MARC-MARS: Modeling Asset Returns via Conditional Multivariate Asymmetric Regime-Switching*

Marc S. Paolella\textsuperscript{a,b}  Paweł Polak\textsuperscript{a,b}

\textsuperscript{a}Department of Banking and Finance, University of Zurich, Switzerland
\textsuperscript{b}Swiss Finance Institute

January 17, 2012

Abstract

A new multivariate model for asset returns is motivated and studied. It allows for volatility clustering, excess kurtosis, asymmetry, and dynamics in the dependency between assets over time. It nests several models previously proposed in the literature, and is demonstrated to outperform all of them in out-of-sample exercises. An EM algorithm is developed for estimation and is demonstrated to be far faster than existing methods, and thus crucial for use with a large number of assets. The predictive distribution is a (possibly special case of a) multivariate generalized hyperbolic, so that sums of marginals (as required for portfolios) is tractable. Each marginal is endowed with a common univariate shock, interpretable as a common market factor, and this stochastic process has a predictable component. This leads to the new model as being a hybrid of GARCH and stochastic volatility, but without the estimation problems associated with the latter.

\*Part of the research of Paolella has been carried out within the National Centre of Competence in Research “Financial Valuation and Risk Management” (NCCR FINRISK), which is a research program supported by the Swiss National Science Foundation. The authors wish to thank Jochen Krause for computational assistance and other input which led to an improved presentation.