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FAMILIARITY BIAS INVESTIGATION IN PORTFOLIO CREATION

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Abstract. The prevailing opinion exists that investors include to their portfolio what they know or what is located around them. Investment decision, which is impacted by familiarity bias, avoid including international companies to portfolio which might lead to lower performance compared to portfolio which has both, local and international, stocks in a portfolio. The aim of this study is to analyse the impact of familiarity bias on investment decision, to form portfolios from the stocks listed on the Nasdaq Baltic stock exchange and compare their performance to global portfolios, which are formed from the stocks listed on the New York Stock Exchange. Investment portfolios were built using mean variance (MV) and Black–Litterman (BL) models. The analysis revealed that the returns of the portfolios built on the Nasdaq Baltic exchange are higher than the returns of the global portfolios. Additionally, the volatility of returns is lower for Nasdaq Baltic portfolios. When selected markets have different growth rates, investment decisions based on familiarity bias can achieve better results.

Keywords: Behavioural finance, Investment portfolio, familiar decisions, portfolio optimisation, Baltic market, food sector.

JEL Classification: G11, G41.

Introduction

Behavioural Finance theory questions traditional theory idea that investors are rational, and their investment decisions are based on analysis, research, etc., it says opposite, that investors are imperfectly rational, and their investment decisions are impacted by psychological factors: overconfidence, familiarity, home bias, etc. In this paper, we will investigate familiarity bias in two different markets: Baltic stock exchange, which is still considered an emerging market, and Nasdaq stock exchange, which is considered a developed market.

The authors of the analysis state that avoiding including international companies in investment portfolios increases portfolio risk and decreases the level of diversification, which might lead to low investment performance (Liu et al., 2018; Dong et al., 2021).

The aim of this study is to investigate the impact of familiarity bias on investment decision and how familiarity biases impact portfolio results by forming investment portfolios in two different markets. To achieve this goal, the following objectives have been completed:

1. Reviewed previous studies in this area.
2. Presented methodology.
3. Formed 12 portfolios in the New York Stock Exchange (NYSE) and Nasdaq Baltic Stock Exchanges.
4. Evaluated portfolio performance.
5. Concluded the results and presented findings.

In Section 1, previous studies will be reviewed in the field of Behavioural Finance Theory and its relation to this study. In addition, familiarity bias will be analysed and how it influences investment decision.

Section 2 describes the portfolio creation methodology used in this paper. Section 3 determines how the research was organized. Also, the performance and results of the created portfolios are. In Section 4, conclusions and findings of the study presented.

Limitation of the study. Although the study was completed on two stock exchanges which are in different stages of development, only one sector, food and beverages, was analysed. Second, the study has lasted only two years.

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1. Literature overview of Behavioural finance theory and influence on decision making

Prior Behavioural Finance Theory, the prevailing assumption was that investor is rational and investment decision is made based strictly on rules and empirical analysis. Traditional financial theory says that investors are rational and make their decision based on fundamental results of the companies (Muhammad, 2009).

But Behavioural Finance Theory presents a different view to the investment decision making. Theory analyses psychological factors and the impact of those factors on investor's investment decision making (Peša & Brajković, 2016; Muradoglu & Harvey, 2012; Psuturi, 2021). However, if all investors would be rational, there hadn't been completed so much research in the field.

Previously completed studies confirm assumptions of Behaviour finance theory and agree that sociological and psychological factors have an impact on individual investor decision making. A stereotypical investor is a simple man who does not have all the information about stocks and is influenced by his emotions and makes an irrational investment decision (Psuturi, 2021).

Human, as smart and intelligent species, over the years developed a lot of habits, which assist him to make a decision. However, there is a study done by Ackert et al. (2003), which says habits can lead humans to make incorrect decisions. Investors make irrational investment decisions.

The theory says that the investor acts irrationally and that his decision is influenced by cognitive and behavioural heuristics. Kilka and Weber (2000), analyse optimism bias in their paper. Individual investors overestimate the performance of local stocks and think that local stocks are less risky.

The more research is completed in this field, the more unknown psychological factors can be revealed and understood. If these factors are known by investors, it can lead to avoid making mistakes and become more resilient to these factors and achieve better results in the investment process (Lekovic, 2019).

Familiarity bias will be analysed deeper in the field of investment decision making in the following section.

