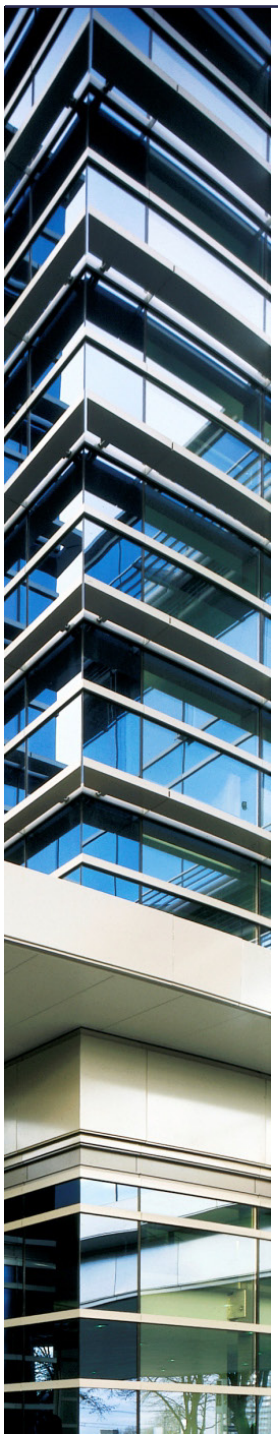
LATVIJAS BANKA
EIROSISTĒMA

ISBN 978-9934-578-77-9

MARKUSS BERĢĪTIS

ASSESSMENT OF INVESTMENT REGULATION AND ITS EFFECTIVENESS IN THE LATVIAN STATE FUNDED PENSION SCHEME



DISCUSSION PAPER
2 / 2025

Latvijas Banka
K. Valdemāra iela 2A, Riga, LV-1050
Tel.: +371 67022300 info@bank.lv
http://www.bank.lv https://www.macroeconomics.lv

Assessment of Investment Regulation and its Effectiveness in the Latvian State Funded Pension Scheme

Markuss Bergītis[1]

September 29, 2025

Abstract

This paper assesses the effectiveness of investment limits in the Latvian state funded pension scheme and their impact on portfolio diversification, investment opportunities, and investments in the Latvian capital market. Using qualitative analysis of legal provisions and quantitative multi-factor regression, the study finds that strict concentration limits – particularly on individual equity holdings – restrict investments in the Latvian economy and might hinder exposure to key risk factors such as size and value. Policy recommendations include easing concentration and exposure limits, adopting a look-through approach for investments in investment funds, and expanding access to alternative assets.

Keywords: investment regulation, defined contribution pensions, portfolio construction
JEL Codes: G18, G11, H55

[1]Insurance and Pension Supervision Department, Latvijas Banka, K. Valdemāra iela 2a, Rīga, LV-1050, Latvija; e-mail: Markuss.Bergitis@bank.lv

1 Introduction

The pension system is a significant component of the economy and its regulatory framework can have a strong impact on macroeconomic processes and aggregate outcomes. Pension assets also play a crucial role in the development and growth of a stable and efficient local capital market (Vittas (1996)). Against the background of worsening demographic trends and rising fiscal pressures, many countries rely on the individual, asset-backed pension schemes. The Latvian state funded pension scheme (SFPS) is an excellent example of such a scheme, where contributions are mandatory and assets are invested in global financial markets. These schemes are often subject to stringent regulation, including investment limits and restrictions. Although existing research has shown that investment limits and restrictions can have a negative effect on investment returns (Davis (2002); Gutierrez et al. (2019); Joenväärä et al. (2019)), they are also used in Latvian legislation to ensure investment diversification, safety, and liquidity of pension investment plans.

This study aims to document and analyse the limits and restrictions imposed on Latvian SFPS investment plans, which might restrict potential investment and diversification opportunities, which, consecutively, could hurt investment results. In addition, it identifies the investment limits that restrict the opportunities to invest in the Latvian economy. The study employs both qualitative and quantitative research methods to identify potential pitfalls in Latvian pension investment regulation.

The rest of the paper is structured as follows. The next section provides an overview of the Latvian pension system and literature related to investment management. Section 3 describes the methodology and data used in the analysis. Section 4 contains a qualitative analysis of the regulatory framework and a quantitative analysis of risk factor exposure in Latvian SFPS investment plans. The last section concludes the study and provides recommendations to policymakers.

2 Brief overview of the pension system in Latvia

This chapter begins with a short overview of the Latvian pension system. Given the heightened socioeconomic significance of the pension system, the chapter also examines its role within the economy and in broader macroeconomic processes. Additionally, it summarises several portfolio construction theories and principles that are often considered when making investment decisions. Particular emphasis is placed on topics that are especially relevant to investments of SFPS investment plans.

2.1 Latvian pension system

The Latvian pension system consists of three pillars. The first pillar operates under the notional defined contribution principle. Social security contributions are recorded in individual accounts and valorised according to the nominal growth of the social security contribution wage base. This pillar is based on the principle of intergenerational solidarity, whereby the working-age population contributes to the system and funds the pensions of current retirees.

The second pillar or the state funded pension scheme is a mandatory funded pension scheme under which assets are invested in financial markets. The combined contribution rate to the first and second pension pillars is 20% of gross wage. Since 2025, 15% has been allocated to the first pillar and 5% – to the second pillar. The contribution split has varied over time due to political decisions. The third pillar or private supplementary pension functions similarly to the second pillar, but participation is voluntary. Contributions can be made by individuals or employers in amounts of their choosing. This pillar also provides tax incentives, as participants are eligible for a personal income tax refund on contributions.

The State funded pension scheme was introduced in 2001. Participation is mandatory for all employees born after 1971, while individuals born between 1951 and 1971 may participate voluntarily. Pension assets are managed by licensed investment management companies registered by Latvijas Banka as managers of the funded pension scheme. These companies may offer one or more investment plans with differing risk profiles, equity exposures, and investment strategies. At the end of 2024, assets under management in the SFPS amounted to 8.8 billion euros, equivalent to 21.9% of gross domestic product.[1]

The SFPS is primarily governed by the Law on State Funded Pensions (2000), which specifies participation rules, pension payouts, stakeholder responsibilities, capital requirements of investment managers, commission fee ceilings, and investment rules. Investment management companies are also subject to the Law on Investment Management Companies (1997), which sets out prudential and operational requirements for these financial institutions. Additional regulations issued by Latvijas Banka and the Cabinet address rules specifying internal control systems, prospectuses and key information documents, commission fee calculations, financial reporting, and other requirements to ensure the integrity and efficiency of Latvia's investment management sector, including pension asset

[1]For key statistics on the SFPS, see: https://www.bank.lv/darbibas-jomas/uzraudziba/finansu-sektora-darbibas-raditaji#valsts-fondeto-pensiju-shemas-darbibas-raditaji-2024-gada-4-ceturksni

management. Latvijas Banka, in its capacity as the national financial market supervisory authority, oversees the operations of pension scheme managers and custodians to safeguard solvency, financial stability, and, where necessary, to take corrective action concerning SFPS assets (Section 13 of the Law on State Funded Pensions (2000)).

2.2 The role of the pension system in the economy

The pension system is a significant component of the national economy, and its efficiency and regulatory framework can have a strong impact on macroeconomic processes and aggregate outcomes. The macroeconomic impact stems from at least four different channels.

The first channel relates to an increase in contemporary savings. Since contributions to the SFPS can be regarded as financial investments, they are essentially part of savings, with the ensuing implications for consumption and gross domestic product. Therefore, changes to the contribution design can have an immediate impact on the economy. This is well illustrated by the example of Estonia, where the second pillar of the pension system was made voluntary in 2021, and participants were allowed to withdraw the accumulated capital before retirement. Meriküll (2025) finds that this reform led to a 3.5% increase in the aggregate consumption during the first quarter; however, the overall positive impact on consumption was only observed in the short-run. The reform also significantly increased inflation by an average of 1.8 percentage points per quarter, driven by increased demand. The impact on inflation was also observed in the medium-term.

The second channel is related to a fiscally sustainable pension system. Due to aging population, many countries see the dependency ratios and retirement income replacement rates worsen which in turn put pressure on government budget and inequality (European Commission and Directorate-General for Employment, Social Affairs and Inclusion and Social Protection Committee (SPC) (2024)). Worsening demographic trends amplify fiscal pressures, thereby increasing the importance of individual, asset-backed pension schemes that help ease the immediate economic burden. Bulõgina and Kukk (2025), analysing the Estonian pension reform, find that individuals who withdrew funds from the second pillar did not create personal investment accounts but instead used the funds for consumption or held money in bank accounts. This indicates that the future financial well-being of this segment of the population is likely to deteriorate significantly as a result of the pension reform, which jeopardised the effective accumulation of pension capital. This, in turn, may lead to greater future income inequality or increased fiscal pressure to ensure adequate pensions.

Similar outcomes may also result from inefficient investment of funds or other inefficiencies in the pension system. In turn, maximally efficient and profitable capital accumulation leads to higher future pensions, supporting higher future consumption and reducing fiscal pressure on the government budget.

Third, a funded, asset-backed pension system can help in the development of local capital markets. Vittas (1996) argues that mandatory but decentralised pension schemes play an important role in the development of local capital markets because these asset accumulation systems pool together long-term financial savings which, consecutively, can be invested in the domestic capital market and facilitate market development. Additionally, pension fund investments can also stimulate innovation and modernisation of financial markets, improve corporate governance, and facilitate privatisation of assets. Recent empirical research also provides evidence on the role of pension funds in the development of local capital markets (Roldos (2004); Brida and Seijas (2016); Khan et al. (2025)). A cross-country analysis conducted by Khan et al. (2025) indicates that fully funded, mandatory pension schemes are positively associated with stock market liquidity, depth, and enhanced access to the equity markets. Historical examples of pension reforms in Chile and other emerging economies have shown that efficient pension regulation leads not only to growth of assets under management but also to expansion of local securities markets (Roldos (2004)).

