Accepted Manuscript

Stable limits for the Gaussian QMLE in the non-stationary GARCH(1,1) model

Stelios Arvanitis, Alexandros Louka

PII: S0165-1765(17)30411-1
DOI: https://doi.org/10.1016/j.econlet.2017.09.035
Reference: ECOLET 7791

To appear in: *Economics Letters*

Received date : 27 March 2017
Revised date : 21 August 2017
Accepted date : 29 September 2017

Stable Limits for the Gaussian QMLE in the Non-Stationary GARCH(1,1) Model

Stelios Arvanitis* Alexandros Louka

August 22, 2017

Address: Dept. of Economics, AUEB, Patision str. 76, Athens P.O. Box 10434, GREECE.

Abstract

We derive the limit theory of the Gaussian QMLE in the non-stationary GARCH(1,1) model when the squared innovation process lies in the domain of attraction of a stable law. Analogously to the stationary case, when the stability parameter lies in $(1, 2]$, we find regularly varying rates and stable limits for the QMLE of the ARCH and GARCH parameters.

Keywords: Martingale Limit Theorem, Domain of Attraction, Stable Distribution, Slowly Varying Sequence, Non-Stationarity, Gaussian QMLE, Regularly Varying Rate.

JEL: C13, C22.

1 Introduction

We derive the limit theory of the Gaussian QMLE in the non-stationary GARCH(1,1) model when the squared innovation process lies in the domain of attraction (DoA) of a p-stable law for $p \in (1, 2]$. Our interest stems from the empirical fact that distributions of financial asset returns exhibit fat tail behavior. This renders plausible the consideration of heavy-tailed distributions for the innovation process of GARCH-type models in financial applications. In the stationary versions of such cases, $\sqrt{n}$-consistency and possibly asymptotic normality can break down for the Gaussian QMLE (see for example Hall and Yao (2003); Mikosch and Straumann (2006); Arvanitis and Louka (2017)). Hence the question of whether this holds under non-stationarity arises naturally, and can be important for the determination of the asymptotic validity of inferential procedures based on the QMLE.

For the non-stationary GARCH(1,1), when the innovations fourth moments exist (hence $p = 2$), Jensen and Rahbek (2004a) and Francq and Zakoïan (2012) establish standard limit theories for the ARCH and GARCH parameters QMLE. In the non-stationary ARCH(1) case

*Corresponding Author-Email address: stelios@aueb.gr.