Riff and Yagil (2016) describe familiarity as investors' feelings about how well they know stocks. Other (Baker & Nofsinger, 2002; Grullon et al., 2004; Huberman, 2001; Speidell, 2009) authors describe familiarity as investment in the stocks which are familiar to investors.

According to the studies which were completed by Ahearne et al. (2004), Bae et al. (2008), an individual investor has more information about the local market compared to foreign, which leading investor invests more in the local market, because of his confidence level, which increases as he can easier access information. However, the familiarity bias is very closely related to other bias. One of them is overconfidence. Barber and Odean (2001) talk about overconfidence bias, which confirms that if an individual investor has a choice, he will invest in the stock he knows better because he believes that he has more information and that information is accurate and reliable.

Uslu Divanoglu and Bagci (2018) determined three groups of factors that affect individual investor behaviour: personal factors, financial factors, and environmental factors. To the environment group, they added such factors as socio-cultural environment, close environment, friends, hobby, and other close surroundings of investor.

Asymmetric information, leading to familiar local market investment (Van Nieuwerburgh & Veldkamp, 2009). Due to language barrier, tax, and higher cost prevents from investing in the foreign markets. Although some of the analysed authors claim that higher cost of investing in foreign markets does not have any significant impact (Mann & Meade, 2003; Domowitz et al., 2001) However, there is an existing phenomenon, having in mind globalization process and equal information accessibility, investor chooses to invest in local market.

Fidora et al. (2007) talk about exchange rates volatility and investment in domestic market strong positive correlation. Moreover, other authors (Solnik et al., 1996) say that there exists a high correlation between return in different markets, which can influence individual invest in local market.

Familiarity behavior is more common among less educated investors (Grinblatt & Keloharju, 2001). Less educated investors usually have less knowledge about investment process, portfolio diversification. Moreover, they do not know a foreign language, which limits their ability to search and collect information in foreign languages.

Riff and Yagil (2016) confirm in their analysis that investors are more willing to take higher risk with familiar stocks than with unfamiliar ones. According to their research, 65% of the assets of investors go to risk-free assets and only 35% go to risky assets when the investor is familiar with the investment. When investors are not familiar with the investment asset, then they divided their investment accordingly: 69% in risk-free assets and 31% in risky assets.

However, there is not much research done in the emerging market and analysis of whether the investor's decision is impacted by familiarity bias.

2. Methodology

The authors who were analysed in the previous sections confirmed the prevailing opinion in society that investors tend to invest in the stocks they consider familiar.

In this study, eight portfolios will be formed and analysed.

Four portfolios will be formed from the stocks which are considered to be brand/name familiar to investor from the drink and food industry which are listed on the New York Stock Exchange and represent Global portfolios. The other four portfolios will be formed from the

stocks listed on the Baltic stock exchange and represent Baltic portfolios.

Analysing portfolios which are formed taking into consideration familiarity bias can help answer questions such as "Does familiarity help achieve better results? Does the local familiarity bias have an advantage versus global familiarity? Does familiar portfolio results be acceptable?"

For portfolio formation in the Baltic Stock Exchange, all companies representing food and beverages sectors were chosen.

In the OMX Baltic Consumer Discretionary GI index, all food and beverage companies are included, except one, AS Linda Nektar, which is not included in the index due to low liquidity. In this index are included all food and beverage companies which are listed in the Baltic stock exchange: AUGA group (AUG1L), Latvijas balzams (BAL1R), Linas Agro Group (LNA1L), PR-Foods (PRF1T), Pieno zvaigzdes (PZV1L), Rokiskio suris (RSU1L), Siguldas CMAS(SCM1R), Vilkyskiu pienine (VLP1L), Zemaitijos pienas (ZMP1L).

For global portfolio formation, companies listed on the New York Stock Exchange (NYSE) were chosen. To mirror the selection made on the Baltic stock exchange, the stocks of food and beverage sector companies were chosen: Walmart Inc. (WMT), J & J Snack Foods Corp. (JJSF), Lancaster Colony Corporation (LANC), Tyson Foods, Inc. (TSN), Mondelez International, Inc. (MDLZ), Diageo plc (DEO), Brown-Forman Corporation (BF-B), The Boston Beer Company, Inc. (SAM), Willamette Valley Vineyards, Inc. (WVVI).