Fourth, SFPS investment plans, as long-term capital accumulation vehicles, can implement asset allocation strategies that include investments in less liquid assets, including private equity and venture capital. These investments, in turn, bring benefits not only to investment outcomes but also to the national economy, as several studies find that such funds improve corporate governance, profitability, and innovation. Lavery et al. (2024) show that private financing appears to have a positive effect on productivity. Additionally, they show that productivity gains persist even after the exit. Private equity ownership is also associated with higher exports, contributing to increased financial and economic resilience of those firms (Lavery et al. (2021)). Moreover, Marini et al. (2021) shows that private equity ownership is associated with better corporate governance, which then allows companies to make better decisions and reduce the risk of financial distress. Private equity investments provide benefits not only to individual private equity-backed firms but also generate positive externalities to the whole industry by increasing employment, profitability, capital expenditures, and productivity across all industry peers (Aldatmaz and Brown (2020)).

2.3 Investment principles of the SFPS

The investment rules which govern the portfolio construction of SFPS investment plans, are among the most important aspects of the regulatory framework. Section 12 of the Law on State Funded Pensions (2000) stipulates that the investment manager shall mitigate risks, ensure investment safety, quality, liquidity, and invest in a manner which is profitable for the scheme's members. This subsection provides a more detailed review of these concepts.

The key principle for risk mitigation is diversification which was formalised by Markowitz (1952). The goal of diversification is to minimise the co-variation of individual investment returns. However, it cannot be achieved simply by investing in a large number of financial instruments, but rather by allocating capital across different sources of risk. This approach leads to the formation of minimum-variance or efficient portfolios, which lie along the efficient frontier, where each level of return corresponds to a specific level of risk. Although this method reduces risk, it can only eliminate idiosyncratic risk; investors must still bear the systematic risk, which is tied to global macroeconomic conditions and financial stability. Building on Markowitz's framework, the Capital Asset Pricing Model (CAPM) formalised the trade-off between risk and return, linking expected returns to market-wide systematic risk (Sharpe (1964)). Subsequent multifactor models extended this approach, recognising that systematic risk may stem from multiple sources beyond market risk alone (Fama and French (1993); Fama and French (1996); Harvey et al. (2015)).

In traditional portfolio theory, only three asset classes are considered: debt securities, equity securities, and cash. However, in contemporary investment practice, alternative investments and alternative investment funds play an increasingly important role in portfolio construction. This asset class includes a broad range of typically illiquid assets: real estate, infrastructure, natural resources, private equity, venture capital, private debt, hedge funds, and others. Ljungqvist (2024), in a review of literature related to private equity, has found that private equity historically has outperformed public markets and, depending on data and models employed, has outperformed the expected return. This premium can be attributed to higher financial and liquidity risks, as well as the use of leverage.

Investment safety cannot be understood as an absolute risk reduction, as investing in less risky assets may lead to lower returns, thereby increasing the risk of inadequate pension outcomes. Mitchell and Utkus (2003), summarising theories of finance and behavioural economics, find that younger individuals, who still have a long time horizon until retirement, are advised to take on higher

risk; however, as retirement age approaches, investments should focus more on capital preservation and security. Considering that the period during which a person should take on high risk is long, it is important to ensure maximum efficiency and broad investment opportunities specifically in the high-risk investment plan category.

Investment quality can be assessed according to several principles. The primary quality indicator for debt securities is the credit rating of the issuer, determined by independent rating agencies. Based on these ratings, bond yields are determined – the better the rating, the lower the yield. The quality of equity securities is more difficult to assess, as these issuers are not evaluated by independent experts. In order to determine whether an investment is of high quality and potentially profitable, the investment manager must carry out a thorough financial analysis and company evaluation. In the case of an active and developed capital market, the value of an investment can also be determined by the market itself and its participants. Fama (1970) argues that in an efficient market, stock prices always reflect the true value of companies, allowing investors to assess investment quality based on the actions of other investors. This theory suggests that a broad base of market participants is necessary both to ensure investment quality and to develop an efficient capital market. Therefore, the number of investors can help determine the quality of assets and ensure that other market participants also consider the investment to be profitable.

When assessing liquidity, both the convertibility of investments into cash and the potential losses that may arise when liquidating investments must be considered. In SFPS investment plans, liquidity is essential to cover obligations to participant payouts, which may occur due to switching investment plans or retirement, as well as to meet obligations arising from financial instruments. One of the central concepts related to liquidity is the illiquidity premium. This indicates that holding less liquid assets can improve investment outcomes, but at the same time, the need to maintain sufficient liquidity must be taken into account. The most liquid investment is demand deposit, i.e. cash in a bank account, which can be used for immediate obligation coverage without any losses or lost future returns. As these funds generate little or no interest (or even yield expenses when rates are negative), the investment plan loses part of its potential return, since these funds could have been invested in more profitable instruments. Therefore, the manager must find a balance between ensuring the necessary liquidity and the efficient use of funds, for example, by conducting stress and scenario analyses to effectively determine liquidity needs.

2.4 Investment regulation

One of the most critical aspects of the Law on State Funded Pensions (2000) is the investment rules set by the Section 12 of the Law on State Funded Pensions (2000). The section not only sets the key investment principles, which were reviewed previously, but also specific asset allocation limits and investment restrictions. While such limitations are often criticised, Davis (2002) summarises the arguments in favour of such regulation. First, they are necessary to control excessive risk-taking to reduce the likelihood of pension shortfalls, thus preventing the associated fiscal burden on the state. Second, regulation through limits provides a relatively simple investment risk control mechanism in supervision and portfolio management. Third, they ensure confidence to customers (tax-payers in the SFPS case) that their assets are invested in a safe and prudent manner. Finally, investment limits are necessary to mitigate conflicts of interest, which might occur if assets are invested in entities related to the asset manager.

Section 12 of the Law on State Funded Pensions (2000) stipulates different asset classes in which SFPS assets may be invested. These include sovereign bonds, international financial institution bonds, municipality bonds, stocks, corporate bonds, deposits in credit institutions, investment funds, alternative investment funds, derivatives, and venture capital. In addition to the permitted asset classes, it sets out the conditions under which investments can be made in the respective asset class, such as jurisdiction, exchange in which the instrument is traded, and the required risk management procedures. Section 12 of the Law on State Funded Pensions (2000) stipulates not only permitted asset classes, but also restrictions. Asset managers are forbidden to invest in real estate, employ leverage unless for short-term liquidity needs or repo agreements, invest in alternative investment funds using a leverage higher than 2 if it is a credit fund or 3 if it is not, and to invest in crypto-assets. While these limitations are important as they establish the overall investment framework, the most economically significant are the quantitative investment limits that govern the overall asset allocation and portfolio structure. An overview of these limits is presented in subsection 4.1.

Antolin et al. (2009) summarise pension regulation across OECD countries. They conclude that policymakers employ various regulatory approaches to reduce investment risks for plan participants. Most countries, including Latvia, use a range of quantitative limits that apply not only to individual instruments but also to aggregate asset classes (e.g. equities) and foreign investments. Some countries also apply direct risk mitigation methods such as Value at Risk (VaR) limits, stress testing,

and minimum guaranteed return. While these methods are highly suitable for risk management, they were primarily designed to assess financial stability in banking and to calculate capital requirements. In the context of pension investments, these regulatory tools may reduce risk appetite and result in overly procyclical investment policies. Another regulatory method, reviewed by Davis (2002), is the prudent person rule or prudent person principle. In Europe, this principle is embedded in the Solvency II Directive, which governs the solvency of insurers and reinsurers.[2] In the case of defined contribution pension plans, this method would effectively enable unrestricted freedom in portfolio construction since these plans have no defined liabilities and return is not guaranteed. Although this approach could potentially yield more efficient investment outcomes, it should be considered that pension products are not subject to the same stringent prudential requirements as credit institutions or insurers, which would otherwise naturally shape the portfolio composition.

Davis (2002) also outlines multiple arguments against quantitative portfolio regulations. From a portfolio construction perspective, they may limit managers' ability to achieve the efficient frontier and reduce the ability to be flexible under changing economic conditions. From a macroeconomic perspective, strict quantitative restrictions may lead to inefficient capital allocation and hinder the ability to invest in small enterprises.

3 Methodology and data

3.1 Methodology for regulatory analysis

This study primarily employs a doctrinal, descriptive-analytical approach to examine the regulatory investment limits imposed on Latvian SFPS investment plans. Statutory requirements set by the Section 12 of the Law on State Funded Pensions (2000) of the Law are examined and evaluated in light of portfolio theory and the available opportunities to invest in the domestic capital market.

First, the current quantitative investment limits are summarised and categorised into two categories: exposure limits and concentration limits. Exposure limits stipulate the maximum allowed weight of a single financial instrument in the portfolio. Concentration limits, on the other hand, define how large the maximum allowable investment relative to the size of a particular financial instrument. Second, when the regulatory framework is summarised, investment opportunities are evaluated. Particular emphasis is placed on investments in the Latvian capital market – NAS-

[2]For more detailed information on Prudent Person Principle, see: https://www.eiopa.europa.eu/rulebook/solvency-ii/article-2219_en

DAQ OMX Riga.[3] Domestic investment opportunities are assessed by collecting data on listings in Latvian stock and bond markets at the end of 2024.

