PRACE NAUKOWE UNIWERSYTETU EKONOMICZNEGO WE WROCŁAWIU
RESEARCH PAPERS OF WROCŁAW UNIVERSITY OF ECONOMICS 2019, vol. 63, nr 7

ISSN 1899-3192
e-ISSN 2392-0041

Jacek Pera
Cracow University of Economics
e-mail: jacek.pera@uek.krakow.pl
ORCID: 0000-0002-2856-1323

DEFAULT AND EQUITY RISK PREMIUM IN THE CONDITIONS OF GLOBALIZATION AND THE INTERNATIONALISATION OF THE BIGGEST CAPITAL MARKETS OF THE EU AND GFCI COUNTRIES. *EX POST* IMPLIED EQUITY PREMIUM ANALYSIS

NIEWYPŁACALNOŚĆ A PREMIA ZA RYZYKO KAPITAŁOWE W WARUNKACH GLOBALIZACJI I INTERNACJONALIZACJI DZIAŁALNOŚCI NAJWIĘKSZYCH RYNKÓW KAPITAŁOWYCH KRAJÓW UE I GFCI. ANALIZA WYKONANIA *EX POST*

DOI: 10.15611/pn.2019.7.07
JEL Classification: B26, B27, E44, F65, G15

Summary: The purpose of the work is to examine the relationship between market risk premium and default. The research hypothesis assumes that the amount of the market risk premium significantly affects the level of the estimated probability of default of the company. The analysis was carried out using the example of the largest capital markets in the European Union and GFCI within the period from 1 January 2012 to 31 December 2018. Time series of the 20 most important stock market indices of non-financial companies representing all continents were applied in the empirical study. The largest non-financial companies, with regard to assets held as of 1 January 2012, listed on particular capital markets and included in the analyzed stock indices, one for each index, were included in the study. The following research methods were applied: the CAPM equilibrium model, Sharpe's market asset value ratio and the market value of the corporate equity. The empirical study used time series of the 20 most important stock market indices of non-financial companies representing the analyzed markets. As a result of the analysis, the following research conclusion was established: the final value of companies from the GFCI area does not prove any significant difference with regard to their value before considering the risk premium. In the case of the EU market, this difference is significant. This means that capital markets with weaker capital and poorer, less stable economic conditions are less able to face market risk.

Keywords: premium, market risk, liquidity, default, index.

Streszczenie: Celem artykułu jest zbadanie zależności między premią za ryzyko rynkowe a niewypłacalnością. Przyjęta hipoteza badawcza brzmi następująco: wysokość premii za ryzyko rynkowe wpływa zasadniczo na poziom oszacowanego prawdopodobieństwa niewypłacalności spółki. Analizę przeprowadzono na przykładzie największych rynków kapitałowych w UE oraz GFCI w okresie 1.01.2012-31.12.2017. W badaniu empirycznym wykorzystano szeregi czasowe 20 najważniejszych indeksów giełdowych spółek niefinansowych reprezentujących wszystkie kontynenty. Badaniem objęto największe pod względem posiadanych aktywów spółki niefinansowe w dniu 1.01.2012 r., notowane na poszczególnych rynkach kapitałowych i wchodzące w skład analizowanych indeksów giełdowych, po jednej dla każdego indeksu. Jako metody badawcze zastosowano: model równowagi rynku kapitałowego CAPM oraz rynkowy współczynnik wartości aktywów Sharpe'a i rynkową wartość kapitału własnego przedsiębiorstwa. W badaniu wykorzystano szeregi czasowe 20 najważniejszych indeksów giełdowych spółek niefinansowych reprezentujących analizowane rynki. Sformułowano wniosek badawczy: wartość finalna spółek z obszaru GFCI nie wykazuje istotnie różnicy w stosunku do ich wartości przed uwzględnieniem premii za ryzyko. W przypadku rynku UE różnica ta jest już znacząca. Wskazuje to, że rynki kapitałowe o słabszym kapitale i gorszych, mniej stabilnych warunkach gospodarowania gorzej radzą sobie z ryzykiem rynkowym.