Portfolio formation. The portfolio of equal weights was formed as a benchmark for comparison. The next two portfolios were created with portfolio optimization methods:

1) Black-Litterman potfolio (Black & Litterman, 1990).

The Eq. (1) for the new Combined Return Vector is:

$$E(R) = ((T\Sigma)^{-1} + P'\Omega^{-1}P)^{-1}((T\Sigma)^{-1}\pi + P'\Omega^{-1}Q, \quad (1)$$

where: $E(R)$ – the new (posterior) Combined Return Vector ($N \times 1$ column vector); T – a scalar; Σ – the covariance matrix of excess returns ($N \times N$ matrix); P – a matrix that identifies the assets involved in the views ($K \times N$ matrix or $1 \times N$ row vector in the special case of 1 view); Ω – a diagonal covariance matrix of error terms from the expressed views representing the uncertainty in each view ($K \times K$ matrix); Π – is the Implied Equilibrium Return Vector ($N \times 1$ column vector); Q – the View Vector (Izodorek, 2007).

Black-Litterman portfolio methods requires the following:

– Equilibrium return.
– Estimated assets return.

Black-Litterman methods does not require input of expected return. Usually, this is unknown by investor when he makes investment decision or forms portfolio.

This model builds up equilibrium equations by enabling a covariance matrix and asset returns in a portfolio optimisation. Then the prices of the stocks are compared to the index chosen by the investor. In this study, we choose Dow Jones Industrial (DJIA) index, which present market changes in all industries. Idzorek (2007) in his work provided detailed explanation, a step-by-step guide how Black-Litterman model works.

2) Mean variance (Markowitz, 1991).

Mean variance portfolio method requires the following:

– A covariance matrix.
– Mean of historical asset returns.

Expected return:

$$E(R_p) = \sum_i w_i E(R_i), \quad (2)$$

where: R_p – return on the portfolio; R_i – return on asset; W_i – weighting of component asset.

Portfolio return variance:

$$\sigma_p^2 = \sum w_i^2 \sigma_i^2 + \sum_i \sum_{j \neq i} w_i w_j \sigma_i \sigma_j p_{ij}, \quad (3)$$

where: σ_i – standard devation of the periodic returns on an asset; p_{ij} – correlation coefficient between the return on assets.

For a two-asset portfolio:

Portfolio return:

$$E(R_p) = w_A E(R_A) + W_B E(i_{R_B}) = w_A E(R_A) + (1 - w_A) E(R_B). \quad (4)$$

Portfolio variance:

$$\sigma_p^2 = W_A^{\alpha} \sigma_A^2 + W_B^2 \sigma_B^2 + 2 W_A W_B \sigma_A \sigma_B p_{AB}. \quad (5)$$

In order to calculate the above, 5 years of monthly historical data was used in this study. Stock price data was extracted from the Yahoo finance website (Yahoo Finance, 2022) for New York Stock Exchange (NYSE) stocks and from the Nasdaq Baltic Stock Exchange website for Baltic stock prices (Nasdaq Baltic Stock Exchange, 2022).

MATLAB Code 2 was used (20–22 January, 2022) to create portfolios with Mean Variance and Black-Litterman methods. Code assisted in receiving visual view of the portfolios and stocks included in the portfolios.

Testing and valuation of portfolios. Portfolios were created at the beginning of 2020 and 2021 on the first workday of the Stock Exchanges. Portfolios' evaluation was performed twice: in 2020 and 2021.

The below are described ratios which were chosen for investment portfolios performances valuation:

1. Return on investment. This is used to evaluate efficiency and compare profitability between different portfolios. The ratio is calculated based in the formula below:

$$\frac{CIR - CI}{CI}, \quad (6)$$

where: CIR – Current Value of Investment; CI – Cost of Investment.

2. Standard deviation. It determines the spread of the price of the stocks from their average price. The higher the standard deviation, the higher the volatility of the price, meaning a higher risk of investment. The ratio is calculated on the basis of the Equation (7) below:

$$\sqrt{\frac{\sum_{i=1}^{n}\left(x_i-\overline{x}\right)^2}{n-1}}, \quad (7)$$

where: x_i – Value of the ith point in the data set; $\overline{x}$ – The mean value of the date set; n – The number of data points in the date set.

