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Controversial curves of the economy: An up-to-date investigation of long waves

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ABSTRACT

The question of the validity of the "so called" Kondratieff's theory of long waves has been a well-known controversial issue among historians, economic, social and political science scholars. In this work, the author analyses its consistency and cycles general framework investigating both original Kondratieff's data (never processed by harmonic analysis in their whole dataset) and the latest and longest available economic time-series. Fixing the boundaries of statistical analysis, hence, the main purpose is to furnish an up-to-date empirical contribution in exploring the conceptual cycles hypothesis by recurring to dedicated quantitative techniques applied to strictly economic datasets.

1. Introduction

The current and persistent financial crisis seems to have all the inherent conditions to renew the debate on the general consistency of the presence of cycles within economic activity. As of its beginning, it is reasonable to (re)question whether recurrence acts as an endogenous feature of the whole economic system. The feeling seems that history repeats itself flowing from rises and falls notwithstanding modified rules, technological dynamics and political changes.

As far as the genesis of the current downturn is concerned, the main consensus shares its financial and monetary nature (Caballero, 2016; Basu and Stiglitz, 2015; Jutasompakorn et al., 2014). Other scholars consider and add, however, further structural motivations to posit present issues (Batra, 2015; Michaillat and Saez, 2015; Teimouri, 2015). Nevertheless, despite different theoretical aspects, both economists and historians generally agree with the fact that capitalistic economic systems display oscillating patterns alternating prosperity and depressions periods (Adelman, 1965). Since the nineteenth century, an "apparent regularity" in these events impressed and influenced the studies of several scholars (Phillips, 1828; Wade, 1833; Lloyd, 1837; Mills, 1867). Under this perspective, the very first pioneering work assuming the concept of (long) waves, seems that of Tugan-Baranowsky (1901) even if van Gelderen (publishing under the pseudonym of J. Fedder in 1913), De Wolff (1929) and mainly Kondratieff (1926, with an English widespread translated version in 1935) followed by Schumpeter (1939) were the most renowned authors in this field (Reijnders, 1988). However, it is with the raising viewpoint supporting the theory of a business cycle, that (hypothetical) regular periodicity in economic patterns seemed gain proper dignity (Aftalion, 1909; Pigou, 1927; Frisch, 1933). Considering a review of specific literature regarding main classical theoretical cycles, as well-reported by Reijnders (2009), it is possible to identify:

- Kitchin cycles (average duration 3–5 years);
- Juglar cycles (average duration 7–12 years);
- Kuznets cycles (average duration 15–25 years);
- Kondratieff cycles (average duration 40–60 years);
- Hegemonial cycles (longer than precedents).

Among all above mentioned different periodic movements, the most controversial and argued are the Kondratieff ones, generally not yet accepted by economists (Hilmola, 2007; Devenezas and Corredine, 2001).

The first goal of this work lies in the application of the frequency-domain methodology to analyse original data presented in the Kondratieff's article published in 1926 and translated in English in 1935 (graphed from Figs. 1 to 12 and labeled with a capital letter from A to L to simplify proper identification). All Kondratieff's original data were previously never processed by a real in-depth analysis. Within literature, the main criticisms of Kondratieff's long-cycle theory were basically focused on theoretical aspects of its constructs and on the specific statistical methodology applied by the Russian economist as detailed by Garvin (1943). Adoption of frequency-domain Harmonic Analysis (HA) is here preferred to classical time-domain based models considering its appropriateness in investigating and evidencing statistically significant periodicities.

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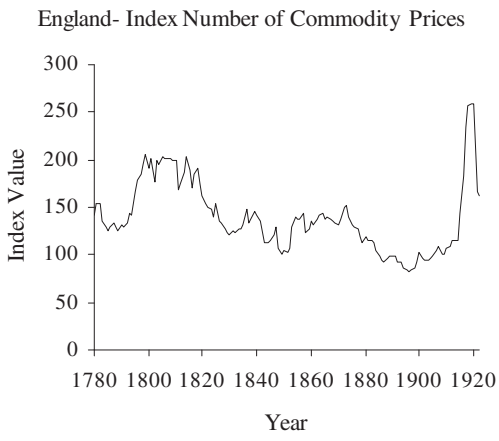

Fig. 1. Series A. Source: Gattei (1981).

