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## Gold and inflation(s) – A time-varying relationship

Brian M. Lucey<sup>a</sup>, Susan Sunila Sharma<sup>b</sup>, Samuel A. Vigne<sup>a,c,\*</sup><sup>a</sup> Trinity Business School, Trinity College Dublin, Dublin 2, Ireland<sup>b</sup> Centre for Economics and Financial Econometrics Research, Faculty of Business and Law, Deakin University, 221 Burwood Highway, Burwood, Victoria 3125, Australia<sup>c</sup> Queen's Management School, Queen's University Belfast, BT9 5EE, Northern Ireland, United Kingdom

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## ABSTRACT

What is the relationship between the price of gold and inflation? How stable is it – over time and across measures of inflation? We examine this for three countries (the USA, the UK and Japan) over forty years and failure of rejecting the null-unit root hypothesis at with a variety of mediate statistical significance aasures of inflation and monetary liquidity. We apply a formal test for time variation and proceed to extract time varying cointegration relationships. Both formal and graphical evidence points to a break in the relationship(s) of gold and official inflation in the mid 1990s in the USA but to less clear results for the UK and Japan. However, gold seems to have offered a protection against an increase in money supply throughout nearly the entire past 40 year period in the US and the UK but failed to do so in Japan. Supporting previous findings we find evidence for a time-varying relationship in cointegration between gold and both predicted and realized inflation in nearly all cases. Contrasting multiple inflation indicators, we find evidence for the importance of money supply in the gold/inflation relationship.

## 1. Introduction

The end of the Bretton Woods system in 1971 and the transition of the United States of America from a gold linked currency to a fiat currency led to an increased academic and professional interest in the nature and extent of gold's role in financial markets.

To date however, the ability of gold to act as a financial protector remains in debate. The question of financial protection has been approached from a multitude of angles and some questions are perhaps more comprehensively answered to than others. For example, from the work of [Baur and Lucey \(2010\)](#) and [Baur and McDermott \(2010\)](#) the role of gold as a safe haven has been addressed. Work such as [Conover et al. \(2009\)](#) have discussed its role in portfolios. Unfortunately, there is no commonly accepted answer or even model that would best describe the relationship between gold and inflation.

As of now, two distinct different approaches to the relationship between gold and inflation can be observed in academic literature. The first focuses on how inflation affects gold prices: here recent examples are the paper of [Batten et al. \(2014\)](#) who find evidence for time-variation in the gold/inflation relationship and account gold's sensitivity to inflation to interest rate changes, or [Bampinas and Panagiotidis \(2015\)](#) who look at over two hundred years of data and find that gold is an inflation hedge in the long run for both the USA and the UK, [Hoang](#)

[et al. \(2016\)](#) recently offered evidence in support to the findings of [Bampinas and Panagiotidis \(2015\)](#), and finally, [Sharma \(2016\)](#) who finds evidence for the CPI to be able to predict gold returns in the UK and the USA among other countries. The second approach focuses more on how the price of gold affects inflation, such as [Moore \(1990\)](#) who states that gold prices are affected by the market's view of inflation, or [Mahdavi and Zhou \(1997\)](#) who consider gold to be a leading indicator of the inflation rate. Our paper straddles both strands by looking at cointegration between the two variables in order to understand their basic relationship; we also apply a formal test for time variation and detect breaks in the relationship among the variables. Our results offer new insights in the relationship between gold and inflation in three major economies and looks into the very roots of inflation: money supply. Recent findings by [Hoang et al. \(2016\)](#) have suggested that gold was not a hedge against inflation for any of the countries considered in the long-run; though it was a hedge in the short-run for both the US and the UK. We complete their results by identifying the breaks in the relationship between the series, visualizing when gold was indeed a hedge against inflation, and by arguing that since gold is a hedge against money supply, it's true inflation hedging abilities are not to be found by contrasting the gold price with official CPI rates. [Sharma \(2016\)](#) studies the ability of the CPI of 54 countries to predict the price of gold quoted in US dollars. The author finds that

\* Corresponding author at: Trinity Business School, Trinity College Dublin, Dublin 2, Ireland.

E-mail addresses: [blucey@tcd.ie](mailto:blucey@tcd.ie) (B.M. Lucey), [s.sharma@deakin.edu.au](mailto:s.sharma@deakin.edu.au) (S.S. Sharma), [s.vigne@qub.ac.uk](mailto:s.vigne@qub.ac.uk) (S.A. Vigne).<http://dx.doi.org/10.1016/j.econmod.2016.10.008>

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**Table 1**  
Research examining the relation between gold and inflation.

