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Extracting portfolio management strategies from volatility transmission models in regime-changing environments: Evidence from GCC and global markets ☆

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ABSTRACT

Unlike previous studies, this paper uses the Multi-Chain Markov Switching model (MCMS) to examine portfolio management strategies based on volatility transmission between six domestic stock markets of Gulf Arab states (GCC) and global markets (i.e., the U.S. S&P 500 index and oil prices) and compares the results with those of the VAR model. Our volatility approach is range-based and not return-based which is traditionally used in estimating the optimal hedge ratios and portfolio weights. The results demonstrate the relative hedging effectiveness of the MCMS model compared to the VAR. We also highlight the time and regime dependency of the optimal hedge ratios and the portfolio weights for each selected pair of the considered markets conditional on the regime of the same market and the regimes of the other market. Policy implications on portfolio strategies under different states are also discussed.

1. Introduction

In this paper, we apply the Multi-Chain Markov Switching (MCMS) model (Otranto, 2005) to model the volatility of several market indices, detecting the changes in the regime of volatility and the volatility transmission mechanisms. Specifically, we analyze volatility transmission and regime changes for six GCC stock markets (Abu Dhabi, Dubai, Kuwait, Oman, Qatar and Saudi Arabia)[1], the U.S. S&P 500 index and the oil market. We use weekly data of the range-based volatility, which Parkinson (1980) shows to be an unbiased estimator of the volatility, and not the return-based volatility. Brunetti and Lildholdt (2002) also show that the range-based proxy of volatility is superior to that of the return volatility. Patton (2011) also provides a comparative analysis of the properties of the range volatility proxy with respect to alternative measures of volatility. The presence of changes in regimes and reciprocal spillover effects between pairs of the series under consideration are shown in Khalifa et al. (2014). This study justifies the use of the MCMS models, which for those series provide better forecasting performance relative to other volatility transmission models existing in the literature (Otranto, 2005). The forecasts of the MCMS-derived, range-based volatility indices can be used to construct time-varying hedging and optimal portfolio weights. Chou and Liu (2006) compare the hedge ratios estimated using the range against several hedge ratios derived from return-based approaches; they find that the range-based multivariate volatility models outperforms, in terms of out-of-sample performance, other alternative methods including traditional static hedge method and other dynamic hedge methods using the return-based multivariate GARCH model. Within this approach, we estimate the hedge ratios and the portfolio weights under different regimes and across time. Then, we compare the MCMS estimated results with those of the standard VAR approach to determine the relative performance of those models.

The paper makes several contributions to the literature. First, it estimates the optimal hedging ratios and portfolio weights using the range as a proxy of volatility, which as indicated earlier is superior to the return-based volatility common in the literature. Second, it examines the hedge ratios and portfolio weights under different regimes (tranquility and turmoil) and various patterns of dependence/independence structure. The considered approach is able to recognize that any shock in any of the financial markets (commodities, stock markets or any …etc.) can spread to other markets simultaneously or with a lag, showing different patterns of interdependence or independence. We apply this approach to the GCC countries because their stock markets have different characteristics from many other frontier and

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[1] The six GCC markets belong to five countries that are members of the Gulf Cooperation Council (GCC). This study excludes Bahrain which is also a GCC member because of the 2004 changes in its stock index that shortened its series and the political instability that the plagued the country starting in 2010.

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Table 1
Descriptive statistics of the volatility indices of selected markets.

	SP	OIL	SA	QA	DU	AD	KU	OM
Mean	0.009594	0.020823	0.01364	0.013933	0.015417	0.011186	0.00712	0.009026
Median	0.007162	0.016714	0.010062	0.009601	0.012227	0.008454	0.005804	0.006412
Maximum	0.067253	0.123348	0.085558	0.07345	0.092697	0.071231	0.03284	0.091516
Minimum	0.000741	0.003207	0.001337	0.000334	0.000524	0.000893	0.000119	0.000496
Std. dev.	0.008338	0.014675	0.012189	0.012334	0.012732	0.009669	0.005239	0.009709
Skewness	3.070608	2.513066	2.445221	1.914195	2.725171	2.531558	1.87521	3.729991
Kurtosis	16.24273	12.22927	10.63946	7.605758	14.06913	12.06446	7.957263	24.16413
Jarque–Bera	3222.902	1670.426	1244.452	542.5273	2302.509	1630.469	584.4317	7616.521

emerging markets (Ajmi et al., 2014; Khalifa et al., 2014). We use the S&P 500 index as a representative of the global stock market because it has the largest market capitalization and extensive linkages with the world's markets. In the meantime, the GCC and oil markets are intertwined. The GCC countries are important players in the oil markets (i.e., the five members of the GCC countries are OPEC members), which means that oil is a major driver of their GDP and their economic growth. The GCC investors at the individual and institutional levels consider stocks in the S&P 500 index as a major stock market for their portfolios. The study uses the regime-switching approach because the United States within the study period is the source of the recent financial crisis that spilled over to global markets including those of the GCC. Thus, the sample includes both tranquil and tumultuous periods and the paper focuses on the importance of the optimal portfolio weights and hedging ratios during those periods.

