Greece
Caa3	20.81%	15.00%	-
Ca	23.82%	18.00%	-

Source: Author based on Moody´s investors services (2015).

The credit ratings of the individual countries are divided into several groups, but these groups are divided into 2 basic groups - investment and speculative grades. The investment group includes ratings from Aaa to Baa3. The speculative groups range from Ba1 to Ca. Moody's has placed the Czech Republic in the Aa3 rating group which has the overall risk premium of 6.71% and the country risk premium of 0.90%. Thus the Czech Republic has been upgraded by one notch for the first time in 17 years and has received the highest credit rating ever in the country's credit rating history.

In creating the credit rating scale, the credit rating agencies cooperate with the countries' major institutions such as central banks, ministries, government agencies and others. Subsequently, the data collected are analysed and a specific rating is assigned to each country to indicate the riskiness of the country. The most developed countries with low

inflation and unemployment rates while good infrastructure and a high level of education of the population have the highest ratings. Countries with high levels of debt and insolvency have lower ratings. The credit rating of the countries may differ, so each investor must consider in advance which credit rating agency to follow and take into account.

Risk Premium According to Damodaran

According to Damodaran, other methods can be used to calculate the country risk premium.

Method 1 for discount rate adjustment

The first way is to calculate the discount rate using this formula

$$DR_D = R_F + RP \tag{1}$$

where:

DR_D is the discount rate
R_F is the domestic risk free interest rate
RP is the country risk premium determined by the difference between the host country's and the home country's credit ratings.

The calculation formula for the risk premium can then be derived from this formula:

$$RP_{CR} = RB_{CR} - R_{aaa} \tag{2}$$

where:

RP_{CR} is the risk premium of a specific country, i.e. the Czech Republic

RB_{CR} is the real interest rate of the Czech Republic

R_{aaa} is the real interest rate of a country rated AAA

According to Damodaran, the country risk premium can also be appropriately calculated as the difference between the yield on the country's sovereign bonds and a risk free country with the highest possible AAA rating. Therefore, Damodaran uses the US rating for this calculation. The resulting risk premium is then the result for all countries in a particular rating group. To achieve better results for a given country, volatilities within the countries have to be exploited. Using the first adjustment of the discount rate, the risk premium can be calculated for unrated countries by simply calculating the real interest rate for a particular country and subtracting the real interest rate of a country in the AAA rating group. This method is propitious for countries that do not provide sufficient capital market data for use in the CAPM model (Damodaran, 2021).

Method 2 for discount rate adjustment

The second method for calculating the risk premium is to determine the risk premium using historical data and the long-term rating of a particular country. The calculation formula is as follows:

$$RP_C = \text{country default risk} * (\text{stock market volatility/bond market volatility}) \qquad (3)$$

The country default risk is determined by its long-term local rating. For the capital market risk premium, Damodaran (2020) uses data obtained from the U.S. and thus relies on country credit ratings. Volatility is expressed using standard deviations of returns. This provides an important first step to measure the country risk premium, but it only relates to the risk of country default, so the risk premium has to be slightly increased. There are two obstacles faced if the country risk premium is determined as explained above. The first is the volatility of the stock market which may differ between countries. The other obstacle is the estimation of the bond market volatility. Damodaran recommends to use a 1.5 factor for convenience. In this case, however, countries need to have a fixed credit rating and at the same time a late response to market changes.

The second adjustment of the discount rate is based on the CAPM model which is based on the WACC model. Here it is important to know the country credit rating, preferably a long-term rating published by the credit rating agencies. This credit rating is then translated into the risk premium (the difference between the yield on bonds with the same rating and US government bonds). The country default risk is only a reflection of the creditor's view. The shareholder's view is important for estimating the risk premium. Therefore, the difference between the volatility of a country's stock market and the volatility of that country's government bonds is used for calculation.

Country Risk Model

The third method for calculating the country risk premium is to derive it from the country-specific cost of equity capital formula

$$RPZ_{CR} = NVK_{CR} - Rf_{USA} + B * RPT_{USA} \qquad (4)$$

where:

Rf_{USA} is the risk free rate of return from the US

NVK is the cost of equity capital in the Czech Republic

B is the BETA coefficient

RPT_{USA} is the US capital market risk premium

RPZ_{CR} is the country risk premium (CR)

This model is based on the cost of equity capital of a particular country minus the risk free return of the highest rated country plus a multiple of the beta coefficient and the risk premium of the country with the highest available rating. According to Mařík and Maříková (2008), the BETA coefficient is adjusted according to the specific characteristics of the company, which take into account its current risks from a business and financial point of view. The US rating is used for Damodaran's calculations. The country risk model is the most commonly used but least efficient method for determining country risk. According to Mařík and Maříková (2014), this method is the least effective for calculating the risk of specific companies precisely because all companies in said country are exposed to country risk to the same extent.