3.2 Methodology and data for the assessment of risk-factor exposures

In addition to the qualitative analysis of the regulatory framework, a quantitative analysis of risk-factor exposure is employed. This analysis complements the qualitative research by providing a more nuanced analysis of the existing investment portfolios in order to understand which systemic risk factors are driving the returns in the Latvian SFPS, and identify those that are ignored or potentially cannot be achieved because of investment limits and restrictions. The analysis covers the time period from 2020 to 2024 and uses monthly observations.

To assess the risk exposures of the analysed portfolios, the extended Fama-French multifactor regression model (Fama and French (1993)) is employed. The regression is specified as follows:

$$R_{it} - R_{ft} = \alpha_i + \beta_{MKT} MKT_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{TERM} TERM_t + \beta_{DEF} DEF_t + \varepsilon_{it} \quad (1)$$

where R_{it} is the return of the investment plan i at time t, R_{ft} is the risk-free rate, defined as euro short-term rate (€STR), and ε_{it} is the error term. α is the intercept of the regression, which can be interpreted as the alpha or the average level of abnormal return generated by the investment plan. The factor loadings β capture the sensitivity of investment plan returns to each respective risk factor. MKT or the market risk component measures the return spread between the global equity market index and risk-free return. SMB (small minus big) or the size factor captures the difference between the returns of low-capitalisation companies and high-capitalisation companies. HML (high minus low) or the value factor is the return spread between value stocks (high book-to-market ratio) and growth stocks (low book-to-market ratio). The TERM factor is the spread between the long-term government bond interest rate and the short-term government bond interest rate. DEF is a proxy for default risk, measured as a return spread between corporate bonds and German government bond returns. This specification allows for the decomposition of investment plan's returns into systematic components driven by market, size, value, term, and default risk. The regression is estimated using ordinary least squares, and the statistical significance of each factor loading is evaluated to determine which risks are priced in the portfolios' performance.

[3] Nasdaq Baltic statistics: https://nasdaqbaltic.com/statistics/lv/statistics

Investment plan returns are calculated using data from the website *manapensija.lv*, which provides information on unit values, total assets, and the number of participants.[4] Developed markets' equity factors – MKT, SMB, and HML – are obtained from the Fama-French Data Library maintained by Kenneth R. French.[5] Market risk premium is adjusted for the euro area by replacing the US one-month T-bill rate with the respective €STR obtained from the European Central Bank.[6] Equity factor returns initially denominated in US dollars were converted into euros using contemporaneous EUR/USD exchange rate returns. TERM is calculated as the difference between spot rates of 10-year[7] and 1-year[8] euro area government bonds with a credit rating AAA. DEF is calculated as the return spread between iShares Euro Investment Grade Corporate Bond Index Fund[9] and iShares Germany Government Bond fund[10]. An overview of geographical asset allocation in the SFPS, which justifies the choice of the respective risk factors, is presented in subsection 4.1.2.

4 Analysis

4.1 Investment constraints and their implications

This subsection documents the current asset allocation limits applicable to investment plans in the Latvian SFPS stipulated by the Section 12 of the Law on State Funded Pensions (2000) of the Law. It evaluates the extent to which these limits align with the investment principles outlined in the preceding sections. Furthermore, this subsection assesses how these limits affect asset managers' ability to invest in the Latvian capital market.

From a portfolio construction perspective, the most significant investment limits are those that impose diversification requirements at the plan level (exposure limits). For example, the Law requires that investment in the equity securities of a single issuer may not exceed 5% of the total assets of an investment plan. Such limits apply across all permitted asset classes and are summarised in Table 1. The primary objective of these limits is to ensure a minimum level of diversification. The 5% limit on equity securities issued by a single entity implies that, if the limit is fully utilised,

[4]See: https://www.manapensija.lv/en/2nd-pension-pillar/statistics/
[5]See: https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html
[6]Dataset available: https://data.ecb.europa.eu/data/datasets/EST/EST.B.EU000A2X2A25.WT
[7]Dataset available: https://data.ecb.europa.eu/data/datasets/YC/YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_10Y
[8]Dataset available: https://data.ecb.europa.eu/data/datasets/YC/YC.B.U2.EUR.4F.G_N_A.SV_C_YM.SR_1Y
[9]See: https://www.ishares.com/uk/individual/en/products/228414/blackrock-blk-euro-inv-grade-corp-bd-inst-eur-dist-fund
[10]See: https://www.ishares.com/uk/individual/en/products/251744/ishares-germany-government-bond-ucits-etf

a portfolio must include shares of at least 20 different companies. However, given the need for prudence to avoid breaches of the prescribed limits, actual exposure levels must generally remain below the legal thresholds.

Section 12 of the Law on State Funded Pensions (2000) of the Law not only defines exposure limits but also concentration limits, i.e. the maximum proportion of share capital and voting rights, the fund's net assets, or total issued instruments, that an investment plan may acquire. Although these limits do not directly promote diversification or mitigate investment risk per se, they are important to ensure the presence of other investors, which in turn plays a crucial role in verifying investment quality and ensuring liquidity and stability of the issuer or fund. The concentration limits are summarised in Table 2.

Table 1: Exposure limits in Latvian SFPS investment plans

Position	Limit
Shares of a single issuer	5%
Bonds of a single issuer	10%
Bonds of a single government or international financial institution	35%
Latvian government bonds	100%
Single investment fund	10%
Single investment fund which replicates an index	25%
Single alternative investment fund	10%
Single foreign currency	10%
Single OECD currency in investment plans, where equity exposure can exceed 20%	50% of maximum equity exposure

Source: Section 12 of the Law on State Funded Pensions (2000)

Table 2: Concentration limits in Latvian SFPS investment plans

Position	Limit
Issuers' capital and share of voting rights	5%
Total value of bonds issued by a single issuer	10% or 30%
Net assets of a single investment fund or alternative investment fund	30%

Source: Section 12 of the Law on State Funded Pensions (2000)
Note. 10% concentration in bonds of a single issuer is the base-line scenario, 30% can be reached if the issuer meets several additional criteria.

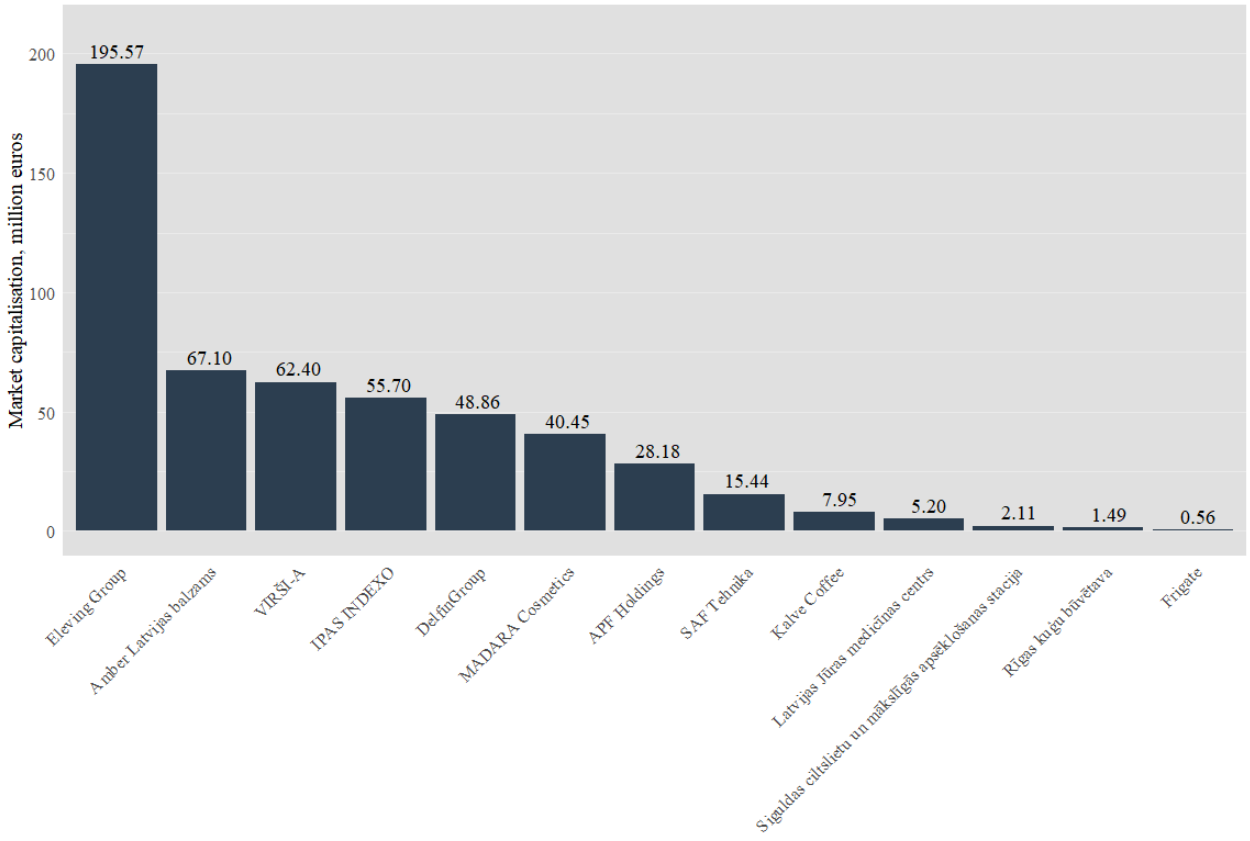
4.1.1 Investments in stocks and bonds

When constructing an investment portfolio, asset managers must consider both types of limits: the plan's exposure to a particular issuer and the concentration of the plan's holdings in a financial instrument. The binding constraint is the lowest of the two limits. For example, an investment plan managing 1 billion euros could, based on the exposure limit, invest up to 50 million euros in a single company's shares. However, if the issuer's share capital amounts to 100 million euros, the investment is limited to 5 million euros, corresponding to 1% of the investment plan's assets.

