

# The Impact of Pension Risks on Share Performance

## Our Investment Strategy with a Swiss Equity Portfolio

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**Asset Management, Final Presentation**  
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# Your Portfolio Specialists: Team Switzerland

“*Team Switzerland has satisfied customers by delivering **high return with comparatively low risk**. Rigorous **academic** training at Frankfurt School of Finance & Management by **Prof. Dr. Olaf Stotz** combined with longstanding **experience** within the asset management industry makes Team Switzerland **your best partner** for the Swiss market.”*



Setor  
Blagogee



Paulina  
Güldenber



Jessica  
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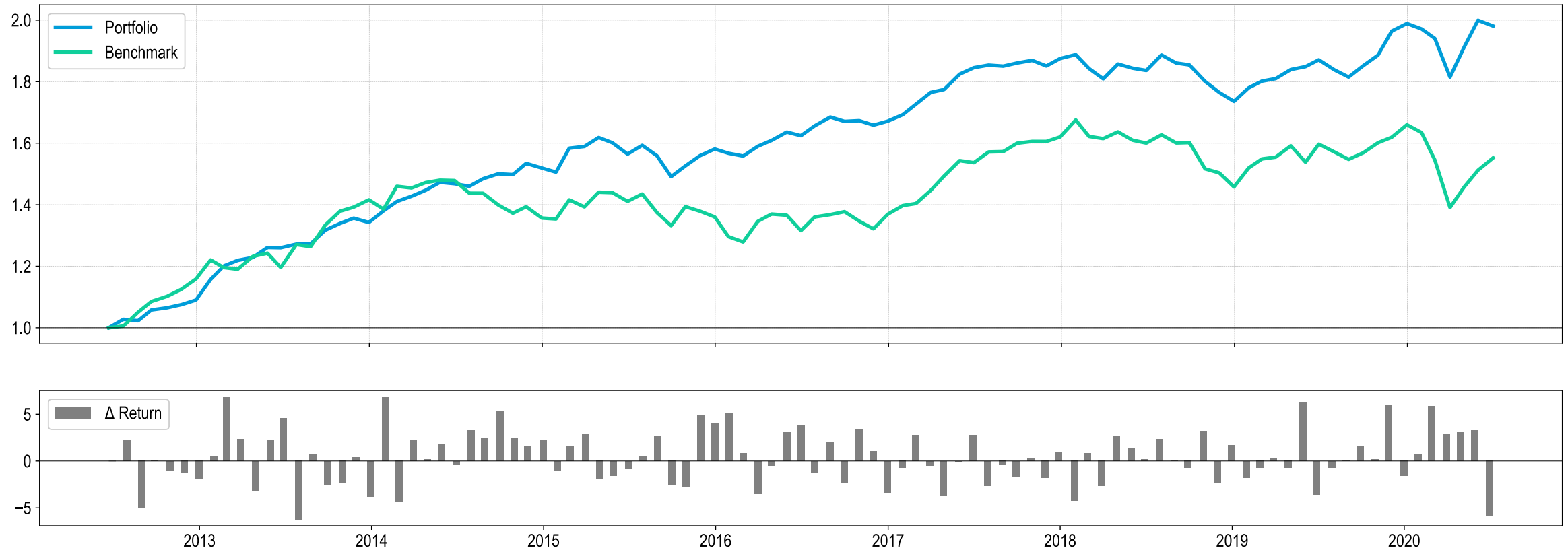


Julian  
Posmeck



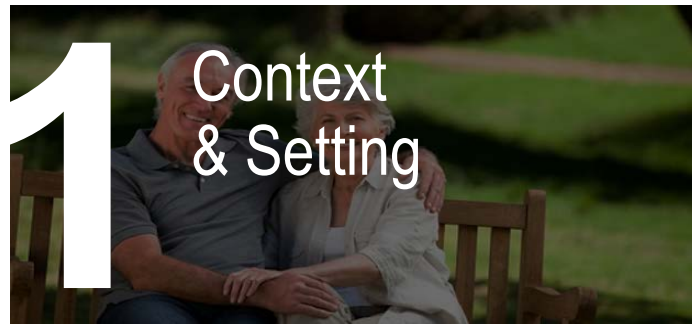
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Shemunkasho

# We beat the market! But how?

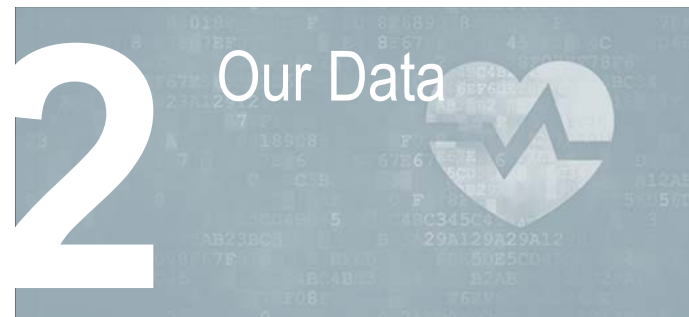
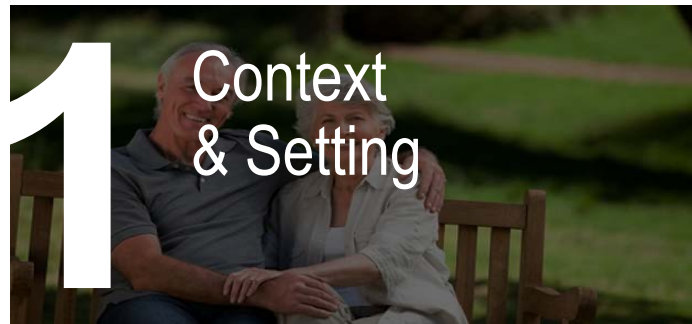


