

National Research University Higher School of Economics

as a manuscript

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**IDENTIFICATION OF A UNIQUE SOURCE OF RISK IN EMPIRICAL ASSET
PRICING MODELS IN EMERGING MARKETS**

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Research relevance

The dissertation develops the direction of factor investing. Currently, a large number of factors have been proposed in the academic literature, the most popular of which are momentum, size, value, and low volatility (Harvey & Liu, 2020), which, based on historical data, can explain differences in the observed returns on common stocks in different capital markets (with varying success). Various proposed factors introduced the term "factor zoo" (Cochrane, 2011). The problem with building investment strategies on these factors (after this, referred to as factor strategies) is that investment results are sensitive to the business cycle (Asness et al., 2013) and stock market volatility. A relevant direction in recent years has been the formation of factors based on the sentiment of private investors due to the influx of retail investors (especially after the pandemic), the development of platforms for communication between private investors (Reddit, Telegram), and the development of technologies for machine reading of text. In the author's opinion, the issues that are poorly addressed in the literature within the framework of factor investing are the issues of disclosing the nature of the preservation of these anomalies in the pricing of financial assets in different capital markets, especially in developing ones, as well as the development of algorithms and techniques for switching between factor portfolios when the business cycle in the economy changes or when external shocks occur in the market (Asness et al., 2013 and Teplova & Tomtosov, 2021). Since the role of private (retail) investors has been growing in developed and developing capital markets in recent years, the issue of constructing adequate models, including the investor sentiment factor, remains open (Teplova et al., 2022 and Münster et al., 2024). The first problem is reflected in the works of Asness et al. (2013) and Gupta & Kelly (2019), which emphasize the limited performance (the ability to generate Jensen's alpha) over different periods and the lack of reasonable signals for switching from one-factor strategy to another. While similar studies are presented for the US market, there are also studies for the Russian market (Teplova et al., 2022), this paper is the first to compare emerging capital markets. While there is a relative consensus on the formation of factor portfolios for the factors tested in the academic literature (momentum, size, etc.) (ETFs, indices are proposed, and public calculations are conducted on Kenneth French's website), there is no single methodology for the sentiment factor. For example, Kenneth French's database discloses the methodology and results of calculating portfolios of traditional factor portfolios for developed and emerging capital markets. The methods for processing data on the sentiment factor of private investors differ significantly in published studies.

In this paper, factor portfolios are understood as "arbitrage portfolios" that simultaneously contain long positions in the 30% of stocks with the highest factor value (e.g., the top 30 percent by price change over the past twelve months) and short positions in the 30% with the lowest. A factor is a quantitative variable, such as size or market capitalization, that can be measured for each public company in each observation period (month). A similar methodology is used in the seminal work of Fama & French (1993) and modern works (Arnott et al., 2019 and Hou et al., 2020) on constructing factor portfolios.

The dissertation develops the concept of unique risk in empirical pricing models in emerging capital markets. Instead of the classical interpretation of the risk of systemic and non-systemic (diversifiable) risk to the market portfolio (based on the CAPM concept), the paper introduces the concept of unique factor risk, which is a risk that is not associated with the risk of portfolios from a set of two or more factors that determine factor strategies. The author's approach to constructing investment strategies is to divide the risk of factor portfolios into systematic and unique based on data on the composition of factor portfolios (held shares) in each period. Shares present in only a one-factor portfolio (from the set of tested ones) reflect the unique risk of the portfolio. Based on these shares, factor portfolios are formed, which allow the investor to avoid drawdowns during crisis periods for factor portfolios. Such periods are market trend reversal (Daniel & Moskowitz, 2016) and increased volatility (Barroso & Santa-Clara, 2015). The risk-return ratio of the author's unique factor portfolios remains open.