Słowa kluczowe: premia, ryzyko rynkowe, płynność, niewypłacalność, indeks.

1. Introduction

Rapid price changes in international capital markets caused by the globalization of financial markets, financial crises, speculative attacks, fluctuation of interest rates, risk premium, and uncertainty due to unpredictable information or other macroeconomic factors, lead to the transfer of market risk to all market participants (investors, business entities and financial institutions in particular). This process is of particular importance when large and cyclical losses are observed in the markets. They are identified with extreme price changes and a threat to market participants (the losses caused may contribute to an increase or complete default). Therefore, this is a great challenge for today's international capital markets.

A factor partially mitigating the risk of losses is the amount of the set risk premium that may significantly reduce the size of these losses in practice and contribute to the overall improvement of the company's financial condition. The surplus of the nominal rate of return on investment in securities over the assumed rate of return on securities was considered to be a risk premium. According to Dobija (Dobija, 2006), "the risk premium is an economic constant and with a free, good market, it shapes fair economic values, wages, prices, profits and interest rates."

According to this author, "fair values could (...) be used for economic policy, a policy of social justice, and at the same time sustainable development." The Palgrave dictionary (Newman, 2004) states that risk premium is considered to be the difference between the expected (based on all available information) profit from the risk-bearing asset and the profit from the safe asset. In the subject literature, risk premium

also defines the surplus of the return on investment over the risk-free rate. Similarly, B. Cornell (Cornell, 1999) in the definition of this category stated that this term refers to the difference between the return on investment in ordinary securities and the return on investment in secure government securities. Risk premium was similarly specified by (Ibbotson & Sinquefield, 1976; Mehra & Prescott, 1985; Brealey & Myers, 1996; Siegel, 2002; Fama & French, 2002; Welch, 2000). Mishkin (2003) uses the concept of risk premium, which he defines as the spread between the interest rate of a particular security at risk of default and risk-free securities. Such a definition, although not always formulated explicitly, is often used in works on securities gains. A similar definition is provided by Duffee (1999) and Amato and Remolona (2003). Others, such as Collin-Dufresne (Collin-Dufresne, Goldstein, & Martin, 2001), do not directly define the term of risk premium, although they use such a definition in their calculations (Carr & Wu, 2016; Corte, Ramadorai, & Sarno, 2016; Du, Hu, & Zhao, 2016).

According to Krześniak (Krześniak, 2005) "it must be noted that the risk premium definitions are rather of an empirical nature. The *considered* subject is defined by the method of its measurement, and not by the economic interpretation of the concept. Such a definition often leads to the rash identification of the linguistic content of the concept with its economic meaning. The fact that despite the widespread use of the concept of risk premium still raises some doubts, confirms this thesis." Mishkin (Mishkin, 2003) states that (despite the name) this premium proves not only the issuer's default risk, but also its liquidity. Therefore, he suggests that it would be more precise to use the definition of risk premium and liquidity. Annaert and De Ceuster (Annaert & De Ceuster, 1999) also attempted to use a descriptive definition of risk premium in their study claiming that it should at least compensate investors for losses related to the risk of bankruptcy but - due to the risk aversion phenomenon – it must also take into account the premium, which is the remuneration for incurring the risk of loss exceeding the expected losses (Krześniak, 2005).

