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The study on the tail dependence structure between the economic policy uncertainty and several financial markets

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ABSTRACT

The paper firstly studies the static tail dependence structure between the economic policy uncertainty (EPU) index and several financial markets (Brent Oil, CDS, VIX, SP500 and UK EPU) with Copula models. The results show significant negative upper tail dependence between the EPU index and the SP500 index in most years, but also show positive upper tail dependence during the 2016 period. Further, the negative tail dependence area between EPU and CDS also demonstrates that higher economic policy uncertainty may reduce real risk premium. Finally, based on Markov time-varying Copula functions, the dynamic time-varying structures between the EPU index and indexes including SP500, CDS, VIX and UK EPU indexes are studied. The significant regime switching characteristic is shown between the EPU index and the UK EPU index.

1. Introduction

Uncertainty in economics includes many factors, and the policy uncertainty is one of them (Morikawa, 2016). Some studies revealed the negative effect of political instability on the investment on developing countries (Fernandez & Rodrik, 1991). To measure this, many scholars used proxy variables like the change of government and officials and election time, however, due to the low occurrence rate, more turned to use tax rate, government purchase or monetary policy to indirectly measure and study how the economic policy uncertainty affects economic growth (Baker, Bloom, & Davis, 2016; Fernández-Villaverde, Guerrón-Quintana, Kuester, & Rubio-Ramirez, 2015; Klingenspor, Herzig, & Pfeifer, 2012), mostly concluding negative effects.

The economic policy uncertainty can be quantified by EPU Index proposed by Scott R. Baker et al. since 1985. The index can be used to measure the uncertainty in monetary, fiscal, and other relevant policies (Baker et al., 2016).

Bloom (2009) innovatively related the impact of policy-generated uncertainty to oscillations in growth, inflation and interest rates. The news-based economic policy uncertainty was firstly developed and quantified by Baker et al. (2016). The news-based EPU index used newspaper archives from the Access World News Bank service. The primary source comprises month-by-month searches by a large number of articles. Their results showed significant negative relationship between EPU and macro variables like growth rates and employment rates, and the EPU can even explain the large fluctuation for equity market like SP500. The manipulation of government on social-economic development, especially on the policy making of public finance, monetary, industries, trade and stock markets, will directly or indirectly influence financial markets. Some announcements of new regulation rules may strike out fluctuations of financial markets.

To our knowledge, available studies on how to build the EPU are scarce. Baker et al. (2016) suggested that newspaper text search

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could yield useful proxies for economic and policy conditions stretching back several decades, which could be remarkably valuable in earlier eras and in countries with fewer data sources. There is a rapidly growing literature on text search methods (Azqueta-Gavaldón, 2017; Gentzkow & Shapiro, 2010; Hoberg & Phillips, 2010; Alexopoulos & Cohen, 2015). Tobback et al. (2016) proposed an alternative methodology using text-mining techniques to create an EPU index for Belgium. The model improved the original policy uncertainty index by using an SVM classification model, which had a higher predictive power when predicting the OLO-Bund spread, long term government bond yield, CDS spread and consumer confidence in the short term.

There are many more researches on the impact of EPU on investment. It has been widely recognized that EPU has a significant impact on stock markets (Dakhlaoui & Aloui, 2016; Arouri, Estay, Rault, & Roubaud, 2016; Antonakakis, Chatziantoniou, & Filis, 2013; Antonakakis, Gupta, & Andre, 2015) and bond markets (Wisniewski & Lambe, 2015). Antonakakis et al. (2013) presented the following rationale for the correlation between EPU and stock market returns. Uncertainty induced by economic policy had a profound influence on the overall financial market and the national economy.

Financial markets dislike uncertainty because increased EPU is associated with lower asset prices (Bansal & Yaron, 2004). Hence a decrease in stock prices can be significant when a higher uncertainty about the government policy is observed in the economy (Pastor & Veronesi, 2012). Similarly, since EPU is highly correlated with the cost of finance, and negatively correlated with firms' capital expenditure and investment (Sum, 2013), investors and consumers are unwilling to invest and spend when they perceive higher degree of policy uncertainty in the economy. Wisniewski and Lambe (2015) showed a significant reaction of the CDS spreads to shocks in the policy risk, which meant that country-level risk could permeate to the corporations. Ajmi, Aye, Balcilar, Montasser, and Gupta (2015) observed a stronger predictive power from EMU to EPU than from EPU to EMU. Ko and Lee (2015) found that the relationship is generally negative but changes overtime exhibiting low to high frequency cycles. Li, Zhang, and Gao (2015) found that innovations in the policy uncertainty index impacted negatively and asymmetrically on the subsequent stock–bond correlations that were characterized by a structural break and positive-type asymmetry. Li and Peng (2017) verified that a larger rise or a larger fall in US policy uncertainty would both reduce the magnitude of subsequent co-movements between the Chinese and American stock markets.

