# The Return Expectations of Institutional Investors

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# Motivation

- Considerable attention has been devoted to estimating investor beliefs about expected returns on asset classes as parameters of portfolio choice models:
  - Black and Litterman (1992); Pastor (2000); Ang, Ayala and Goetzmann (2014).
- Little direct evidence about the beliefs of institutional investors across a range of asset classes, and even less on the *cross-sectional* drivers of such beliefs.
- Extrapolation of past returns to expectations and actions has been documented among retail investors.
  - Vissing-Jorgensen (2003); Malmendier and Nagel (2011); Greenwood and Shleifer (2014).
- Is extrapolation also important for the beliefs and actions of institutional investors?
  - Such findings could matter for aggregate asset pricing, because these investors hold relatively more wealth (Fuster, Laibson and Mendel, 2010).
- Is extrapolation among institutional investors based on rational updating about skills or other factors?
  - Institutional investors appear to have persistent skill in some asset classes (Cavagnaro, Sensoy, Wang and Weisbach, 2016) but not in others (Goyal and Wahal, 2008).

# Our setting: U.S. public pension funds

**Challenge: How to observe/infer institutional investors' actual expectations about future expected returns by asset class**

- Surveys focus on individual investors (Greenwood and Shleifer, 2014).

**U.S. public pension funds have around $4T assets under management.**

**We use newly required GASB67 disclosures for U.S. public pension funds:**

- Effective from 2014 to present
- Must disclose long-term expected returns *for each asset class*
- Must disclose target asset allocation
  - ➢ Not affected by inertia in actual allocation (Samuelson and Zeckhauser, 1988; Rauh, 2009; Choi, Laibson, Madrian, and Metrick, 2002)

# Explaining the portfolio expected return

**Null hypotheses:**

- The main determinant of the cross sectional variation in Portfolio ER is the **target asset allocation** chosen by the fund (more risky assets → higher Portfolio ER)
- Within an asset class the expected return (or expected risk premium) is **not affected** by the past return
- The target asset allocation does not depend on the experienced past returns

**Alternative hypotheses:**

- **Past returns shape the ER** of the portfolio and individual asset classes:
  - **Rational skill hypothesis** – past returns reflect genuine variation in the skill of pension plans.
  - **Excessive extrapolation** – past returns affect expectations about asset classes in which they provide no information about future returns (Benartzi, 2001; Greenwood and Shleifer, 2014).
- **Past returns affect the target asset allocation weights** (through the expected risk premium).
- **Unfunded pension liabilities** affect Portfolio ER – strategic incentives to reduce the amount of recognized unfunded liabilities through optimistic return expectations (Brown and Wilcox, 2009; Novy-Marx and Rauh, 2011; Andonov, Bauer, and Cremers, 2017)

# Preview of results

- **Public pension funds extrapolate past performance in forming their expectations**
  - Past performance adds substantial explanatory power for portfolio expected returns in the cross-section even after controlling for asset allocation and risk-taking.
- **Extrapolative expectations affect the target asset allocation for institutional investors**
  - Pension funds with higher past performance expect higher risk premia in risky asset classes and plan to invest more in those asset classes.
- **Rational skill hypothesis does not fully explain the extrapolation**
  - Extrapolation occurs across many asset classes including public equity, where there is very low performance persistence for institutional investors.
  - In private equity, the extrapolation of past returns is driven by the oldest investments, even though these are less informative about the future period.
- **State governments that face higher unfunded pension liabilities relative to their revenues and GSP assume higher portfolio returns overall**
  - Operates through both higher asset inflation assumption and higher expected real returns on assets.
  - Reflects strategic incentives to reduce the recognized magnitude of unfunded liabilities.
  - Does not mitigate the effect of past returns on expected future returns

# GASB guidelines on the required disclosure

GASB provides guidelines with arithmetic real rates of return.

In their example, the Portfolio ER equals 7.75%.

| Asset class | Target allocation | Long-term expected real rate of return | Long-term expected nominal rate of return |
|---|---|---|---|
| Domestic equity | 46% | 5.40% | 8.90% |
| International equity | 21% | 5.50% | 9.00% |
| Real estate | 6% | 4.50% | 8.00% |
| Fixed income | 26% | 1.30% | 4.80% |
| Cash | 1% | 0.00% | 3.50% |
| Total | 100% | 4.25% | 7.75% |
| Inflation rate | | 3.50% | |

# Alaska TRS example: Pension DR vs. Portfolio ER

- **Pension DR:** "The discount rate used to measure the total pension liability was **8.00%**. The projection of cash flows used to determine the discount rate assumed that employer and nonemployer State contributions will continue to follow the current funding policy, which meets State statutes (CAFR, 2016)."
- **Portfolio ER:** "The long-term expected rate of return on pension plan investments was determined using a building-block method in which best-estimate ranges of expected future real rates of return (expected returns, net of pension plan investment expense and inflation) are developed for each major asset class (CAFR 2016)."

| Asset class | Target allocation | Long-term expected real rate of return | Long-term expected nominal rate of return |
|---|---|---|---|
| Equity | 3% | 4.70% | 7.82% |
| Domestic equity | 26% | 5.35% | 8.47% |
| Global equity | 25% | 5.55% | 8.67% |
| Fixed income | 12% | 0.80% | 3.92% |
| Cash | 3% | 0.00% | 3.12% |
| Private equity | 9% | 6.25% | 9.37% |
| Absolute return | 5% | 4.70% | 7.82% |
| Real estate | 17% | 3.65% | 6.77% |
| Total | 100% | 4.43% | **7.55%** |
| Inflation rate | | 3.12% | |

# Another example of GASB 67 reporting

Three Connecticut plans: different asset allocation and expected returns by asset class.

| | SERS *DR = 8.00%* | | TRB *DR = 8.50%* | | JRS *DR = 8.00%* | |
|---|---|---|---|---|---|---|
| **Asset Class** | **Target Allocation** | **Long-Term Expected Real Rate of Return** | **Target Allocation** | **Long-Term Expected Real Rate of Return** | **Target Allocation** | **Long-Term Expected Real Rate of Return** |
| Large Cap U.S. Equities | 21.0% | 5.8% | 25.0% | 7.3% | 16.0% | 5.8% |
| Developed Non-U.S. Equities | 18.0% | 6.6% | 20.0% | 7.5% | 14.0% | 6.6% |
| Emerging Markets (Non-U.S.) | 9.0% | 8.3% | 9.0% | 8.6% | 7.0% | 8.3% |
| Real Estate | 7.0% | 5.1% | 5.0% | 5.9% | 7.0% | 5.1% |
| Private Equity | 11.0% | 7.6% | 10.0% | 10.9% | 10.0% | 7.6% |
| Alternative Investment | 8.0% | 4.1% | 6.0% | 0.7% | 8.0% | 4.1% |
| Fixed Income (Core) | 8.0% | 1.3% | 13.0% | 1.7% | 8.0% | 1.3% |
| High Yield Bonds | 5.0% | 3.9% | 2.0% | 3.7% | 14.0% | 3.9% |
| Emerging Market Bond | 4.0% | 3.7% | 4.0% | 4.8% | 8.0% | 3.7% |
| TIPS | 5.0% | 1.0% | 0.0% | 0.0% | 5.0% | 1.0% |
| Cash | 4.0% | 0.4% | 0.0% | 0.0% | 3.0% | 0.4% |
| Inflation Linked Bonds | 0.0% | 0.0% | 6.0% | 1.3% | 0.0% | 0.0% |
| **Authors' calculation:** | | | | | | |
| Portfolio ER | 7.937% | | 9.091% | | 7.636% | |