The academic relevance of the study is confirmed by the growing number of studies on the topic of factor investing in recent years and the publication of works on identifying the effects of failure of factor strategies for individual markets and in individual time periods. In the Science Direct search engine, the number of published studies with the keyword "factor investing" for 2021 was 28311, for 2022 - 30196, for 2023 - 32582, and for eleven months of 2024 - 41615. The top three financial journals for 2022-2024 published 354 works on empirical asset pricing and the proposal of new factors that explain differences in portfolio returns (in the Journal of Finance - 13, Journal of Financial Economics - 318, Review of Financial Studies - 23). Separately, it is worth highlighting modern studies that reflect the problem of overproduction of pricing factors (Hou et al., 2020; Harvey & Liu, 2020).

The works of Daniel et al. (2020) and He et al. (2023) identify unique risks in the market portfolio or use methods that are inapplicable to emerging capital markets due to the requirements for the number of instruments and the testing period. The novelty of this study lies in the fact that the proposed author's method for isolating unique factor risk develops a new direction for

determining risk about a set of factors using the author's methodology adapted for emerging capital markets. An additional justification for the academic relevance is formulating the significance of the unique risk problem by the President of the American Finance Association (Cochrane, 2011) and the Editor-in-Chief of the Journal of Finance (Harvey, 2017).

The work's **practical relevance** is associated with asset managers' requests to build factor strategies and actively manage such strategies. During the AFA seminar on current issues of asset pricing, Clifford Asness, founder of the AQR hedge fund, noted that a third of the current set of factors are proxy variables for the underpricing effect, and another third are for the market trend effect. Therefore, it is important to develop methods to reflect the contribution to the explanatory power of new factors about the already studied set of characteristics. At the moment, there are at least 53 ETFs on the momentum factor in the world. Most of these funds are formed on American stocks and a small part on other emerging capital markets. At the same time, there are no factor ETFs on emerging capital markets. There are mutual funds on dividend stocks for the Russian market, but the question of forming momentum or low volatility strategy funds remains open. The practical relevance of the work is enhanced in emerging capital markets with a smaller number of exchange-traded instruments, where the problem of non-unique risk in the set of factors is more common. Due to the segmentation of individual developing capital markets, it is important to form factor strategies from local stocks and search for signals to switch between strategies.

The study's purpose is to justify the feasibility of constructing unique factor portfolios and reveal their characteristics (primarily risk-return and alpha coefficient dynamics) in developing capital markets. The paper proposes an original methodology for constructing unique factor portfolios that reduces the co-direction of factor portfolio returns. This reduces the risk of investing for active management funds and qualified retail investors.

The following is a **list of tasks** that are solved to achieve the goal:

1. Review and systematization of literature on empirical pricing models and methods for testing them in developing markets.

2. The purpose of testing factor portfolios is to rank them by alpha coefficient for eleven developing capital markets. Factor portfolios of momentum, size, value, low volatility, low beta, and high trading volume are tested using factor portfolio construction methods and cross-sectional Fama-Macbeth regressions. The initial factors are based on the work of Hanauer & Lauterbach (2019), where the given factors are designated as having the most significant explanatory power for stock prices in emerging markets.
3. Building a factor portfolio based on the author's HYPE

indicator. The indicator is calculated based on the tonality and number of messages from private investors in the Telegram messenger and on the mfd.ru forum. Each message is marked by the text's tonality (negative, neutral, and positive) using a neural network model trained on messages on stock exchange topics. Sentiment has high explanatory power in developed capital markets (Renault, 2017) but has not been tested for the Russian market, according to the sources cited.

4. Quantitative determination of the level of unique factor risk in a set of the three best factor strategies from the second task. A monthly series of estimates of the level of unique risk for the three best strategies will be constructed, which will be used further to empirically test the relationship between the level of unique risk, the co-directionality of returns, and the return of factor portfolios. A practical application is to test the effectiveness of signals for switching between investments in the original or unique factor portfolio based on the unique risk level.

5. Testing the characteristics of a decrease in the co-directionality of returns in a set of unique factor portfolios during periods of financial crises, during periods of high and low market returns, volatility, and for periods of high volatility of the local currency exchange rate to the US dollar.

