What Drives Variation in Investor Portfolios? Evidence from Retirement Plans

Mark Egan, Alexander MacKay, and Hanbin Yang

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Erik Loualiche – University of Minnesota

This Paper

Understanding heterogeneous asset allocations

- How do investors choose their 401K portfolio
  - Summary statistics from allocation data at the plan level ...
  - ... age, income, and demographics predict allocations

Structural Exercise

- Recovers risk-aversion and expectations of investors
- Evidence on beliefs ties in to recent survey evidence: *extrapolative expectations*

This Discussion

A lot to cover ...

- Quick summary
- The framework
- Identification

Summary

Three papers in one!

- Reduced form analysis: asset allocation and demographics
  - Who buys risky stocks
  - Who responds to fees
- Demand-based structural mean-variance framework
  - Estimate risk aversion and agents expected returns
- Analysis of expectations
  - Surprise! It is extrapolative.

Plan

Mean-Variance Optimization

Merton Formula

$$\pi = \frac{\mu - r_f}{\gamma \sigma^2}$$

If I know

- Expected excess returns
- Volatility
- Risk aversion

$\rightarrow$ Optimal allocation π

Mean-Variance Optimization

Merton Formula

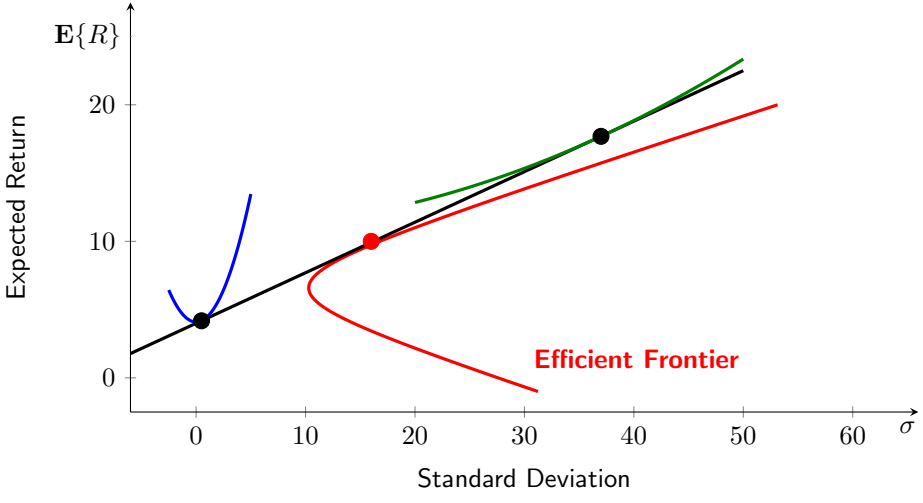
$$\pi = \frac{\mu - r_f}{\gamma \sigma^2}$$

If I know

- Expected excess returns
- Volatility
- Allocation

$\rightarrow$ Risk aversion γ

Mean-Variance Optimization



Mean-Variance Optimization: This paper

Merton Formula

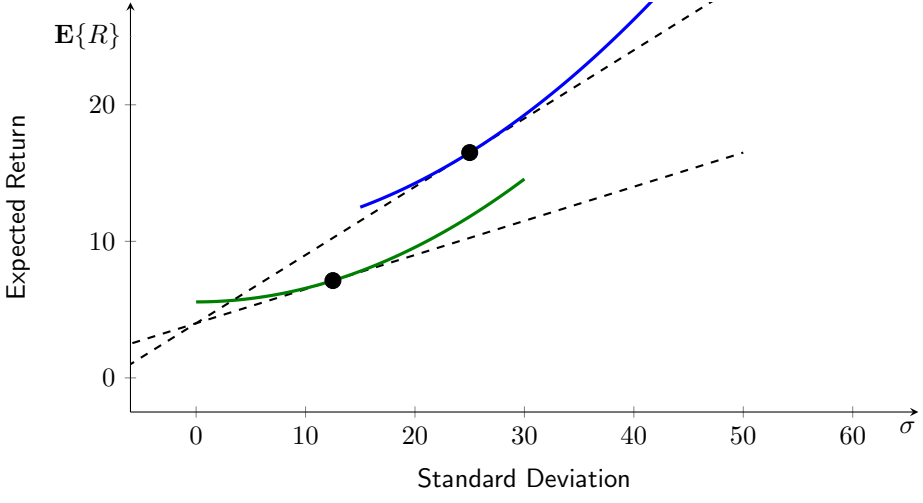
$$\pi = \frac{\mu - r_f}{\gamma \sigma^2}$$