Source: Own figure

# Agenda



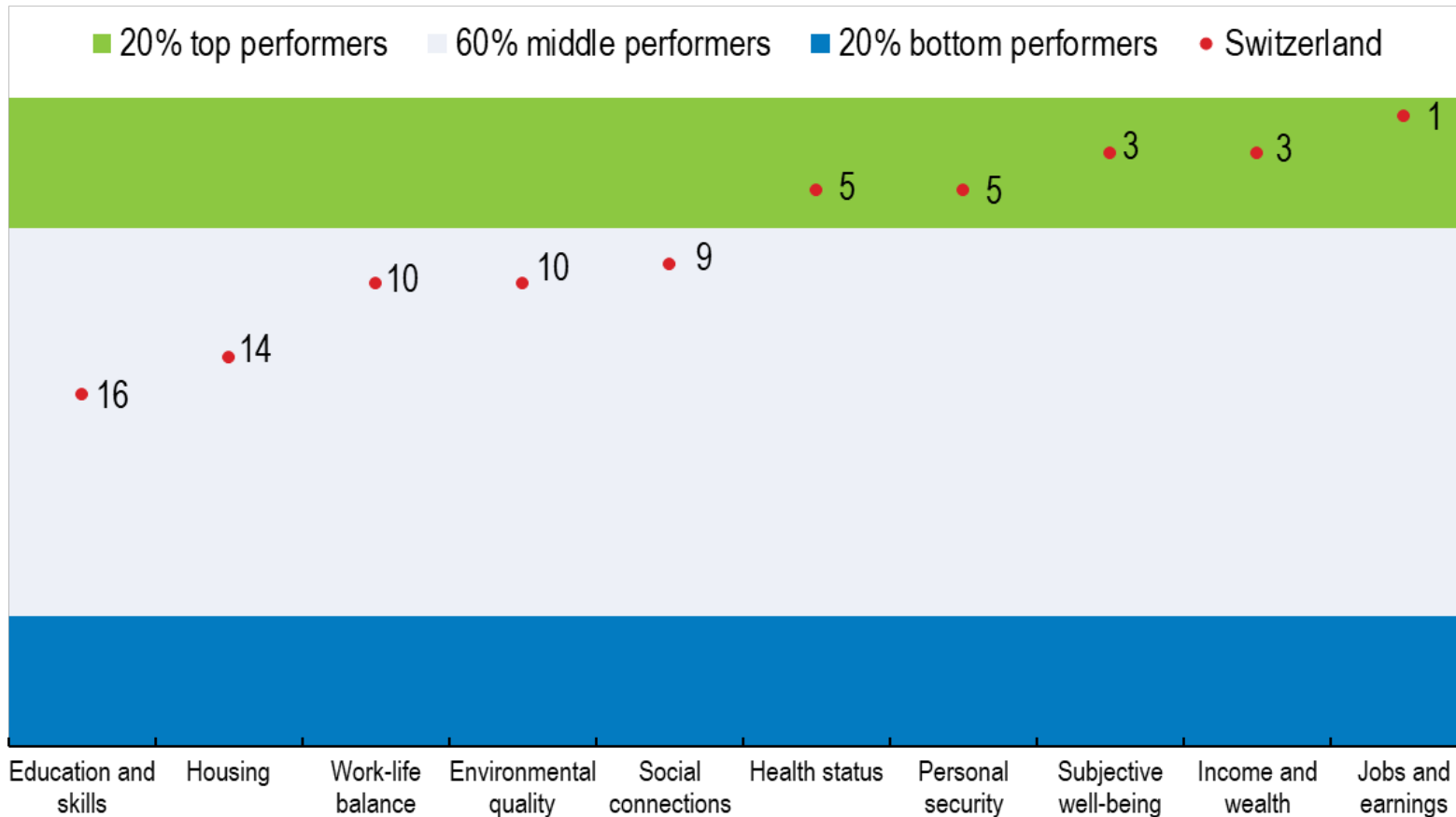
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# Switzerland remains one of the countries with the highest living standards in the world ...

Better Life Index, country rankings [from 1 (best) to (36) worst]

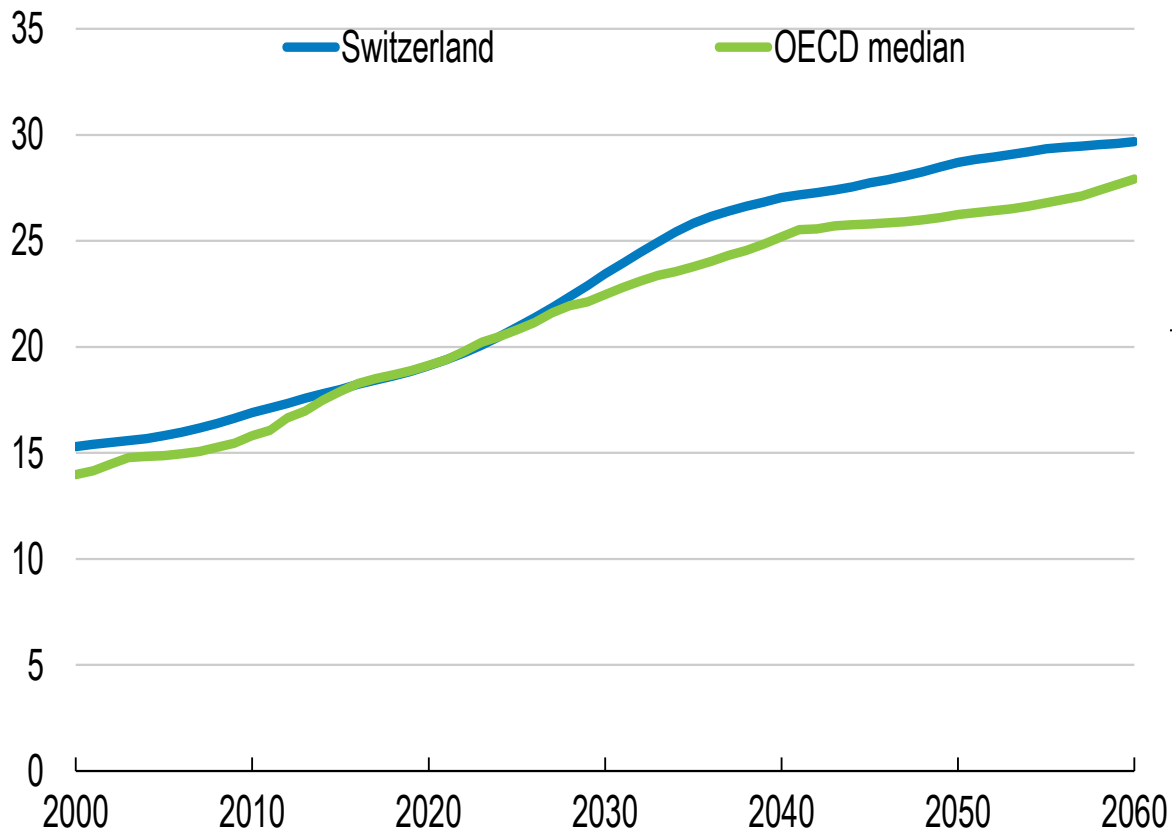


Sources: OECD Better Life Index; GDP: World Bank

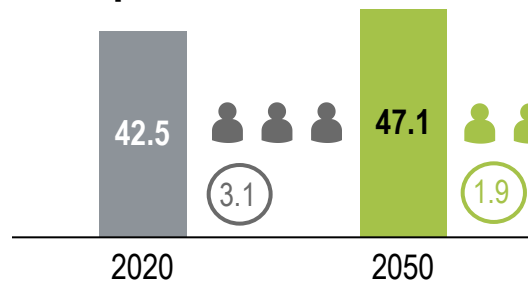
- > Switzerland enjoys **one of the highest per-capita GDP** (current USD 81,994) and some of the **highest living standards** of all OECD countries
- > Taking action now to prepare for a fast-ageing population will be fundamental **for the prosperity and well-being** of future Swiss generations
- > **Retiring baby boomers and rising life expectancy** will lift the share of the population aged 65 or over to almost 30% by the 2050s, constituting a faster rate of ageing than most OECD countries
- > The share of Swiss people over 80 will double to 10% by 2045
- > **Updating the pension system** and lengthening working lives is crucial to ensure adequate old-age incomes