Although concentration limits generally do not constrain investments in global equity markets, where companies tend to have large capitalisations, they can significantly restrict investments in smaller companies, such as those listed on the Latvian stock exchange. Figure 1 illustrates the market capitalisation of all issuers listed on the Latvian stock exchange.

As shown in the figure, there are only 13 publicly listed companies, and only one Latvian issuer has a market capitalisation exceeding 100 million euros, and only four exceed 50 million euros, indicating that the Latvian stock market predominantly comprises relatively small companies. 5 companies do not exceed even 10 million euros, indicating that an investment from a single investment plan cannot even reach 1 million euros. The average market capitalisation at the end of 2024 was 40.8 million euros, meaning that the maximum allowed investment by a single investment plan in an average company would be 2.04 million euros. Meanwhile, the average assets under management in Latvian SFPS investment plans was 266.6 million euros at the end of 2024, implying that the average investment of the plan in an average Latvian stock cannot even reach 1% of the plan's assets.

Figure 1: Market capitalisation of companies listed in NASDAQ OMX Riga at the end of 2024



Source: NASDAQ OMX Riga

It is important to note that not all investment plans are eligible to invest in these equities due to varying investment policies. Some plans exclude equities altogether, others invest exclusively in index funds, and some might invest only according to sustainability principles. This highlights that potential investments in Latvia are limited not only by legal constraints but also by the specific investment policies of individual investment plans. Another crucial factor is the company evaluation performed by the asset manager. Acting as a prudent and diligent fiduciary, the manager should only invest in financial instruments deemed to have positive return potential. If such opportunities are absent or limited by investment regulation, the manager should not be obligated to invest in the domestic market.

Given the low allowed investment per issuer, the limits substantially restrict the potential return on such investments for both the manager and the plan participants. First, the weight of a single equity holding is too small to economically influence overall portfolio performance, which, in turn, can affect client attraction and performance fees. Second, a thorough and continuous analysis of the company is required, which entails the deployment of additional resources. As a result, the marginal benefit of such investments may be negligible or even non-existent.

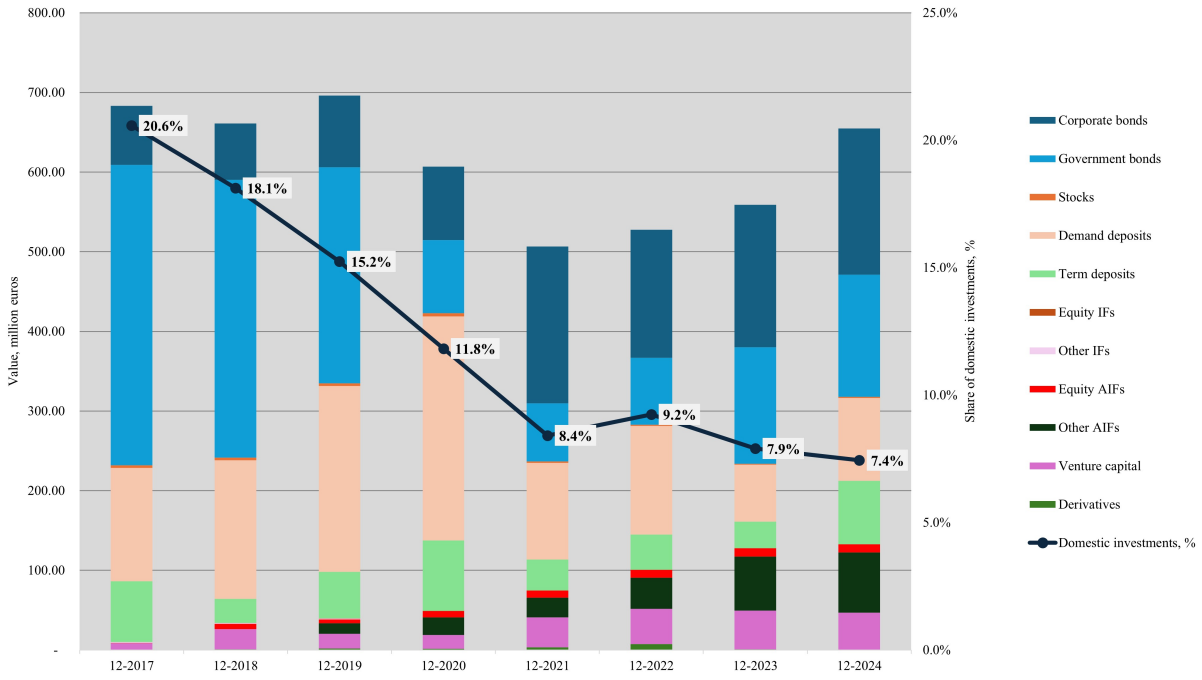
A similar, albeit less restrictive, situation applies to investments in corporate debt instruments. The limits on bond holdings are somewhat more liberal – up to 10% of the plan's assets may be invested in bonds from a single issuer. Furthermore, the concentration in these instruments must not exceed 10% or 30%, depending on additional sustainability-related criteria. Figures A1 and A2 in the Appendix present the nominal values of bonds issued in the regulated and alternative markets in Latvia at the end of 2024, respectively. It is evident that the Latvian bond market offers a wider range of issuers and larger issuance volumes, suggesting that investment managers face fewer market-based constraints when investing in domestic bonds. Nevertheless, opportunities in smaller bond issues remain limited, particularly for the largest investment plans.

4.1.2 Investments of the state funded pension scheme

Figure 2 shows investments in Latvia from the SFPS in the time period from 2017 to 2024. The figure illustrates both the weight of domestic investments on the right-hand axis and absolute value of investments made in Latvia by asset class. It can be observed that the share of domestic investments has dropped significantly over the years from 20.6% in 2017 to 7.4% in 2024. However, the absolute value has experienced a less pronounced decline. Since the majority of investments in

Latvia are made in debt instruments (corporate bonds and government bonds) or bank deposits, the actual investment structure supports the arguments outlined above. First, the domestic bond market offers more investment opportunities allowing managers to invest more. Second, since there is almost no supply in the Latvian public equity market, actual investments are low. This shows that investment limits, combined with a lack of investment opportunities, severely restrict possibilities to invest in the Latvian stock market.

Figure 2: SFPS investments in Latvia (2017 – 2024)



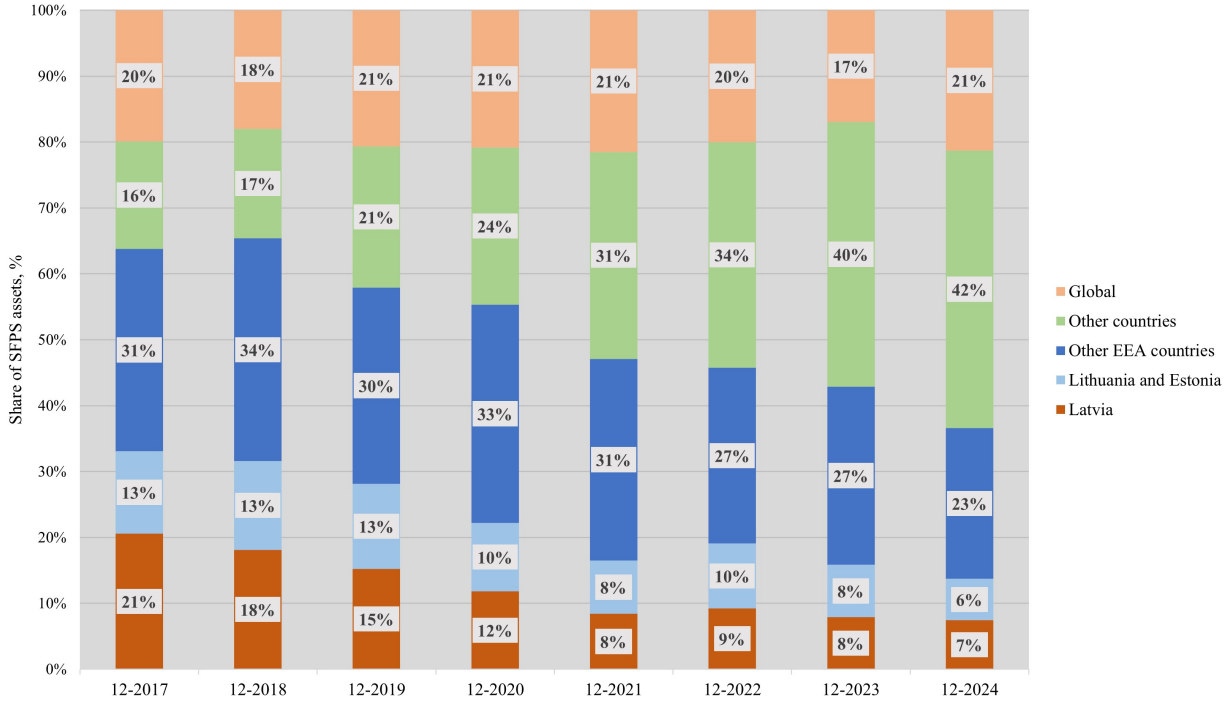
Source: Supervisory reports

Figure 3 illustrates the geographical diversification of SFPS assets using a look-through approach, capturing the final destination of investments. Investments in other countries, e.g. those not belonging to the European Economic Area (EEA), have increased nearly threefold since 2017. This has largely come at the expense of investments in Latvia and other European countries whose shares in SFPS portfolios have declined markedly. However, the geographical distribution of assets is heterogeneous across investment plan risk categories.