# Data

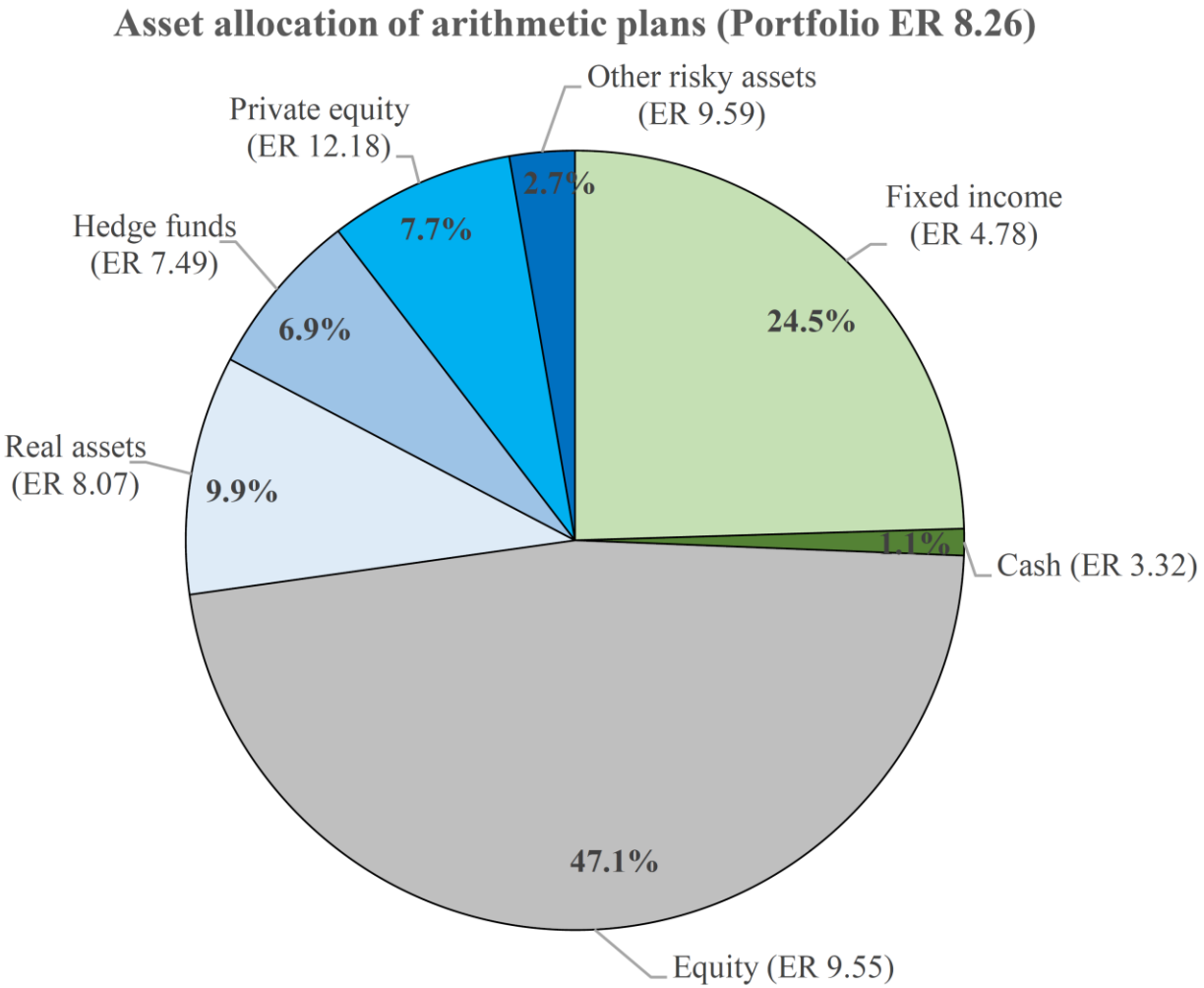
- **We collect the new disclosures for 229 U.S. public pension plans**
  - Time period 2014–2016 (→ 673 observations).
  - Source: CAFRs or separate GASB 67 disclosure statements.

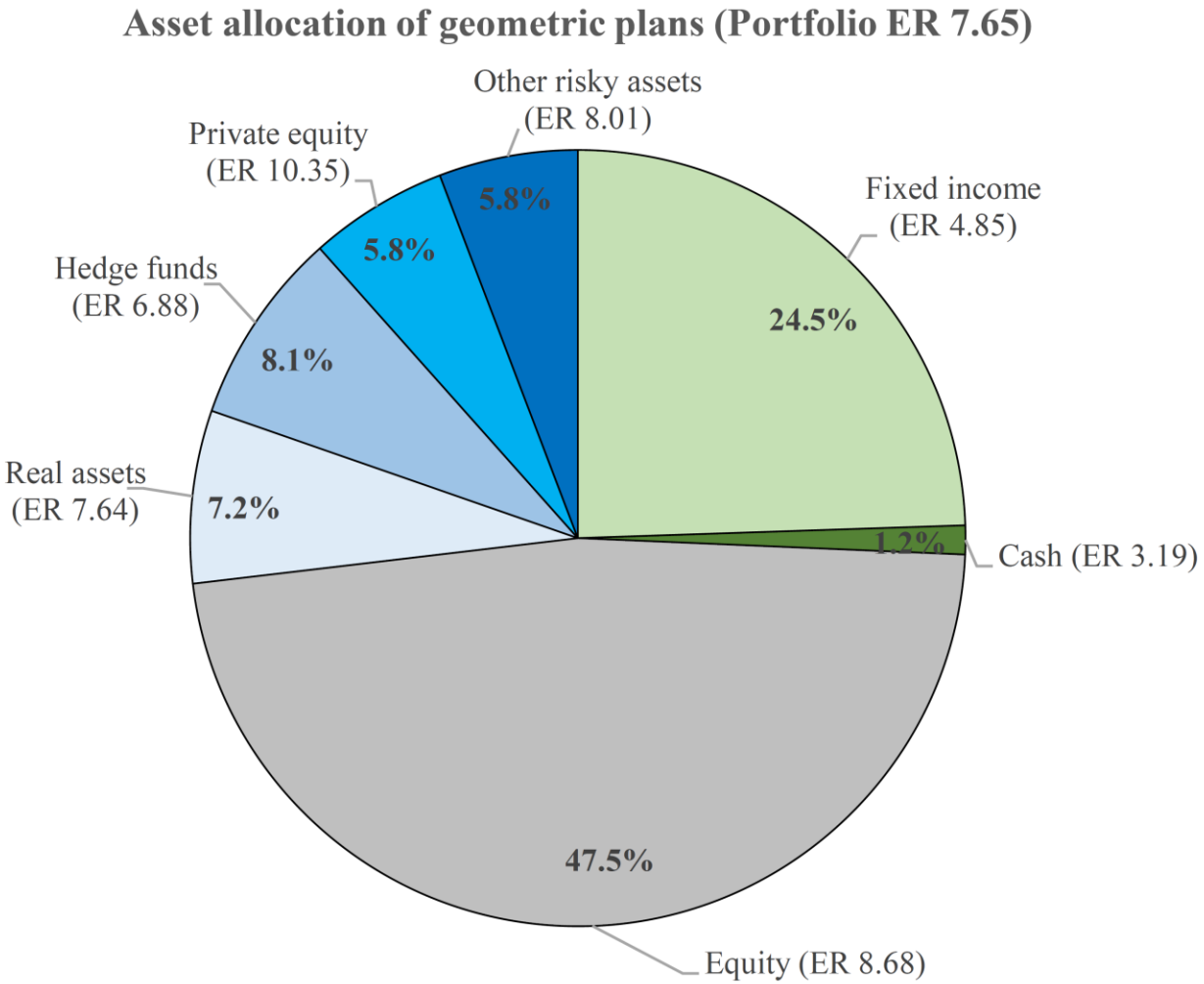
- **Reporting basis dimension #1: nominal/real**
  - Around 89% report real expected returns, and then an inflation assumption separately.
  - The remaining 11% report nominal expected returns, and then an inflation assumption separately.
  - We convert all real disclosures into nominal ones with the plan's inflation assumption to allow for comparability.
  - We also separately analyze the inflation assumption and the expected real returns.