# However, Switzerland is predicted to have a higher share of old-age population than most OECD countries – New challenges ahead

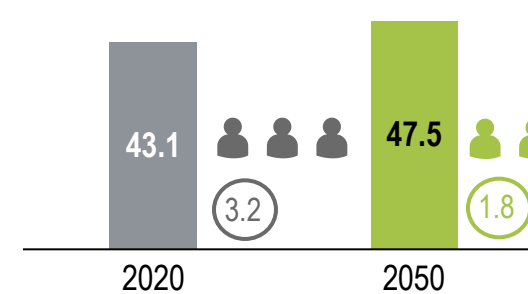
Left: Population share aged 65 or over [%]; Right: Median age and old-age potential support ratio



## Europe:



## Switzerland:

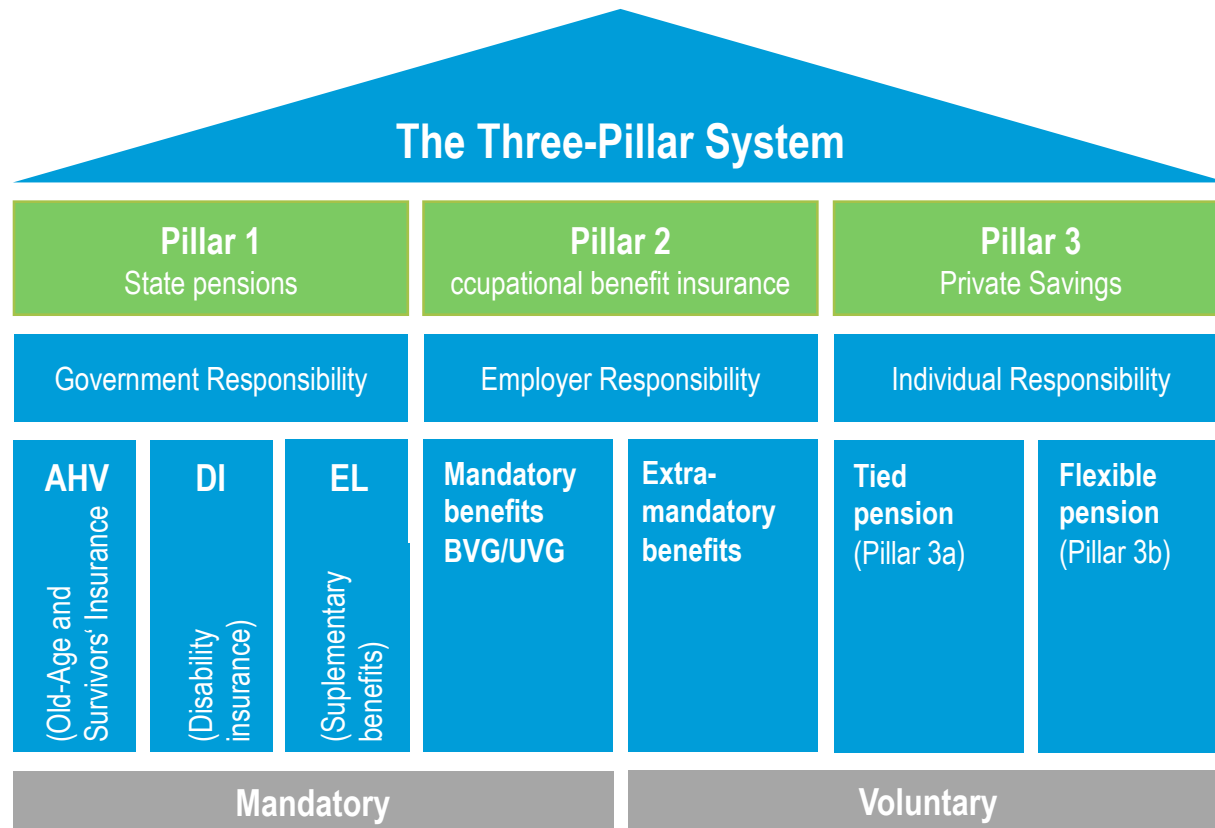


- > **Median age [years] and old-age potential support ratio by region [people 20-64 / people 65+], 2020 vs. 2050**
- > **A low old-age support ratio can have severe consequences for countries** if a large proportion of the government's expenditure is on e.g. health and social security, which to a large extent **are used by older members of the population**
- > However, the old-age support ratio ignores that people above the age of 65 **are not necessarily dependent on support** as an increasing proportion of them works; reversely not all of those considered "working age" are actually working

Sources: OECD Economics Department Long-term Model (left); UN DESA (right); Own illustration

# The higher share of old-age population along with lower fertility rates will pose challenges to the Swiss pension system

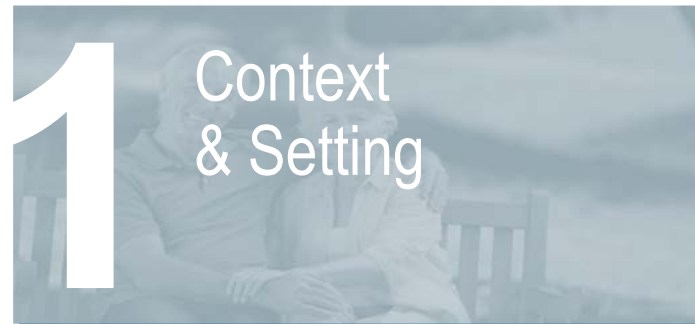
## Swiss Pension System



- > **State pensions** serves to cover the subsistence needs of the population
- > 1<sup>st</sup> and 2<sup>nd</sup> pillar together should enable all employees to continue their **accustomed standard of living** appropriately
- > Financing of the state pensions is based on the principle of solidarity, while the **2<sup>nd</sup> is financed by funded schemes**
- > Goal of private savings → complement the income after retirement
- > Two types of pension plans → defined benefit (DBO) and contribution benefit plans (CBO)
- > Three most significant pension risks **are longevity risk, actuarial interest rate and pension adjustment risk**
- > Accounting standards for pension plans are based on IAS 19 and its reform IAS 19R