An additional premium allows undertakings to attract investors that are interested in a higher rate of return on investment and are willing to take a higher investment risk to achieve it. The correct valuation of the risk premium has now become necessary not only due to the increase in basic types of risk (currency, interest rate or even bankruptcy risk), but also due to the complexity of contemporary investment strategies which are a consequence of the ongoing globalization of international capital markets. These strategies often remain highly sensitive to relative changes of asset prices (and therefore also to changes in the risk premium). What is more, the literature suggests that the amount of risk premium in individual markets may be a certain indicator of the level of their development, expectations of market participants, as well as one of the economy's fluctuation indicators (Guha & Hiris, 2002). The identification of the factors determining the amount of the risk premium may allow investors to distinguish the change in the premium amount resulting from a change in the issuer's situation from the one that results from changes in the market situation. Analysis of the dynamics and structure of the risk premium is necessary to minimize

the risk of securities of a different structure. At the macroeconomic level, disaggregation of the risk premium may allow the early identification of negative market signs, and thus increase the chance to avoid negative processes (such as the formation of speculative bubbles or market panic). This mainly applies to entities with a significant portfolio of securities. It can also contribute to the earlier forecast of changes in the cycle of economy fluctuations (Krześniak, 2005).

As mentioned above, the risk premium is often defined as a market risk premium, e.g. as a surplus return on capital over the return on risk-free securities. The literature describes three main methods for determining this premium: on the basis of models using historical data (actually achieved returns), discounted cash flow models, and utility function based models. The empirical study in this thesis mainly uses the first of these approaches.

2. Methods

In order to examine the relationship between the market risk premium and default, 20 financial centers in the world were subject to the analysis. The empirical research used the time series of the 20 most important stock indices of non-financial companies representing all continents:

a) Latin America and the Caribbean – Brasilia: BOVESPA (Petrobras – PETR3/ PETR4).

b) North America − New York: DJIA (General Electric – GE), Chicago: CHX (Magellan Development Group – MDG), Toronto: CNQ (Imperial OIL-IO).

c) Australia and Oceania – Sydney: S&P/ASX 200 (The a2 Milk Company − A2M).

d) Asia and the Pacific − Singapore: STI (Singapore Technologies Engineering Ltd − S63.SI), Hong Kong: HIS (Tencent Holdings Limited − 0700.HK), Shanghai: SSE (China Shipbuilding Industry − CSI, Tokyo: NIKKEI 225 (Toyota Motor Company – TMC).

e) Middle East and Africa – Dubai: DFMGI (Emaar Development PJSC-ED − PJSC).

f) Europe (EU) – London: FTSE 100 (Vodafone Group – VG), Frankfurt: DAX (Volkswagen Group – VOW), Warsaw: WIG 20 (KGHM-KGHM), Paris: CAC 40 (Total – Total), Amsterdam: AEX (Royal Dutch Shell − RDSA), Tallinn: Eesti Telekom – ETLAT), Riga: TALSE (Baltika − BLT1T), Prague: PX (ČESKÝ TELECOM – CT), Budapest: BUX (MOL Group – MOL), Cyprus: CYSMMAPA (Cyprus Forest Industries − CFI).

The analysis included the largest non-financial companies with regard to the assets held as of 1 January 2012, listed on individual capital markets and included in the analyzed stock exchange indices, one for each index. The companies' period of operation on the market completely coinciding with the period assumed for analysis was the condition for the classification of the analyzed companies for the study. The

selection of the largest companies was made due to the fact that they are capital-intensive i.e. make numerous and large investments and therefore are exposed to a very high risk of losses and reduction of the value of their assets. In this particular case, the premium amount will be significant from the point of view of their liquidity and thus potential default. The necessary data used in the study come from databases such as: World Development Indicators (WDI), Global Development Finance (GDF) and from www.bloomberg.com and www.damodaran.com, as well as websites of individual stock exchanges.

For the European Union a more detailed analysis was carried out, applying the ten largest indices. The level of importance of the indices is based on the Global Financial Center Index (GFCI). The choice was guided by their importance on the financial markets. The data was synchronized in terms of time, while any missing data was interpolated using the moving average method for three preceding and following observations. For this purpose, daily observations were used from 1 January 2012 to 31 December 2018, which resulted in a total of L = 2,520 observations. An accounting year of 360 days was used for calculation. The selection of the research period was guided by the actual period of the last crisis in 2007-2008 and the effects of its impact immediately after its completion. Therefore, it was assumed that in the adopted period of research from 1 January 2012 to 31 December 2018, there was a relative stability and comparability of management conditions, which in turn was shown in the level of the risk premium for investors and the emergence of potential default in companies included in the individual indices.

