

The spillover of the wave-bream in the inter-State financial market and its dynamic characteristics[^]

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Abstract: in DCC - GARCH , DCC - egarch , DCC - tgarch Method , takes a medium , Beautiful , Day , Germany , UK etc countries 1993 year 1 Month to 2013 year month Financial data , empirically draws the following knot comment : Sample Domestic market rate and index volatility present spikes , fat tail , biased features ,more compliant t divide cloth . -like domestic market interest rate fluctuations show significant spillover effects , leverage effect and linkage effect . Sample Country shares the spillover effect of volatility on Chinese stock index volatility tends to increase , especially after the US financial crisis . Sample Country interest rate fluctuation has a certain spillover effect and leverage effect on Chinese stock index volatility , but the Impact is very low . governance Worldwide financial risks ,National authorities should strengthen policy coordination , Reasonable risk sharing .

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Primer say

US financial crisis , the impact and contagion of financial risks, such as Europe's debt crisis, have caused economists and policy systems The great concern of the , . Financial Globalization and financial risk-contagious , forcing people to think about the volatility of international financial markets effect and dynamic dependencies . on illinand Liu (2003) , Hakkio Keeton (2009), Cardarelli etc (2009) System risk metrics and early warning indicator system ,Fmnkel and Rose (1996) proposed FR probability model ,Nag+ Mitra (1999) using the artificial neural network (Artificial neural network , ANN) to and abiad (2007) build time-varying transfer probability (time~varying Transition probability)Markov ext Change Model , Establish network through interbank exposure and transaction data , According to the network shape of the interbank market simulation riskMutual infection , to measure the risks accumulated in each banking network (IMF , 2009). simultaneous , from financial market angle ,Engle (1993) proposed dynamic conditions related (Dynamic Conditional Correlation,DCC) GARCH Model , Hamilton (1989) proposes a state transition ARCH Model (SWARCH), Estimating Stocks , Debt Coupon Market volatility spillover effect .

at the same time , Most of the literature focuses on European and American stock markets . (Eim and Shim , 1989 Koutmos and Booth , 1995 Fratzscher , 2002 Caramazza etc ,;Barberis Casazza , 2005). US financial crisis break , People use dynamic non-linear methods to move this issue forward . Dimitris etc (%) use multivariable to turn swap Gaskopla model (mrsgm) and asymmetric general dynamic conditional correlation analysis model (AG ~DCC), root

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moderate decentralization and local financial system reform by 1992), China postdoctoral Science Foundation eighth batch of special projects Financial Risk Insurance, Moderate decentralization and local financial system development Research (2015T80173) Financing. Thanks to the People's Bank of China Zhangye Center branch Zhou Chao and Southwest University of Technology Shang Technical Help. Article only Representative's personal academic view, is Independent of the organization. According to, Beautiful, English, India and other countries 1995 ~ 2006 Year related data, under non-linear conditions in financial market data, Check the contagion effect of financial risk in countries.

As economic openness and financial globalization develop, Whether our financial markets will be affected by the spillover effects of international financial risks ring, do our financial fluctuations have spillover effects on other countries? For these issues, Zhu Hongquan et al (2001), Shi Jianxun and Wu Ping spokeswoman (2008), Li Xiaoquan and Zhang your (2008) etc conducted a preliminary study, The concludes that our stock market The field is increasingly affected by international shocks. Zhang Bing et al (+) from economic fundamentals hypothesis " and " Market contagion hypothesis " theory " The level analyzes the conduction mechanism of stock market linkage, and then 2001 Year Month Day to 2009 Year 1 Month Day Shanghai Index vs. Dow Day Transaction Data sample, A phased examination of the linkage characteristics of China-US stock market, draw "" China shares There is no long-term equilibrium relationship between the city and the United States. , on QDII after implementation, The opening price of the U.S. stock market to the Chinese stock market and the closing price all have a significant lead effect, U.S. stock market volatility is increasing in China's stock market. Li Hongquan et al (2011) using an information overflow test system empirical comparison with the, " U.S. , to Hong Kong, A Stock Market with financial contagion effect; A The stock market can not only reflect U.S. stocks, Important Peripheral market information such as Hong Kong stocks, and has has the ability to affect the perimeter market; Ashares and U.S. stocks, The interaction between Hong Kong stocks is reflected in the mean overflow, Volatility Overrun, Extreme risk overflow, and so on multiple levels.

