Predictability of Optimal Portfolio Weights
A Proposal to the Lowe Institute by Ben Gillen

Macroeconomic conditions exert a profound influence on financial asset returns, both indirectly through time-varying risk premia for different asset classes and directly through the performance of individual securities. A substantial literature seeks to identify the key dimensions of the macroeconomic environment that shape forward-looking expectations, volatilities, and covariances across assets.[1] These empirical insights have motivated the development of dynamic models for return generating processes, allowing researchers and practitioners to examine how conditional means and risk measures evolve with economic conditions.[2] To evaluate the economic significance of predictability, these conditional expectations are often embedded within a Markowitz-style optimization framework to evaluate how macroeconomic information can improve portfolio performance.[3]

Much of the existing literature focuses on estimating conditional expected returns or covariances based on macroeconomic indicators, and then examines how these estimates affect the characteristics of optimized portfolios. In this two-step approach, macroeconomic conditions influence portfolio allocations only indirectly through their effect on asset return moments. However, it is well known that instability associated with the portfolio optimization problem can complicate this analysis. Optimized portfolio weights are highly sensitive to small changes in conditional expectations and risk measures, all of which are very imprecisely estimated, potentially obfuscating the influence of macroeconomic conditions on optimal portfolio performance.

This project proposes a complementary perspective by exploring the direct relationship between optimized portfolio weights and macroeconomic state variables. The empirical methodology is conceptually straightforward. Using a rolling window approach, we compute the optimal portfolio weights that a risk-averse investor with perfect foresight would choose to hold. We then regress these optimal, forward-looking, portfolio weights on lagged macroeconomic factors to estimate predictive models of optimal allocations. Applying careful econometric techniques to prevent lookahead bias, we can use out-of-sample tests to assess how well macroeconomic conditions predict desirable portfolios.

The direct approach mitigates instability associated with portfolio optimization and its potential to obscure the link between optimal portfolios and macroeconomic conditions by placing the forward-

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[1] Ferson and Harvey (1991, 1993, 1999) explore the sources of predictability in portfolio and international equity returns, showing how conditioning variables are useful in predicting the cross-section of future returns. Pesaran and Timmermann (1995) demonstrate the economic significance of this predictability, which Jagannathan and Wang (1996) embed in a conditional CAPM framework. Avramov (2004) demonstrates the predictive value of conditioning on macroeconomic information with a Bayesian model of predictability in asset pricing models. More recent contributions address model instability and structural breaks, exemplified by Pettenuzzo and Timmermann (2011). In broader overviews, Cochrane (2008) provides a defense of return predictability against statistical critiques and Rapach and Zhou (2013) provide a comprehensive synthesis of statistical methods and economic predictors, underscoring both the challenges and the potential of return forecasting for portfolio management.

[2] Busse and Irvine (2006) use Bayesian methods to estimate time-varying mutual fund alphas. Avramov and Wermers (2006) demonstrate welfare gains from exploiting predictability in fund selection. Avramov and Chordia (2006) develop a framework for forecasting stock returns with macroeconomic and firm-specific predictors.

[3] Kandel and Stambaugh (1996) links predictability to asset-allocation, demonstrating that even modest forecastability of asset returns has substantial implications for portfolio weights. Pastor and Stambaugh (2002) show that mutual fund performance and optimal allocation change materially when returns depend on lagged macro variables. Banegas et al. (2013) extend conditional performance evaluation to European markets and portfolio selection of European mutual funds.

looking optimal weights as the prediction target. This framing clearly lays out the key econometric questions to be addressed. Which macroeconomic variables contain the most information for predicting optimal portfolio weights? What is the best predictive mechanism for constructing out-of-sample portfolios? To what extent can this approach improve on classical approaches to portfolio selection?

This past summer, I demonstrated the core empirical strategy in preliminary tests of this approach using a set of four standard macroeconomic factors (Term Spread, Earnings Yield, Default Spread, and Short-Term Interest Rate) and ten industry portfolios. Turning these preliminary results into a more robust analysis that addresses the above questions and consolidating them into a paper would prove an excellent opportunity for students to see how a research idea becomes an academic work.

I will meet with students weekly as a group to track our progress and manage assignments. In September, Students will get oriented to the problem by engaging in a literature review to collect references, building an annotated bibliography, and identifying macroeconomic variables for the study. October's focus will be on assembling the master data set to build a collection of test settings in which to address the above econometric questions. In November and December, we will implement the first empirical tests to support my writing the literature review, data, and methodology sections, over the winter holiday. In January and February, students will explore alternative forecasting techniques, including multinomial logit and boosted regression trees to identify best practices, while refining the tables to be included in the paper. March is reserved for writing up the results and preparing a finished paper, during which students will prepare a replication package and support editing of the draft, with April providing the buffer for inevitable time overruns.

I believe this project would work well with two to three students working a collective 20-25 hours per week. I have contacted two students with whom I'd like to work on this project who have committed 10-15 hours per week. I've also inquired about the availability of a third student from whom I have not yet received a response.

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