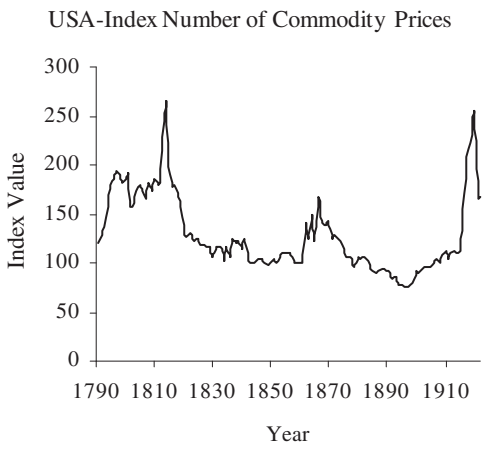

Fig. 3. Series C. Source: Gattei (1981).

The second aim and novelty of this contribution is the analysis of the longest and up-dated available time-series in order to investigate the present consistency of the economic cycles hypothesis with a specific focus on long-waves. To pursue this aim, the following datasets (labeled as M-N-O-P and graphed from Figs. 13 to 16) are investigated:

- United States of America real 2009 US$ per-capita GDP (from 1791 to 2014);
- United Kingdom real 2011 GB pounds per-capita GDP (from 1820 to 2014);
- Australia real 2010 AUS$ per-capita GDP (from 1828 to 2013);
- United States of America Annual Consumer Price Index (CPI from 1774 to 2014).

In this paper the adoption of GDP values to search for potential cycles is driven by objective motivations. The main reason lies in the fact that GDP series are (almost) the longest available collections to process. Length of the sequence is a very crucial aspect within periodicity detections through spectral analysis (Adelman, 1965; Harkness, 1968; Berry, 2000). Other indicators representing structural economic variables like for example employment (unemployment) rates, international and/or foreign trade and interest rates do not cover an equivalent time span. To overcome such problems, some authors have recurred to the reconstruction of different series (grain prices, wages and trade statistics) dating back to previous times to process uninterrupted long group of data (Metz 1984; Fisher 1996). Nevertheless, when various (even authoritative) sources are assembled into one single data-frame both the whole resulting dataset homogeneity and the methodological approach could be questioned by the more skeptical observers. A further point to remark can be found in the explicative content of the indicator itself. As well-known (despite several critics and adverse theoretical positions regarding real effectiveness in capturing and measuring people's material well-being), GDP statistics remain the widespread (and leading) indicators internationally employed when approaching economic themes.

Other potential financial indicators as stock prices indexes, for example, are not processed because assumed as less representative than GDP values. Financial markets are far more sensitive to speculative behaviors and irrational expectations. It is not difficult to assess that -since the beginning of the present crisis onwards- stock indexes have also raised up with remarkable "rallies". Monetary policies can exert a specific influence (Gorodnichenko and Weber, 2016), but main issues in real economy are not solved yet. In addition, it could be pointed out that available collections involving stock prices indexes are covering a shorter (or in the best case, an equivalent) time span than GDP series adopted here.

As far as the technical treatment of GDP data is concerned, figures are not processed in their original form, but recurring to their natural logarithm (nat-log; Box-Cox transformation with $\lambda = 0$) of the $\frac{y_t}{y_{t-1}}$ values. This pretreatment is needed in order to achieve stationarity before the implementation of HA, as it will be better explained in the next section.

For what concerns the elaboration of USCPI index figures, adoption appears appropriate both for length (the longest time span useful for periodicity detection among the various available time-series) and for

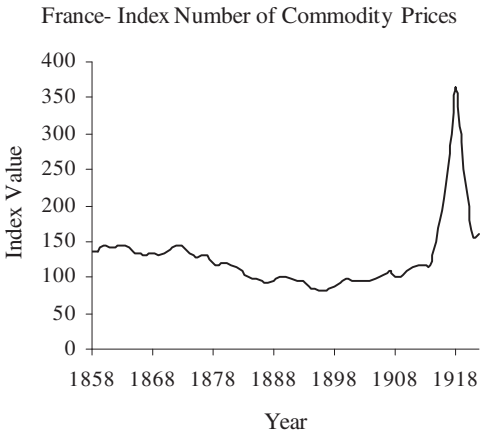

Fig. 2. Series B. Source: Gattei (1981).

Fig. 4. Series D. Source: Gattei (1981).

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