If I know

- Volatility
- Allocation

$\rightarrow$ Risk aversion and expected excess returns

Mean-Variance Optimization: This paper



One equation ... two unknowns?

Merton Formula

$$\pi = \frac{\mu - r_f}{\gamma \sigma^2}$$

Find the risk aversion

- Exogenous shifter of Capital Market Line (fund fees)

$$\frac{d\pi}{d \text{ fund fee}} = \frac{d\pi}{d(\mu - r_f)} = \frac{1}{\gamma \sigma^2}$$

- A measure of γ

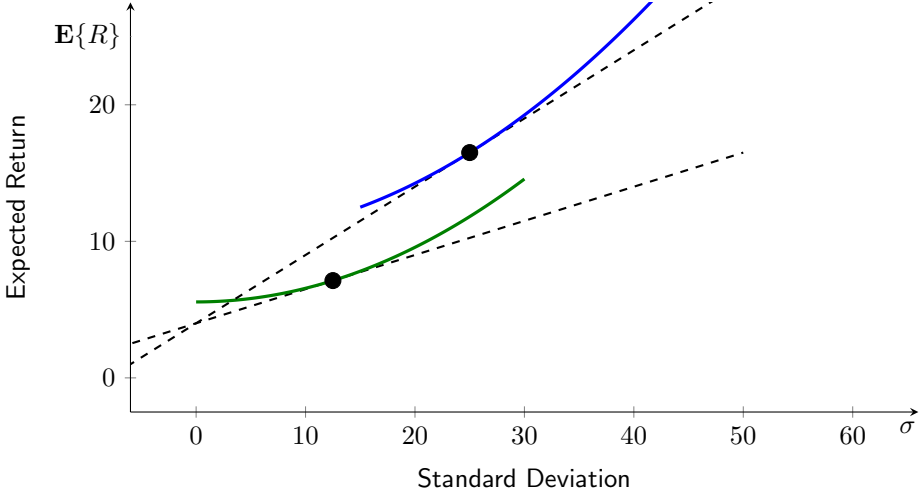
Find expected returns

- After accounting for fund fees, expected returns "clear the market"

$$\mu - r_f = \pi \gamma \sigma^2$$

- Given my measure of γ (from small perturbation), what are expected returns that would rationalize my asset allocation

One equation ... two unknowns?



Implementation 1

Allocation data is richer than risky-riskfree allocation

- Mean-variance framework leans on variance covariance matrix

$$\mu_i - p_i - r_f = \gamma_i \Sigma \omega_i$$

Common problem in portfolio management

- How to estimate Σ?
- EMY use factor model based on equity and bond factors

Common problem in portfolio management

- Σ is hard to estimate because of dimensionality
  - Equity markets with 5000 stocks implies roughly 12,500,000 parameters to estimate
- 26 investment options by plans: why not estimate covariance directly?

Implementation 2

Main regression

$$\varsigma_{mkt} = \theta_m p_{mkt} + \varphi_{mt} + \varphi_{j(k)t} + \epsilon_{mkt}$$

- Dependent variable is marginal increase in variance from holding asset k
- θ_m is the inverse of the risk aversion coefficient

Implementation 2

Main regression

$$\varsigma_{mkt} = \theta_m p_{mkt} + \varphi_{mt} + \varphi_{j(k)t} + \epsilon_{mkt}$$

What source of variation

- Fees p_{mkt} vary across funds/plan/years
- Model includes plan-year fixed effects and fund category-year fixed effects
- What variation is left?
  - Variation in the fees of a growth-fund for HBS different from growth-funds fee trajectories
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- Imagine Fidelity is dominant on HBS 401K market
  - Increase in fees from fidelity is not generating variation because it is absorbed by HBS-time fixed effect
- Is this good or bad?
  - Good: avoids catering of fidelity and correlation of fees with demand
  - Bad: misses on variation that might be exogenous (fidelity is monopolist and does not decide fees for each fund?)