Author (date)	Span of Study	Inflation Rate(s) used	Origin of Inflation Rate(s)	Main Finding
Adrangi et al. (2003)	1968–1999	Industrial Production Index and CPI	IMF	Real gold returns are a hedge against expected inflation, but not against unexpected inflation
Artigas (2010)	1971–2009	Root	Money Supply and Velocity of Money	Increases in the price of gold predict future inflation
Awokuse and Yang (2003)	1975–2001	US CPI	Commodity Research Bureau	Commodity prices signal future direction of economy
Baker and Van Tassel (1985)	1973–1984	US CPI & World CPI	N/A	The future rate of the US CPI explains movements in the price of gold
Bampinas and Panagiotidis (2015)	1791–2010	UK & US CPI	Reinhart and Rogoff (2011)	Gold is a superior hedge than silver in both countries
Batten et al. (2014)	1985–2012	US CPI	Federal Reserve Bank of St. Louis Fred	No cointegration relationship if the early 1980s are excluded
Baur (2013)	1968–2013	US CPI and Global CPI	N/A	Inflation is, amongst others, a key driver of the gold price
Beckmann and Czudaj (2013)	1970–2011	CPI & PPI (US, UK, Euro Area, Japan)	IMF, OECD & ECB	Gold is partially able to hedge against inflation
Bekaert and Wang (2010)	1980–2010	CPI	IMF	Suggests that working with TIPS is misleading due to the liquidity premium
Blose (2010)	1988–2008	US CPI	Wall Street Journal Surveys	Surprises in the CPI do not affect gold spot prices
Bruno and Chincari (2010)	1930–2009	Official Inflation	N/A	Gold is a necessary asset in a portfolio that beats inflation
Cai et al. (2001)	1994–1997	CPI & PPI	Official Announcements	CPI announcements have a significant effect on the volatility of the gold market
Cecchetti et al. (2000)	1975–1996	Multiple	N/A	An increase in the price of gold precedes future declines in inflation
Chua and Woodward (1982)	1975–1980	US CPI	IMF	The US inflation rate has the biggest impact on the gold price
Christie-David et al. (2000)	1992–1995	CPI & PPI	Official Announcements	Gold responds strongly to the release of CPI, GDP and PPI announcements
Ciner (2011)	1983–2010	US CPI	Bloomberg	Long term positive relation between

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**Table 1 (continued)**

Author (date)	Span of Study	Inflation Rate(s) used	Origin of Inflation Rate(s)	Main Finding
Dempster and Artigas (2009)	1997–2009	TIPS	Barclays' Aggregate US Treasury Inflation-Protected Securities Index	Gold is the most effective portfolio diversifier against assets held by a typical US investor
Dempster and Artigas (2010)	1997–2009	TIPS	Barclays' Aggregate US Treasury Inflation-Protected Securities Index	Gold is likely to outperform traditional assets in an inflationary scenario
Erb and Harvey (2012)	1975–2012	CPI	IMF	Gold reports inflation more objectively than State institutions
Erb and Harvey (2013)	1975–2012	US CPI	IMF	Finds little evidence that gold has been an effective hedge whether measured in the short or in the long term
Feldstein (1980)	N/A	N/A	N/A	An increase in expected inflation leads to an increase in the gold price
Ghosh et al. (2004)	1975–1999	US Retail Price Index & World CPI	Bureau of Labor Statistics & IMF	The US Retail Price Index has an influence on the long-run relationship between gold and inflation
Hoang et al. (2016)	1955–2015	China, India, Japan, France, UK and US CPI	OECD	Gold is never a hedge in the long-run but it is in the short-run for the UK, the US and India
Jaffe (1989)	1971–1987	N/A	N/A	Assumes that the price of gold rise during inflationary periods; but fails to provide evidence
Kolluri (1982)	1968–1980	CPI of Industrialized Nations	N/A	Gold is a good hedge against inflation
Kutan and Aksoy (2004)	1996–2001	Turkish CPI	State Institute of Statistics of Turkey	The Istanbul gold market is not a hedge against inflation
Larsen and McQueen (1995)	1972–1992	N/A	N/A	Gold acted as a hedge against inflation but gold stocks did not
Lawrence (2003)	1975–2001	US PPI	EcoWin	No statistical significant correlation between gold returns and inflation
Mahdavi and Zhou (1997)	1958–1994	US CPI	IMF	Finds evidence for cointegration between commodity prices and the US CPI

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