Figure A3 in the Appendix illustrates the geographical diversification across three investment plan categories. High-risk plans, consisting mainly of equity securities, exhibit substantial exposure to non-EEA countries, showing that investments are made in global markets, while investments in

the Baltic markets are almost non-existent and Europe (excluding the Baltic states) accounts for only 14% of the total allocation in high-risk investments. In medium-risk and low-risk plan categories investments are more balanced, investments in the Baltic markets constitute a considerable share of the portfolio, and allocations to European markets are also higher in lower-risk portfolios. Together, these findings indicate that equity investments are are primarily allocated to global markets, while the fixed-income share of the portfolio is more Europe-biased.

Figure 3: Geographical allocation on SFPS assets (2017-2024)



Source: Supervisory reports
Note. Global refers to investment funds diversified across multiple countries.

4.1.3 Passive investment strategies

Alongside the introduction of high-risk investment plans, passively managed index plans have gained increasing popularity. These plans aim to track the performance of a specific equity or bond market index. The key advantage of this strategy lies in its low-cost structure: investments are made exclusively through index funds, which generally have lower fees than actively managed funds, and managers incur no additional expenses related to active investment research and analysis.

Although this approach has demonstrated strong performance and enjoys global popularity, it also introduces regulatory diversification risks that are not currently addressed in the existing SFPS

investment regulation. Since market indices do not have any investment limitations, the weight of a single company within an index fund can exceed the statutory 5% limit. For instance, in the market-weighted S&P 500 index, the largest companies often approach or even exceed this threshold. This trend is even more pronounced in indices that apply sustainability filters. Consequently, an index plan tracking such an index may technically violate the legally prescribed diversification requirement, despite investing in more than 500 different instruments. This highlights the issue that too strict statutory exposure limits can effectively restrict investments in large-cap companies, especially if the manager has chosen a more passive investment strategy.

It should also be noted that a special limit applies to investments in index funds. However, this does not prevent asset managers from investing in multiple funds that replicate the same index (e.g. the S&P 500), thereby failing to ensure effective diversification. As noted previously, this increases exposure to individual issuers. Thus, the relevant limit does not effectively mitigate portfolio exposure risk, but rather addresses counterparty risk. First, it must be recognised that counterparty risk in index funds is generally lower than in, for example, over-the-counter financial instruments. Second, if a manager adopts a passive investment approach by allocating funds across multiple index funds, the portfolio must include at least four different funds – even if their composition are identical. This may result in higher transaction costs compared to investing a larger amount in a smaller number of funds, thereby foregoing potential economies of scale, which might occur from bulk discounts and fewer brokerage fees.

Passive strategies can be implemented not only through investing in index-tracking funds but also through direct replication, which, in turn, could lower the costs by eliminating the commission fee paid to the intermediary investment fund. The exposure limit on a single stock is not the only restriction which limits managers' ability to implement such a strategy. Limit on a single foreign currency, which currently stands at 50% of the maximum equity position for OECD currencies, can also hinder ability to develop a plan with direct index exposure, especially if the index tracks global equity market.

4.1.4 Alternative investments

Given that pensions are inherently long-term investments, alternative investments – although typically less liquid in the short term – can play a strategically important role by offering the potential for higher long-term returns, broader diversification, and stimulus to the domestic economy.

Currently, in the baseline scenario the total investment in alternative investment funds can reach up to 10% of an investment plan's assets, with the possibility to increase the exposure to 15% if there is diversification across different alternative investment fund types and to 25% across different alternative investment funds, given that additional, sustainability-linked conditions are met (Section 12 of the Law on State Funded Pensions (2000)). However, these additional conditions can be restrictive, requiring regular monitoring and, in practice, may be difficult to meet. As a result, investment rules may further constrain managers' ability to make use of such opportunities – already limited by risk appetite, market supply, and economic feasibility - while also increasing administrative requirements and associated costs.

Asset managers are also permitted to directly invest pension assets in the equity of private companies, but these investments are subject to particularly restrictive limits – 5% of the plan's assets and 5% of the company's share capital and voting rights. Additionally, investments are allowed only in enterprises that are in a growth stage. This investment opportunity resembles private equity strategy, but without the fees typically charged by intermediary alternative investment fund manager. Therefore, such investments could, in principle, provide cost savings to managers and plan participants. However, given that the applicable limits are the same as those for listed equity, the practical challenges encountered are similar, and in some respects, even more pronounced. Direct investments require even more extensive due diligence, monitoring, and governance, which lead to higher costs and, ultimately, may limit the attractiveness of such investments, particularly when the permitted allocation is small.

4.2 Risk-factor exposures

The results of the regression specified by Equation 1 are presented in Table 3. Additionally, it provides the information on the R-squared and adjusted R-squared values of the regressions for each investment plan. Investment plans are divided into 3 categories, where low-risk represents plans where maximum equity exposure cannot exceed 25%, high-risk plans have a maximum equity exposure from 75% to 100%, the rest of the plans fall under the category of medium-risk investment plans, where maximum equity exposure is 50%.

MKT refers to the traditional market beta, which represents assets' sensitivity to stock market fluctuations. This is the only factor which is statistically significant for all investment plans, indicating that, first, the global equity market premium is the primary driver of investment plan re-

turns. Second, a clear trend emerges – high-risk plans exhibit greater sensitivity to the global equity market compared to low-risk plans, which is expected given their higher equity allocations. The low beta coefficients in low-risk plans clearly demonstrate their ability to deliver reduced volatility and lower losses during periods of market uncertainty, suggesting that bond exposure enhances capital preservation as pension payouts approach, which is essential for investment safety and predictability of payouts from the SFPS. None of the investment plans in the high-risk plan category, however, show beta value close to 1, where the investment plan would have a full exposure to market risk in the same proportion as the benchmark. This could be explained by multiple factors: (1) management fees that reduce net returns; (2) liquidity buffers; and (3) the fact that 100% equity exposure has been allowed only since 2021, thereby reducing the overall beta for high-risk plans.

The size factor is represented by SMB coefficients. The coefficients are statistically significant and negative for all investment plans in the high-risk and medium-risk categories, except for one investment plan, which has an insignificant factor loading. The size factor is mostly insignificant for low-risk plans. Such a pattern suggests a systematic bias towards investments in larger, more established firms, which are generally more liquid and perceived as less risky. However, it also highlights a limitation in diversification, as exposure to the potential size premium from small-cap stocks is largely absent. This diversification limitation, at least partially, can be attributed to asset allocation limits which hinder managers' ability to invest in companies with a low market capitalisation.

HML coefficients show the value factor loadings for investment plans in the Latvian SFPS. Negative and statistically significant coefficients can be observed for all high- and medium-risk investment plans. These results indicate that investment plans are more closely tied to growth stocks, which have high price-to-book ratios. Growth stocks are often more volatile and potentially overvalued, posing elevated risks. This pattern likely reflects the strong performance of growth stocks, particularly in the technology sector, in recent years. For instance, by the end of 2024, 37% of S&P 500 companies were classified as growth stocks, while pure value stocks comprised less than 10%, and the proportion of growth stocks continued to increase.[11] This implies that Latvian SFPS plans are potentially highly dependent on growth companies, which may suffer heavier losses during economic downturns. Although this exposure cannot be directly regulated, since value criteria cannot be legally defined, the findings suggest that managers systematically invest in growth stocks,

[11] See: https://www.blackrock.com/us/individual/insights/value-stocks-underweight-and-unaware

mirroring global market trends and potentially overlooking systemic risk and the value premium.

TERM coefficients present the factor loadings for the bond term structure. These coefficients are statistically insignificant for all high- and medium-risk plans, indicating that this bond-related risk factor does not materially affect the outcomes of equity-dominated portfolios. Regarding two low-risk plans, the term structure factor is significant and negative for two investment plans. This suggests that these plans are exposed to duration risk and may incur greater losses when the yield curve is upward sloping. It indicates that portfolios may not be sufficiently diversified across maturities or that interest rate risk is not being effectively managed. This risk could be mitigated by using derivatives. It should be noted that managers are already permitted to use derivatives for risk management and hedging.

Coefficients regarding the DEF factor show the factor loadings for the default premium. A consistent pattern emerges – this factor is statistically significant primarily for high- and medium-risk plans. Since the factor has a positive effect on plan returns, it indicates that high-risk plans are strongly linked to credit cycles, meaning that investment plans are performing well during periods of strong credit markets. This finding reinforces the previously described results regarding the value factor and suggests that high-risk investment plans are distinctly pro-cyclical and may lack sufficient diversification across risk factors.

Alpha or the intercept of the regression shows the average level of abnormal returns for investment plans. Half of the investment plans in the SFPS, mainly in medium- and low-risk categories, show negative and statistically significant alpha. This indicates that, according to the model, these plans underperformed the expected return.

R-squared values for each plan and its respective model, indicating the proportion of return variability explained by the model and selected risk factors. R-squared values range from 50% to 90%, suggesting that the model and systemic risk factors account for the majority of return variation.

As a robustness assessment, two supplementary analyses were conducted. First, the baseline OLS regressions were re-estimated employing heteroskedasticity and autocorrelation-consistent standard errors (Newey and West (1987)) with a 12-month lag. The comparison of coefficients' p-values is presented in Table A1 in the Appendix. This adjustment yields nearly identical results to the baseline specification, indicating that the statistical significance is not materially affected by serial correlation or heteroskedasticity in the error terms. Second, a restricted model incorporating only

three Fama–French equity factors (MKT, SMB, HML) was estimated. The results are presented in Table A2 in the Appendix. The coefficient estimates from this specification remain identical in sign and significance with those of the extended five-factor model, suggesting that the inclusion of the TERM and DEF factors does not materially influence the estimated exposures on equity factors. Overall, these supplementary analyses indicate that the baseline results are robust to alternative standard error estimation and to the choice of factor specification.

