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# An alternative measure of the “world market portfolio”: Determinants, efficiency, and information content

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The world market portfolio plays an important role in international asset pricing, but is unobservable in practice. We first propose a framework for constructing a market proxy that corresponds to the “market portfolio” of financial theory. We then construct this proxy, analyze its determinants and test its efficiency and explanatory power over the period 1975–2007 with respect to the return generating processes of a broad asset universe. We show that its major determinants are traded assets and that it is not efficient. However, it is significant for explaining individual asset returns over an asset universe that includes stocks, bonds, money markets and commodities. The explanatory information is incremental to what is available in traded asset prices and the significance of this information is robust with respect to diversified portfolios generated by factor analysis and to characteristic-sorted portfolios as well as to various model specifications, including the single-index model, the Fama–French (1992) three factor model for stocks, and various specifications of multi-index models hedged and unhedged for foreign currency risk.

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## 1. Introduction

The “market portfolio” figures prominently in modern asset pricing.<sup>2</sup> Many, if not most, theoretical pricing models include the market portfolio as an explanatory variable.<sup>3</sup> By definition, the market portfolio is supposed to comprise all assets in the economy, both traded and non-traded, including human capital and capital owned by the government. The problem that we address and provide a solution for in this paper is that the “market portfolio” cannot be observed directly, thereby making it necessary to use proxy portfolios when conducting empirical studies. The problem is important for theory and practice. Empirical validation of the theoretical models, such as the CAPM (capital asset pricing model) or the Fama–French 3-factor model, depends crucially on the index or indices chosen to proxy for the true market portfolio.<sup>4</sup> In practice, the proxy portfolio is important for asset evaluation and portfolio construction on the one hand and for performance measurement on the other, because performance measurement is extremely sensitive to the choice of the market proxy as shown in many studies, such as Roll (1978), Dybvig and Ross (1985) and Green (1986).

The most popular proxy for the market portfolio is typically a general stock market index. For example, many US studies use the CRSP equal weighted or value weighted index and most international studies use the MSCI global index (e.g. Vassalou, 2000). There are, however, many problems with indices such as these. First of all, they represent only one asset class and are typically inefficient. Shanken (1987), for example, shows that using the equally weighted CRSP index (alone, or together with a long-term US government bond portfolio) as the market portfolio, either invalidates the CAPM or the proxy is inefficient. Fama and French (1998) find that the MSCI global index is inefficient with respect to the value and growth portfolios they form. Secondly, irrespective of whether the proxy used is efficient or not, using a proxy market portfolio which consists of the individual assets used in the tests makes it likely that their returns will be correlated with the proxy used. In other words, the results will be tautological. To overcome this, some researchers exclude from the proxy they use the returns of the assets included in their tests. However, Fama and French (1998) have argued that while this may avoid inducing a spurious relation between assets’ returns and the proxy, it can corrupt the estimates of the risk loading in the tests employed.

Attempts to improve the proxy quality follow two general routes. Some studies, such as Mayers (1972) and Stambaugh (1982), who used several definitions of the market portfolio, including corporate bonds, government bonds, Treasury bills, home furnishings, residential real estate, automobiles, and common stocks, have attempted to augment the market proxy with other marketable assets and/or non-marketable assets in order to include a bigger proportion of the economy’s value. Others use a traditional proxy and add explanatory variables. For example, Jagannathan and Wang (1996) include a measure of human capital and Vassalou (2003) uses GDP forecast revisions as an additional risk factor.<sup>5</sup> Neither method overcomes the fact that a large part of the economy’s value is excluded and both are vulnerable to the tautology weakness.

In this paper we take a completely different route to construct the “market portfolio”. We build on the intuition that if the “market portfolio” of financial theory represents the value of all the assets in the economy, it, in fact, represents the total value of the economy. Thus, rather than adding up values of individual assets to determine a proxy for the national “market portfolio”, we use the Hicks (1987) model of discounted macroeconomic cash flows to calculate the value of the economy directly. In this way, all assets are represented in the country “market portfolio”, but since no individual assets enter the portfolio directly, we avoid the tautology problem. We construct the international market proxy, which we call the world market portfolio (WMP), as the sum of the ninety national market portfolios in

<sup>2</sup> Campbell (2000) provides an extensive literature review of the development of asset pricing models.

<sup>3</sup> Some of the best known multivariate models are by King (1966), Rosenberg (1974), Chen et al. (1986), Burmeister and McElroy (1988), Fama and French (1992) and Carhart (1997). At the international level, see: Adler and Dumas (1983) and Solnik (1974a).

<sup>4</sup> For example, in the context of the CAPM Roll (1977) has shown that the only testable hypothesis is the mean-variance efficiency of the proxy used for the market portfolio.

<sup>5</sup> Another extended version of the CAPM incorporates hedging against changes in future investment opportunities in a multi period setting (Merton, 1973; Campbell, 1996).

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