- **Reporting basis dimension #2: arithmetic/geometric**
  - 38% disclose on a geometric basis, 62% disclose on an arithmetic basis.
  - If returns are lognormally distributed, the difference between arithmetic and geometric would converge as T gets large to approximately $\sigma^2/2$.
  - Systems do not generally disclose assumed volatility.

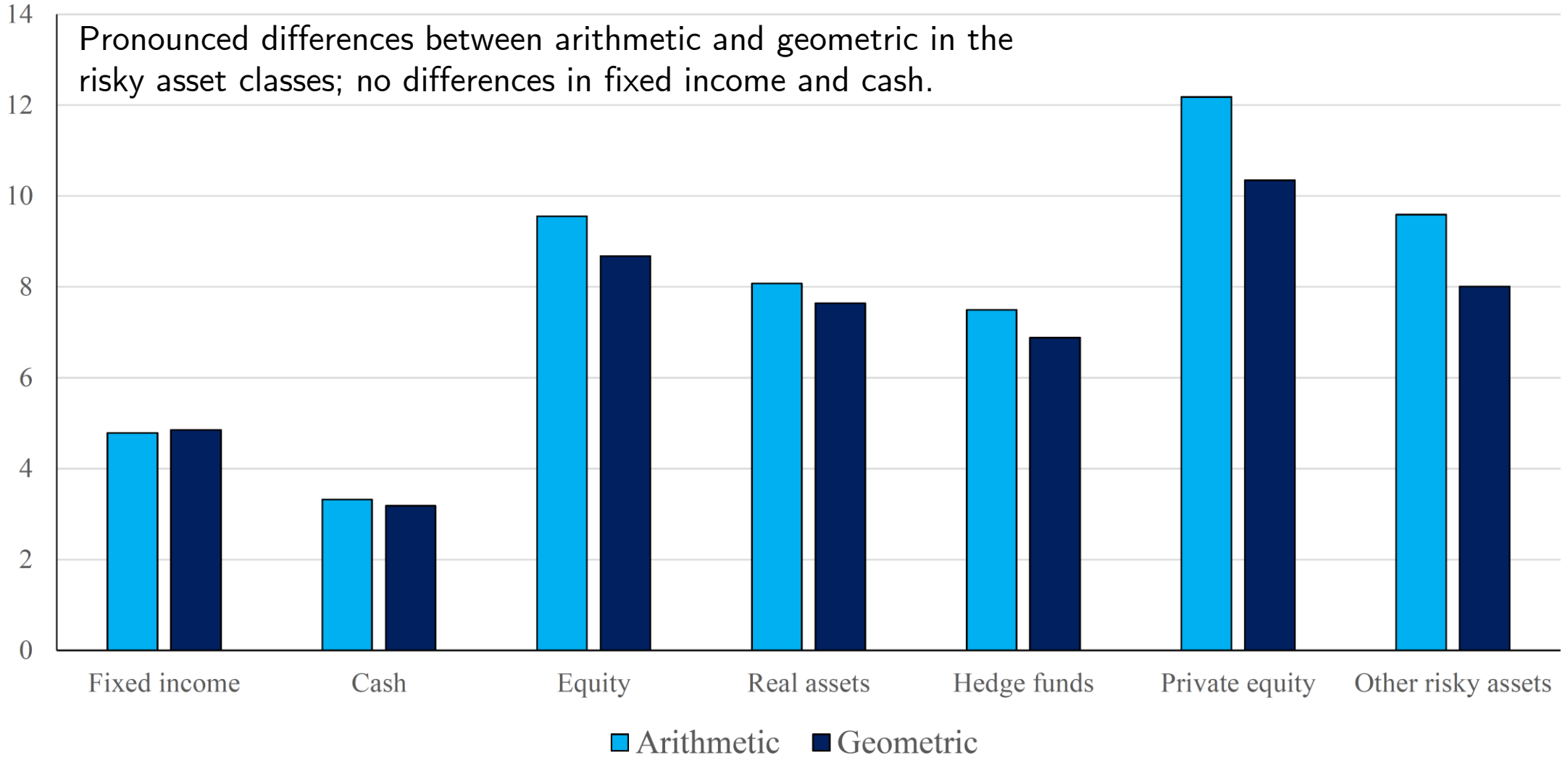
# Portfolio composition and expected returns by asset class

Geometric returns are 0.61% lower than arithmetic returns (implies volatility of 0.110).



# Expected (nominal) returns by asset class



# Portfolio ER generally does not match the Pension DR

- Contrary to GASB guidelines, the Portfolio ER ("dot product") generally does not match Pension DR
- Mismatch between the Portfolio ER and the Pension DR for 93% of the arithmetic plans and 88% of the geometric plans.
- Variation in Portfolio ER – opportunity to analyze the drivers of heterogeneity in the formation of return assumptions.