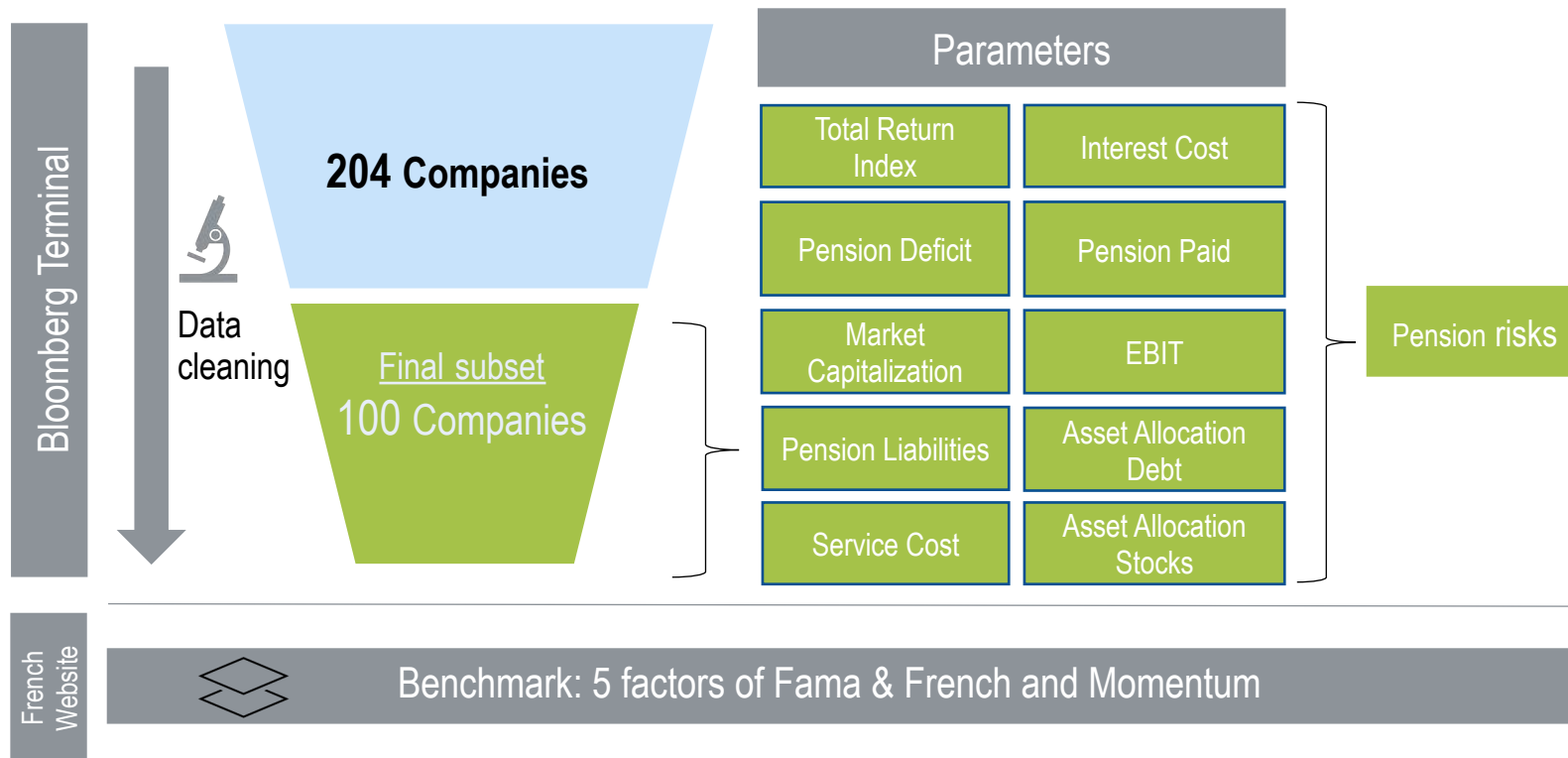


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In order to construct a portfolio with the 100 largest Swiss companies in terms of market cap, we needed complete set of data

Data funnel, Parameters, Pension Risks



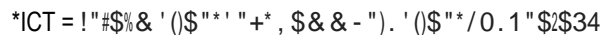
### Bloomberg terminal

- > Complete and consistent data set
- > Selection of the companies with an observation of the data results:
  - Many companies did not provide the required data
  - To finally derive our subset of the 100 largest Swiss companies in terms of market capitalization, we initially examined the 204 largest Swiss companies by market capitalization
- > Extraction of parameters from our subset of 100 companies

### Kenneth R. French Website

- > Our aim was to select an appropriate and realistic benchmark
- > The European data set as an appropriate benchmark (heuristic)

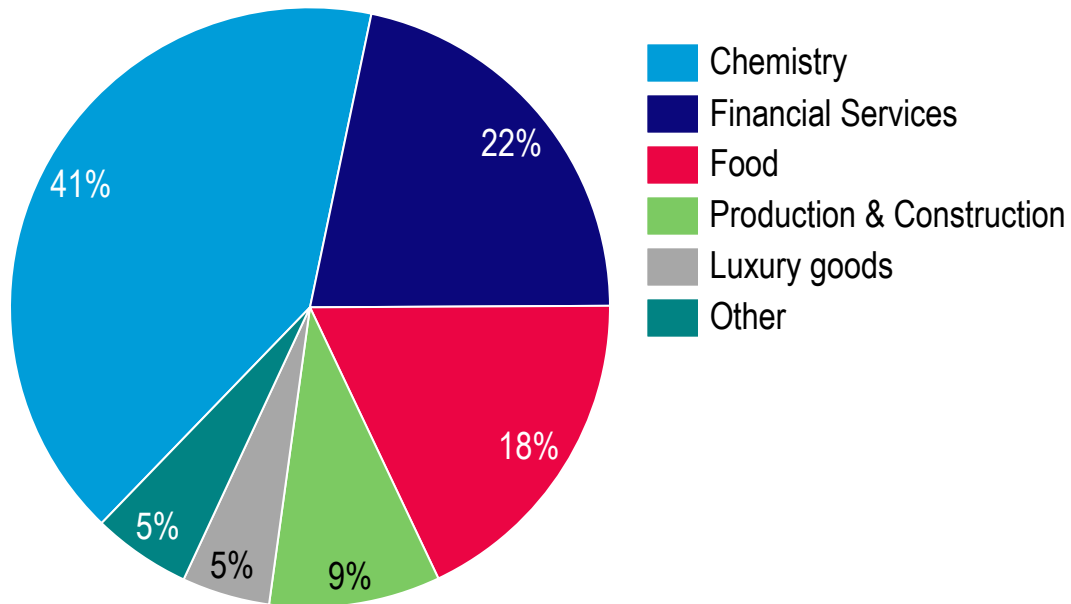
## Asset allocation of our portfolio [2011 – 2018]



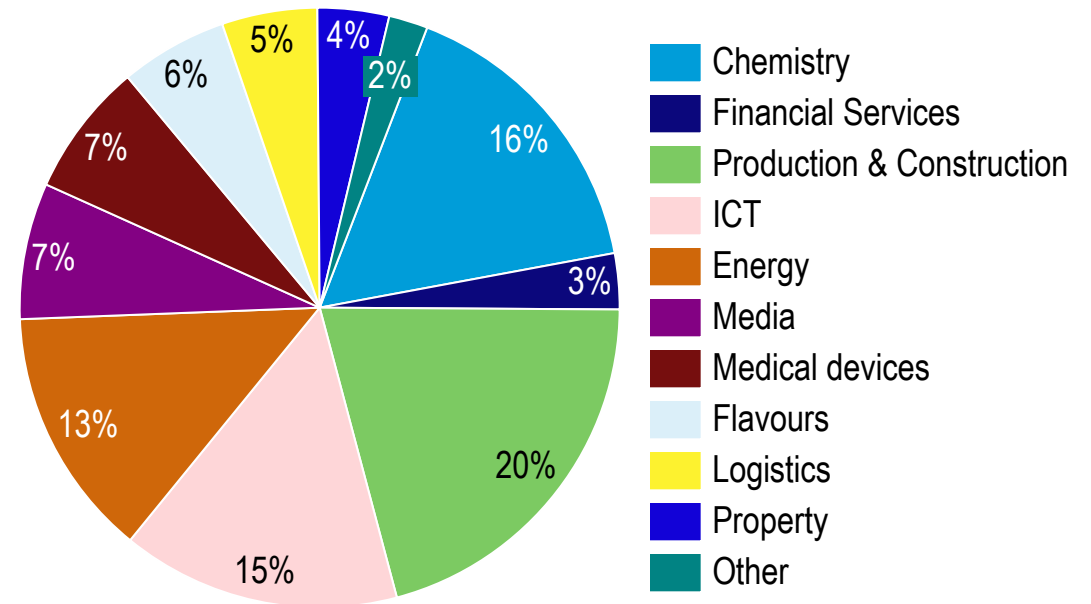
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# Our portfolio allocation demonstrates stronger diversification than the composition of the Swiss Market Index