The above literature is of great significance in confirming the linkage between international financial markets. Compare to previous research documents, This force the diagram supplements the study from the following aspects: One is to consider the volatility spillover effects of money markets and capital markets at the same time, their corresponding Financial variables are interbank rates and stock index volatility; Interest rate as the main indicator of macro policy, This article estimates by Spillover effects of international interest rate fluctuations on domestic stock index fluctuations, To Verify the capital market between the money markets and the currency city dynamic relationship between farm and capital market. The Two is in the t distribution Assumption, selection dcogarch, DCC-egarch, DCC -tgarch, Compare the significance of international financial volatility spillover effect. Engle (2002) on Bollerslev proposed CCC - mgarch A more generalized extension of the model is based on, The establishes a DCO mgarch model, empirical spillover effects of bond market volatility. however, in real world financial markets suddenly change the same picture next, the drop is bigger than the rise and the effect on volatility is greater, standard GARCH model assumes volatility is past letter The linear combination of the square of the term, Asymmetric is not considered for negative and positive information impact. glosten et al (1993) As a measure of Gold the asymmetry of market volatility, Build dcc-tgarch (Threshold GARCH) model. DCC- mgarch and DCC-tgarch The model requires that the conditional variance is greater than 0, and that The coefficients for the variance equation need to be restricted. To resolve this problem, Nelson (1991) proposed DCC - egarch Model, modeling by standardizing residuals, in the minute leverage effect while the other side differential equation coefficient is no longer restricted. for accurate verification of international financial volatility spillover effect, This article also to perform a estimate of three methods.

1. Theoretical Analysis

When considering both money markets and capital markets in both countries, its intrinsic and overflow relationships are as shown in figure 1 shows. Concrete principles follows:

1.1 Currency market interest rate volatility spillover effect

economically powerful countries , The unusual volatility of interest rates typically produces spillover effects on other countries with economic contacts , Primer The interest rates In other countries are fluctuating accordingly . The main principles of include : Investment income , Economic expectations , policy infection .

The interest rate is the direct embodiment of Gao low investment income in the money market . When exchange rate is stable , Benefits of powerful countries rate increase , make money investment in other countries relatively low , funds must flow from low interest rates to countries with high interest rates , forced Increase interest rates for other countries . at the same time , If a country stays at a higher rate for a long time , to prove the entity economy of the country benefit higher , Because interest rates come from the real economy's profits , the money must flow from low interest rates to economic expectations better. Rate Country . interest rate is the core tool of monetary policy , the unusual movements of interest rates in economic powers often reveal the actions of the government orientation and policy-oriented changes , This is bound to cause sensitive reactions and market fluctuations in other countries . so , " in nearly two times finance crisis , German interest rates have a greater spillover effect on US interest rates , instead of passively withstanding US interest rate impact . and , Given the professionalism and information timeliness of financial institutions , Interbank Lending rates are more quickly reversed than index volatility . should have financial risk contagion . "(Miao Wenrong and weekly flushes,2013 ; Liu Xiliang, 2014.

Proposition 1 The sharp adjustment of interest rates in the economically powerful international financial centre countries should have a significant effect on their interest rate changes Overflow effect . Its main mechanism is :A State rate fluctuation -(Investment income , via Ji-expected , policy Contagion) - B Guo Li rate fluctuation .

1.2 stock index volatility spillover effect

Powerful , National Center for International Financial Markets , large fluctuations in the stock index typically cause other countries Index fluctuation response , China should also be so . Its underlying principles include : Market psychology and investment income two aspects ^

Market Psychology includes market sentiment , market expectations and herding effects . Market sentiment performance in , Market volatility country to Other countries generate " Wakeup effect " , causes financial markets in other countries to reassess economic fundamentals (Goldstein , 1995, countries whose economic fundamentals are not satisfactory or where financial vulnerabilities are greater are bound to be infected by them , Social public sentiment thread sharp turn or increase risk aversion . Market expected performance in , the volatility of the stock market has caused other countries to be public to the country Stock market expected returns , Development-expected changes , and then quickly adjust investment behavior , Causes the stock index to fluctuate . herd effect table now , economically powerful international financial center country , playing a leading role in the world economy Operation , this State Index's dramatic fluctuations , Surely it's not groundless ., Even blindly following without judgment , Create herding effect . at the same time , due to market participants not completely rational , under Asymmetric information , Easier to produce Overflow effect ,Convergence effect , behavior characteristics such as herding effects .