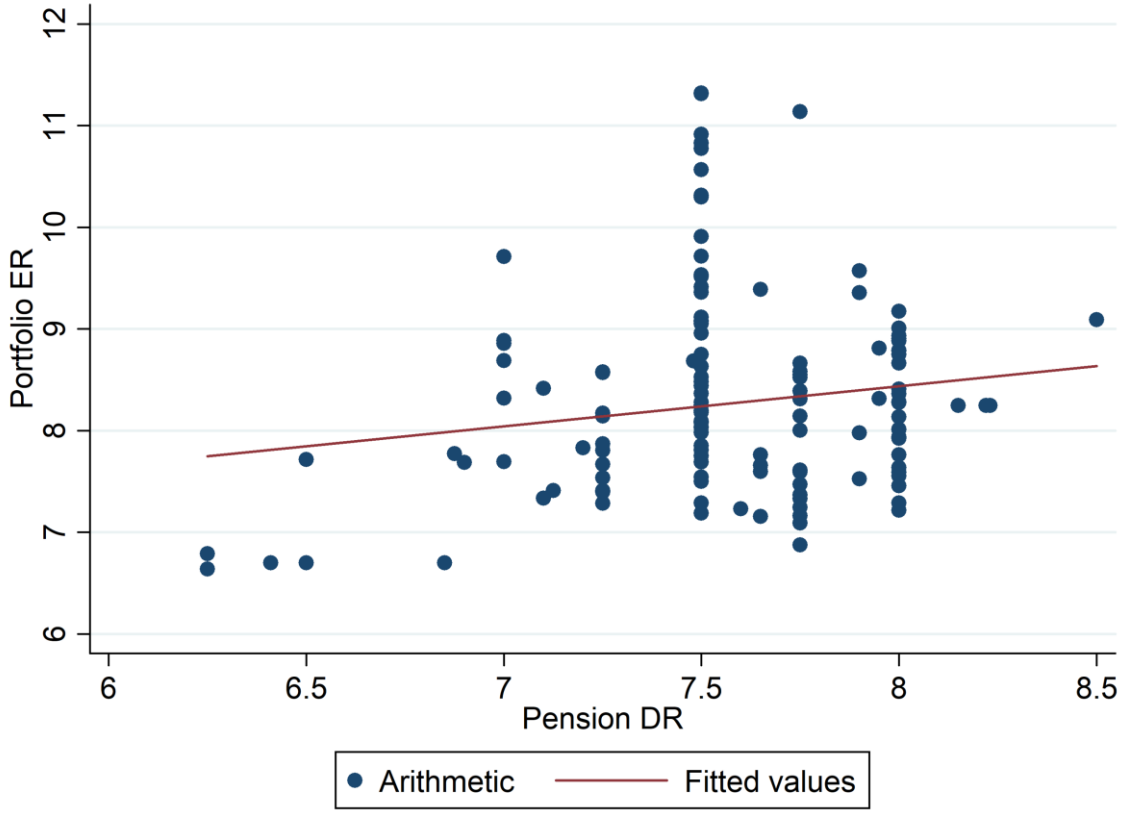
| | PFs | Portfolio ER | Pension DR | Diff | SD Diff |
|---|---|---|---|---|---|
| **Panel A: Reporting arithmetic portfolio expected return** | | | | | |
| Portfolio ER < Pension DR | 71 | 7.357 | 7.748 | -0.391 | 0.177 |
| Portfolio ER = Pension DR | 30 | 7.841 | 7.835 | 0.006 | 0.039 |
| Portfolio ER > Pension DR | 315 | 8.500 | 7.469 | 1.031 | 0.755 |
| **Panel B: Reporting geometric portfolio expected return** | | | | | |
| Portfolio ER < Pension DR | 105 | 6.970 | 7.554 | -0.584 | 0.337 |
| Portfolio ER = Pension DR | 31 | 7.450 | 7.456 | -0.006 | 0.040 |
| Portfolio ER > Pension DR | 121 | 8.300 | 7.458 | 0.842 | 0.626 |

# Pension discount rate and portfolio expected return

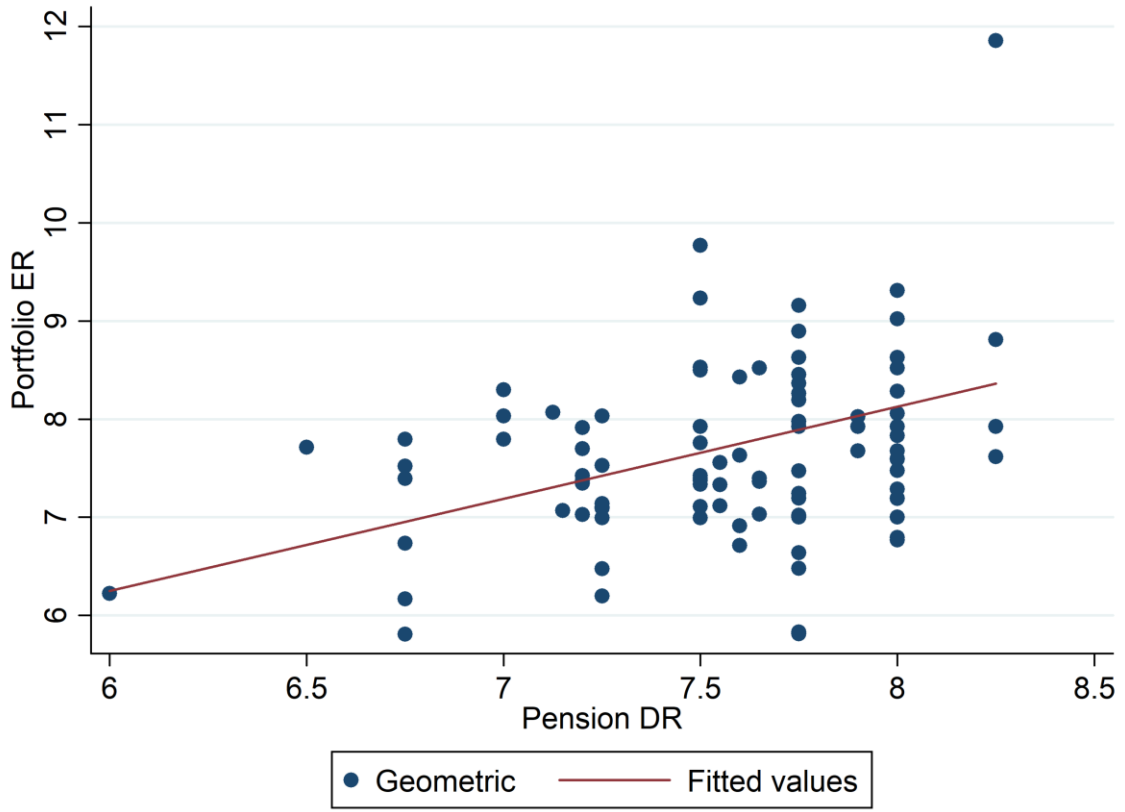
Positive relation, but considerable variation in the Portfolio ER than is not explained by Pension DR.

Example: 49 plans report the same Pension DR of 7.50% in 2014, but their arithmetic Portfolio ER range from 7.19% to 11.32%.