3. Sharp ratio. It helps the investor to understand the return of an investment compared to its risk. The ratio is the average return earned more than the risk-free rate per unit of volatility. The ratio is calculated on the basis, see Eq. (8):

$$w\frac{R_p-R_f}{\sigma_P}n, \quad (8)$$

where: R_p – return of portfolio; R_f – risk-free rate; σ_p – standard deviation of the portfolio's excess return.

A comparison of investment results with the DJI index and with the Nasdaq Baltic index changes in the same period of time also adds value to the study.

3. Research

Familiarity bias refers to the fact that an individual investor tends to invest in familiar stocks. The more the investor invests, the higher the possibility that his actions will become repetitive or routine which increases the possibility of mistakes, as it is said in the Behavioural Finance Theory.

The following analysis will reveal whether individual investor choice invest in familiar stocks is efficient.

Creation of portfolios. To analyse any differences in familiar portfolios and global portfolios, eight portfolios were created. To create these portfolios, 2 portfolio formation methods were used: Black-Litterman and Mean Variance. Four portfolios were created from the global stocks and the other four were created from the stocks listed in Baltic Stock exchange. Furthermore, to analyse the time impact, not only access portfolio efficiency, portfolios were also created at different time – four at the beginning of 2020 and four at the beginning of 2021. Additionally, four portfolios were created, two at the beginning of 2020 and at the beginning of 2021 with equal asset allocation.

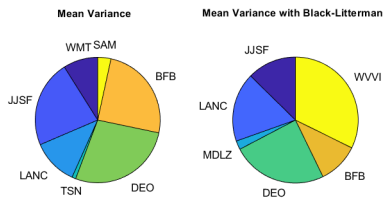

Figure 1. Global portfolio 2020 (source: created by authors)

Portfolios. Figure 1 presents two global portfolios, which were created at the beginning of 2020. These portfolios were formed from global stocks, which data were extracted from Yahoo Finance web page. In the first portfolio (Mean Variance) were included

The Boston Beer Company, Inc. (SAM), Walmart Inc. (WMT), J & J Snack Foods Corp. (JJSF), Lancaster Colony Corporation (LANC), Tyson Foods, Inc. (TSN), Diageo plc (DEO), Brown-Forman Corporation (BF-B). The largest portion of the asset was allocated to three companies: JJSF, DEO, and BFB. The second portfolio represents the Black-Litterman portfolio creation methods. From this portfolio were excluded TSN and SAM stocks and included one additional: MDLZ.

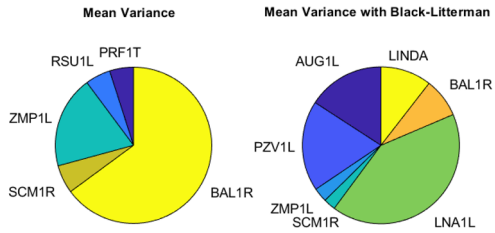

Figure 2. Baltic portfolio 2020 (source: created by authors)

Figure 2 presents two portfolios formed from the stock listed on Nasdaq Baltic stock exchange. In this portfolio which was formed using Mean Variance methods, were included Latvijas balzams (BAL1R), Siguldas CMAS (SCM1R), Zemaitijos pienas (ZMP1L), Rokiskio suris (RSU1L), PRFoods (PRF1T). Portfolios which were formed using Black-Litterman method have higher diversification level. To this portfolio are included AS Linda Nektar (LINDA), Latvijas balzams (BAL1R), Linas Agro Group (LNA1L), CMAS (SCM1R), Zemaitijos pienas (ZMP1L), Pieno zvaigzdes (PZV1L), Auga Group (AUG1L). Also, it is clearly seen that portfolio, which is created using Mean Variance, allocates 65% asset to only one stock, BAL1R – takes dominant position, meaning that risk is increased, and diversification lowered. Portfolio, which was created using the Black-Litterman method, also has dominant investment, Linas Agro Group, however, the asset invested in this stock is less than 50%.

To compare Global portfolio (Figure 1) and Baltic portfolio (Figure 2) created in 2020, we see that Global portfolio has higher diversification level. This hypothesis was also confirmed by other authors.

