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A story of the red lantern

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a story of
The Red Lantern

CHAPTER 1

The Red Lantern

THE HAREM
of Sima Yan

From 266-290 BC., China was ruled by Emperor Wu (also known as Sima Yan). He was the first King of the Jin Dynasty that conquered Three Kingdoms. Apart from his great talents in politics,

legends boasted of his incredible potency among 10,000 concubines.

The Sheep
Since The Emperor had so many beautiful ladies, every night he sat in the cart drawn by a sheep and let the sheep take him to a room by chance.

A red lantern is raised in front of the room of that lucky lady during the night.

IF WE ASSUME THE SHEEP WERE NOT CONTROLLED BY ANY FACTORS RATHER THAN THEIR OWN DISCRETION

THEN THE RESULTS OF THEIR MOVES WHICH WERE PRESENTED BY THE RED LANTERNS WERE UNPREDICTABLE.

The red lantern is considered similar to a **shock in capital markets** which is commonlly referred to an unexpected news that is either good or bad.

Similar to the red lantern story, however, the venue of my research is not the harem of the Emperor but the stock markets. The aim of my research is to understand

HOW A STOCK MARKET IN ONE COUNTRY REACTS TO A "SHOCK" FROM A STOCK MARKET IN ANOTHER COUNTRY.

The Research

The test is performed for a pair of markets (bivariate test) between China and other global equities e.g. the U.S., U.K., Germany, Japan, Australia, and the ASEAN-5 countries (Singapore, Thailand, Malaysia, Philippines & Indonesia) from February 2002 to June 2017. We expect three types of relationships:

1 Aggressive
A stock market in one country reacts strongly to a shock from a stock market in another country

2 Passive
A stock market in one country is impacted by a shock from another country but not vice versa.

3 Ignorance
A shock from a stock market in one country is unlikely to have a significant impact on a stock market in another country.

GARCH

NELSON (1991) & ENGLE (1982)

Generalised Autoregressive Conditional Heteroscedasticity model is employed to predict daily stock returns (first moment) at any single day based on all information that includes the unexpected news from a stock market in another country to one day before. It can also capture the joint distribution of volatility of daily stock returns (second moment) between two markets.

CONTRIBUTION
of the study
The findings can provide important inputs to calculate the asset ratio for an optimal international investment portfolio. In simple words, it can help to determine if adding U.S. equities to an investment portfolio that includes Chinese equities can reduce the portfolio risk or not (and vice versa).

Preliminary analysis

A PRELIMINARY ANALYSIS ON DAILY PRICES OF STOCK MARKETS IN CHINA AND THE U.S. FOUND THAT BOTH TIMES SERIES EXHIBIT:

NON-NORMALITY
The distributions have fat tails and negative skewness.

NON-STATIONARITY
The mean and variances are time-varying. Therefore, we use the first-difference technique to convert these series to stationarity.

First-difference: Daily prices of each stock market in the sample are downloaded from Bloomberg and converted to natural logarithm. Daily return at time t of stock market i is the change of daily prices (Pi) in log form of two consecutive days, expressed as $Ri,t = \ln(Pi,t) - \ln(Pi,t-1)$

SERIAL CORRELATION
Large (small) changes in daily price are followed by large (small) changes which is commonly observed in financial time series. This phenomenon dismisses in first difference log-returns.

HETEROSKEDASTICITY
A bivariate model between stock returns of two markets is constructed using the daily return of one market at time $t - 1$ (one lag) to predict the daily return of another market at time t. Other factors that can explain the variation in the dependent variable but not included in the model is represented by an error term (also called residual factors). Heteroskedasticity refers to the event where the independent variable is related to the residual factors, which is found between China and the U.S. Since GARCH is designed to deal with this issue, the model is considered as appropriate to examine the relationship between these markets.

Unknown structural breaks

BAI-PERRON (1998)

Bai-Perron (1998) test found two breaks for each market that are coincident with the Global Financial Crisis time frame. The first one is July 2007 and the second one is March 2009 for the U.S. while China's breaks are two months behind. Therefore, data is subdivided into three sub-periods according to these breaks.

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