Table 3: Latvian SFPS investment plans' risk-factor exposures

Risk level	Investment plan	Alpha	MKT	SMB	HML	TERM	DEF	R^2	Adj. R^2
High-risk	IP1	-0.002	0.569***	-0.618***	-0.282***	0.001	0.817***	0.779	0.758
	IP2	-0.003	0.516***	-0.450***	-0.203***	0.001	0.920***	0.766	0.744
	IP3	-0.003	0.539***	-0.245***	-0.322***	-0.003	0.569***	0.839	0.825
	IP4	-0.003	0.548***	-0.476***	-0.243***	0.000	1.111***	0.770	0.748
	IP5	-0.001	0.537***	-0.525***	-0.277***	0.000	0.949***	0.731	0.706
	IP6	-0.003	0.562***	-0.474***	-0.253***	0.001	0.534**	0.785	0.766
	IP7	-0.003	0.565***	-0.479***	-0.253***	0.001	0.532**	0.785	0.765
	IP8	-0.003	0.567***	-0.482***	-0.253***	0.001	0.538**	0.785	0.765
	IP9	-0.004**	0.451***	-0.100	-0.267***	-0.001	0.694***	0.851	0.837
	IP10	-0.004	0.456***	-0.377***	-0.202***	-0.000	0.845***	0.777	0.756
Medium-risk	IP11	-0.003**	0.363***	-0.213***	-0.155***	-0.002	0.356***	0.811	0.794
	IP12	-0.003*	0.349***	-0.204***	-0.151***	-0.001	0.722***	0.776	0.755
	IP13	-0.003*	0.340***	-0.228***	-0.149***	-0.001	0.250*	0.761	0.739
	IP14	-0.004***	0.390***	-0.146**	-0.132***	0.000	0.582***	0.872	0.860
	IP15	-0.004*	0.349***	-0.242***	-0.146***	-0.001	0.556***	0.754	0.732
	IP16	-0.003	0.391***	-0.366***	-0.200***	0.001	0.424**	0.742	0.718
	IP17	-0.002	0.328***	-0.216***	-0.111**	-0.001	0.660***	0.779	0.758
Low-risk	IP18	-0.001	0.102***	0.046	-0.024	-0.004**	0.101	0.627	0.592
	IP19	-0.003*	0.173***	-0.033	-0.088**	-0.004*	0.016	0.543	0.500
	IP20	-0.002	0.225***	-0.074	-0.070**	-0.002	0.408***	0.757	0.734
	IP21	-0.004**	0.267***	-0.129*	-0.114***	-0.002	0.393***	0.701	0.674
	IP22	-0.003*	0.241***	-0.085	-0.097**	-0.001	0.457***	0.735	0.711
	IP23	-0.003*	0.193***	0.019	-0.085**	-0.003	0.132	0.595	0.558
	IP24	-0.004**	0.204***	-0.057	-0.090**	-0.002	-0.077	0.499	0.453
	IP25	-0.004**	0.198***	-0.041	-0.082*	-0.003	0.259*	0.581	0.542
	IP26	-0.003*	0.168***	0.012	-0.044	-0.003	0.170	0.619	0.584

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: manapensija.lv, Kenneth R. French Data Library, European Central Bank, BlackRock, author's calculations

5 Conclusion and policy recommendations

This study analyses the current regulatory framework of investments in the Latvian state funded pension scheme. The goal of this study is to identify the investment limits and restrictions which are inefficient and do not allow managers to fully employ investment opportunities. Investment opportunities given or restricted by the regulation, on the other hand, can have a significant effect on portfolio management which is essential for efficient pension capital accumulation. Special emphasis is placed on those limits that might restrict investments in the Latvian capital market.

Given that the state funded pension scheme is of significant importance and is financed through taxpayers' contributions, it is essential to regulate the investment of these assets. International experience demonstrates that there are several approaches to regulating pension fund investments. The Latvian pension system employs quantitative investment limits. This method offers a clear and transparent regulatory framework for consumers, asset managers, and the supervisory authority. Moreover, it avoids the need for introducing additional prudential requirements or allocating extra resources for the development of new regulatory methodologies.

The findings of this study indicate that the investment limits established by the Law on State Funded Pensions most stringently constrain the ability to invest in individual equities through concentration limits, currently set at 5% of a company's share capital and voting rights. This restriction significantly limits investment opportunities in smaller enterprises, which constitute the majority of firms in the Latvian capital market. The impact of this regulation is further evidenced by the quantitative analysis of risk factor exposures in Latvian SFPS investment plans. Analysis shows that SFPS portfolios are more biased towards high-cap stocks, showing that this source of risk might not be enough diversified and investment plans are not able to capture the return premium which is often associated with investments in smaller companies. Therefore, it is recommended to raise the concentration limits applicable to investments in a single issuer. Such a reform is necessary not only to enhance diversification and portfolio returns and improve plan offering, but also to broaden the scope for investment in the Latvian capital market, especially in equity instruments.

Another important finding is that the value factor exposure is negative for high- and medium-risk investment plans, indicating a significant tilt towards growth companies that are potentially overvalued and carry a higher risk. These growth-oriented firms, which have performed strongly in recent years, constitute a substantial portion of global equity indices. Given the widespread

adoption of passively managed investment plans, the outsized influence of a small number of firms, and the resulting risk, several regulatory improvements can be made. First, the exposure limit to a single index-tracking investment fund should be increased to allow higher investments in one fund, which could result in lower transaction fees. Second, recognising that the investment fund is not the ultimate investment vehicle, it is essential to practically apply issuer-level exposure limits – i.e. limits on investments in the equity and debt securities of a single issuer – even when investments are made through collective investment vehicles. This necessitates the adoption of a look-through approach. Third, in order to accommodate the specificity of index-based plans while applying the look-through principle, the exposure limit for a single issuer's equity securities should be raised.

Considering the potential cost savings that could result from direct index replications rather than via intermediating index-funds, the limit on investments denominated in a single OECD member state's currency should be raised in order to allow managers to directly replicate global indices. At the same time, the existing principle – that this limit should be defined as a proportion of the maximum allowable share of equity securities within the investment plan – should be retained. This approach ensures that, as the payout phase approaches, key risks, including currency risk, can be effectively mitigated.

Considering both portfolio-level diversification within individual investment plans and the diversification across the range of available plans, it is necessary to ease restrictions on investments in alternative assets. This recommendation applies to both direct investments in alternative asset classes and investments via alternative investment funds. Given that alternative investments often include private equity – primarily targeting small and medium-sized enterprises – as well as real estate, this measure has the potential to effectively support broader economic development while also enhancing the performance of investment plan portfolios.

While this study finds that existing investment limits – particularly concentration and exposure thresholds – restrict the ability of investment managers to invest in Latvian enterprises, regulatory reform alone might not be sufficient. To fully unlock the investment potential of the state funded pension scheme and strengthen its contribution to the national economy, efforts must also be directed toward the development of the local capital market. Only through a coordinated approach that addresses both the regulatory framework and market development can the SFPS effectively foster sustainable and efficient long-term investment results and domestic economic growth.

The primary goal of the pension system is to ensure adequate future pensions. This study finds

that several improvements can be made regarding the investments of SFPS assets. However, it is vital to also consider other components of pension system design such as contribution rates, pension payouts, and financial literacy in order to design a pension system which would provide the best possible outcomes for future retirees.

References

Aldatmaz, S. and G. W. Brown (2020). Private equity in the global economy: Evidence on industry spillovers. *Journal of Corporate Finance 60*(101524).

Antolin, P., S. Blome, D. Karim, S. Payet, G. Scheuenstuhl, and J. Yermo (2009). Investment regulations and defined contribution pensions. *OECD, Directorate for Financial and Enterprise Affairs, OECD Working Papers on Insurance and Private Pensions* (37).

Brida, J. G. and M. Seijas (2016). Pension funds and capital market development: A global perspective. *Economía 19*(1), 55–76.

Bulõgina, T. and M. Kukk (2025). How the large-scale early withdrawals from private pension plans were used: insights from young adults. *Bank of Estonia Working Papers 2025-03*.

Davis, E. (2002). Prudent person rules or quantitative restrictions? the regulation of long-term institutional investors' portfolios. *Journal of Pension Economics and Finance 1*, 157–191.

European Commission and Directorate-General for Employment, Social Affairs and Inclusion and Social Protection Committee (SPC) (2024). *The 2024 pension adequacy report – Current and future income adequacy in old age in the EU. Volume I.* Publications Office of the European Union.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance 25*(2), 383–417.

Fama, E. F. and K. R. French (1993). Common risk factors in the returns on stocks and bonds. *Journal of Financial Economics 33*(1), 3–56.

Fama, E. F. and K. R. French (1996). Multifactor explanations of asset pricing anomalies. *The Journal of Finance 51*(1), 55–84.

Gutierrez, T., B. Pagnoncelli, D. Valladão, and A. Cifuentes (2019). Can asset allocation limits determine portfolio risk–return profiles in DC pension schemes? *Insurance: Mathematics and Economics 86*, 134–144.

Harvey, C. R., Y. Liu, and H. Zhu (2015). ... and the cross-section of expected returns. *The Review of Financial Studies 29*(1), 5–68.

Joenväärä, J., R. Kosowski, and P. Tolonen (2019). The effect of investment constraints on hedge fund investor returns. *Journal of Financial and Quantitative Analysis 54*(4), 1539–1571.

Khan, S., B. Li, and Y. Zhao (2025). Pension reform and stock market development. *IMF Working Papers WP/25/42*.

