Persistence in trends and cycles of gold and silver prices: Evidence from historical data

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HIGHLIGHTS

- Persistence in gold and silver prices is analyzed in a fractional integration basis.
- Two parameters for the long run trend and the cyclical behavior are estimated.
- Only when the cyclical component is considered, mean reversion is detected.
- Cycles have a higher periodicity for gold than for silver prices.

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ABSTRACT

This study examines the persistence in gold and silver prices covering the historical periods of 1257 to 2016 and 1687 to 2016 respectively, by means of simultaneously estimating two differencing parameters for the long run trend and the cyclical behavior in a fractional integration framework. As opposed to many previous papers in the literature, once the cyclical differencing parameter is taken into account, mean reversion is detected in the long run trend of both gold and silver prices. The same result is obtained when structural breaks are taken into account. As far as the cyclical behavior of gold and silver prices is concerned, we find that cycles have a higher periodicity for gold (around 7 years) than for silver (4–5 years).

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1. Introduction

Although gold and silver prices have remained relatively flat and stable for centuries until the second half of the 20th century [1], they have been characterized, as the rest of the commodity prices, by a high volatility in the past two decades [2]. For example, gold and silver prices rose by 528% and by 806%, respectively, from 2001 to 2011 (with only a 25% increase in overall inflation), and after reaching their maximum levels in 2011, they fell a 40% and a 68%, respectively, from 2011 to 2016. During the same two decades, gold and silver prices have shown a higher correlation with other commodity prices and stock prices [2–4]. These figures have raised different debates and questions in the economic literature that justify the interest of modeling the behavior of these two commodity prices. First, the increasing correlation of the prices of these two precious metals with stock prices could reduce the attractiveness of investments in gold or silver as a diversification and a hedging tool, raising the question of whether gold and silver have been or are safe havens [5–8], and whether they act as inflation hedges [9–11]. Additionally, the increasing trend in prices during the last decades raised the question of whether

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the gold and silver prices are driven by supply and demand factors or by speculation due to the so-called "financialization" of the commodities markets [2,3,12–14]. Moreover, since gold and silver represent a significant proportion of developing economies' exports[1] [15] commodity price dynamics also constitute an economic growth and development factor in several developing countries, so that commodity price stability may constitute a policy objective to reduce poverty. Furthermore, the analysis of the degree of persistence of commodity prices relative to the prices of the manufactured goods is central to test the Prebisch–Singer hypothesis.[2] Finally, central banks and governments hold gold as part of their reserves (according to the [18], gold is the third most popular asset in the advanced countries accounting for 20% of the international reserves), making the price of this precious metal part of the central banks' policies.

Like any other goods, gold's and silver's prices are determined by supply and demand factors, although unlike other commodity prices, they have historically played, and still play, an important role as money, as an investment and as a store of value, and, thus, are driven by a great number of factors. According to the literature, gold and silver prices are driven by the US dollar [19], the exchange rates of other currencies [20,21], interest rates [22], inflation rates or expected inflation rates [9,10,23–26], equity and bond market returns [27], the prices of other commodities [28–30], investor sentiment [31,32], economic cycles [31], or economic and policy uncertainty [26,33–35], among others. For example, Lau et al. [4] analyze the relationship between white precious metals, gold, oil and global equity by means of analyzing return spillovers and volatility transmission, and find that all these markets are well integrated.

Determining whether the impacts of all the above factors on gold and silver prices are temporary or permanent will depend on the time series properties of gold and silver prices. For example, if gold and silver prices are stationary, shocks will only have transitory effects on these variables, while if they are non-stationary, shocks will have permanent effects on them. Furthermore, the order of integration of these variables will determine whether or not these variables might be cointegrated with other variables [10], such as inflation, stock returns or interest rates. Additionally, if gold and silver were perfect inflation hedges, the real price of gold and silver would be stationary [10]. However, despite the vast literature directed to estimate the integration order or persistence of these variables [10,16,36–42] the results are not yet conclusive (see, for example, [41], for a recent survey of the literature). For example, Ghoshray [16] reexamines the Prebisch–Singer hypothesis, employing the unit root tests proposed by Lee and Strazicich [43,44] with one and two structural breaks and the results suggest the existence of unit roots in many commodity prices, including gold and silver. Narayan and Liu [36], for example, analyze whether shocks to ten commodity prices are persistent or transitory using two recently developed unit root tests (Narayan and Popp test and the Liu and Narayan test) allowing for structural breaks and they also conclude that gold and silver prices are non-stationary. However, Gil-Alana et al. [39] use monthly data from 1972:1 to 2013:13 and fractional integration techniques, and they find that real gold price is non-mean reverting while real silver price is mean reverting, concluding that in the event of exogenous shocks, the effects will be permanent in gold prices, although temporary in silver prices. Gil-Alana et al. [40] use annual data spanning from 1833 to 2013 for gold and 1792 to 2013 for silver and they find fractional order of integration above 1 in case of gold and below 1 for silver, concluding again that gold prices exhibit a non mean-reverting behavior, while they find mean reversion in silver prices. Winkelried [42] reexamines the Prebisch–Singer hypothesis testing for unit roots in commodity prices and find evidence against nonstationarity in at least 20 out of 24 cases, including gold and silver prices. Earlier attempts in this regard, can be found in [45–47], which in turn provides support for the Prebisch–Singer hypothesis.

In this context, the objective of the paper is to analyze the persistence in the trend and cyclical components of gold and silver prices using long spans of data, covering 1257 to 2016 and 1687 to 2016 respectively, within a fractional integration framework and allowing for two differencing parameters for the long run trend and cyclical behavior of these prices. The main contributions of the paper are the following. First, we use a long span of data that covers more than seven centuries for gold and more than three centuries for silver prices, a time period which includes many historical episodes that significantly impacted oil and silver prices, such as: the adoption of the gold standard, the Great Depression and the stock market crash in 1929, World Wars I and II, the Bretton Woods accord in 1944, the end of the gold standard, the oil price shocks in the 70s, the Lehman Brothers collapse and the Eurozone debt crisis, among others. Second, in a fractional integration framework, we use a model that incorporates simultaneously two fractional differencing parameters, one at the long run or zero frequency and another one at a cyclical frequency. Although a rather similar methodology has already been used in [40], in this paper we use a longer time period that allows us to more precisely estimate the two fractional differencing parameters and of the periods for the length of the cycles. In fact, in [40] the time period goes from 1833 (gold) and 1792 (silver) till 2013 while in this work the period examined is 1257–2016 for gold and 1687–2016 for silver. Moreover, we provide in this paper a more exhaustive analysis of the cyclical periodicity in the two series.

The rest of the paper is organized as follows: Section 2 presents the methodology, while Section 3 discusses the data and the empirical results. Finally, Section 4 concludes.

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[1] Note, for example, that gold is the leading export for several countries, such as Mali, Tanzania, Ghana or Guyana.

[2] According to this hypothesis, the price of primary commodities declines relative to the manufactured goods over the long term. If this hypothesis holds, developing countries, with a higher export dependence on primary products, will lose out from a worsening of the terms of trade. See [16] and [17] for a survey of the literature.