Panel A: Arithmetic basis (416 pension plans)
$\beta$=0.394, s.e. = 0.118, R-squared = 0.026



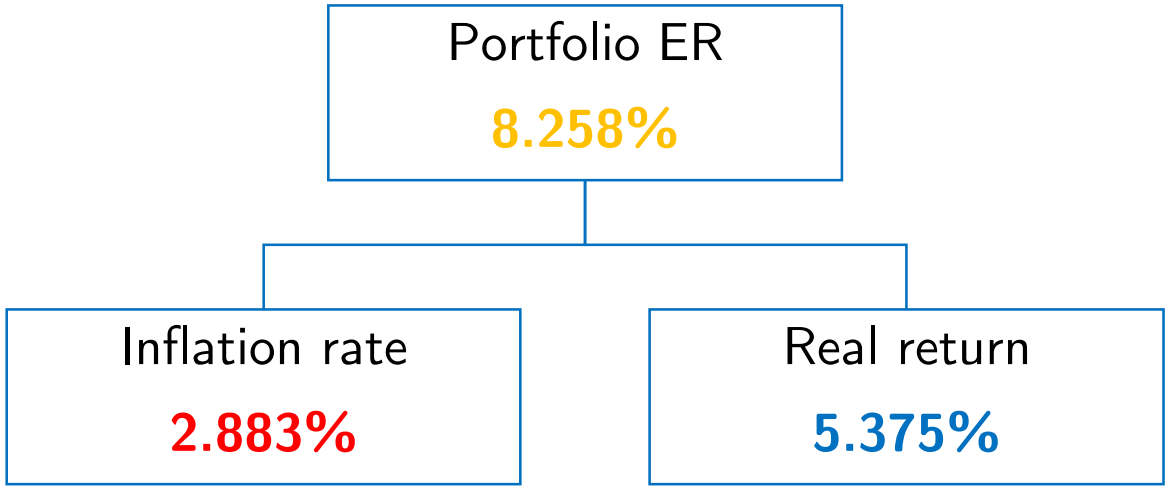

Panel B: Geometric basis (257 pension plans)
$\beta$=0.938, s.e. = 0.123, R-squared = 0.186



# Components of Portfolio ER and historical averages

For arithmetic systems, 362 of the 416 plans have a Portfolio ER that exceeds the past return. For geometric plans, this is the case for 225 of the 257 plans.

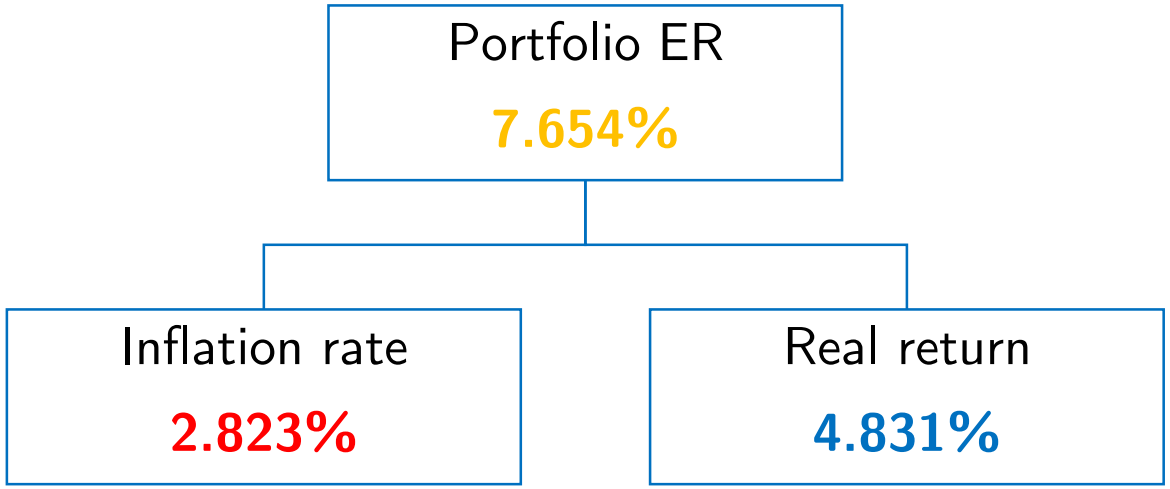
## Pension plans reporting on arithmetic basis




**Historical averages:**

Past arithmetic return **6.822%**

## Pension plans reporting on geometric basis




**Historical averages:**

Past arithmetic/geometric return **6.974%/6.286%**

# Basic conceptual/empirical framework

$$ER_{it} = \alpha_t + \beta_1 R_{i,t-1} + \mathbf{\Gamma_1}'\mathbf{X} + \epsilon_{it}$$

$$R_{it} = \alpha_t + \beta_2 R_{i,t-1} + \mathbf{\Gamma_2}'\mathbf{X} + \epsilon_{it}$$

- $\mathbf{\Gamma}$ is a vector of coefficients, $\mathbf{X}$ is a matrix of controls, $\alpha_t$ are year effects
- $\beta_1 > 0$ → evidence of extrapolation
- $\beta_1 > 0$ and $\beta_2 \leq 0$ → investors are extrapolating past performance to their expectations of future performance in situations where such extrapolation is not justified by historical relationships
- Our approach: focus on $\beta_1$ in estimation, make inferences about $\beta_2$ from prior literature
  - Given long-horizon, note that we observe $ER_{it}$ today but not $R_{it}$
- Decompositions
  - $ER_t = E\pi_t + Er_t$
  - $ER_t = Er_{ft} + E(R_t - r_{ft})$
- Empirical analysis: $\mathbf{X}$ includes target asset allocation weights, pension fund size, reporting-month fixed effects
  - Then add terms for past returns, past standard deviation, and unfunded liabilities

# Explaining the portfolio expected return (1)

- Pension plans reporting on a **geometric basis** expect returns that are 68 basis points lower.
- With inclusion of **asset allocation** variables, we explain 21.5% of the variation in the Portfolio ER; pension plans that invest more in risky assets expect higher returns.
- The **past return** explains an additional 5.3% of the variation in the Portfolio ER:
  - A one percentage point increase in the average arithmetic return in the previous 10-year period is associated with 29-33 basis points higher Portfolio ER.
- The 10-year **standard deviation** is insignificant
  - pension plans do not set higher ER in response to the risk they took in the past.

| Table 3 | Portfolio expected return | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Geometric | -0.678*** | -0.593*** | -0.681*** | -0.673*** |
| | [0.107] | [0.088] | [0.100] | [0.101] |
| Past return | | 0.332*** | 0.289*** | 0.297*** |
| | | [0.056] | [0.083] | [0.078] |
| Past standard deviation | | | | -0.030 |
| | | | | [0.040] |
| PF size | -0.039 | -0.182*** | -0.096 | -0.104* |
| | [0.055] | [0.054] | [0.063] | [0.060] |
| %Equity | 3.912*** | | 2.203* | 2.309* |
| | [0.803] | | [1.278] | [1.340] |
| %Real assets | 4.145*** | | 2.538* | 2.873* |
| | [1.228] | | [1.528] | [1.615] |
| %Private equity | 0.841 | | -0.133 | 0.028 |
| | [0.960] | | [1.285] | [1.350] |
| %Hedge funds | 3.829*** | | 2.902*** | 2.998*** |
| | [0.766] | | [0.992] | [1.037] |
| %Other risky assets | 4.961*** | | 3.111** | 3.306** |
| | [1.105] | | [1.446] | [1.516] |
| Reporting Month FE | No | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 |
| Adjusted R-squared | 0.215 | 0.227 | 0.268 | 0.268 |