6. Testing the author's methodology for ranking mutual fund managers by alpha coefficient relative to a set of unique factor portfolios compared to the initial set of factors on the Russian market. The hypothesis is tested that selecting 30% of funds with the highest alpha to unique factors allows the investor to identify funds with higher future returns than selecting funds based on the highest alpha to the initial set of factors.

Tomtosov (2024) demonstrates the ability of unique factor portfolios to reduce the risk of return divergence in subsequent periods in the emerging capital markets under consideration. The average return correlation between factor portfolios decreased from -0.13 to -0.3, and the maximum return correlation fell from 0.57 to 0.04. The periods when all factor strategies experienced negative returns simultaneously decreased from 8.1% to 4.4%. The number of streaks when returns were negative for two or more consecutive periods decreased from 2.5 to 0.7, and the average length of such streaks decreased from 2.3 to 1.5. These results complement the work on unique risk: Feng et al. (2020), He et al. (2023), and Daniel et al. (2020). Unlike the author's study, the methods for determining unique risk in the listed works use econometric methods and data based on the past returns of factor portfolios. The author proposes a solution to the shortcomings of this approach: the requirement for data depth for at least the last five years (which

is not always possible in emerging capital markets) and the problem of determining weights for factors with high explanatory power and correlation simultaneously.

The downside of unique factor portfolios, which, within the framework of the author's strategy, are recommended to be switched to when market trends change, diagnosed by the co-direction of portfolio movement and quantitative changes in the level of unique factor risk in the country, is a reduced return compared to the original factor portfolios, which is reflected in the second hypothesis. The feature is characteristic of each factor portfolio in the eleven emerging capital markets. Unique risk allows for avoiding the co-direction of returns (and losses) during crisis periods for factor portfolios. At the same time, non-unique positions can be an important source of return in other periods. Despite the reduced profitability of unique factors, the use of the unique risk level allows us to build a strategy by switching between unique and original factor portfolios, which exceeds both portfolios separately in profitability. To test the hypothesis, a decomposition of profitability is carried out in periods with different levels of unique risk between factor portfolios. For example, a high level of unique risk is the interval of intersections of portfolio compositions from 0 to 10% and the lowest from 90 to 100%. The switching strategy invests all capital in the original factor portfolio with an average intersection of positions between all factor portfolios below 70% and in the unique portfolio when this value is exceeded. On average, such a strategy exceeds the profitability of investments in unique and original factors separately. The hypothesis that mutual funds with higher risk-adjusted returns to a set of unique factors in the Russian market have higher and more persistent alpha in subsequent periods than funds with a similar advantage to a set of non-unique factors is tested using data from 89 equity funds in the Russian market over the period from 2009 to 2020.

Due to a unique set of factors, the one-third of equity mutual funds with the highest risk-adjusted returns over the past twelve months outperform all other funds in the Russian market in subsequent periods. This third of funds also has 17% higher alpha than the one-third of funds with the highest returns to a non-unique set of factors. The results can complement the strategy of an individual investor in selecting mutual funds for an investment portfolio. In studies analyzing the performance of mutual funds, Daniel et al. (1997) and Grønberg et al. (2021) reflect a comparative advantage in returns for a group of mutual funds with the highest alpha to the three-factor model (Fama & French, 1993) and four-factor model (Carhart, 1997) relative to other funds in the United States. Fama & French (2010) test the presence of stock-picking skills among mutual fund managers in the United States. The authors conclude that after taking into account fees, no funds with robust skills were found. This study found that the stock-picking skill of Russian fund

managers is robust over time and can be identified using the proposed methodology based on the alpha coefficient to a set of unique factors.