Implementation 2

Main regression

$$\varsigma_{mkt} = \theta_m p_{mkt} + \varphi_{mt} + \varphi_{j(k)t} + \epsilon_{mkt}$$

In the paper

- At length discussion of threat to identification
  - Measurement error, inattention
- ... but missing some important variation?

Implementation 2

Main regression

$$\varsigma_{mkt} = \theta_m p_{mkt} + \varphi_{mt} + \varphi_{j(k)t} + \epsilon_{mkt}$$

Composition effects

- Data is at the fund level: aggregates of individuals
  - Impossible to measure trends in investors within funds
  - Discuss why composition effects are unlikely to affect estimation
  - Example: investors in company A are rich and investor in company B are poor. Same county. Rich people become enamored with value, poor start liking bonds. Composition effect is at the plan-time-fund level.

Interpretation

Risk aversion

- γ(or λ) = 5
- This itself is interesting and surprising; sample period is peculiar
  - Average expected excess returns: 15%
  - Average volatility: 13%
- Merton formula: $\pi = 0.15/(5 \cdot 0.13^2) = 1.77$
- Implies strongly levered position; is this due to ex-ante vs. ex-post returns?

Investor beliefs

- Focus on market expectations: but model gives results on the whole cross-section!
- Lots of interesting trend in 2010s: e.g. value drought

Interpretation

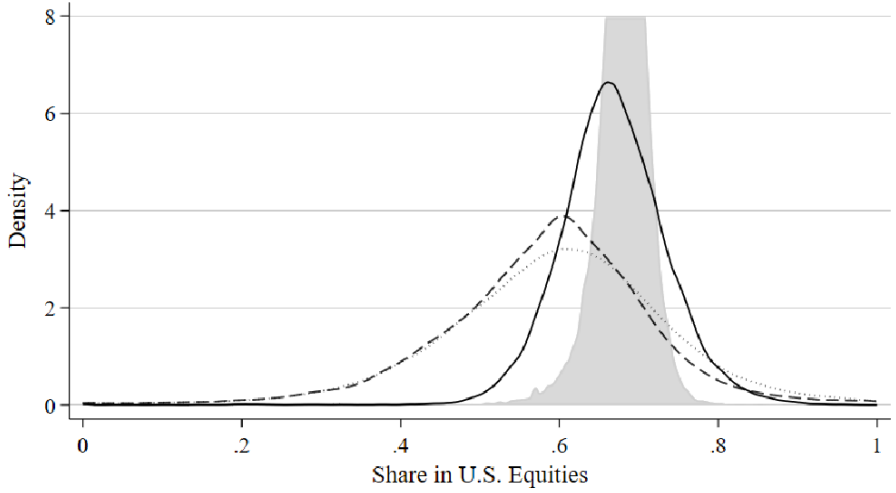
Beliefs vs. Risk averstion

$$\text{Equity Share}_{mt} = \beta\lambda_{mt} + \gamma\delta_{mt} + \epsilon_{mt}$$

- This is an important regression: see figure 2 above
- But the estimated model has an answer
- Why not using the full model to run counterfactuals here?

Interpretation

Figure 12: Counterfactual Allocations without Heterogeneity in Beliefs or Risk Aversion



Extrapolation

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Final Thoughts

Very interesting Paper!

Take away

- How do investors allocate their 401K: data on demographics
- Framework to separate risk aversion and expected returns
- ... towards some support of extrapolative expectations

Great Paper!