The analysis assumes that based on the market value of a company included in a particular stock exchange index, the volatility of this value and the structure of the company's liabilities allow it to be considered in default if the value of its assets at time t is lower than the value of debt (D). In such a case, the company should declare its bankruptcy.

While estimating the relationship between the market risk premium and default, a proprietary, unified approach was used, based on models presented in the literature (Crosbie & Bohn, 2003; Berg & Kaserer, 2008; Wójcicka, 2008; Feunou Jahan-Parvar, & Okou, 2018; Berardi & Plazzi, 2018). However, it should be remembered that the market risk premium is today calculated on the basis of various methods and models − this means that it affects the solvency level of a given listed company differently. Logarithmic rates of return were used in the study (1):

$$rt = 100\%*(\ln(Pt) - (\ln Pt - 1). \quad (1)$$

Market risk was assessed by estimating the neutral risk (R_n) and the real probability of default (PD), in which the difference between the neutral risk value and the probability of default is determined by the dynamics of change in the value of assets − the ratio of the value of Sharpe's assets in particular. Taking this into account and having the asset correlation coefficient, the market-based Sharpe's ratio was estimated – MBS (2).

$$MBS = \frac{\mu - r}{\sigma} = \frac{\Phi^{-1}\left(R_N(t,T)\right) - \Phi^{-1}\left(PD,(t,T)\right)}{\sqrt{T-t}}, \quad (2)$$

where: m − average rate of return on the company's assets, s − variation of the rate of return on the assets of a company, r − risk-free interest rate.

The market value of the company's equity (E) is calculated based on the following formula (3):

$$E = AN(d_1) - De^{r,T}\,N(d_2), \quad (3)$$

where: A – value of company's assets, D – nominal value of debt, T – maturity time, $N(d_1)$, $N(d_2)$ − value of the cumulative distribution of a standardized normal distribution.

To estimate the average value of the return on assets m (that essentially affects the level of the estimated probability of default), a Capital Assets Pricing Model was used (4) CAPM:

$$CAPM = \frac{\Phi^{-1}\left(R_N(t,T)\right) - \Phi^{-1}\left(PD,(t,T)\right)}{\sqrt{T-t}}\ \frac{1}{P_{E,M}}, \quad (4)$$

where: $P_{E,M}$ – market portfolio, F − random variable having the distribution of $N(0,1)$, T – maturity time, t – assets value at t, R_n – neutral risk, PD – probability of default.

The assets market value and its variability was calculated based on the following formula (5):

$$\sigma_E\, E = N(d_1)\,\sigma_A\, A, \quad (5)$$

where: σ_E − variability of equity.

The value of all short-term liabilities (not exceeding one year) plus half of the book value of the long-term debt to be serviced was used as a point of default (A).

The following assumptions were used for calculations:

- estimates were made without dividing into different types of shares,
- risk-free rate of return in the following years was calculated as the average monthly profitability of government treasury securities representing each of the examined financial centers,
- values of β coefficients necessary in the CAPM model were estimated on the basis of prediction equations where the role of the explanatory variable is played by the monthly rate of return from a particular index, while the explained variables by the monthly profitability of shares of each analyzed entity.