Left: Composition of the SMI [2018]; Right: Average asset allocation of our portfolio [2011 – 2018]



Swiss Market Index



Our Portfolio

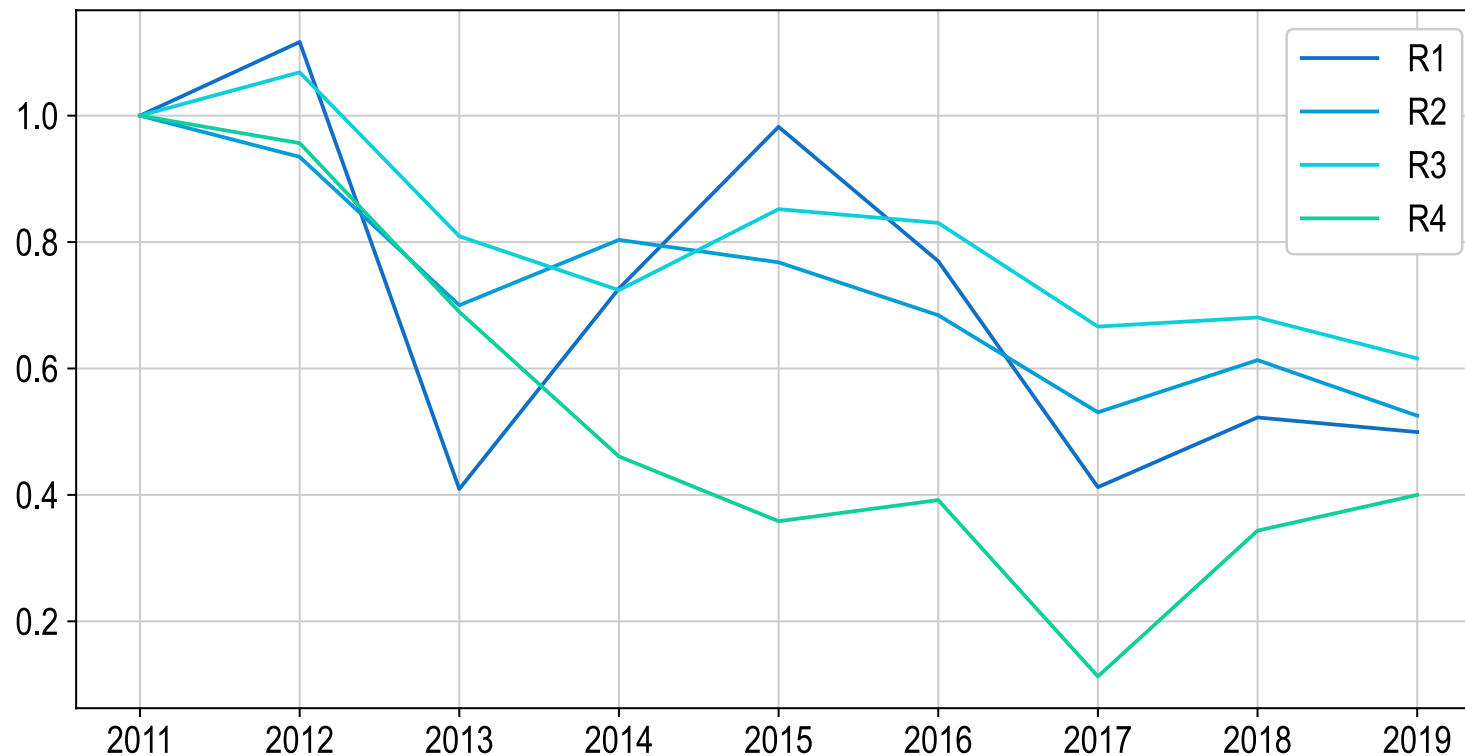
Source: Swiss Infrastructure and Exchange (SMI); Own illustration and calculation

# Agenda



# We have determined and analyzed the pension risks of companies based on five factors

Pension Risk Development [Median; 2011 – 2019]



- > Pension risk was measured by multiple factors which represent different **risk aspects of pension risk**
- > We utilized **five pension risk factors** (see below)
- > We constructed quintile portfolios within each risk factor and benchmarked them against each other
- > **The higher risk portfolios outperformed**
- > Our results indicate that **companies with higher pension risk create higher returns** compared to companies with moderate and low risk levels

$$R_1 = \frac{\text{Pension Deficit}}{\text{Market Capitalization}}$$

$$R_2 = \frac{\text{Pension Liabilities}}{\text{Market Capitalization}}$$

$$R_3 = \frac{\text{Service Cost} + \text{Interest Cost} - \text{Pension Paid}}{\text{EBIT}}$$

$$R_4 = \text{Asset Allocation Debt} - \text{Asset Allocation Stocks}$$

$$R_5 = \text{Average} \{ \text{Percentil}(R_1) + \text{Percentil}(R_2) + \text{Percentil}(R_3) + \text{Percentil}(R_4) \}$$