CAPM Model

For the calculation of the risk premium, the Capital Asset Pricing Model (CAPM) is used. The risk premium is determined by the formula:

$$RP = B \ * (R_M - R_D) \tag{5}$$

where:

B is the BETA coefficient
R_M is the average annual return on a stock market portfolio
R_D is the average annual return on government bonds

CAPM uses the beta coefficient which can be generally defined as the correlated relative volatility. The beta coefficient is calculated using historical data, the covariance of the return of the i-th stock and the market index. The resulting value has the following meaning:

- **B = 0………..risk free assets**
- **0< B<1……. defensive stock**
- **B = 1……… neutral stock**
- **B> 1……….. aggressive stock**

The beta coefficient should always reach 1. Where the values of the beta coefficient exceed 1, this indicates a higher level of systematic risk. On the contrary, if the value is less than 1, this indicates a lower level of systematic risk.

The equation for calculating the risk premium using the CAPM model is commonly used, but in general, this model does not exactly correspond to reality. This is mainly due to the beta coefficient which is only an estimated future value.

Results

The credit rating assigned by the credit rating agencies seems to be the simplest way as this risk premium assessment from a specific credit rating agency is used by investors. It is therefore very important for investors to consider which agency's rating they will use. Whether they will use a credit rating from one of the 'big three' agencies, namely Moody's, S&P or Fitch. And you should also mull over whether the three agencies are still credible or whether it would be a better choice to use a rating from one of the smaller agencies that are less commercial. The credit rating agencies have to analyse data from the major institutions of the countries to determine the risk premium. In most cases, the credit rating agencies perform this analysis on a yearly basis, hence they are not able to respond promptly to changes.

The CRA has the disadvantage of breaking down countries into credit rating groups. There may be significant differences between countries in a particular group, but the differences are not apparent at first glance due to the grouping, and then investors have to recalculate the country risk premium into the specific country risk premium. The risk premium used in the Czech Republic in group Aa3 is set to 0.9%.

Damodaran applies ratings in his models to calculate the risk premium. In the first model, he subtracts the rating of the country with the highest possible AAA rating from the real interest rate of the country for which he wants to determine the risk premium. Damodaran compares all his calculations with the US. This approach is very often criticized as it cannot be said with certainty that the US rating is still AAA.

Damodaran's second model applies credit ratings to determine the default risk of a given country. In this model, the stock and bond market volatility data are also used. To simplify the calculations, Damodaran suggests to use the 1.5 coefficient as a proxy for the ratio of stock market volatility and bond market volatility. However, the use of this universal coefficient leads to biased risk premium results. This simplification leads to a phenomenon where the risk premium increases while the credit rating decreases. If this model is used, it is more efficient to follow the methodology developed by Mařík a Maříková (2014).This methodology applies a higher ratio of standard deviations of stock and bond returns calculated from the actual data of the Czech Republic instead of the universal coefficient of 1.5.

The CAPM (Capital Asset Pricing Model) uses the beta coefficient, the average annual return on a market stock portfolio and the average annual return on government bonds to calculate the risk premium. If this model is to be used, however, there must be a perfect market in which investors expect the same future developments. But it seems unrealistic in a given situation. The CAPM model relies on the necessary database which should contain information about the capital market of a particular country. The Czech Republic has a short history of the database.

In the CAPM model, the beta coefficient plays an important role in the calculation of the risk premium. This coefficient determines the level of risk relative to the market, but it only measures systematic risk. Given the fact that historical data are again used to calculate the beta coefficient, the resulting risk premium can only be considered indicative. To determine the risk premium for the Czech environment, the use of the capital market to estimate the risk premium and the beta coefficient should be considered.