Investment income mainly includes portfolio adjustment and investment yield adjustment . in the context of the increasing economic and financial globalization Some large investors make Cross-border portfolios . abnormal fluctuations in one or more countries may cause the Investors rebalance their portfolios for risk management and liquidity management (Francesco etc ., on index sharp When volatility occurs, investors who have an asset position in the originating country usually reduce the financial assets in that country , Control rising financial risk , get existing asset proceeds (kodres and pritsker , 2002). King and wadhw new i (1990) proposed a Research Information acquisition model for cross-market yield and fluctuation overflow , Analyze the correlation of different stock markets among countries and the parts of the economic fundamentals that are difficult to be observed by the .. cormolly and Wang (2002) Research findings , investors from shares Extract Global information that is not observed in the city yield to adjust their investment decisions , resulting in different stock returns dependencies .

Proposition 2 The abnormal fluctuation of stock indices in the economically powerful international financial center countries should have a significant effect on domestic stock index fluctuation Overflow effect . A Country Index fluctuation -(Market Psychology , investment return -B Country stock index fluctuation .

1.3 volatility spillover effects of interest rates on other countries ' stock markets

exceptional fluctuations in interest rates in powerful countries , The can be used for both spillover effects on interest rates in other countries and other countries Impact on its stock market spillover effect , It can also be influenced by spillover effects on the domestic stock market and fluctuations in the domestic stock market. The spillover effect of his national stock market (See figure 1). at the same time , due to interaction between major economic fundamentals sex , Changes in a country's macroeconomic indicators will also result in future cash flows and discount rates for the listed divisions of the country and other countries. affect , affects index fluctuations in other countries(McQueen and Roley , 1993).

Proposition 3 The sharp adjustment of interest rates in the economically powerful international financial center countries should have a significant effect on the domestic stock index ; Overflow effect . performance :A Country rate fluctuation -(interest rate overflow , stock Overflow) - B Country stock index fluctuation .

2. model and data

to test the spillover effects of interest rates and stock indices , We are in T under Distribution , To establish DCC - GARCH , DCC - egarch , dcc-tgarch Model , Compare Validation . has two series , one with f represents , a J

2.1 metering model

(1) DCC - GARCH . Basic single variable GARCH model , does not consider asymmetric impact of positive and negative information items sex , The assumes that the volatility is a linear combination of the squares of past information items . glosten et (1993) To measure the rate of return fluctuation non-symmetric , Build gjr-GARCH model , in conditional variance equation (1) Leverage effect of negative impact in China :

$$= CO + 2 + a 2 is ^ I) +$$

$$\epsilon r = ^ V ^ 7 (1)$$

The model assumes the . the positive and negative impact of the on the conditional variance heart is different from the . where ,& is conditional variance ,w for interceptentry , Suppression and suppression to ARCH items and GARCH items with lag order . ; is the normalized residuals , is distributed independently with machine variables . S, is virtual variable , when & to negative numbers , take 1, otherwise , 0.

Standard GARCH Model , also does not consider dependencies between assets (covariance) Whether has changed . This literary Grace with DCC (Dynamic Conditional correlation) Law , Analyzing volatility among financial market variables and their dynamics Customs , to analyze fluctuations between markets (Volatility spillover) effect . Two \$ market Time sequence variable matrix represented as type (2):

$$r_t = e [r_t | A-i] + \epsilon / (2)$$

where , a - I is bu 1 A combination of moments and all previous related information ; N = ((~ ,) W 0 the conditional covariance matrix for random error entries can be represented as : han = £ : (/ ia - Mountain

now , The primary task is the dynamic structure of the real and concise description , is the parameterized procedure of the Han . Tse and Tsui (2002) , Engle (2002) To propose a dynamic conditional dependent multivariable GARCH Model (Dynamic conditional correlation -mgarch) , : "" dcc-tgarch + DCC -egarch, to conditional covariance matrices decomposed into conditional variance and condition correlation , Each is then parameterized .