Figure 3 presents Global portfolio which was created at the beginning of 2021. Portfolio created using

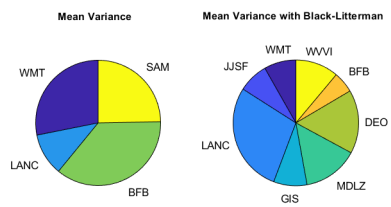

Figure 3. Global portfolio 2021 (source: created by authors)

Mean variance allocates asset only to four stocks: WMT, LANC, SAM, and BFB, almost in equal portions. A lower number of stocks in the formed portfolio resulted in a lower diversification level. If we compare portfolios created with different methods, we also see that the higher diversification level has a portfolio that was formed with the Black-Litterman method. From the portfolio created in 2020, which was formed with Mean Variance method, JJSF, TSN, DEO were excluded and investment amount to SAM stocks significantly increased, the other stocks position grew as well.

The opposite happened with the Black-Litterman portfolio: to the portfolio were added new stocks General Mills, Inc. (GIS). Willamette Valley Vineyards, Inc. The (WVVI) position was weakened, as in 2020 this stock was dominant, but in 2021 fell to the fourth position in asset allocation. The similar happened with Diageo plc. (DEO), asset, invested in DEO, decrease, but stock remained in the second position of asset allocation. All of these changes resulted in a higher level of diversification of this portfolio, which should lead to higher risk and higher return. This will be examined in the *Valuation of portfolio section.*

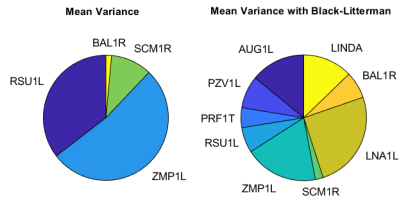

Figure 4. Baltic portfolio 2021 (source: created by authors)

Figure 4 represents the portfolio which was formed at the beginning of 2021. Investment was allocated only to four stocks – Rokiskio suris (RSU1L), Latvijas balzams (BAL1R), Siguldas CMAS (SCM1R), Zemaitijos pienas (ZMP1L). RSU1L and ZMP1L significantly increase their position compared to the 2020 position, especially ZMP1L which become the dominant stock in the portfolio, accordingly to 50% and 35%.

The portfolio that was created using Black-Litterman acted differently, and the number of stocks increased and the position of the stocks in the portfolio, from the perspective of asset allocation, decreased. Compared to the 2020 portfolio 2, new stocks were added: PRFoods (PRF1T), Rokiskio suris (RSU1L), but their position in asset allocation is weak. The dominant stocks remained the same: LNA1L, LINDA, AUG1L. Furthermore, ZMP1L grew its position and took one of the dominant stock positions in the portfolio.

Comparing Mean Variance and Black-Litterman methodology in different markets, taking into consideration time, acts in the same way:

1. Mean Variance – number of stocks in the portfolio decreased and asset is allocated only to four stocks, meaning diversification level decrease.
2. Black-Litterman – number of stocks in the portfolio increases and asset is allocated almost in equal proportion except for couple exceptions.

Valuation of portfolios. Table 1 presents 12 portfolios performances and DJI and in each year.

1 Table. Profitability of portfolios (source: created by authors)

Year	DJI	Global		
		EW	MV	MVBL
2020	6.11%	14.53%	8%	–1.40%
2021	21.43%	6.09%	–17.37%	11.84%
		Nasdaq Baltic		
2020	6.11%	10.81%	–11.24%	16.86%
2021	21.43%	20.14%	4.27%	21.83%

Equal weight portfolios were profitable in each analysed year. Both portfolios, global and Nasdaq Baltic, overperformed Dow Jones index (DJI) in 2020, however, performance in 2021 was not such successful, Global portfolio underperformed Dow Jones index by more than 15%, but Nasdaq Baltic portfolio underperformed only slightly over 1%. If we compare Nasdaq Baltic portfolios to OMX Baltic Consumer Staples GI index, we will see that portfolio profitability is almost equal to index result, the difference is only 0,01% for portfolios created with Black-Litterman methods. However, portfolio created with Mean-Variance method underperformed index result by more than 15%.

