

An empirical analysis of aggregate household portfolios

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Received 13 February 2007; accepted 22 November 2007

Available online 11 January 2008

Abstract

This paper analyzes the important time variation in US aggregate household portfolios. To do so, we first use flexible descriptions of preferences and investment opportunities to derive household optimal decision rules that nest static, myopic, and non-myopic portfolio allocations. We then compare these rules to the data through formal statistical analysis. Our main results reveal that: (i) static and myopic investment behaviors are rejected, (ii) non-myopic portfolio allocations are supported, and (iii) the Fama–French factors best explain empirical portfolio shares.

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JEL classification: G11; G12

Keywords: Dynamic hedging positions; Generalized recursive preferences; Static, Myopic, and Non-myopic portfolio allocations; Time-varying investment opportunity set

1. Introduction

One striking feature of US aggregate household portfolios is that holdings of cash, bonds, and stocks relative to wealth exhibit pronounced fluctuations through time. Specifically, from the mid 1970s to the late 1980s the empirical share of cash drastically increased, holdings of stocks substantially decreased, while the demand of bonds mildly declined (see Fig. 1). This seems at odds with a prediction associated with *static* portfolio allocations, namely that portfolio rules are time-invariant. These decision rules are optimal regardless of the investors' risk aversion, as long as the investment opportunity set is constant. Under such an environment, investors do not perform dynamic hedging because shocks to state variables have no effect on the distribution of future asset returns. Thus, investors

act as if their planning horizon is only one period. This reflects the behavior of short-term investors.

Another important characteristic of US aggregate household portfolios is that the empirical shares display different dynamic properties. In particular, the ratio of the empirical share of bonds to that of stocks falls dramatically between the early 1950s and 1970s, and displays strong upward movements afterwards (see Fig. 2). This seems inconsistent with a prediction derived from the two-fund-separation theorem that the mix of risky assets (such as bonds and stocks) is time-invariant. These rules are optimal, for example, when the relative risk aversion is unity, even if the investment opportunity set is not constant. Under this case, investors never take dynamic hedging positions since they ignore the effects of shocks on future asset returns. This reflects the behavior of *myopic* investors.

These observations suggest that US aggregate household portfolios may be in line with the predictions related to time-varying investment opportunity set and *non-myopic* portfolio allocations, which state that portfolio rules are time-varying and the mix of risky assets also varies. These rules are optimal, for instance, when the relative risk

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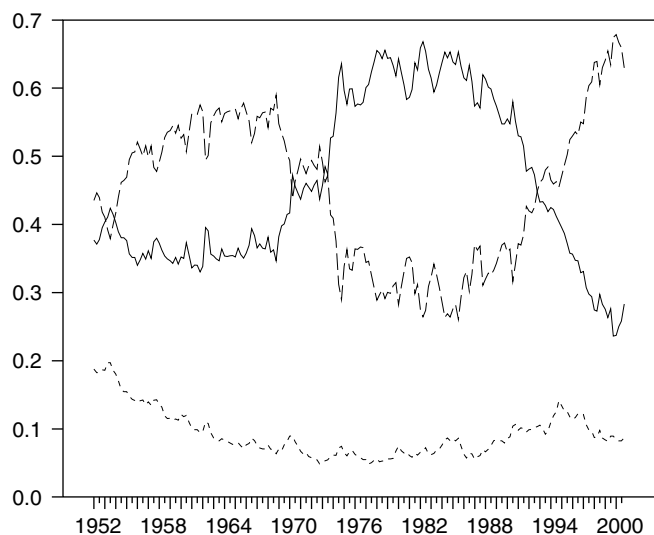


Fig. 1. The solid (dashed) [dotted] lines represent the empirical household portfolio shares of cash (stocks) [bonds]. Each empirical share is measured as the value of assets held by households relative to wealth, where wealth is the sum of the values of holdings of cash, bonds, and stocks (See the Data appendix).