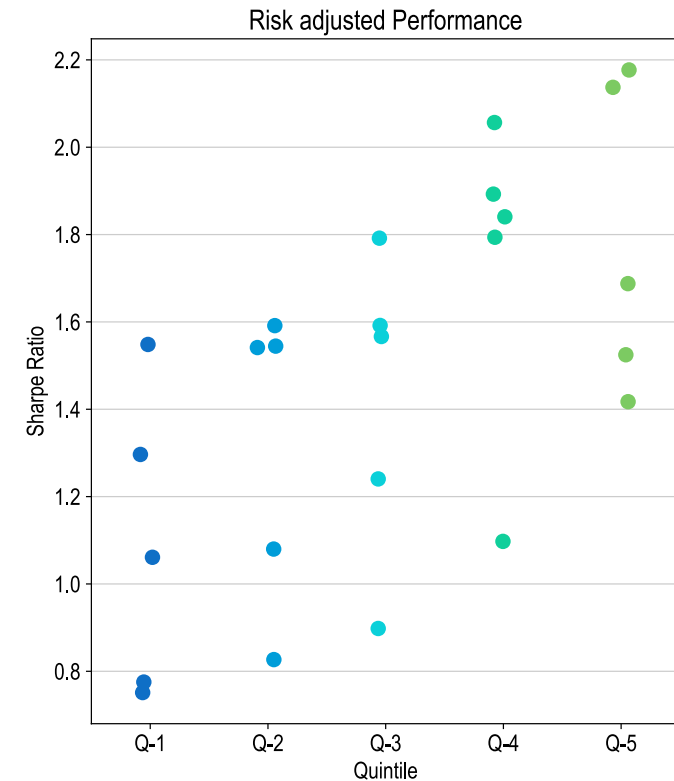
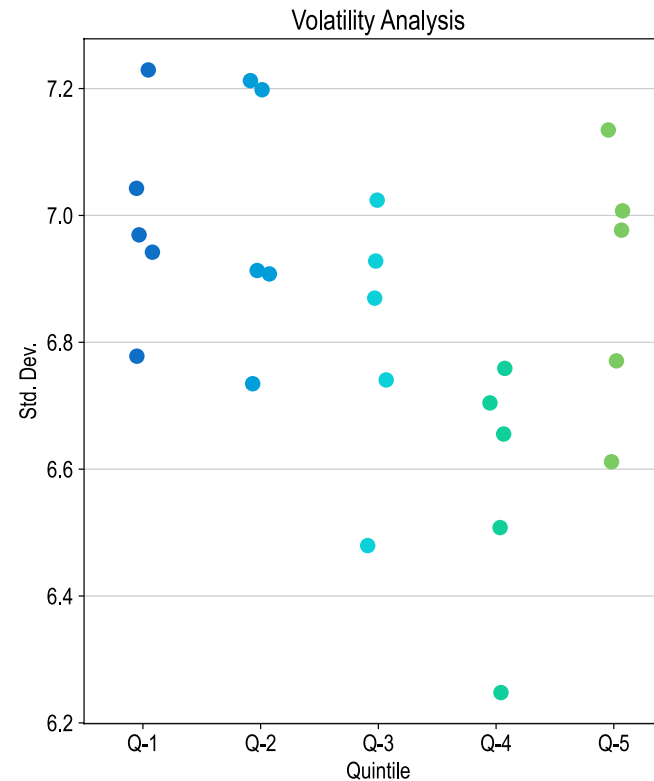
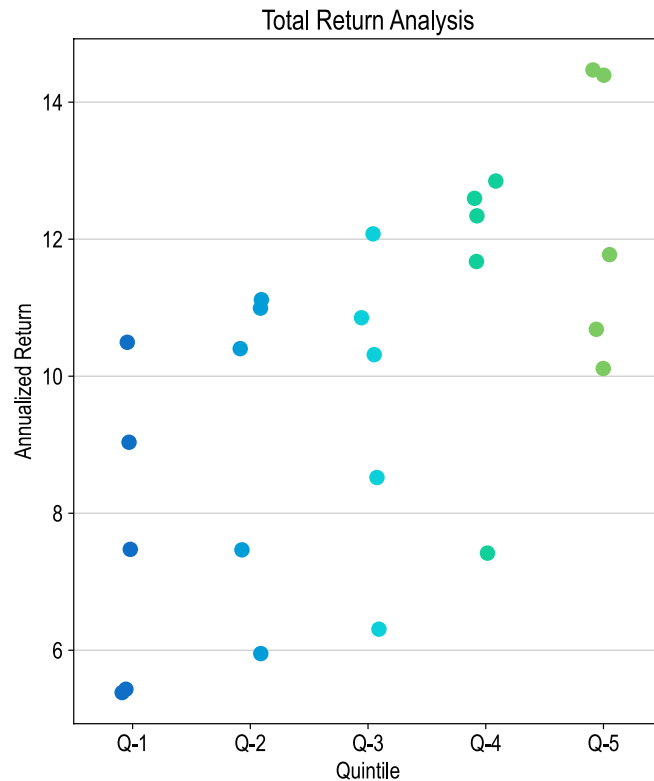
Source: Own figure



# The quintile portfolios and have shown us that higher pension risk is rewarded by the market with higher returns

Total Return Analysis; Volatility Analysis; Risk Adjusted Performance

Performance Analysis Quintile Portfolios



Source: Own figure

# After our OLS regression analysis we determined the exact portfolio weights through minimum variance optimization

## OLS Results and Minimum Variance Optimization

- > The risk factors we use cover from the financial leverage created by under-funding of pension liabilities to the operating risk of having to high cost to service pension liabilities
- > Momentum variables were introduced to further refine our strategy :
  - >  $M_t^{(k)} = \frac{Price_t}{Price_{t-k}}$  for k = 1,6 and 12 months
- > Of these 3 momentum variables  $M_6$  and  $M_{12}$  proved significant
- > Our OLS regression analysis resulted in 4 significant variables ( $R_1$ ,  $R_3$ ,  $M_6$  and  $M_{12}$ )
- > Exact weights and allocation are determined through a minimum variance optimization

### OLS Results

	Coeff.	P> t
<b>const</b>	0.1541	0.010
$M_1$	-0.3687	0.213
$M_6$	0.3967	0.001
$M_{12}$	-0.1106	0.026
$R_1$	0.8259	0.034
$R_2$	0.0332	0.657
$R_3$	0.0444	0.049
$R_4$	0.0012	0.171
$R_5$	-0.1574	0.277

### $\mu_s$

$S_1$   
...  
 $S_i$   
...  
 $S_7$   
 $S_8$   
...  
 $S_{19}$   
 $S_{20}$

Target return  $\mu_p$

### Minimum Variance Optimization

$$\sigma_{PF} = \sum_{i=1}^N \sum_{j=1}^N \omega_i * \omega_j * \sigma_{ij} = \omega' * \Omega * \omega;$$

$$where: \Omega = \begin{pmatrix} \sigma_{11} & \cdots & \sigma_{1N} \\ \vdots & \ddots & \vdots \\ \sigma_{N1} & \cdots & \sigma_{NN} \end{pmatrix}$$

### Optimization problem:

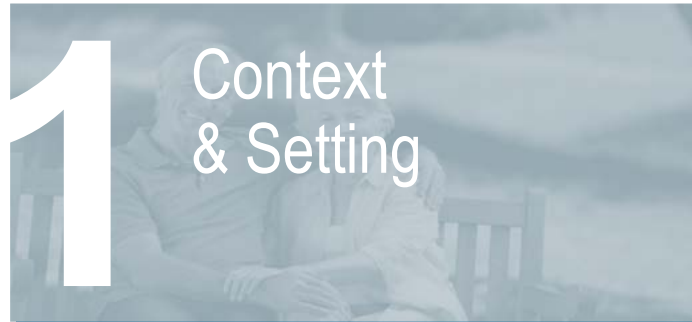
$$\min_{\omega} \omega' * \Omega * \omega$$