Table 2. Risk and Sharpe ratios of portfolios (source: created by authors)

Risk			
Year	Global		
	EW	MV	MVBL
2020	17.26	10.77	7.6
2021	48.21	14.74	9.17
	Nasdaq Baltic		
2020	0.24	0.60	0.18
2021	0.15	0.10	0.12
Sharpe ratio			
Year	Global		
	EW	MV	MVBL
2020	0.008	0.01	–0.003
2021	0.001	–0.012	0.012
	Nasdaq Baltic		
2020	0.416	–0.203	0.881
2021	1.276	0.327	1.736

In Table 2, a risk assessment and the investment are presented compared to its risk. All Nasdaq Baltics portfolios are riskier in 2020, which is not true for Global portfolios. However, all Nasdaq Baltics portfolios have very low risk. The results show that Global portfolios are riskier than Nasdaq Baltic portfolios. The riskiest

portfolio is Global portfolio created in 2021 with Equal weights (EW), the risk is 48.21. The highest return compared to risk generated Nasdaq Baltics portfolios. The best performance is indicated for the portfolio created with Black-Litterman methods in 2021 (MVBL). Even though the standard deviation of the Equal Weights (EW) portfolio was the highest, the portfolio result was high, but not the highest, which means that the accepted risk did not generate the required results.

Conclusions

This paper analysed the familiar bias effect for investment decision making. The analysed previous research showed that familiar bias is important when investor makes investment decision. When the investment decision is impacted by familiar bias, it might cause repetitive failures.

For portfolio creation, two methods were chosen: Mean Variance and Black-Litterman to evaluate whether portfolio profitability is by accident or not.

The analysis revealed that portfolio which were created at the beginning of 2021 had a higher diversification level, which resulted in better performance. In both markets created in the 2021, showed better results: of six created portfolios only one had negative profitability, created with Mean Variance method. However, even though other portfolio profitability was between 4.27% and 21.83%, only the portfolio created on the Nasdaq Baltic stock exchange at the beginning of 2021 outperformed the DJI index by 0.40%.

The analysis carried out in the paper showed that investors who chose to invest in the Baltic Stock Exchange achieved better results compared to global portfolios. The better performance of investment portfolios created in the Baltic market is impacted by the faster speed of the Baltic Stock Exchange compared to the growing speed of the Dow Jones index.

This article analyses portfolios that were created using different methods and in two different markets: developed and still developing. In addition, only one sector was analysed, food and beverages. Further investigation is needed with broader scope of analysis. Also, one should consider a different period of time, which might result in a different portfolio performance result and can explain whether the checked hypothesis in this article can be confirmed.

References

Ackert, L. F., Church, B. K., & Deaves, R. (2003). Emotion and financial markets. *Federal Reserve Bank of Atlanta Economic Review*, *88*(2), 33–41. www.atlantafed.org/research/publications/ecnomic-re view/2003/q2/vol88no2_%20emotion-and-financial-markets

Ahearne, A. G., Griever, W. L., & Warnock. F. (2004). Information costs and HB: An analysis of U.S holdings of foreign equities. *Journal of International Economics*, *62*, 313–336. https://doi.org/10.1016/S0022-1996(03)00015-1

Bae, K. H, Stulz, R. M, & Tan, H. (2008). Do local analyst know more? A cross-country study of performance of local analyst and foreign analyst. *Journal of Financial Economics, 88*(3), 581–606. https://doi.org/10.1016/j.jfineco.2007.02.004

Baker, H. K., & Nofsinger, J. R. (2002). Psychological biases of investors. *Financial Services Review*, *11*(2), 97–116.

Barber, B. M., & Odean, T. (2001). Boys will be boys: gender, overconfidence, and common stock investment. *Quarterly Journal of Economics, 116*(1), 261–292. https://doi.org/10.1162/003355301556400

Black, F., & Litterman, R. (1990). Asset allocation: Combining investor views with market equilibrium. *Goldman Sachs Fixed Income Research*, *115*.

Domowitz, I., Glen, J. & Madhavan, A. (2001). Liquidity, volatility and equity trading costs across countries and over time. *International Finance*, *4*, 221–225. https://doi.org/10.1111/1468-2362.00072

Dong, Y., Young, D., & Zhang, Y. (2021). Familiarity bias and earningsbased equity valuation. *Review of Quantitative Finance and Accounting*, *57*, 795–818. https://doi.org/10.1007/s11156-020-00949-y

Fidora, M., Fratzscher, M., & Thimann, C. (2007). Home bias in global bond and equity markets: The role of real exchange rate volatility. *Journal of International Money and Finance*, *26*, 631–655. https://doi.org/10.1016/j.jimonfin.2007.03.002