(2) DCC - tgarch . The covariance matrix is represented as :

$$H_t = d_t R_t D_t = p_{ij} v h ^ t h j j u (3)$$

D £ = must sigh ..., / ^ , The ruler is a that includes the dynamic condition correlation factor NXN Order symmetric

represents a financial variable I and financial variables I in £ Dynamic condition-dependent coefficients for moments, The dynamic correlation scale for financial time series variables \sim , is represented as :

$$(e^{-i\epsilon} - I) = 2\omega_M^{-1} \text{Tr} \hat{T} / \hbar k$$

$$^{\wedge} i, t \text{ All } (A-1 \text{ Nine JM } 1 - (5))$$

(3) DCC - egarch . DCC-egarch and the difference between DCC-tgarch is the dynamic correlation coefficient and bar Variance spillover effects model . dynamic correlation to:

(Q Bushan

$$\text{Logh}^W | I + a_{2i}^{-\wedge\wedge\wedge} L_0 G(H, \wedge) \quad (7)$$

2.2 Data and variable descriptive statistics

Check results include jarque ~ Bera The statistic and its corresponding P value . The original assumption for this test is : sample follows normal distribution . A skewness of 0 indicates a biased distribution , kurtosis higher than 3 indicates a spike phenomenon . JB value too large ,Probability Low , reject original assumption , The sequence does not serve the normal service ; otherwise , accept . based on table 1 Statistics Results can be reached , in , US , English , de , Interbank rates and stock market volatility in countries such as day , in 10% significant for The level does not obey the normal distribution . gencay and Selcuk (2004),longin (% \$) , Orlowski (2008) , and so on The Research literature also shows that , There are generally significant tail features in international financial markets , and following analysis under t . because this , do not break General ,take t Distribution Assumptions .

3. estimate Results

3.1 smoothness check

takes the ADF validation and PP verifies unit root validation for all data , Is based on the T values and P value , can prove the various changes The measure is at least as smooth as the 10% on a significant level , First-order variable for each variable at least 1% The significant level of the check-ping stable , A metering test to satisfy further volatility spillover effects (See table 2).

3.2 interest rate fluctuation spillover effect

Research shows that , GARCH The family model has a good description of time-varying conditional variance with a first-order lag form , and consider the to estimate cost and explain issues , extend it to higher order no obvious benefit . The empirical results of this article also show first-order lag ratio multiple-order lag can better describe the conditional variance characteristics of the income sequence . so , This article is based on t distributed false set , AR Item , MA Item , GARCH items and ARCH Item Lag order is selected U

(1) model parameter estimate . observation comparison t distributed DCC -GARCH,dcoegarch ,DCC- tgarch methods to estimate the spillover effect of interest rate and China interest rate in sample country , Red Pool guideline , Schwartz Guidelines , H -Q Benchmark estimates such as , International interest rate spillover benefits significantly closer(See table 3). each model parameter and , name ,&, negative , Honkomagome estimates are significant , significant level in 5% above . The main difference between the estimated results for each model in parameter receipt , ft The significant level of . with parameter estimates the results are more significant DCC- Egarch Method Example ,from An estimate of the translation can be seen , beauty , Day , de , The spillover effect of interbank lending rate fluctuations in the UK is very significant for China , The coefficient estimates are in the 0.8 above , With A significant level of 1%. DCC-tgarch e-mail >0, indicates a bad message will increase Greater volatility and heart than the sumof the (1), indicates a bad message with a ripple overflow effect greater than good news , Ripple Overflow presence leverage and asymmetric effects . The estimates show that There is a significant overflow between the interbank rates in the sample countries , effect , And there are significant asymmetric effects and leverage effects ^

(2) regression results are related to dynamic conditions according to the above estimate , We got economic power interest rate and China interest rate dynamic condition correlation for (See figure 2). Three calculation method results have consistency . U.S. federal funds annual interest rate , There is a similar change in the dynamic correlation coefficient between interbank lending rates in Britain and interbank rates in China. , and height relative longer , For example 1998 ~ 2003 Year , ??? Year , 2007 Year , 2009Year , ~ % Year Dynamic correlation coefficients are positive , up to 0.8 above ; 1996 ~ 1997 Year , # Year , 2006 Year , Year , ^ 0 Year dynamic correlation coefficients are negative , up to one 0.8. Germany , Japanese interbank lending rate with China's inter-bank lending The dynamic correlation coefficient of the rate is slightly lower than the U.S. , UK , The German interbank rate is the same as the Chinese interbank rate The dynamic correlation coefficient is slightly Gao in Japan . overall , Sample Domestic market interest rate fluctuation has a more significant effect on Chinese market interest rates Overflow effect . This strongly explains , Why countries 1 0-year bond interest value is very approximate : United States 2. 24%, Italy 2. 16%, UK 2. 19%, Singapore 2. 28%, Israel 2.15%, Spain 1.98%, Norway 2.03%, Canada 1.94%, and these rates are not only statically similar to , Dynamic changes are also converging (Reynolds , 2014)Q