# Explaining the portfolio expected return (2)

- **Fiscally stressed governments** face pressure to maintain higher expected rates of return:
  - An unfunded liability equal to an additional year of total government revenue raises the Portfolio ER by 21 basis points.
  - A one standard deviation of Unfunded liability / GSP (or an increase of 0.082) increases the Portfolio ER by 16 basis points.
- But the fiscal pressure effect does not mitigate the effect of **past return** on the Portfolio ER

| Table 3 | Portfolio expected return | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Geometric | -0.678*** | -0.593*** | -0.681*** | -0.673*** | -0.681*** | -0.673*** |
| | [0.107] | [0.088] | [0.100] | [0.101] | [0.099] | [0.096] |
| Past return | | 0.332*** | 0.289*** | 0.297*** | 0.333*** | 0.352*** |
| | | [0.056] | [0.083] | [0.078] | [0.076] | [0.078] |
| Past standard deviation | | | | -0.030 | -0.048 | -0.058 |
| | | | | [0.040] | [0.038] | [0.037] |
| Unfunded liability / Revenue | | | | | 0.212*** | |
| | | | | | [0.067] | |
| Unfunded liability / GSP | | | | | | 1.903*** |
| | | | | | | [0.538] |
| GSP per capita | | | | | 0.001 | 0.002 |
| | | | | | [0.004] | [0.004] |
| PF size | -0.039 | -0.182*** | -0.096 | -0.104* | -0.132** | -0.136** |
| | [0.055] | [0.054] | [0.063] | [0.060] | [0.056] | [0.057] |
| %Equity | 3.912*** | | 2.203* | 2.309* | 1.839 | 1.699 |
| | [0.803] | | [1.278] | [1.340] | [1.362] | [1.359] |
| %Real assets | 4.145*** | | 2.538* | 2.873* | 2.886* | 2.798* |
| | [1.228] | | [1.528] | [1.615] | [1.612] | [1.605] |
| %Private equity | 0.841 | | -0.133 | 0.028 | -0.145 | -0.153 |
| | [0.960] | | [1.285] | [1.350] | [1.346] | [1.341] |
| %Hedge funds | 3.829*** | | 2.902*** | 2.998*** | 2.747** | 2.643** |
| | [0.766] | | [0.992] | [1.037] | [1.066] | [1.061] |
| %Other risky assets | 4.961*** | | 3.111** | 3.306** | 3.347** | 3.293** |
| | [1.105] | | [1.446] | [1.516] | [1.449] | [1.432] |
| Reporting Month FE | No | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 | 673 | 673 |
| Adjusted R-squared | 0.215 | 0.227 | 0.268 | 0.268 | 0.286 | 0.289 |

# Robustness: Past return is not capturing higher risk-taking

- **Main measure of risk-taking:** past standard deviation.
- **Alternative measures of risk-taking:** MKT beta, SMB beta and HML beta estimated separately for every pension plan with either CAPM or FF 3-factor model using the previous 10-year annual returns.
- The correlation between past standard deviation and MKT beta is **0.82**.
- The positive relation between past return and Portfolio ER does not seem to be due to risk-taking.

| App. Table 3 | Portfolio expected return | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Geometric | -0.672*** | -0.679*** | -0.669*** | -0.700*** | -0.712*** | -0.695*** |
| | [0.102] | [0.099] | [0.096] | [0.097] | [0.094] | [0.090] |
| Past return | 0.296*** | 0.331*** | 0.350*** | 0.297*** | 0.333*** | 0.348*** |
| | [0.078] | [0.076] | [0.078] | [0.080] | [0.078] | [0.080] |
| MKT beta | -0.600 | -0.966 | -1.173 | -0.693 | -1.040 | -1.219 |
| | [0.845] | [0.827] | [0.808] | [0.903] | [0.893] | [0.870] |
| SMB beta | | | | 0.415 | 0.467 | 0.346 |
| | | | | [0.547] | [0.538] | [0.550] |
| HML beta | | | | 1.041** | 1.006* | 0.872 |
| | | | | [0.471] | [0.548] | [0.552] |
| Unfunded liability / Revenue | | 0.213*** | | | 0.216*** | |
| | | [0.068] | | | [0.067] | |
| Unfunded liability / GSP | | | 1.914*** | | | 1.843*** |
| | | | [0.546] | | | [0.558] |
| GSP per capita | | 0.001 | 0.002 | | 0.002 | 0.003 |
| | | [0.004] | [0.004] | | [0.004] | [0.004] |
| PF size | -0.104* | -0.133** | -0.137** | -0.102* | -0.129** | -0.133** |
| | [0.059] | [0.054] | [0.055] | [0.061] | [0.057] | [0.058] |
| Asset allocation variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Reporting Month FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 | 673 | 673 |
| Adjusted R-squared | 0.268 | 0.286 | 0.289 | 0.274 | 0.292 | 0.293 |

# Understanding the extrapolation of past performance

- **Decomposing the portfolio expected return:**
  - Portfolio ER = Expected Inflation + Expected Real Rate of Return
  - Portfolio ER = Expected Risk-free Rate + Expected Risk Premium

- **Potential mechanisms behind the extrapolation of past returns:**
  - **Mechanism 1:** Expecting higher returns in all asset classes:
    - Assuming higher expected inflation rate.
    - Assuming higher risk-free rate of return.
  - **Mechanism 2:** Assuming higher expected real rate of return / higher risk premium:
    - Would be more direct evidence of extrapolating past performance.
    - The extrapolation could be rational or excessive.

# Expected inflation rate (component of Portfolio ER)

- **Past returns** are economically and statistically **insignificant**.
- Pension funds in states with **large unfunded liabilities** relative to their resources tend to justify higher return assumptions using higher inflation:
  - The economic magnitude is 50% of the effect in Table 3.

| Table 4 | Expected inflation rate | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Geometric | -0.045 | -0.042 | -0.041 | -0.048 | -0.044 |
| | [0.057] | [0.054] | [0.055] | [0.051] | [0.050] |
| Past return | | -0.020 | -0.015 | -0.011 | -0.005 |
| | | [0.034] | [0.032] | [0.035] | [0.036] |
| Past inflation | | | -0.183 | -0.233* | -0.242* |
| | | | [0.128] | [0.123] | [0.124] |
| Unfunded liability / Revenue | | | | 0.104*** | |
| | | | | [0.029] | |
| Unfunded liability / GSP | | | | | 0.937*** |
| | | | | | [0.247] |
| GSP per capita | | | | 0.006*** | 0.007*** |
| | | | | [0.002] | [0.002] |
| PF size | -0.091*** | -0.089*** | -0.079*** | -0.082*** | -0.081*** |
| | [0.017] | [0.017] | [0.019] | [0.019] | [0.019] |
| Reporting Month FE | No | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 | 673 |
| Adjusted R-squared | 0.117 | 0.142 | 0.152 | 0.219 | 0.227 |