In the works of Teplova et al. (2022) and Teplova et al. (2022), the sentiment factor of private investors was studied for the first time for the Russian market using messages from popular stock exchange channels and chats in the Telegram messenger and the mfd.ru forum. A similar study for American stocks and social networks used in the USA was conducted in the works of Oliveira et al. (2017) and Al-Nasseri & Ali (2018). In contrast to the American market, the share of private investors is significantly higher in the Russian market. The coverage of active brokerage accounts by Telegram channels on stock exchange topics is also higher, which allows for a more accurate assessment of the sentiment factor in stock pricing. Portfolios formed based on the tonality (negative, neutral, and positive) of messages reflect significant excess returns in the short term for a group of stocks with small capitalization. The object of this dissertation research is the shares of public companies in eleven emerging capital markets: Russia, Brazil, India, China, Hong Kong, Indonesia, Malaysia, Taiwan, Thailand, South Korea, and Vietnam. Currently, the markets of Taiwan, Hong Kong, and South Korea are classified by MSCI as developed, but for most of the study period, they were emerging. These three markets can be grouped as countries in transition. The markets of the BRIC countries are an example of emerging capital markets: a large number of instruments and a highly uneven distribution of liquidity. Indonesia, Malaysia, Thailand, and Vietnam stock markets are also characterized as emerging but differ from the BRIC group by the absence of substantial companies and a low average market capitalization. Thus, the original sample of markets includes capital markets with different levels of liquidity, number of instruments, and observation periods. The subject of the study is the presence of factor effects in pricing in emerging capital markets and the role of a unique factor portfolio for constructing an investment strategy in a situation of high external uncertainty. The research dataset covers 13,836 common stocks from eleven emerging capital markets, including the BRIC countries. The data includes monthly closing prices, local currency trading volume, and market capitalization for each instrument. The exchange rate to the US dollar, inflation values, and market portfolio returns are used for each market.

Additionally, manually collected text messages from the Telegram messenger are used to test behavioral factors based on the sentiment of private investors. The methods used in the study include a method for constructing factor portfolios for six pricing models, econometric analysis, aggregation of factors for several markets with volatility scaling according to the Asness et al. (2013) method, and construction of a sentiment factor through determining text sentiment using

machine learning methods. To test the empirical models, 4,224 investment portfolios are simulated. Due to the small number of instruments in emerging capital markets, three methods for determining liquid stocks and forming portfolios are introduced and compared. The paragraph with the main results on allocating unique risk includes thirty-six portfolios.

The degree of scientific development of the research problem

The degree of scientific development consists of the following:

1. In works on identifying unique risks. Methods for identifying unique risk in a set of factors based on historical portfolio return data are developed in the studies of Feng et al. (2020), He et al. (2023), and Daniel et al. (2020). Testing a large set of factors outside the original sample with the exclusion of small-cap stocks to identify a set of factors with robust explanatory power is carried out in the work of Hou et al. (2020). Harvey & Liu (2020) conduct multiple hypothesis testing for the same purpose by increasing the significance threshold for new factors, considering the number of previously published works. A separate line of empirical work includes identifying unique risks in a small set of related factors. For example, the work of Asness et al. (2018) reflects the return of a portfolio of small-cap stocks with the exclusion of positions included in a portfolio with a high level of debt and low profitability. Guo et al. (2022) decompose momentum returns that other factors can explain. Isolating unique risks in a set of factors remains a relatively new direction, which appeared after recognizing the problem of factor overproduction (Cochrane, 2011). The presented methods are not adapted to emerging capital markets with few liquid instruments and short trading history.

2. In works on switching between factor strategies. The prospects of using strategies with switching from one-factor portfolio to another are discussed in the work of Dimson et al. (2017), which reflects the cyclical structure of factor returns according to the four-factor pricing model (Carhart, 1997). Daniel & Moskowitz (2016) conducted a detailed study of crisis periods of the momentum factor (and, accordingly, the momentum strategy) and concluded that it makes sense not to place funds in a factor portfolio during changing market trends. Works that develop the direction of factor strategy switching in emerging capital markets include studies by Gupta & Kelly (2019) and Ehsani & Linnainmaa (2022). Teplova & Tomtosov (2021) use an adapted methodology for emerging capital markets. An open question remains the strategy of investing in periods of drawdowns for all factors simultaneously, which is identified in the work of Arnott et al. (2019).