Grinblatt, M., & Keloharju, M. (2001). How distance, language and culture influence stockholdings and trades. *Journal of Finance*, *56*, 1053–1073. https://doi.org/10.1111/0022-1082.00355

Grullon, G., Kanatas, G., & Weston, J. (2004), Advertising, breadth of ownership and liquidity. *The Review of Financial Studies*, *17*(2), 439–461. https://doi.org/10.1093/rfs/hhg039

Huberman, G. (2001). Familiarity breeds investment. *Oxford Journals*, *14*(3), 659–680. https://doi.org/10.1093/rfs/14.3.659

Idzorek, T. (2007). 2 – A step-by-step guide to the Black-Litterman model: Incorporating user-specified confidence levels (S. Satchell, Ed.). *Forecasting expected returns in the financial markets*, 17–38. Academic Press. https://doi.org/10.1016/B978-075068321-0.50003-0

Kilka, M., & Weber, M. (2000). Home bias in international stock return expectations. *Journal of Psychology and Financial Markets*, *1*(3/4), 176–192. https://doi.org/10.1207/S15327760JPFM0134_3

Lekovic, M. (2019). Behavioral portfolio theory and behavioral asset pricing model as an alternative standard finance concept. *Economic Horizons*, *21*(3), 255–271. https://doi.org/10.5937/ekonhor1903263L

Liu, Y., Park, J. L, & Sohn, B. (2018). Foreign investment in emerging market: International diversification or familiarity bias. *Emerging Markets Finance & Trade*, *54*(10), 2169–2191. https://doi.org/10.1080/1540496X.2017.1369403

Mann, C. L., & Meade, E. (2003). Home bias, transactions costs, and prospects for the euro: *Asset Price Bubbles: The Implications for Monetary, Regulatory and International Policies* (W. C. Hunter, Ed.). *Cambridge: MIT Press*.

Markowitz, H. M. (1991). Foundations of Portfolio Theory. *Journal of Finance*, *46*(2), 469–477. https://doi.org/10.1111/j.1540-6261.1991.tb02669.x.

MATLAB Code 2. (2022). https://ch.mathworks.com/help/finance/black-litterman-portfolio-optimization.html

Muhammad, N. K. N. (2009). Behavioural Finance vs Traditional Finance. *Advances in management journal*, *2*(6).

Muradoglu, G., & Harvey, N. (2012). Behavioral finance: the role of psychological factors in financial decisions. *Review of Behavioral Finance*, *4*(2), 66–80. https://doi.org/10.1108/19405971211284862

Nasdaq Baltic Stock Exchange. (2022). https://nasdaqbaltic.com/

Peša, A. R., & Brajković, A. (2016). Testing the ´Black Swan Effect' on Croatian stock market between 2000 and 2013. *EMAJ: Emerging Markets Journal*, *6*(1), 1–16. https://doi.org/10.5195/EMAJ.2016.92

Psuturi, T. (2021). Investor psychology: behavioral biases having an impact on financial decisions. *Journal of Multidisciplinary Research (1947–2900)*, *13*(1), 103–110.

Riff, S., & Yagil, Y. (2016). Behavioral factors affecting the home bias phenomenon: experimental tests. *Journal of Behavioral Finance*, *17*(3), 267–279. https://doi.org/10.1080/15427560.2016.1203324

Van Nieuwerburgh, S., & Veldkamp, L. (2009). Information immobility and the HB puzzle. *Journal of Finance*, *64*(3), 1187–1215. https://doi.org/10.1111/j.1540-6261.2009.01462.x

Solnik, B., Boucrelle, C., & Yann, L. F. (1996). International market correlation and volatility. *Financial Analysts Journal*, *52*, 17–34. https://doi.org/10.2469/faj.v52.n5.2021

Speidell, L. (2009). Investing in the unknown and the unknowable – behavioral finance in frontier markets. *Journal of Behavioral Finance, 10*(1), 1–8. https://doi.org/10.1080/15427560902719323

Uslu Divanoglu, S., & Bagci, H. (2018). Determining the factors affecting individual Investors' behaviours. *International Journal of Organizational Leadership, 7*(3), 284–299. https://doi.org/10.33844/ijol.2018.60407

Yahoo Finance. (2022). https://finance.yahoo.com/