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How do bond, equity and commodity cycles interact?☆

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ABSTRACT

We address bond, equity, gold as well as oil markets, and examine their lagged interactions including market volatility and consumer prices. Apart from considering returns, we also address the cyclic component of price levels. Study of the monthly lag structure during January 1950 to June 2015 reveals: (i) U.S. cycles and returns show a consistent pattern of predictability, (ii) the bond-equity interaction has self-enforcing and dampening dynamic components, (iii) equity prices negatively react to shocks in uncertainty and slowly build a positive risk premium, (iv) lagged cross-market pricing transmission occurs from gold to bonds to oil and finally to inflation.

1. Introduction

Despite being of central interest to financial market investors and economic policy makers alike, the literature on financial cycles appears underdeveloped. While the business cycle literature in economics is vast, the results on cycles in financial markets are relatively scarce.[1] Equilibrium model considerations lead to the assertion that aggregate asset prices such as stock markets exhibit time-varying risk premia. While this lead to a large body of literature on the time-varying equity risk premium, early work as for example by Bekaert and Hodrick (1992) has principally also opened the avenue to

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[1] In this paper we aim to address cyclic behavior in financial markets in the spirit of Muth (1960). This has to be distinguished from the occurrence of excessive booms or crashes and other more extreme concepts. Papers which address financial cycles in this sense include e.g. Sinai (1992), Edwards, Gomez Biscarri and Perez de Gracia (2003), Drehmann, Borio and Tsatsaronis (2012), and Stremmel (2015). In their study of credit, house price and equity price cycles for 21 mature markets during 1960 to 2007, Claessens, Kose and Terrones (2011) document that financial cycles are relatively long lasting, highly synchronized across countries and that cyclic behavior has become stronger over time.

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research on financial cycles.[2] On another account there is a broad literature on the return correlation between stock, bond and commodity markets. These studies address the diversification benefits that arise from combined bond, equity and commodity investments. The results from this literature appear mixed as evidence suggests a time-varying relationship in the markets' dependence structure. Overall, the literature is relatively silent when it comes to financial dependence including the lead-lag cross-market relationships measured based on returns or cycles.

The present paper contributes to the question of how financial markets, commodities and inflation interact. A better understanding of how different markets interact with each other allows us to improve our knowledge about cross-market asset pricing relations. Our aim is to go beyond the usual study of return data only. We focus on U.S. markets and identify cycle components. We thereby derive a stationary price component, which represents a transitory price deviation in the spirit of Muth (1960) and Nelson and Plosser (1982). Following the method of Hodrick and Prescott (1997), the resulting cycles, i.e. transitory price deviations, are then represented in a multivariate vector autoregressive setting.

Given our analysis of U.S. bond, equity and commodity price cycles, we derive the following main findings. First, cycles and returns reveal a consistent pattern of predictability. Second, while bonds significantly and *positively* Granger cause equities, equities significantly and *negatively* Granger cause bonds. Consequently, the bond-equity interaction has a self-enforcing as well as a dampening dynamic component. Third, aggregate equity prices negatively react to shocks in uncertainty and relatively slowly build up a positive risk premium. Therefore, on a monthly horizon, market volatility shocks predict an extended period of falling equity prices. Furthermore, the lagged market interaction transmits volatility shocks via the equity and the bond markets back to volatility. Fourth, gold returns predict bond returns. Bond returns in turn Granger cause oil price changes. Finally, we find that oil price changes Granger cause inflation. Hence, a cross-market pricing transmission from gold to bonds to oil and finally to inflation is confirmed.

The remainder of the paper is organized as follows. Section 2 introduces the data of our analysis and undertakes a preliminary examination of returns and cycle components. Section 3 presents and discusses the main findings. The final section provides a concluding remark.

2. Data, cycles, and preliminary analysis

2.1. Data

We use post-war period data for the U.S. markets covering January 1950 to July 2015. All data is obtained as 786 monthly observations and all price observations are denominated in U.S. dollars.

The data set includes U.S. bond and equity market data. Bond data are given as the performance of a rolling investment in U.S. 10-year treasury bonds. Equity data are Standard and Poor's 500 index returns adjusted for dividends[3], i.e. they give a total return representation of U.S. equity market performance. Commodity price data include the gold price and the price of oil. Gold is the price quoted for one ounce.[4] Oil is given by the price of one barrel of West Texas Intermediate crude oil.[5] The price level series is given by the U.S. Consumer Price Index for urban consumers. It is a seasonally adjusted measure of the average price level for goods and services as paid by urban consumers who roughly represent 88% of the overall U.S. population. While the U.S. consumer price index series is provided by the U.S. Bureau of Labor Statistics (see: https://research.stlouisfed.org/fred2/series/CPIAUCSL), all the remainder data are obtained from Global Financial Data (GFD, see: www.globalfinancialdata.com).

Our analysis also includes a measure of macroeconomic uncertainty as measured by equity market volatility. We derive a series of monthly realized equity market volatility based on daily returns of the Standard and Poor's 500 index. The volatility series is based on the last 20 trading days' daily squared returns. For each end of the month point in time we report the annualized square root of the latter as the realized volatility of the respective month.

In summary, our data with corresponding data labels are: (1) U.S. equity market performance including reinvested dividends (SPX), (2) U.S. 10-year treasury bond performance (TSB), (3) gold investment performance in USD (GOL), (4) oil investment performance in USD (OIL), the (5) U.S. consumer price level (CPI), and (6) U.S. equity market realized volatility (RV). A graphical representation of the six series during our sample period is given in Fig. 1.

[2] Apart from this rational explanation of cyclic behavior, behavioral explanations were suggested in the literature. Discussing the occurrence of so-called bull and bear markets, some authors state that this can be attributed to purely irrational behavior of market participants. DeLong (1992), for example, takes the Muth (1960) approach and asserts that asset prices may deviate from fundamentals in the short run, while, in the long run, differences between prices and fundamentals are bounded. In this interpretation, cycles reflect transitory shifts in consensus perceptions of fundamentals.

[3] Data for stock dividends for the Standard and Poor's Composite Index from the Cowles Commission and from Standard and Poor's are used to calculate total returns for the period up to 1970. Official monthly dividend yield data are used from 1971 onwards.

[4] From January 1934 until March 1968, gold transactions of the U.S. Government were made at US$ 35 per ounce, corrected by handling and mint charges. In 1968 the private commodity price of gold was permitted to fluctuate without official intervention. This system was terminated in November 1973.

[5] Up to 1968, the price as collected by Platt's is used. From 1969 to 1982, data from the Bureau of Labor Statistics is used, with the exception of the period from October 1973 through December 1982, where prices of imports from the Department of Energy are used.