3. Definitions of active asset management skills (e.g., managers of equity mutual funds). The direction of studying the results of active management in mutual funds compared to passive

investing begins with the work of Jensen (1968), where managers' skill is assessed by the alpha coefficient to the market portfolio. Daniel et al. (1997) evaluate managers using individual benchmarks based on factor portfolios. Carhart (1997) showed that the returns of most US equity funds can be explained by the three-factor model (Fama & French, 1993) with the inclusion of the momentum factor. The question of selecting the best variations of factor portfolios, the superiority over which would reflect a stable skill in selecting stocks for a portfolio, remains open. It is important to clarify that the results of most of the cited works relate to the US market or other developed capital markets. An important contribution of this study is the development of academic research in three directions in the context of emerging capital markets.

The theoretical basis of this study is the arbitrage pricing theory (Ross, 1976). The author of the theory introduces a set of unnamed factors that explain differences in the returns of stock portfolios. The problem of unique risk in multifactor models is raised in the work of Daniel et al. (1997) when evaluating mutual fund managers. The authors select an individual benchmark from a set of factor portfolios for each fund based on the characteristics (capitalization, price change, and fundamental undervaluation) of the positions held. The study by Harvey & Liu (2021) reflects three main problems in testing pricing models: the composition of factor portfolios depends on the method of signal generation (cross-section or time-series), portfolio rebalancing parameters, and considering unique risk in factor sets. The methodological basis for research in the field of determining unique risk is proposed in the works of Feng et al. (2020), He et al. (2023), and Daniel et al. (2020).

In contrast to this dissertation, the methods for identifying unique risks in the listed studies use econometric methods and data based on the past returns of factor portfolios. The advantage of this group of methods is the reflection of weights for a set of factors with the most significant explanatory power and the lowest correlation. The disadvantage is the requirement for data depth for at least the last five years (which is not always possible in emerging capital markets) and the problem of determining weights for factors with simultaneous high explanatory power and correlation. The proposed method for identifying unique risk based on the composition of portfolios is based on the works of Daniel et al. (1997) and Cremers & Petajisto (2009). In the first work, the authors use triple sorting of portfolios to identify a portfolio of shares with the highest value of the first characteristic in groups of the second and third characteristics. The disadvantages are the requirement for a large number of liquid stocks - after triple sorting, extremely undiversified portfolios are obtained if the number of stocks is less than a thousand (as in most emerging capital markets) and the importance of the sorting order (according to the first characteristic, selection is

carried out from all stocks, and for the subsequent ones - from reduced samples). In the second paper, the authors measure the share of unique positions in fund portfolios to benchmarks (country and sector stock indices). The authors' contribution and the study's novelty is the exclusion of overlapping positions between factor portfolios in emerging capital markets to identify unique risk factors.

The **methodology** for constructing factor portfolios is based on the work of Fama & French (1993) and similar studies, where an adaptation of the methodology is used for developed markets outside the United States (Asness et al., 2013) and emerging capital markets (Hanauer & Lauterbach, 2019). Switching between the original and unique factor portfolios practically applies the unique risk level. Gupta & Kelly (2019) and Ehsani & Linnainmaa (2022) use a similar methodology to select factor portfolios based on risk-adjusted excess returns (instead of unique risk) over recent periods. This strategy builds on the observations of Dimson et al. (2017) on the cyclicity of factor portfolio returns.

Carhart (1997) and Daniel et al. (1997) rank fund managers based on the alpha of the original set of factors, whose performance has declined over time (McLean & Pontiff, 2016) and is subject to directional risk (Arnott et al., 2019). In this paper, manager skill is assessed through the alpha of the set of unique risk factors and compared with the original set of factors.