Discussion

Damodaran's risk premium models (Damodaran, 2020) have often been under criticism by subject matter experts. Damodaran himself is often criticized for his pragmatism. Although Damodaran has set out several ways of calculating the risk premium, none of them is preferred by Damodaran himself. Also, his models are often criticized on the grounds that insufficient studies are available to confirm that more mature markets are more reliable than markets that are emerging gradually. At the same time, there is also lack of support for the claim that country-specific risk cannot be countered by diversification.

In general, the most commonly used approach for determining the risk premium is to use a rating from credit rating agencies. Although this credit rating is rather generalized. Credit rating agencies primarily use historical data provided by the governmental institutions to determine the risk premium. However, this data may not fully reflect the future of the Czech

markets. The Czech Republic is still considered to be an emerging country in the financial sector. Therefore, to determine the risk premium in the Czech Republic only based on historical data is considered inadequate. This is clearly supported by the fact that the Czech Republic was assigned a higher credit rating in 2019 than ever before. The Czech Republic is now in the Aa3 credit rating group along with countries such as Taiwan, Saudi Arabia, Chile and Hong Kong. Those are all countries with different living standards and therefore it is not possible to compare these countries with each other. In this context, it would be appropriate to extend the credit rating groups into sub-groups by the individual risk premium of the countries. This extension would make it obvious at a glance which countries in one credit rating group are more or less risky than other countries in the same group.

Damodaran often directly uses credit ratings in his models to calculate the risk premium or to calculate the country default risk, and thus again to calculate the risk premium. Of course, all of this information is based on historical data, so it is important to keep this in mind at all times as a fact that these are not perfect markets. The future value may not always be the same as the historical value. This statement can be verified in periods of financial crisis. It is not appropriate to use historical data to determine the risk premium of the Czech Republic as it is an emerging country with an emerging capital market. In his risk premium models, Damodaran often compares results with the US which is supposed to have the highest possible rating.

In order to determine the real risk premium in the Czech Republic, it is best to calculate the risk premium individually, and then compare the result to the credit rating. In this way, you can identify whether the real risk premium of the country corresponds to the credit rating and how it differs from other countries in the same credit rating group. For the Czech Republic, the use of data provided by the local capital market which is used both to estimate the risk premium and to determine the beta coefficient should be considered.

Damodaran's second model of discount rate adjustment for determining the risk of the Czech Republic appears to be the best solution. Currently, the Czech Republic is an emerging country in terms of the equity market. The data available on Damodaran's website can be used to calculate the risk premium using volatilities. This data is regularly updated and therefore the risk premium can always be calculated according to the current needs. For the Czech Republic, the most appropriate method how to determine the risk premium is to use Damodaran's method and his second method of discount rate adjustment using the calculation of volatilities.

Conclusion

The aim of this paper was to identify the most appropriate method for determining the risk premium in the Czech environment by comparing Damodaran's models and the credit rating assigned by credit rating agencies.

The methodology of the paper describes the most commonly used methods for determining the risk premium in the Czech environment. In the discussion of the results,

the different methods are then compared. The credit rating agencies are unable to respond immediately to changes in the emerging markets such as the current equity market in the Czech Republic. On the other hand, the CAPM model is slowly being abandoned because it uses the beta coefficient which is based on historical data. Therefore, the entire CAPM model is irrelevant as it is based on historical data and it is impossible to fully ensure that the results will be valid in the future.

To determine the risk premium using credit rating agencies appears to be the simplest way, but it may be the least specific. There are several countries in one credit rating group which may differ significantly in their risk levels. Here I would recommend to restructure the credit rating groups into sub-groups where the countries would be further differentiated from each other to make it obvious at a glance which country is more or less risky than the other countries in the same credit rating group. The last major disadvantage of credit ratings is that they are not up-to-date and they are unable to respond quickly to changes in the markets.

The most optimum method of calculation for the Czech Republic was the second method of the discount rate adjustment by Damodaran, which uses the volatility of the stock / equity and bond markets. In this model, however, Damodaran recommends to use a universal value of 1.5 to simplify the calculation.However, if this coefficient was used, it would lead to biased results as in all other models. Therefore, I recommend that data available at Damodaran's website is used for calculation using stock market volatility and bond market volatility or using calculations from the actual Czech data.

In conclusion, the stated aim of the work paper was fulfilled. The best methodology for calculating the risk premium is the adjustment of the discount rate according to Damodaran which can be used to determine the risk premium in the Czech Republic, or in specific markets of the Czech Republic.

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