In the volatility transmission literature, there are relatively few studies that examine the movements of stock returns and the patterns of the volatility dependence structure in the GCC stock markets. Assaf (2003), for example, examines the dynamic relationships among the six GCC markets during the period 01/15/1997 to 04/26/2000, using VEC models. Hammoudeh and Li (2005), Hammoudeh and Al-Gudhea (2006), Malik and Hammoudeh (2007), Hammoudeh et al. (2008) and Hammoudeh and Choi (2007) include within their analysis of the GCC stock market interdependence the most important factor influencing the GCC economies which is the oil price. Malik and Hammoudeh (2007) and Malik and Hammoudeh (2007) employ a MV-GARCH (BEKK) model for the period 02/14/1994 to 12/25/2001 to determine the volatility interdependence across selected GCC markets. To our knowledge, no studies in the literature have explored the state-varying hedging ratios and optimal portfolio weights for the GCC markets, using the MCMS model.

The MCMS and VAR models have yielded interesting results. Concerning optimal portfolio hedging, the results demonstrate that hedge ratios differ from one regime to another. Generally, hedging becomes more expensive (in terms of short position) if the hedged asset is in the turmoil state and the hedging assets are in the tranquil state or if the hedged asset in the long position is more volatile. The mean absolute error loss function (MAE), in most of the cases, is smaller for the MCMS model compared to the VAR model and also the gain in the loss function is significantly different from zero according to

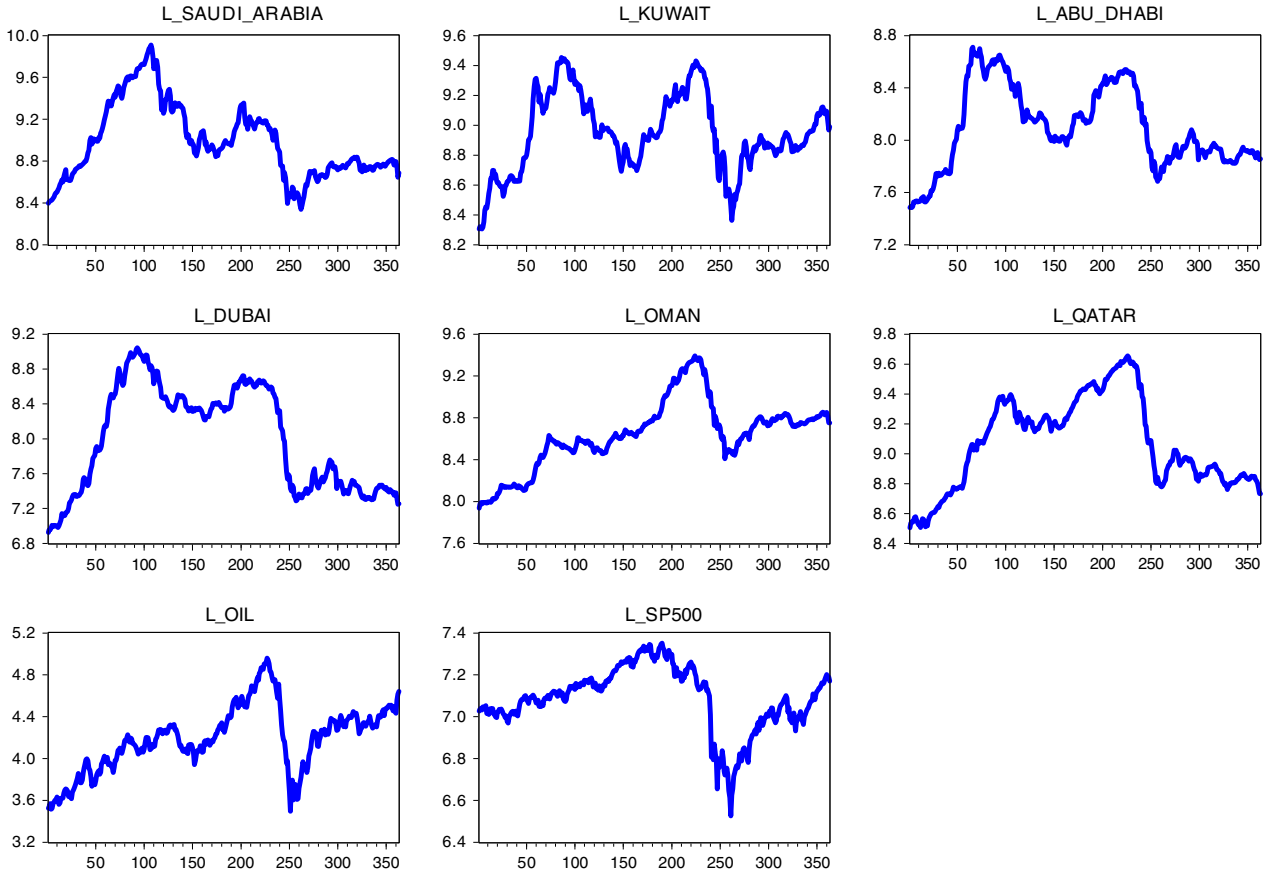

Fig. 1. Log for oil (prices), U.S. S&P 500 Index and the GCC markets.