Novelty of the research

The novelty of the work lies in four directions:

1. The problem of factor investing is the co-directionality of negative results (profitability) of portfolios during periods of crisis and periods of high market volatility and the openness of the issue of constructing signals for switching from one strategy (from one factor) to another (to another factor). The author's term unique factor risk and the methodology of its quantitative assessment are proposed. The author's method excludes intersecting assets (shares) in each period's set of factor portfolios. Using this method allows for the reduction of the correlation between the profitability of factor portfolios. It almost eliminates the co-directionality of portfolio returns for most developing capital markets. A practical application of unique risk can be forming a strategy by switching and ranking equity fund managers based on unique factors.

2. A new strategy for switching between original and unique factor portfolios is presented based on assessing the level of unique risk in a set of factors. At a low level of unique risk (overlapping assets of more than 70%), it is more profitable for investors to invest in a unique

factor portfolio and, in other cases - in the original one. In contrast, the study by Geertsema & Lu (2020) on the US stock market reflects the highest return for groups of factor portfolios that are characterized by the highest correlation of returns of factors within a cluster.

The theoretical significance of the results of the work lies in:

- Revealing the nature of pricing anomalies in emerging capital markets through testing factor strategies for 11 capital markets and identifying the co-directionality of factor portfolios.
- Reflecting the specifics of the retail investor sentiment factor in the Russian market.
- Proposing the author's HYPE indicator as a proxy for the sentiment of retail investors.
- Developing a methodology for quantitatively reflecting the share of unique factor risk and the role of unique factor portfolios in developing benchmarks for comparing the skills of asset managers.
- Reflecting the relationship between unique risk and future profitability and the co-directionality of factor portfolios.
- Adapting the methodology for constructing factor portfolios and a unique portfolio for emerging capital markets.

The practical significance of the research results lies in constructing an investment strategy that switches based on factor investing and ranking mutual funds in the Russian market. Unlike existing metrics based on portfolio yield data, the proposed method allows us to determine the share of unique risk between factors/strategies without requirements for the length of historical data, which is relevant for new managers or asset classes. It was found that the presence of a stable alpha to a set of unique factors better reflects the skills of Russian mutual fund managers in selecting securities.

Provisions submitted for defense

The main provisions submitted for defense:

1. Five-factor strategies were ranked for eleven emerging capital markets. Three factors with the highest returns were identified in most markets. The methods for identifying unique risks in the literature on financial economics were systematized. Based on the analysis of existing methods, a technique for identifying unique risk in a set of pricing factors based on the composition of factor portfolios was developed. The efficiency of isolating and quantifying unique factor risk

was proven. The developed method was adapted for emerging capital markets with few liquid instruments and trading history.

2. The developed technique was applied to eleven emerging capital markets to form unique factor portfolios without overlapping assets in the set of factors. The resulting portfolios eliminate the risk of co-directionality for the factors "momentum," "low capitalization," and "low volatility" for most markets.

3. The author's technique for determining the value of the unique factor risk level for each of the eleven emerging capital markets for each month is proposed. For each country, recommendations have been developed for switching between the original and unique versions of the factor portfolio. It has been established that a low level of unique risk (the intersection of positions in the set of factors is more than 70%) is characterized by a lower return on the factor portfolio than for lower values of intersecting positions in the portfolios.

4. A proprietary HYPE indicator is presented, which allows investors to form factor portfolios based on the number and tone of private investors' messages in Telegram messenger exchange chats.

5. A proprietary methodology for ranking fund managers based on the alpha coefficient to a unique set of factors is proposed. This methodology allows you to select funds with higher future returns, in comparison with investing in all funds in equal shares or selecting funds with the highest alpha to a non-unique set of factors.

