

Further developments on temporary cointegration

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Abstract: La presenza di break strutturali nelle variabili economiche è una delle ragioni per cui non sempre le procedure di analisi di cointegrazione sono in grado di rilevare l'esistenza di una relazione di lungo periodo, anche nel caso in cui quest'ultima sia avvalorata dalla teoria economica. Questo problema è particolarmente sentito nel caso in cui si voglia costruire un modello ECM a scopi previsivi.

In questo lavoro verranno presentati alcuni approfondimenti al concetto di cointegrazione temporanea proposto da Granger and Siklos (1997) per modellare casi in cui, prevalentemente per il sopraggiungere di break strutturali, le serie non sono necessariamente cointegrate per tutto l'arco di tempo considerato. Sarà inoltre presentata una applicazione alla serie reale dei prezzi di oro ed argento nel periodo 1971–2004.

Keywords: Structural breaks, Bai-Perron test, Temporary cointegration

1. Introduction

Nowadays there is still a huge interest on the statistical concept of cointegration. Many applications of cointegration tests can be found in finance literature because markets are believed to clear quickly in the absence of regulatory impediments and also because equilibrium relationships are well established and defined.

However, the existing body of empirical work has been less than completely successful at consistently finding such equilibrium relationships and there is space for some more proposals. In this context, Granger and Siklos (1997) introduced the concept of temporary cointegration (hereafter TC) where the underlying series do not need to be cointegrated at all times. Following Granger and Siklos (1997) non-cointegration may be due to the introduction, occasionally, of another $I(1)$ common stochastic trend, for example consequently to a new policy rule. Indeed, events or important changes in some institutional features of an economy can interrupt an underlying equilibrium relationship for an extended period of time. Hence, for some applications at least, it seems more realistic to assume that some series are cointegrated only during some periods and not at others.

In the paper by Granger and Siklos (1997) the break points that divide the series in regimes are chosen ex-ante, leaving open the issue of how to select them in the realistic hypothesis they are not known.

In this paper we propose a scheme to detect TC in the hypothesis of unknown break points, based on the Engle and Granger procedure (Engle and Granger, 1987), which is enriched by a preliminary phase of break points detection using the Bai-Perron test (hereafter BP) for structural breaks in series (Bai and Perron, 1998).

The BP procedure estimates and tests for multiple breaks at unknown dates by means of a type test for the null hypothesis of no change versus a prespecified number of changes and also an alternative of an arbitrary number of changes (up to some maximum). The method of estimation is based on the least squares principle, where, supposing that m is the number of break points, for each m -partition of the sample estimates are obtained by minimizing the sum of squared residuals.

2. An application to real data: the relationship between gold and silver

The data set we examine comes from the International Financial Statistics. The two series are the monthly prices of gold and silver (US dollar per ounce) from the beginning of 1971 to april 2004, covering a very extensive range of economic conditions, political change in major producers and increased sophistication in asset markets. Gold and silver have historically been seen as close substitute for one another and this would suggest that the two markets share the same dynamics. In literature there are several attempts to test for the existence and stability of the gold and silver relationship, for example Escribano and Granger (1998). However, it seems that while they share a similar set of drivers there are also economic fundamentals that may drive the process of gold and silver apart (for instance, Dooley *et al.* 1995).

The motivations why modelling with the TC approach the series of the price of gold and silver are *i*) the failure at finding cointegration between them over all the sample period 1971-2004 *ii*) the suspicion, from the graphical inspection of the series, that at least one break point should be present in the series and located around April 1979. This date corresponds to a documented bubble in the silver price that affects the dynamics of both series. The results of the TC analysis we performed following the scheme described in the previous section reveal that while no cointegration is found over all the sample period, evidence of cointegration is found starting from May 1979 to the end of the sample.

3. References

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