Asset market linkages: Evidence from financial, commodity and real estate assets

Kam Fong Chan [a], Sirimon Treepongkaruna [b,*], Robert Brooks [c], Stephen Gray [a]

[a] Finance Cluster, UQ Business School, The University of Queensland, Australia
[b] Accounting and Finance Discipline, UWA Business School, The University of Western Australia, Australia
[c] Department of Econometrics and Business Statistics, Monash University, Australia

ABSTRACT

We use a general Markov switching model to examine the relationships between returns over three different asset classes: financial assets (US stocks and Treasury bonds), commodities (oil and gold) and real estate assets (US Case–Shiller index). We confirm the existence of two distinct regimes: a "tranquil" regime with periods of economic expansion and a "crisis" regime with periods of economic decline. The tranquil regime is characterized by lower volatility and significantly positive stock returns. During these periods, there is also evidence of a flight from quality – from gold to stocks. By contrast, the crisis regime is characterized by higher volatility and sharply negative stock returns, along with evidence of contagion between stocks, oil and real estate. Furthermore, during these periods, there is strong evidence of a flight to quality – from stocks to Treasury bonds.

© 2010 Elsevier B.V. All rights reserved.

1. Introduction

During the recent global financial crisis, strong linkages were observed among different assets. Falling housing prices in the US contributed to the collapse of a number of banks and other financial institutions, which triggered sharp declines in global equity markets, commodity prices and international property markets. The 2008 calendar year was also one of the most volatile periods in the history of oil prices. The crude oil price reached its record high of $147 per barrel in July 2008 but dropped to below $60 per barrel by November in the same year. Furthermore, volatility in equity markets increased markedly and option implied volatilities reached record levels. In addition, the troubled US economy and fear of a global recession led to a coordinated government stimulus response that resulted in record low interest rates in many countries. The Federal Funds rate, for example, ended 2008 only slightly above 0%. Strong demand for government bonds, particularly in major developed countries, drove prices up and yields down substantially. Conversely, corporate bond spreads widened appreciably. The gold price hit its (then) record high of over $1000 per ounce in March 2008.

These examples illustrate some of the linkages that exist between financial, commodity and real estate markets. A good understanding of the linkages between these different assets is an important consideration when designing investment portfolios. Any proposed benefits from portfolio diversification across assets depend on the relationships between their returns. In particular, Guidolin and Timmermann (2007) note that strategic asset allocation decisions can only be properly made in the context of a model that fully considers the joint distribution of asset returns.

Of course, it is possible that the joint distribution of returns across assets is not constant but rather varies over time. In this case, investors would require information about the conditional joint distribution of asset returns in order to implement dynamic portfolio rebalancing strategies. For example, if the returns from two assets tend to be negatively correlated in some circumstances but are strongly positively correlated in others, this has clear implications for portfolio diversification. Hartmann et al. (2004) and Piplack and Straetmans (2009) provide evidence that the relationships between the returns on different assets change during periods of market stress. Consequently, it is important for portfolio managers to be able to identify the circumstances in which there may be a change in the relationships between the returns of different assets.

* Corresponding author. Tel.: + 61 864887853; fax: +61 864881068.
E-mail addresses: k.chan@business.uq.edu.au (K.F. Chan), sirimon.treepongkaruna@uwa.edu.au (S. Treepongkaruna), robert.brooks@monash.edu (R. Brooks), s.gray@business.uq.edu.au (S. Gray).

A model of the conditional joint distribution of asset returns is also important for anyone seeking to measure risk or expected returns. The conditional joint distribution is relevant for performance benchmarking and the measurement of excess returns. Furthermore, financial regulators and policy makers are interested in the conditional joint distribution of asset returns and linkages across assets. If different assets are largely interconnected during periods of market crisis, there are strong implications for the need for, and the form and likely success of government intervention.

Despite the importance of understanding the linkages between different assets and that of being able to model the conditional joint distribution of returns across assets, relatively little work has been done in this area. In this paper, we examine the linkages across five assets in three different classes: financial assets (US stocks and Treasury bonds), commodities (oil and gold) and real estate (US housing) assets. We seek to model the conditional joint distribution of returns on these assets and to characterize the implications for portfolio diversification and asset allocation. In particular, we use a Markov regime-switching model to characterize the conditional joint distribution to allow for any variation in the relationships between the returns of different assets across regimes or during periods of market crisis.

We begin our analyses by using univariate Markov switching models to characterize the marginal return distribution of each of the five assets. A good understanding of the dynamics of the respective marginal return distributions serves as a platform to study linkages between assets. We then follow Guidolin and Timmermann (2006) in adopting a multivariate Markov Switching Intercept Autoregressive Heteroscedasticity (MSIAH) specification to model the joint return distribution. This model is flexible enough to accommodate different means, autoregressive coefficients and variance–covariance matrices in different states or regimes over time.