The results of the study have been published in four papers:

1. Teplova T., Sokolova T., Tomtosov A., Buchko D., Nikulin D. (2022) «The sentiment of private investors in explaining the differences in the trade characteristics of the Russian market stocks». **Journal of the New Economic Association**. 1 (53). C. 53–84 <http://doi.org/10.31737/2221-2264-2022-53-1-3>
2. Teplova T., Tomtosov A. (2021). «Can high trading volume and volatility switch boost momentum to show greater inefficiency and avoid crashes in emerging markets? the economic relationship in factor investing in emerging markets». **Quarterly Review of Economics and Finance**. 80. 210–223 <http://doi.org/10.1016/j.qref.2021.01.018>
3. Teplova T., Tomtosov A., Sokolova T. (2022). «A retail investor in a cobweb of social networks». **PLoS One**. 17(12). Article e0276924. <http://doi.org/10.1016/j.qref.2021.01.018>

4. Tomtosov A. (2024). «Unique factors in emerging markets». **Borsa Istanbul Review**. 24(1), 201-217. <https://doi.org/10.1016/j.bir.2023.12.003>

The results of the study were presented at the following Russian and international conferences and seminars:

1. PhD Workshop “Current topics in financial research. How to prepare publications” (Moscow, Russian Federation, HSE University, February 17 2022). “Rethinking the Threshold Between Selectivity and Market Timing. An Opportunities Approach”.
2. “33rd EBES Conference” (Madrid, Spain, October 7 2020). “Sentiment of Retail Investors on the Internet Anonymous Messengers in Explaining Differences in the Emerging Market Stock Characteristics”.
3. “World Finance Conference” (Kristiansand, Norway, August 3 2021). “A Nonlinearity of Social Networks Influence on Stock Trade Characteristics: The Case of the Russian Market”.
4. “Fifth Russian Economic Congress” (Ekaterinburg, Russian Federation, New economics association, September 11 2023). “Evaluating mutual fund managers' actions based on individual investment opportunity sets”.
5. “Economic Theory: Meeting with Reality. Economics in a Changing World” (Moscow, Russia, Institute of Economics, Russian Academy of Sciences, October 25, 2023). “Alternative models of stock pricing in emerging markets under conditions of limited liquidity”.

The materials were used to conduct practical classes for students on the programs of the National Research University Higher School of Economics:

1. Master's degree program "Financial Engineering" on the course "I.T. for Financiers" from 2021 to the present. Joint course with Prof. S. Kurochkin.
2. Master's Degree in "Financial Markets and Financial Institutions" in "Fundamental and Technical Analysis" from 2020 to 2022. Teaching Assistant to Prof. Teplova T.V.
3. Master's degree in "Financial Strategies and Analytics" at the Perm Campus on the "Data Analytics and Analysis in Finance" course from 2021 to 2023. Together with the head of the international laboratory, Parshakov P.A., and senior lecturer Chadov A.L.

4. Bachelor's degree "Economics" in the course "I.T. for Financiers" at the Institute of Professional Training of Specialists of the Higher School of Business in 2022.

5. Course "Building Investment Strategies on Python" at the IPPS with Professor Teplova T.V. and Associate Professor Sokolova T.V. from 2021 to 2022.

The research results were also presented at the IPS "Building Investment Strategies" and research workshop organized by the "School of Finance" of the National Research University Higher School of Economics.

Patents were obtained for the program code and database prepared within the framework of the thesis research:

1. Buchko Daniil Vladimirovich, Teplova Tamara Viktorovna, Sokolova Tatiana Vladimirovna, Tomtosov Aleksandr Fedorovich. "Program for analyzing the tone of investor messages in Russian-speaking thematic forums". Computer program. RID number 5.0057-2020. Registration information 2020667084.

2. Teplova Tamara Viktorovna, Tomtosov Aleksandr Fedorovich, Buchko Daniil Vladimirovich, Sokolova Tatiana Vladimirovna. "Database of messages and metrics of investor sentiment on the Russian stock market". Database. RID number 6.0020-2020. Registration information 2020622801.

The value of the applicant's research work is confirmed by the fact that the main results were included in the research report "Sentiment of private investors in the market of Chinese A-class shares", performed by the Center for Financial Research and Data Analysis (CFRD) for AimHighTech LLC from 13.11.2020 to 15.01.2021.

Literature

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