3. Results and discussion

Table 1 and Figure 1 present the results of estimated *PD* including the estimated value of μ and using the risk-free rate (r) and Sharpe's index calculated on this basis. Based on the results (the summary and final results are presented in Table 1), it may be assumed that the same values of probabilities of default estimated with the μ parameter and the risk-free rate (r) are significantly different in companies. Therefore the values of the market risk premium estimated with (2) for individual companies assume different values. The market value of companies after consideration of the risk premium is similarly different. As a result, the final value of the GFCI companies does not significantly differ from their value before the risk premium. For the EU

Table 1. Average PD values for 20 non-financial companies from the GFCI and EU area and their market value before and after risk premium

Companies	PDμ	PDr	MBS	Market value* - MBS (1)	Market value* + MBS (2)	Change direction
0700.HK	(+) 0.019085	(+) 0.027643	(+) 0.55	1.96	2.51	–
A2M	(+) 0.035057	(+) 0.011754	(+) 0.47	2.03	2.50	–
BLT1T	(–) 0.000005	(–) 0.002356	(–) 0.41	0.67	0.26	–
CFI	(–) 0.001732	(–) 0.054351	(–) 0.33	0.45	0.12	–
CSI	(+) 0.000511	(+) 0.008610	(+) 0.46	1.99	2.45	–
CT	(–) 0.000601	(–) 0.000323	(–) 0.14	0.76	0.62	–
ETLAT	(–) 0.001441	(–) 0.043121	(–) 0.31	0.56	0.25	–
GE	(+) 0.001712	(+) 0.003622	(+) 0.35	1.89	2.24	–
KGHM	(–) 0.000029	(–) 0,011314	(–) 0.25	0.83	0.58	–
NDG	(+) 0.012921	(+) 0.084341	(+) 0.30	2.09	2.39	–
MOL	(–) 0.002970	(–) 0.031111	(–) 0.42	0.88	0.46	–
OIL-IO	(+) 0.011591	(+) 0.015143	(+) 0.29	2.32	2.61	–
PETR3/PETR4	(+) 0.014072	(+) 0.015144	(+) 0.33	2.45	2.78	–
PJSC	(+) 0.050572	(+) 0.011821	(+) 0.20	2.12	2.32	–
RDSA	(–) 0.001372	(–) 0.000011	(–) 0.21	0.49	0.28	–
S63.SI	(+) 0.005434	(+) 0.031342	(+) 0.28	2.45	2.73	–
TMC	(+) 0.001033	(+) 0.003040	(+) 0.15	2.53	2.68	–
Total	(–) 0.000451	(–) 0.000819	(–) 0.12	0.98	0.86	–
VG	(–) 0.002227	(–) 0.000215	(–) 0.10	0.34	0.24	–
VOW	(–) 0.000123	(–) 0.003222	(–) 0.09	0.59	0.50	–

* Price/book value.

Source: author's elaboration.

market, this difference is significant. This means that capital markets having weaker capital and worse, less stable economic conditions, are more at market risk. It should be noted that in both cases, i.e. companies from the GFCI and EU, there was a downward trend in the value of the assets of individual companies. The largest decreases were reported by the following companies: E − LAT, BLT1T and CFI − on average 15-20% of their market value. The range of decreases for: CT, KGHM, MOL, RDSA, Total, VG and VOM was at an acceptable level of 5-10% of their market value. For the companies from the GFCI area, all analysed companies: 0700. HK, A2M, CSI, GE, NDG, NDG, OIL-IO, PETR3/PETR4, PJSC, S63.SI and TMC, recorded decreases that did not exceed 5% of their market value. After application of the risk premium, capital-intensive companies and companies from the GFCI area are widely recognized, as well as companies from the EU area, must significantly adjust their market values, which also significantly impairs their liquidity. The conducted research also proves that in the case of the size of the market risk premium, the capital value of the company plays a significant role. This is important as companies with strong and stable capital are more able to face the estimated (sufficiently or insufficiently) size of the market risk premium than companies whose capital is less stable or small.

Future research on risk premium and its correlation with default should be made in three basic areas:

A. Analysis of the behavior of estimated values in other industries and sectors of economies and an attempt to introduce other coefficients correcting PD values.