### Constraints:

$$(1) \omega' * \mu = \mu_p;$$

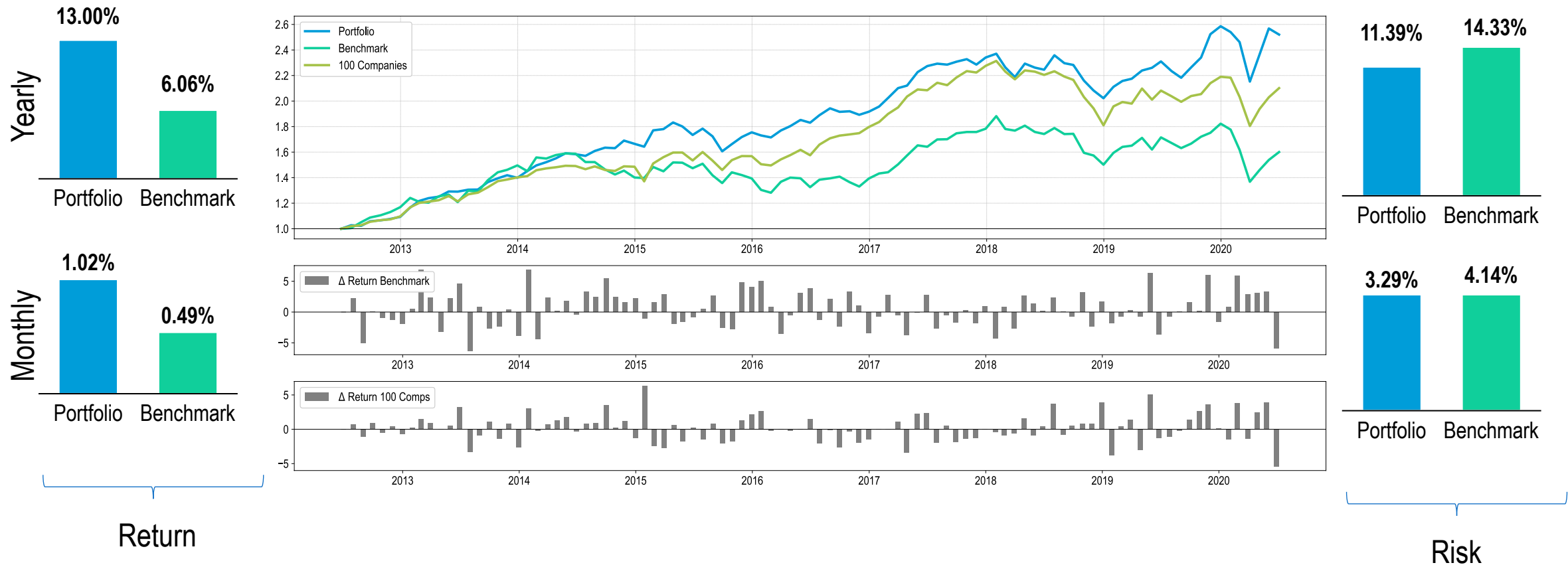
$$(2) \omega' * l = 1; \quad where: l = \begin{pmatrix} 1 \\ \vdots \\ 1 \end{pmatrix}$$

# Agenda



You are rewarded with higher returns for less risk from our portfolio compared to the European benchmark and the 100 largest Swiss companies

### Selected Performance Indicators (1/3)



Source: Own figures and calculations

# Our portfolio beats the market and is earning a statistically significant abnormal return

## Selected Performance Indicators (2/3)

Alpha		Monthly	Annually
$\alpha_{Jensen}$	$\beta$	0.69	8.26
$\alpha_{Fama\&French3}$	$\beta$ SMB HML	0.58	6.98
$\alpha_{Fama\&French5}$	$\beta$ SMB HML RMW CMA	0.57	6.83
$\alpha_{Carhart}$	$\beta$ SMB HML MOM	0.62	7.43

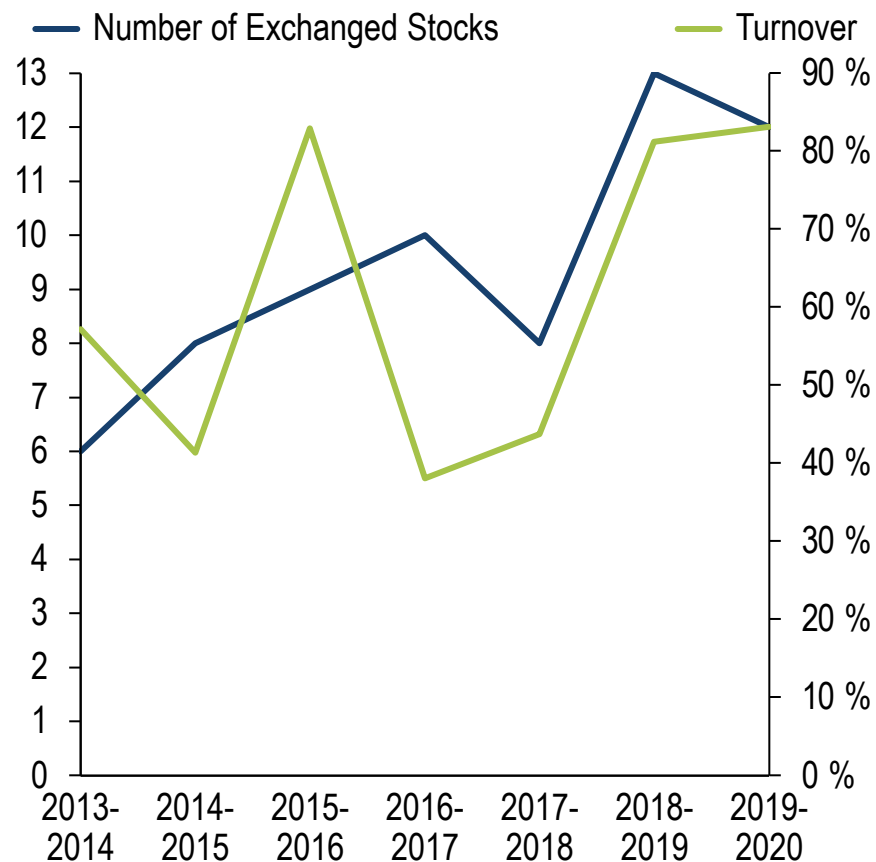
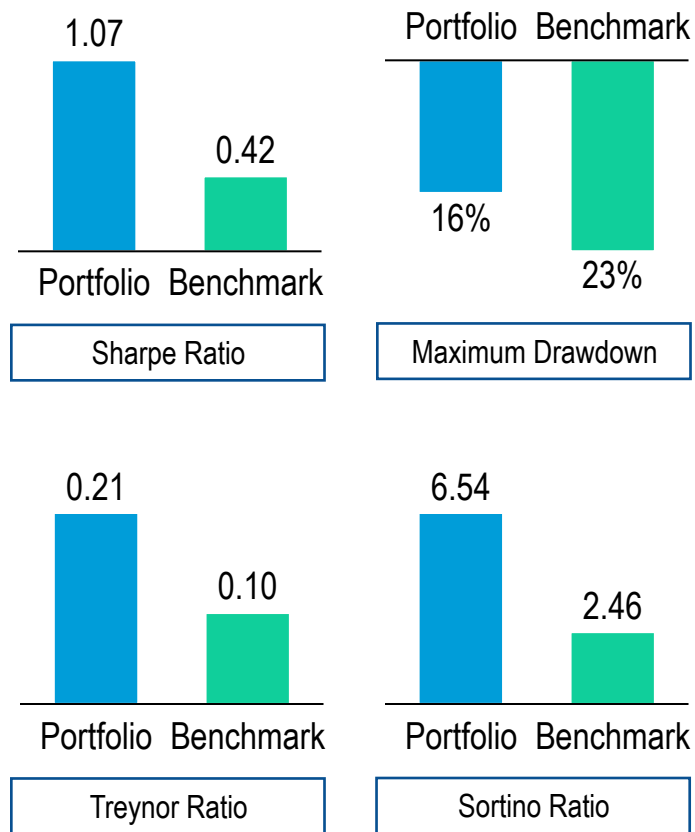
 = Regression factors

