

A Parsimonious Continuous Time Model of Equity Returns (Inferred from High Frequency Data)

Mascia Bedendo*	Stewart D. Hodges
FORC	FORC
University of Warwick	University of Warwick
CV4 7AL Coventry U.K.	CV4 7AL Coventry U.K.
Tel. +44 2476 522701	Tel. +44 2476 523606
Fax. +44 2476 524167	Fax. +44 2476 524167
forcmb@wbs.warwick.ac.uk	forcsh@wbs.warwick.ac.uk

January 15, 2003

Abstract

In this paper we propose a parsimonious continuous time model capable of describing and replicating the dynamics of equity returns. Unlike several related works in the literature, we avoid specifying a model *a priori* and we try, instead, to infer our model from the analysis of a data set of 5-minute returns on the S&P500 future contract. We start with a very general model structure and we perform a careful step by step analysis of the data, recording the relevant features that need to be modelled, whose peculiar characteristics will actually drive the choice amongst different possible specifications. At each step we also attentively look for possible specification errors by testing all the assumptions we make. Throughout the entire paper we try to keep the modelling assumptions to a minimum, while retaining an adequate level of structure. The findings from our analysis suggest a model where: 1. The seasonal intraday volatility component is deterministic and constant through time. 2. The stochastic volatility component is independent from the seasonal one and is well described by a two-factor mean reverting process with volatility forecasts updated every 5 minutes according to a non-linear filtering technique. 3. The conditional return distribution turns out to be surprisingly close to a Gaussian and remarkably constant across the different intraday intervals. The results from a Monte Carlo experiment indicate that a sample of returns simulated according to our model exhibits the main features observed in market returns. Extensions aimed at modelling the leverage effect and at including a jump component in the returns are currently being investigated.

JEL Classification: C11, C51, C52, C53, G12.

*This author will be attending the conference and presenting the paper