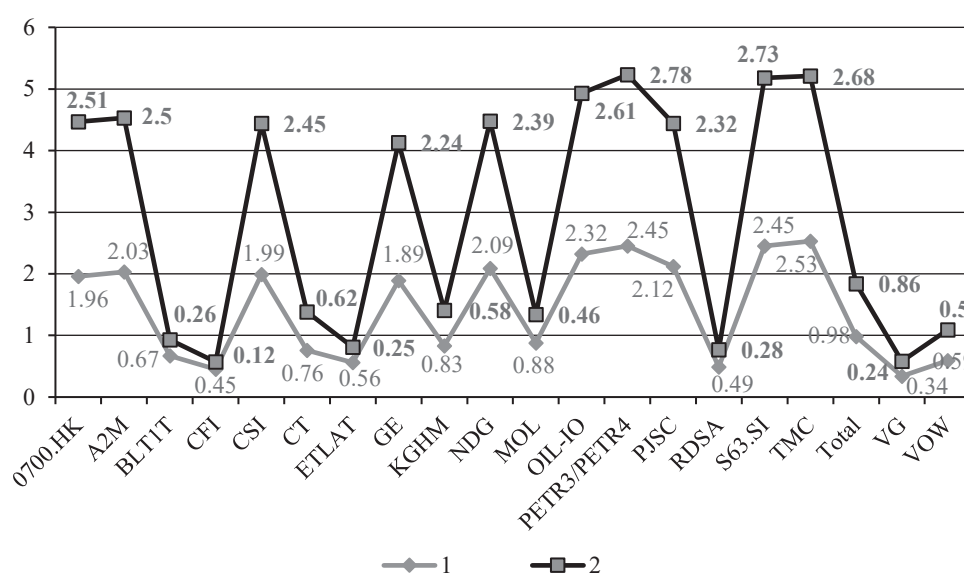

Fig. 1. Market value for (–) MBS and (+) MBS

Source: author's elaboration.

B. Amount/value of premium − research should be carried out in order to confirm unequivocally that the risk premium values in the past properly reflect and forecast its future values. Currently, no such research has been carried out, and the researchers' forecasts regarding the future value of the risk premium are significantly different.

C. The issue of default − in recent years research on linking the risk premium with the probability of default has been significantly extended. However, researchers still do not agree on how to measure this relationship. In the case of the capital market, the risk premium increases with the deterioration of the quality of the security and the increase in the associated risk. It is therefore necessary to undertake further research in this area in order to establish comparable and uniform measurement methods.

4. Conclusion

This paper is an output of the science project: "Market risk premium and default in the conditions of globalization of the main capital markets of the EU and GFCI countries". The research carried out fully confirms the assumed research hypothesis stating that the amount of the market risk premium significantly influences the level of the estimated probability of the company's default. A poorly estimated amount of the market risk premium may lead the company to significant problems related to its liquidity and even contribute to its default. It should be remembered, however, that this hypothesis has been proved on the basis of an original, unified approach, which is not necessarily commonly used on the stock market. The market risk premium is calculated today on the basis of various methods and models. This means that it differently affects the solvency of a particular listed company, which makes it very difficult to assess the liquidity of a given listed company and thus its market value.

There are no doubt about the relationship between the amount of the market risk premium and the company's default issue. This relation affects the value of assets held by both a large, capital-intensive company, as well as a weaker company with a lower level of assets. It is obvious that the assumed market risk premium is of greater importance for small companies than for large companies. In the case of the former, this may significantly affect the level of their liquidity and therefore lead to their default. In the case of large, capital-intensive companies, there is rather an issue of the "depletion" of the assets held by it in the event of an improperly set market risk premium. However, in extreme cases − contrary to small companies − the risk of default may be considered. Therefore it is important that on a global scale, parameter-based methods and means are adopted to allow for safe determination of the market risk premium, adequate to the changing macroeconomic environment of the company. Such methods will also ensure the relative investment security for both companies and potential third stakeholders.

Bibliography

Amato, J. D., & Remolona, E. M. (2003). The credit spread puzzle, *BIS Quarterly Review*, 51-63.