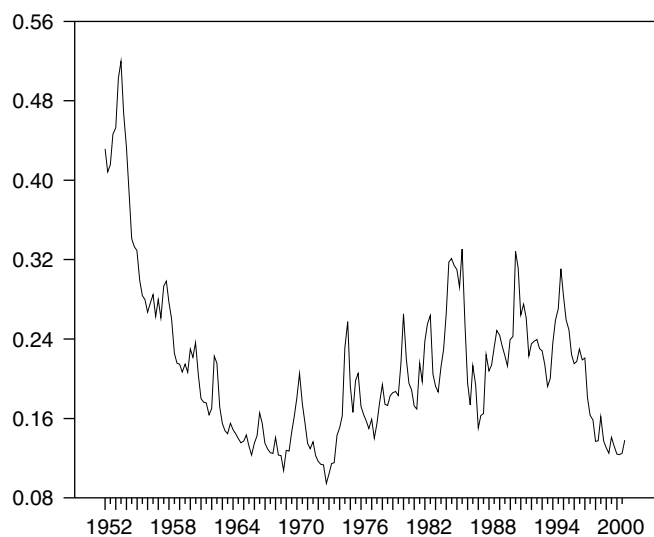


Fig. 2. The solid line represents the ratio of the empirical household share of bonds to that of stocks.

aversion exceeds one, and when the investment opportunity set is not constant. In this context, investors have a multi-period planning horizon, and have dynamic hedging demands to account for the effects of shocks on future asset returns. This reflects the behavior of long-term investors.

The objective of this paper is to analyze a flexible framework's ability in reproducing US aggregate household portfolio shares. In particular, we verify: (i) whether these portfolios are best characterized as being static, myopic or non-myopic, and (ii) which (if any) factors are used by households in selecting asset holdings. To do so, we study the household asset positions from a partial equilibrium environment where the asset supply is perfectly elastic, rather than the pricing implications from a general

equilibrium perspective where the asset supply is perfectly inelastic. For our application, the partial equilibrium approach is relevant given that we focus exclusively on asset holdings of the household sector, rather than those of all sectors (which also include businesses, governments, and non-residents). In fact, the household asset holdings represent only a fraction of those held by all sectors, and as such does not correspond to the aggregate wealth of the entire economy. For example, in 2005 the financial assets directly held by US households was less than one third of those held by all sectors (Source: Board of Governors of the Federal Reserve Bank, Balance Sheet of All Sectors).

Specifically, we consider a general setting that involves time- and state-non-separable preferences (i.e. non-expected utility) as well as various specifications of investment opportunity sets. These preferences are useful in disentangling the investors' attitudes towards risk and inter-temporal substitution. Also, changes in investment opportunities are described from unrestricted vector autoregression (VAR) processes involving asset returns and factor variables. Similar theoretical environments are analyzed for the cases of single risky asset and state variable (Campbell and Viceira, 1999), many risky assets and a single state variable (Normandin and St-Amour, 2002), and several risky assets and state variables (Campbell et al., 2003). Importantly, these environments are attractive since they yield optimal portfolio rules that nest static, myopic, and non-myopic portfolio allocations. The theoretical environment is presented in Section 2.

Also, we consider various wide-ranging specifications of the VAR for the return process. A first specification simply relates the return variables associated with cash, bonds, and stocks to constant terms. This baseline case ensures that investment opportunities are constant, so that portfolio allocations are static. The other specifications link current return variables on their own lagged values as well as past values of factor variables. These alternative cases imply that investment opportunities are time-varying, such that portfolio allocations may be non-myopic. Also, the selected sets of factors include the seminal Fama and French (1993) factors, the well-known Chen et al. (1986) macroeconomic factors, as well as the Campbell et al. (2003) factors. The estimation results, reported in Section 3, for the quarterly post-war US data reveal important implications for portfolio allocations. First, the baseline specification is rejected. This finding refutes the hypothesis of a constant investment set. Second, the conventional criteria of fit are very close across the various alternative factor sets. Consequently, it is difficult at this point to identify the most influential factor set actually used for portfolio allocations.

Next, we apply formal statistical tests to verify whether the empirical and predicted portfolio shares exhibit identical means, volatilities, and co-movements. The empirical portfolio shares are constructed for cash, bonds, and stocks from quarterly aggregate US household data for the post-war period. The predicted portfolio shares, elaborated in Section 4, are evaluated from the optimal rules and the

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