Our univariate analysis indicates that two regimes exist for each of the five assets examined. In particular, we find that the stock and oil markets are characterized by negative-return, high-volatility and positive-return, low-volatility states. By contrast, the bond, gold and real estate markets are characterized by negative-return, low-volatility and positive-return, high-volatility states. From the perspective of portfolio diversification and asset allocation, our univariate findings suggest strategies involving a switch between stocks and oil in one regime, and bonds, gold and real estate assets in the other regime. Of course, another consideration is the correlation between returns on the different assets and the question of whether this differs across regimes, and this leads us to conduct a more formal multivariate analysis.

Our multivariate analysis reveals that two regimes, which we term "tranquil" and "crisis" regimes, exist in the joint distribution of returns on the five assets considered. Specifically, the multivariate MSIAH model identifies a tranquil regime in which stocks, oil and real estate returns tend to be positive, and bond and gold prices tend to fall. By contrast, in the crisis regime, stocks, oil and real estate assets exhibit negative mean returns, whereas bonds and gold exhibit positive mean returns.

The variation in returns on different assets across regimes demonstrates the potential gains from switching asset allocation from stocks, oil and real estate assets to bonds and gold if investors can identify a switch to the crisis state in advance or even shortly after it has occurred. Conversely, a dynamic portfolio allocation strategy would seek to load more heavily on stocks, oil and real estate during episodes of the tranquil regime. These results also have implications for portfolio diversification even if investors cannot identify regimes in advance – diversification across assets is beneficial to the extent that some assets perform well in the crisis regime and others perform well in the tranquil regime.

In addition, our multivariate MSIAH model provides evidence of contagion between markets and of flights to and from quality. In particular, the tranquil regime is characterized by lower volatility and significantly positive stock returns. During these periods, there is also evidence of a flight from quality – from gold to stocks. By contrast, the crisis regime is characterized by higher volatility and sharply negative stock returns, along with evidence of contagion between stocks, oil and real estate. Furthermore, during these periods, there is strong evidence of a flight to quality – from stocks to Treasury bonds.

The remainder of the paper is organized as follows. Section 2 reviews the literature that has examined linkages between assets. This section also discusses the contributions of the current study. Section 3 discusses the univariate and multivariate Markov switching models that form the basis of our analysis. Section 4 describes the data. Section 5 reports the empirical results and discusses their implications and Section 6 concludes.

2. Literature review

The existing literature on the inter-relationships between different assets examines small sub-sets of assets or asset classes. For example, some studies examine the relationships between financial assets such as stocks and bonds. Other studies investigate the relationships between various financial assets and certain commodities and between financial assets and real estate assets. None of the existing studies investigates the joint relationships between the range of financial, commodity and real estate assets that we examine in this paper.

The earlier studies on examining the relationships between assets focus exclusively on different pairs of financial assets. For example, Barsky (1989) concludes that stock–bond co-movements are state dependent, and Fleming et al. (1998) provide empirical evidence of strong linkages across stock, bond and money markets, particularly in terms of volatility spillovers. Panchenko and Wu (2009) find a link between emerging stock market integration and stock–bond return decoupling in 18 emerging markets. In addition, Baur (2010) investigates stock–bond co-movements and their relationship to cross-country linkages. He reports a decline in within-country stock–bond correlations and an increase in cross-country interdependence of stock and bond markets in recent years. He attributes these findings to more frequent portfolio reallocations arising from the globalization of securities markets and lower international diversification benefits across similar assets. He also conducts a test for temporal commonalities of changes in cross-country and stock–bond linkages and finds that the flight to quality from stocks to bonds and cross-country stock market contagion occur simultaneously.

Beber et al. (2008) analyze flight to quality and flight to liquidity in the Euro area bond market. They find that credit quality matters for bond valuation but that, in times of market stress, investors chase liquidity and not credit quality. Baur and Lucey (2009) construct formal definitions and tests of flights to and from quality, and contagion. They demonstrate episodes of both occurring between stocks and bonds over different periods.

There is also a growing literature on the inter-relationship between financial assets and commodities. For example, Jones and Kaul (1996), Sadorsky (1999) and Driesprong et al. (2008) document the relationships between oil price movements and stock returns. Jones and Kaul (1996) study the impact of global oil shocks on equity prices in Canada, Japan, UK and the US, finding that only in the cases of US and Canada can the impact of oil shocks on real cash flows completely account for the reaction of stock markets. Sadorsky (1999) examines the links between fuel oil prices and stock prices. Using an unrestricted Vector Autoregressive (VAR) model that includes a short-term interest rate and industrial production, Sadorsky highlights the importance of the oil price in