# Expected real return (component of Portfolio ER)

- **Past returns** operate completely through increasing the pension fund's **real** expected return assumptions.
- Geometric reporting also significantly related to the expected real rate of return.

| Table 5 | Expected real return | | | | | |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Geometric | -0.627*** | -0.551*** | -0.630*** | -0.622*** | -0.625*** | -0.620*** |
| | [0.097] | [0.089] | [0.092] | [0.094] | [0.093] | [0.091] |
| Past return | | 0.352*** | 0.311*** | 0.320*** | 0.343*** | 0.352*** |
| | | [0.063] | [0.078] | [0.075] | [0.074] | [0.075] |
| Past standard deviation | | | | -0.033 | -0.041 | -0.046 |
| | | | | [0.046] | [0.046] | [0.044] |
| Unfunded liability / Revenue | | | | | 0.115** | |
| | | | | | [0.059] | |
| Unfunded liability / GSP | | | | | | 0.975** |
| | | | | | | [0.491] |
| GSP per capita | | | | | -0.005 | -0.004 |
| | | | | | [0.004] | [0.004] |
| PF size | 0.042 | -0.093* | -0.024 | -0.033 | -0.055 | -0.056 |
| | [0.057] | [0.056] | [0.064] | [0.060] | [0.056] | [0.057] |
| Asset allocation variables | Yes | Yes | Yes | Yes | Yes | Yes |
| Reporting Month FE | No | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 | 673 | 673 |
| Adjusted R-squared | 0.206 | 0.191 | 0.270 | 0.270 | 0.278 | 0.278 |

# Expected return on fixed income and cash

- Expected return on fixed income and cash as proxy for **risk-free rate of return**.
- **Past returns** are economically and statistically insignificant.

| Table 6 | Expected return in fixed income and cash | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Geometric | 0.136 | 0.193 | 0.192 | 0.188 | 0.191 |
| | [0.117] | [0.130] | [0.127] | [0.132] | [0.131] |
| Past return | | -0.158* | -0.162 | -0.152 | -0.141 |
| | | [0.089] | [0.101] | [0.105] | [0.103] |
| Past standard deviation | | | 0.008 | 0.001 | -0.006 |
| | | | [0.068] | [0.071] | [0.069] |
| Unfunded liability / Revenue | | | | 0.100 | |
| | | | | [0.096] | |
| Unfunded liability / GSP | | | | | 1.072* |
| | | | | | [0.622] |
| GSP per capita | | | | 0.001 | 0.002 |
| | | | | [0.003] | [0.003] |
| PF size | -0.185*** | -0.186*** | -0.185*** | -0.194*** | -0.196*** |
| | [0.067] | [0.070] | [0.064] | [0.064] | [0.065] |
| Reporting Month FE | No | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 667 | 667 | 667 | 667 | 667 |
| Adjusted R-squared | 0.028 | 0.060 | 0.059 | 0.059 | 0.062 |

# Expected risk premium

- **Extrapolation of overall performance:** a one percentage point increase in the average 10-year return is associated with 50 basis points higher expected risk premium.
- **Extrapolation of asset-class level performance** in equity and private equity.
- Some indication of **spillovers** of good performance across risky assets when forming beliefs.
  - See *RA* coefficient

| | Dependent Variable: Risk Premium | | | | | |
|---|---|---|---|---|---|---|
| **Table 7** | All | All | All | Equity | RA | PE |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Geometric | -1.169*** | -1.162*** | -1.165*** | -0.805*** | -0.720*** | -1.782*** |
| | [0.159] | [0.155] | [0.157] | [0.126] | [0.136] | [0.373] |
| Past return | 0.437*** | 0.494*** | 0.506*** | 0.104 | 0.274*** | 0.459 |
| | [0.101] | [0.103] | [0.107] | [0.105] | [0.088] | [0.296] |
| Past return equity | | | | 0.318*** | | |
| | | | | [0.112] | | |
| Past return RA | | | | | 0.065 | |
| | | | | | [0.050] | |
| Past return PE | | | | | | 0.110*** |
| | | | | | | [0.035] |
| Past standard deviation | | -0.130** | -0.140** | 0.087 | 0.078 | 0.052 |
| | | [0.052] | [0.056] | [0.107] | [0.073] | [0.158] |
| Unfunded liability / GSP | | | 0.691 | 0.881* | 2.820*** | 3.547* |
| | | | [0.575] | [0.456] | [0.794] | [2.057] |
| GSP per capita | | | 0.004 | -0.006 | 0.015** | -0.006 |
| | | | [0.006] | [0.004] | [0.007] | [0.005] |
| PF size | 0.099* | 0.074 | 0.069 | -0.204*** | 0.151 | -0.020 |
| | [0.055] | [0.055] | [0.055] | [0.045] | [0.120] | [0.214] |
| Reporting Month FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 435 | 320 | 220 |
| Adjusted R-squared | 0.267 | 0.280 | 0.281 | 0.305 | 0.409 | 0.551 |

# Implications of extrapolating past performance

- **Extrapolative expectations and investments of individual investors:**
  - Individuals who have experienced high stock market returns allocate a higher proportion of their financial wealth to stocks (Malmendier and Nagel, 2011).
  - Even the beliefs of wealthy investors depend on their own investment experience and affect their stockholdings (Vissing-Jorgensen, 2003).
  - Young mutual fund managers exhibit more trend-chasing behavior (Greenwood and Nagel, 2009).

- **Extrapolative expectations and corporate investments:**
  - Corporate investments are well explained by CFOs' extrapolative expectations of earnings growth (Gennaioli, Ma and Shleifer, 2016).

- **Hypothesis:** higher expected returns in risky assets lead to higher allocation to risky assets.

# Target allocation to risky assets

- **Dependent variables:** target asset allocation weights in total risky assets, equity, real assets and private equity.

- **Extrapolation is related to the asset allocation:** pension plans that have experienced higher past returns plan to invest higher percentage of their assets in risky asset classes.

| | Dependent Variable: Target Allocation to Risky Assets | | | | | |
|---|---|---|---|---|---|---|
| **Table 8** | All | All | All | Equity | RA | PE |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Geometric | -0.002 | -0.003 | -0.003 | -0.008 | -0.017*** | -0.022** |
| | [0.009] | [0.008] | [0.008] | [0.012] | [0.006] | [0.009] |
| Past return | 0.027*** | 0.019*** | 0.022*** | 0.049*** | 0.017*** | 0.022*** |
| | [0.005] | [0.005] | [0.004] | [0.009] | [0.005] | [0.005] |
| Past return equity | | | | 0.054*** | | |
| | | | | [0.007] | | |
| Past return RA | | | | | -0.000 | |
| | | | | | [0.002] | |
| Past return PE | | | | | | 0.003*** |
| | | | | | | [0.001] |
| Past standard deviation | | 0.019*** | 0.017*** | -0.027*** | 0.012*** | 0.007** |
| | | [0.004] | [0.004] | [0.009] | [0.002] | [0.003] |
| Unfunded liability / GSP | | | 0.110** | 0.369*** | -0.094** | -0.132*** |
| | | | [0.054] | [0.096] | [0.042] | [0.033] |
| GSP per capita | | | -0.000* | -0.001 | -0.000 | -0.000** |
| | | | [0.000] | [0.000] | [0.000] | [0.000] |
| PF size | -0.009** | -0.006 | -0.007* | -0.024*** | 0.001 | 0.010 |
| | [0.004] | [0.004] | [0.004] | [0.007] | [0.005] | [0.007] |
| Reporting Month FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 435 | 320 | 220 |
| Adjusted R-squared | 0.130 | 0.218 | 0.239 | 0.405 | 0.412 | 0.610 |