Annaert, J., & De Ceuster, M. J. K. (1999). Modelling European Credit Spreads, Research Report, Antwerpen: Universiteit Antwerpen – UFSIA.

Berardi, A., & Plazzi, A. (2018). Inflation risk premia, yield volatility, and macro factors, *Journal of Financial Econometrics,* 5-10.

Berg, T., & Kaserer, C. (2008). *Linking credit risk premia to the equity premium* (Working Paper no. 01). Munchen: Technische Universitat.

Brealey, R. A., & Myers, S. C., (1996). *Principles of Corporate Finance*, 5th Edition, New York: The McGraw-Hill Companies.

Du, D., Hu, O., & Zhao, X., (2016). Currency risk premium and U.S. macroeconomic announcement, *The Journal of Financial Research*, *39*, 335-340.

Carr, P., & Wu, L. (2016). Analyzing volatility risk and risk premium in option contracts: A new theory, *Journal of Financial Economics*, *120*, 5-10.

Collin-Dufresne, P., Goldstein, R. S., & Martin, J. S. (2001). The Determinants of Credit Spread Changes, *Journal of Finance*, *56*, 2177-2207.

Cornell, B. (1999). *The equity risk premium. The long-run future of the stock market*, New York: John Wiley & Sons.

Corte, P. D., Ramadorai, T., & Sarno, L., (2016). Volatility risk premia and exchange rate predictability, *Journal of Financial Economics*, *120*, 25-30.

Crosbie, P., & Bohn J. (2003). *Modeling default risk – modeling methodology*. Moody's KMV Company.

Dobija, M. (2006). Wartość godziwa jako kryterium prawdy w teorii ekonomicznej. In *Dążenie do prawdy w naukach ekonomicznych*, Kraków: Akademia Ekonomiczna w Krakowie.

Duffee, G. R. (1999). Estimating the price of default risk. *Review of Financial Studies*, *12*, 197-226.

Fama, E. F., & French K. R. (2002). The Equity Risk Premium. *The Journal of Finance*, *57*, 2, 637.

Feunou, B., Jahan-Parvar, M. R., & Okou, C. (2018). Downside Variance Risk Premium. *Journal of Financial Econometrics*, *16*, 345-347.

Guha, D., & Hiris, L. (2002). The aggregate credit spread and the business cycle. *International Review of Financial Analysis*, *11*, 219-227.

Hull, J. C. (2014). *Options, futures and other derivatives*. New Jersey: Prentice Hall, Upper Saddle River.

Ibbotson, R. G., & Sinquefield R. A. (1976). Stocks, bonds, bills and inflation: Year-by-year historical returns (1926-1974), *Journal of Business*, *49*, 1, 11.

Krześniak, A. (2005). Dekompozycja premii za ryzyko na rynku pozaskarbowych instrumentów dłużnych na przykładzie polskiego rynku obligacji korporacyjnych, *Materiały i Studia NBP*, 197, 6-8.

Mehra, R., & Prescott E. (1985). The Equity Premium: A Puzzle, *Journal of Monetary Economics*, *15*, 2, 145.

Mishkin, F. S. (2003). The Economics of Money. *Banking and Financial Markets*, 6,

Newman, P. (2004). *The New Palgrave Dictionary of economics and the law (vol. 1-3)*. Palgrave Macmillan.

Siegel, J. (2002). *Stocks For The Long Run. The Definitive Guide to Financial Market Returns and Long-Term Investment Strategies* (3rd edition). New York: McGraw-Hill.

Welch, I. (2000). Views of Financial Economists on the Equity Premium and on Professional Controversies, *Journal of Business*, *73*, 4, 501.

Wójcicka, A. (2008). Szacowanie premii za ryzyko rynkowe za pomocą modeli oceny ryzyka kredytowego w warunkach polskiej gospodarki. *Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania w Szczecinie*, 10.