However, in fact the relationship between EPU and financial markets is much more complicated. Given uneven distribution of EPU, as well as other financial markets and crude oil time series, we find financial crisis mainly abnormal fluctuation. With traditional correlation coefficient, it is hard to characterize this dynamic and asymmetric structural change (Li, Balcilar, Gupta, & Chang, 2016).

For instance, when discussing EPU and stock price, we think that both high and low economic policy uncertainties in a local interval could be significantly correlated with stock price. But full sample of stock trading may dilute this correlation. Besides, both high and low uncertainties could be asymmetric and time-varying structure. Consequently these factors probably contribute to correlation of different intensity in different periods, other than consistent high negative correlation. Therefore, we need a method capable of detecting tail dependence, especially with extreme events, from heterogeneous areas of structures. With such method, investors could alter their investing strategies to avoid the risks from economic policy uncertainty.

There are also some literatures focusing on the influence of EPU on corporate capital structures (Zhang, Han, Pan, & Huang, 2015; Kang, Lee, & Ratti, 2014; Bernal, Gnabo, & Guilmin, 2016; Bordo, Duca, & Koch, 2016; Chi & Li, 2017; Beckmann & Czudaj, 2017; Morikawa, 2016). The forecasting effect with EPU were also investigated deeply. Wang, Zhang, Diao, and Wu (2015) found that the commodity price changes could be taken as a leading indicator of EPU. Christou, Gupta, and Hassapis (2017) showed that regardless of the forecasting model considered, EPU was useful for forecasting real housing returns. Liu and Zhang (2015) showed that incorporating EPU as an additional predictive variable into the existing volatility prediction models significantly improved forecasting ability of these models. Li et al. (2016) found that there are bidirectional causal relationships between EPU and stock returns in several sub-periods rather than in the whole sample period.

Other relevant studies focused on dependence between EPU and monetary policies (Aastveit, Natvik, & Sola, 2017), unemployment rates (Caggiano, Castelnuovo, & Figueres, 2017), Exchange rates (Kido, 2016) and Exchange rate expectations (Beckmann & Czudaj, 2017).

Economic and financial system is one of the most complex systems interdepending across regions and time, where the exact mechanism of effects of policy intervention remains unknown, and hence prospective governing strategies are unguided in this case. To uncover a potential channel for optimal policy design, the initial step we take is to test the dependence intensity between market layers, say Brent oil market and SP500, between policy agents, say US EPU and UK EPU, and between tools, say CDS and SP500 both in financial markets. The factors involved are too massive to concisely specify and reduce within a parsimony model, and neither can we even control or isolate a channel to test the Neyman-Rubin causal effects. If we impose too many assumptions on the model, we mostly fail to capture the possibility of interlock "anomalies" in economies under a normal-modeled world. This thought illuminates this paper to model extreme interdependence at the distribution tail and propose a framework expected to extend to compatible with increasing multivariate factors in market dynamics researches of extreme economic phenomena, by compromising causality and data-guaranteed correlation, concise models and over reduction, as well as tail and center estimation. The implication of this paper is to unearth paths to extreme dependence within markets, and by further supplementing more conditioned factors variables into our Copula fitting, we step forwards to the occurrence of extreme events in economics and financial systems.

This paper applies static and dynamic Markov regime switching copula-based approach to shed new light on the time-varying relationship between these new innovative news-based measures of economic policy uncertainty developed by Baker et al. (2016), and other financial indexes like VIX, CDS, etc. That is, to the extent that EPU influences macro financial market and macro financial market affects the business cycle immediately, such relation should respond to the attention of policy makers and market participants quickly. We investigate the dependence between different financial indexes and EPU index, using copula approach. To the best of our