Source: Own figures and calculations

- > **Jensen's Alpha:**
  - Based on the CAPM (Sharpe, Treynor, Lintner and Mossin, early 1960s)
  - Beta as the only relevant risk factor, idiosyncratic risk can be diversified
- > **Fama & French Alpha:**
  - Three-factor model (1993) as an extension of the CAPM,
  - Companies with different market capitalizations have the same beta but different returns
  - Extension to the five-factor model (2015)
- > **Carhart Alpha:**
  - Four-factor model (1997) as an extension of the Fama & French three-factor model
  - Momentum factor further improved the explanatory power

# Our portfolio consistently outperformed the benchmark by a considerable margin

## Selected Performance Indicators (3/3)



### > Sharpe ratio:

- Measurement of risk-adjusted returns

### > Treynor ratio:

- Excess return earned above the return which could be earned from a risk-free investment (better measure for well-diversified portfolios than the Sharpe Ratio)

### > Sortino ratio:

- Considers only downside risk, while the Sharpe ratio equally penalizes upside and downside risk

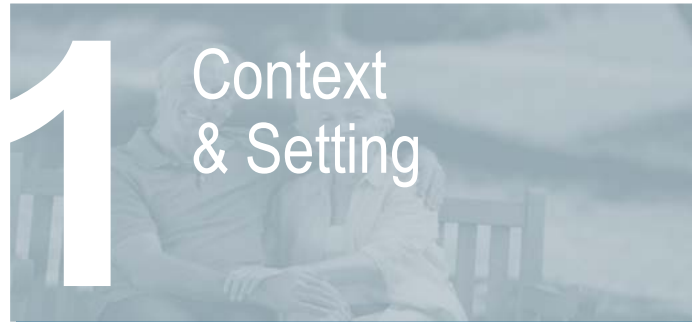
### > Maximum drawdown:

- Indicator of downside risk which shows maximum observed loss from one peak to a new peak
- The maximum portfolio drawdown of the investigated time period can be traced the start of the Covid-19 pandemic

Source: Own figures and calculations



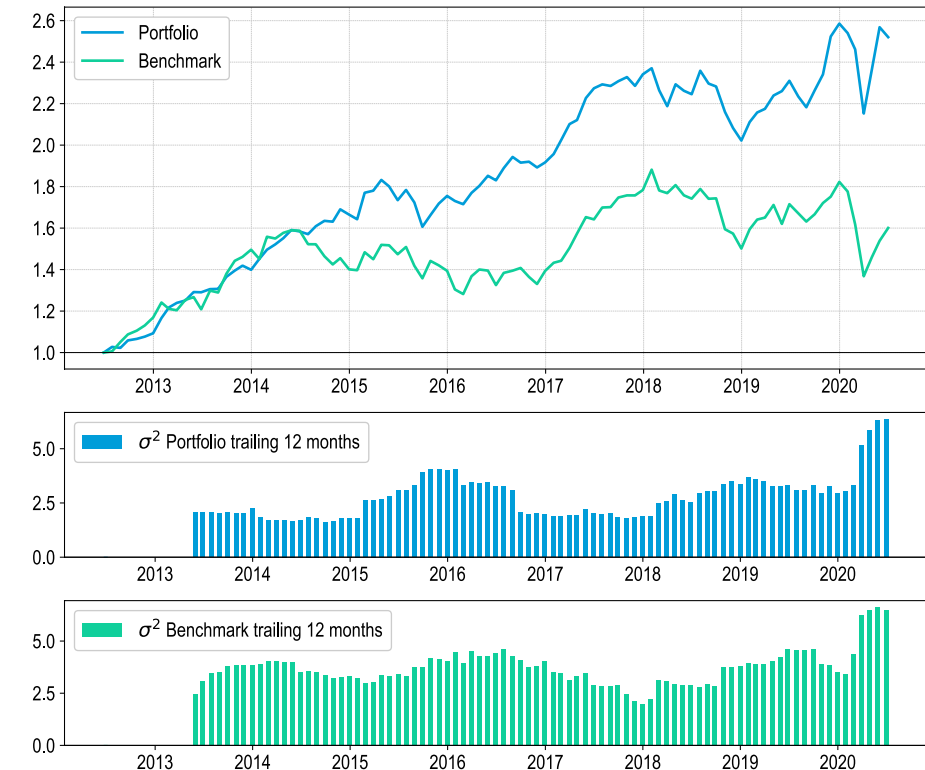
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# Analyzing the impact of pensions risk on share performance revealed contradictory results with respect to the Franzoni & Marín's (2006) anomaly

## Summary

- ➔ Portfolio creation: Quintile Portfolios based on the five pension risk factors revealed that higher pension risk is rewarded with higher return and vice versa, thus contradicting Franzoni & Marín's stock market anomaly
- ➔ Momentum incorporation: One-month, six-month and twelve-month momentum
- ➔ OLS regression: Pension risk factors  $R_1 \frac{Pension\ Deficit}{Market\ Capitalization}$ ,  $R_3 \frac{Service\ Cost + Interest\ Cost - Pension\ Paid}{EBIT}$ , **six-month** and **twelve-month momentum** are significant explanatory variables
- ➔ Further optimization: Minimum Variance calculation and weighting constraints to minimize downside risk and increase diversification



Source: Own figures and calculations

# Our portfolio strategy, incorporating pension risks and momentum, offers high return with comparatively low risk

## Key Takeaways



The stated investment approach represents solid investment opportunity



The portfolio strategy outperforms the benchmark in terms of risk & return measures

*“Of course, if alpha could be earned merely by following (...) instructions, everybody would do it, causing the money-making opportunity to evaporate. Active management necessitates much more; it involves both hard work and luck. (...) [However,] meticulous research into the predictability of asset class returns is a wonderful start.”*

– Ilmanen (2012)

# 13%

Average Annual Return

# 1.07

Portfolio Sharpe Ratio

# 6.98

Fama & French 3 Alpha

# Thank you for your attention! Questions?

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