3.3 Index volatility spillover effect

(1) model parameter estimate . observation comparison t distributed DCC -GARCH,DCC - egarch , DCC - tgarch methods such as to estimate the volatility spillover effect of the stock index in the sample country . Red Pool Guidelines , Schwartz Guidelines , H-Q The estimated values are , The effect of international stock index volatility spillover is quite similar . (See table 4). model parameters

is called , for , a z_i , ft , ft The estimate for is more pronounced , Significant levels are generally in 5% above . the

Main results of the model estimates are different from the parameters Cafe , ft The significant level of . Select each parameter estimates the results are more significant dcc-egarch method , analysis ft To draw the United States , Day ,de , Index volatility of Chinese stock indexes in the UK 0.9 above , indicates that the stock market is has significant spillover effects and leverage effects , significant level 1%. based on dcc-tgarch estimate results , US , Day The overflow of stock index fluctuation to Chinese stock index fluctuation more than 0, show Beauty The index fluctuation of the bad news for the, is better than good news to China shares Refers to a larger overflow effect . This is the same as the actual feeling ,2008 Year , U.S. stock market expectations good , Index up when , China's stock index has not risen accordingly . de , English mail less than 0, indicates that The index fluctuation of the good news is worse than the bad news China stock index has a greater spillover effect . estimates show A significant volatility spillover effect between , and sample Country Indices ,leverage and asymmetric effects .

(2) Dynamic Conditional correlation . based on previous estimates , We got economic power index volatility and China's stock index dynamic condition correlation coefficient for volatility , results See figure 3. Comparison of three calculation methods , US index volatility , German Index volatility is similar to the dynamic correlation coefficient of Chinese stock index volatility. , And the level of correlation is up ., For example on 1995~2006 The dynamic correlation coefficient for the year is approximately 0.1, 2007 year after this value rises to 0.4 above , year after , the dynamic correlation is slightly down , currently about 0.3. United Kingdom , Japanese stock index volatility with China's index dynamic correlation coefficient of volatility lower than us , Germany , But the trend is similar to , The value is from the previous 0.1 near up to 2009 year 0.24 near . overall , after the US financial crisis , Sample Country stock index volatility to China index volatility has a certain spillover effect , but beauty , European stock index volatility is more volatile to China's stock market than significant a

3.4 spillover effects of interest rate fluctuations on the stock market

(1) model parameter estimate . observation comparison t^{\wedge} distribute DCC - GARCH , dcoegarch , DCO tgarch methods of estimating the spillover effects of interest rates and interest rates in the sample countries , Red Pool Guidelines , Schwartz Guidelines , H -Q Benchmark estimates such as , International interest rate spillover benefits significantly closer (See table 5). each model parameter ..., name , print , you , ft , & The estimate for is more pronounced , Significant levels are generally in 5% above . the main reason for the estimates for each model is the difference is in parameter mail , ft The significant level of . Select each parameter estimates the results are more significant dcc-egarch method , analysis A To draw , US , Day , de , interest rate fluctuations in the UK and other countries have significant spillover effects on Chinese stock index fluctuations . based on DCC- tgarch estimated results , postal off 0, indicates an overflow with asymmetric . estimated results , Sample Country same fluctuations in the rate of interbank lending affect the change in China's stock index .

(2) Dynamic Conditional correlation . based on previous estimates , We got economic power interest rate and fluctuation rate of China's stock index State condition correlation (See figure 4). Comparison of three calculation methods , dynamic Relationship between US interest rate and China stock index volatility number higher , and less relevant , on 0~ 0.2 constant fluctuation between . German interest rate and China's stock index volatility dynamic correlation factor lower than us , This number is more than 0.04 nearby fluctuations . Japanese interest rate and China stock index volatility dynamic correlation factor is negative , generally in a 0.04 nearby fluctuations . overall , the sample country's interest rate is spilling over on China's index volatility effects significantly , but less affected .

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