Lavery, P., M. Serena, Jose, M.-E. Spaliara, and S. Tsoukas (2021). Private equity buyouts and firm exports: evidence from UK firms. BIS Working Papers 961, Bank for International Settlements.

Lavery, P., J. Tsoukalas, and N. Wilson (2024). Private equity financing firm productivity. Technical report, The Productivity Institute.

Law on Investment Management Companies (1997). Law on Investment Management Companies. Latvijas Vēstnesis, Nr. 342/346, 30.12.1997. Obtained from: https://likumi.lv/ta/id/52953.

Law on State Funded Pensions (2000). Law on state funded pensions. Latvijas Vēstnesis, Nr. 78/87, 08.03.2000. Obtained from: https://likumi.lv/ta/id/2341.

Ljungqvist, A. (2024). The economics of private equity: A critical review. Obtained from: https://rpc.cfainstitute.org/research/foundation/2024/economics-of-private-equity.

Marini, V., M. Caratelli, G. P. Stella, and I. Barbaraci (2021). Is corporate governance of private equity targets more effective for risk mitigation? *Journal of Management and Governance 26*, 781–811.

Markowitz, H. (1952). Portfolio selection. *The Journal of Finance 7*(1), 77–91.

Meriküll, J. (2025). The impact of early pension withdrawals on household finances and inflation. *Bank of Estonia Working Papers 2025-04*.

Mitchell, O. and S. Utkus (2003). Lessons from behavioral finance for retirement plan design. *PRC Working Paper 2003-6*.

Newey, W. K. and K. D. West (1987, May). A simple, positive semi-definite, heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica 55*(3), 703–708.

Roldos, J. (2004, 10). Pension reform, investment restrictions and capital markets. *IMF Policy Discussion Papers 2004*.

Section 12 of the Law on State Funded Pensions (2000). Section 12, provisions for investment of funded pension scheme funds. Latvijas Vēstnesis, Nr. 78/87, 08.03.2000. Obtained from: https://likumi.lv/ta/id/2341#p12.

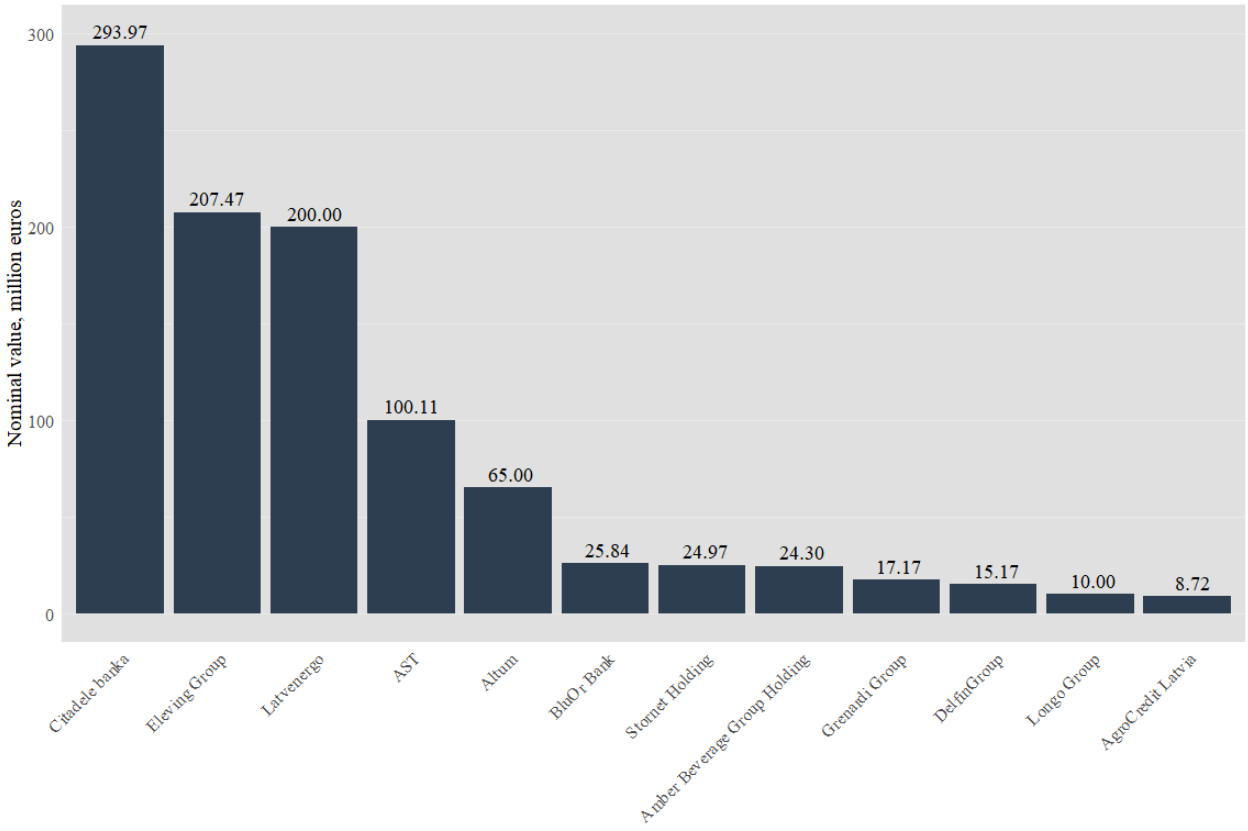
Section 13 of the Law on State Funded Pensions (2000). Section 13, supervision of funded pension scheme managers and custodians. Latvijas Vēstnesis, Nr. 78/87, 08.03.2000. Obtained from: https://likumi.lv/ta/id/2341#p13.

Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *The Journal of Finance 19*(3), 425–442.

Vittas, D. (1996). Pension funds and capital markets : Investment regulation, financial innovation, and governance. World Bank Publications - Reports 11632, The World Bank Group.

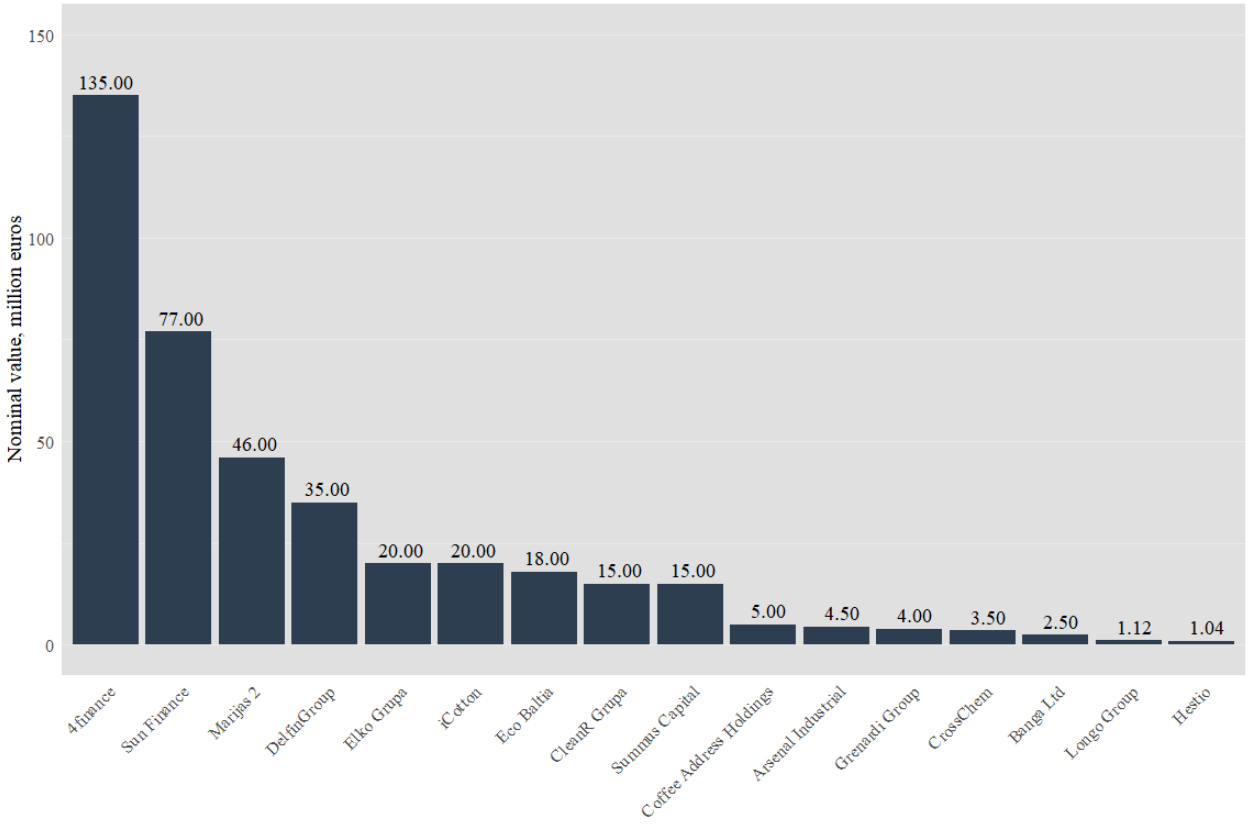
A Appendix

Figure A1: Nominal value of bonds issued in the regulated market of NASDAQ OMX Riga at the end of 2024