# Target allocation to risky assets and risk premium

| Tables 9 and 10 | Target allocation to risky assets | | | | | |
|---|---|---|---|---|---|---|
| | OLS | OLS | OLS | 2SLS | 2SLS | 2SLS |
| Geometric | 0.010 | 0.009 | 0.010 | 0.071*** | 0.042** | 0.047** |
| | [0.011] | [0.010] | [0.009] | [0.024] | [0.019] | [0.018] |
| Risk premium all risky assets | 0.008* | 0.009** | 0.010*** | 0.062*** | 0.039*** | 0.043*** |
| | [0.004] | [0.004] | [0.004] | [0.015] | [0.011] | [0.011] |
| Past standard deviation | | 0.022*** | 0.022*** | | 0.024*** | 0.023*** |
| | | [0.003] | [0.003] | | [0.004] | [0.004] |
| Unfunded liability / GSP | | | 0.074 | | | 0.080* |
| | | | [0.049] | | | [0.048] |
| GSP per capita | | | -0.000* | | | -0.001 |
| | | | [0.000] | | | [0.000] |
| PF size | -0.008* | -0.005 | -0.006 | -0.015** | -0.009 | -0.010* |
| | [0.005] | [0.004] | [0.004] | [0.007] | [0.006] | [0.005] |
| Reporting Month FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Year FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 673 | 673 | 673 | 673 | 673 | 673 |

In 2SLS, First Stage is Risk Premium on Past Return with same controls

(see Table 7)

# Explanations for past return extrapolation

**Rational skill hypothesis:**

- Extrapolation primarily or exclusively due to performance persistence.
- Alternative assets:
  - Private equity (Lerner, Schoar and Wongsunwai, 2007; Cavagnaro, Sensoy, Wang and Weisbach, 2016).
  - Real estate – mixed evidence (Andonov, Eichholtz and Kok, 2015)
  - Hedge funds – mixed evidence (Fung, Hsieh, Naik and Ramadorai, 2008; Jagannathan, Malakhov and Novikov, 2010; Dichev and Yu, 2011).

**Excessive extrapolation hypothesis:**

- The extrapolation also occurs in asset classes where there is no evidence of performance persistence.
- Public equity:
  - Pension funds cannot time the hiring and firing of asset managers in public equity (Goyal and Wahal, 2008).
  - These asset managers display heterogeneity in performance, but they have only modest persistence (Busse, Goyal and Wahal, 2010).

# Private equity – strongest potential for persistence

- **Extrapolating private equity performance can be explained if pension plans display skill or have differential access to general partners (GPs) of a given quality:**
  - Persistent differences in skills and performance among institutional investors investing in private equity funds (Cavagnaro, Sensoy, Wang and Weisbach, 2016).
  - Public pension funds are more likely to reinvest in the follow-on fund of the same GP (Lerner, Schoar and Wongsunwai, 2007).
  - Persistence in performance on a GP level when considering consecutive funds (Kaplan and Schoar, 2005; Hochberg, Ljungqvist and Vissing-Jørgensen, 2013; Korteweg and Sorensen, 2015).
  - Braun, Jenkinson and Stoff (2017): GP-level persistence has diminished over time.

- **Rational extrapolation (skill) hypothesis:** Persistence on a GP level could justify extrapolating recent past performance if the performance measures available for such a young fund are sufficiently informative so that a reinvestment decision could be made on the basis of such information.

# Preqin data to test the rational extrapolation hypothesis

- **2017 Preqin database: pension plan private equity investments and performance.**
- **Three categories of investments in private equity funds based on age:**
  - Past PE IRR old funds – average net IRR of investments made more than 13 years ago.
  - Past PE IRR medium funds – average net IRR of investments made 9–13 years ago.
  - Past PE IRR recent funds – average net IRR of investments made 3–8 years ago.

# Expected risk premium in private equity

- **Overall past performance** and **Past PE IRR in old funds** are the dominant factors
- Suggests reliance on stale and not-relevant information in forming expectations

| Table 10 | Expected risk premium in private equity | | | | |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Geometric | -1.674*** | -1.782*** | -1.815*** | -1.575*** | -1.643*** |
| | [0.343] | [0.400] | [0.365] | [0.374] | [0.434] |
| Past return | 0.486* | 0.401 | 0.504*** | 0.596*** | 0.583*** |
| | [0.279] | [0.285] | [0.176] | [0.211] | [0.222] |
| Past standard deviation | -0.150 | -0.098 | -0.151 | -0.090 | -0.105 |
| | [0.172] | [0.170] | [0.139] | [0.141] | [0.142] |
| Past PE IRR recent funds | | 0.153** | | | 0.040 |
| | | [0.069] | | | [0.089] |
| Past PE IRR medium funds | | | -0.151*** | | -0.074 |
| | | | [0.049] | | [0.053] |
| Past PE IRR old funds | | | | 0.073*** | 0.057*** |
| | | | | [0.014] | [0.017] |
| #Investments PE | | -0.001 | -0.000 | -0.002 | -0.002* |
| | | [0.001] | [0.001] | [0.001] | [0.001] |
| Unfunded liability / GSP | 2.336 | 1.782 | 0.250 | 2.539 | 1.437 |
| | [1.969] | [1.400] | [1.868] | [2.134] | [1.281] |
| GSP per capita | 0.001 | -0.003 | -0.004 | -0.003 | -0.006 |
| | [0.006] | [0.005] | [0.007] | [0.005] | [0.008] |
| PF size | 0.139 | 0.180 | -0.035 | 0.122 | 0.075 |
| | [0.188] | [0.224] | [0.161] | [0.161] | [0.128] |
| Year FE | Yes | Yes | Yes | Yes | Yes |
| Observations | 220 | 215 | 190 | 181 | 179 |
| Adjusted R-squared | 0.501 | 0.541 | 0.484 | 0.522 | 0.535 |

# Conclusion

- Direct observation of expectations allows us to test how expectations relate to asset allocation
- Extrapolative expectations affect the target allocation to risky assets of institutional investors.
- Pension funds with higher expected risk premia do invest more of their funds in risky assets.
  - Seem to respond even more strongly when such expected risk premia are affected by past returns
- Rational skill hypothesis does not fully explain the extrapolation
- Fiscal pressure of liability side leads to increased return assumptions through asset inflation and real returns, but does not mitigate effects of past returns