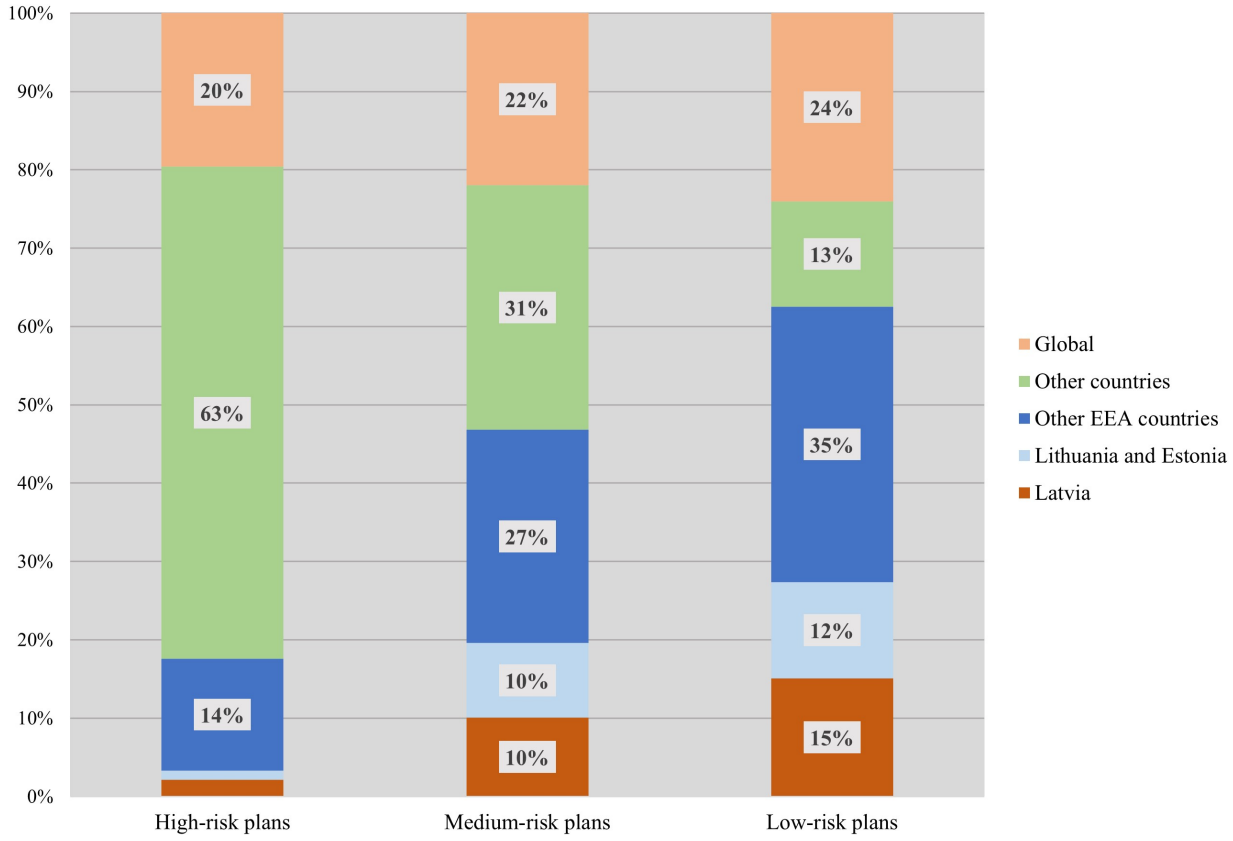
Source: NASDAQ OMX Riga

Figure A2: Nominal value of bonds issued in the alternative market of NASDAQ OMX Riga at the end of 2024



Source: NASDAQ OMX Riga

Figure A3: Georaphical allocation of SFPS assets within investment plan risk categories as of 2024



Source: Supervisory reports

Table A1: Comparison of OLS and Newey-West (N-W) p-values

Risk level	Investment plan	Alpha		MKT		SMB		HML		TERM		DEF	
		OLS	N-W	OLS	N-W	OLS	N-W	OLS	N-W	OLS	N-W	OLS	N-W
High-risk	IP1	0.403	0.460	0.000	0.000	0.000	0.000	0.000	0.000	0.852	0.661	0.000	0.000
	IP2	0.237	0.293	0.000	0.000	0.000	0.000	0.002	0.003	0.770	0.509	0.000	0.000
	IP3	0.171	0.142	0.000	0.000	0.008	0.001	0.000	0.000	0.377	0.087	0.003	0.000
	IP4	0.253	0.328	0.000	0.000	0.000	0.000	0.001	0.002	0.996	0.991	0.000	0.001
	IP5	0.643	0.681	0.000	0.000	0.000	0.000	0.000	0.000	0.964	0.920	0.000	0.001
	IP6	0.275	0.314	0.000	0.000	0.000	0.000	0.000	0.003	0.744	0.536	0.012	0.002
	IP7	0.281	0.321	0.000	0.000	0.000	0.000	0.000	0.003	0.762	0.564	0.013	0.002
	IP8	0.276	0.319	0.000	0.000	0.000	0.000	0.000	0.003	0.771	0.585	0.012	0.002
	IP9	0.029	0.036	0.000	0.000	0.200	0.108	0.000	0.000	0.686	0.400	0.000	0.008
	IP10	0.119	0.224	0.000	0.000	0.000	0.000	0.001	0.000	0.991	0.979	0.000	0.002
Medium-risk	IP11	0.035	0.033	0.000	0.000	0.001	0.000	0.000	0.000	0.494	0.171	0.008	0.086
	IP12	0.091	0.125	0.000	0.000	0.009	0.000	0.002	0.001	0.796	0.532	0.000	0.005
	IP13	0.067	0.109	0.000	0.000	0.001	0.002	0.001	0.005	0.701	0.354	0.071	0.044
	IP14	0.009	0.006	0.000	0.000	0.016	0.019	0.001	0.000	0.869	0.799	0.000	0.000
	IP15	0.055	0.102	0.000	0.000	0.002	0.001	0.002	0.001	0.656	0.268	0.001	0.014
	IP16	0.124	0.206	0.000	0.000	0.000	0.000	0.000	0.000	0.702	0.327	0.011	0.029
	IP17	0.167	0.247	0.000	0.000	0.003	0.002	0.011	0.005	0.782	0.489	0.000	0.001
Low-risk	IP18	0.550	0.427	0.000	0.000	0.271	0.171	0.340	0.144	0.017	0.000	0.238	0.245
	IP19	0.069	0.033	0.000	0.000	0.603	0.595	0.024	0.002	0.084	0.000	0.902	0.872
	IP20	0.190	0.181	0.000	0.000	0.173	0.118	0.036	0.015	0.241	0.012	0.006	0.009
	IP21	0.029	0.039	0.000	0.000	0.062	0.059	0.008	0.002	0.474	0.076	0.007	0.057
	IP22	0.054	0.055	0.000	0.000	0.164	0.046	0.011	0.002	0.538	0.162	0.001	0.032
	IP23	0.093	0.015	0.000	0.000	0.780	0.700	0.044	0.000	0.247	0.044	0.351	0.495
	IP24	0.043	0.021	0.000	0.001	0.441	0.461	0.047	0.007	0.513	0.120	0.611	0.670
	IP25	0.016	0.005	0.000	0.000	0.564	0.524	0.062	0.012	0.234	0.006	0.080	0.161
	IP26	0.048	0.007	0.000	0.000	0.842	0.781	0.222	0.055	0.146	0.003	0.167	0.286

Source: manapensija.lv, Kenneth R. French Data Library, European Central Bank, BlackRock, author's calculations

Table A2: Latvian SFPS investment plans' risk-factor exposures using Fama-French 3 factor model

Risk level	Investment plan	Alpha	MKT	SMB	HML	R^2	Adj. R^2
High-risk	IP1	-0.001	0.617***	-0.635***	-0.206***	0.721	0.706
	IP2	-0.001	0.570***	-0.469***	-0.118*	0.688	0.671
	IP3	-0.002	0.578***	-0.256***	-0.271***	0.807	0.797
	IP4	-0.001	0.616***	-0.499***	-0.141*	0.674	0.656
	IP5	0.000	0.594***	-0.544***	-0.189**	0.656	0.637
	IP6	-0.002	0.593***	-0.485***	-0.204***	0.758	0.745
	IP7	-0.002	0.595***	-0.490***	-0.203***	0.759	0.746
	IP8	-0.002	0.597***	-0.494***	-0.203***	0.758	0.745
	IP9	-0.003	0.495***	-0.115	-0.204***	0.797	0.786
	IP10	-0.002	0.507***	-0.395***	-0.124**	0.693	0.677
Medium-risk	IP11	-0.003*	0.387***	-0.221***	-0.123***	0.782	0.771
	IP12	-0.002	0.394***	-0.219**	-0.085*	0.685	0.668
	IP13	-0.003	0.357***	-0.233***	-0.126***	0.745	0.732
	IP14	-0.003*	0.424***	-0.158**	-0.079*	0.818	0.808
	IP15	-0.003	0.383***	-0.254***	-0.095**	0.692	0.676
	IP16	-0.002	0.415***	-0.375***	-0.160***	0.709	0.693
	IP17	-0.001	0.369***	-0.229***	-0.051	0.690	0.673
Low-risk	IP18	-0.001	0.114***	0.044	-0.016	0.573	0.550
	IP19	-0.003**	0.181***	-0.033	-0.088**	0.516	0.490
	IP20	-0.001	0.254***	-0.083	-0.034	0.687	0.671
	IP21	-0.003*	0.294***	-0.137*	-0.078*	0.653	0.635
	IP22	-0.002	0.271***	-0.094	-0.059	0.666	0.648
	IP23	-0.003*	0.206***	0.017	-0.075*	0.577	0.555
	IP24	-0.004**	0.203***	-0.055	-0.098**	0.493	0.466
	IP25	-0.004**	0.219***	-0.046	-0.059	0.543	0.518
	IP26	-0.003*	0.183***	0.008	-0.030	0.589	0.567

Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: manapensija.lv, Kenneth R. French Data Library, European Central Bank, author's calculations