



UNIVERSITI PUTRA MALAYSIA

***A NETWORK STRUCTURAL ANALYSIS OF MALAYSIAN
STOCK MARKET WITH EDGE DENSITY CONSTRAINT***

LAM SHI XIANG

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**A NETWORK STRUCTURAL ANALYSIS OF
MALAYSIAN STOCK MARKET WITH EDGE
DENSITY CONSTRAINT**

By

LAM SHI XIANG

© This Thesis Submitted to the School of Graduate Studies, Universiti
Putra Malaysia, in Fulfilment of the Requirements for the Degree
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A NETWORK STRUCTURAL ANALYSIS OF MALAYSIAN STOCK MARKET WITH EDGE DENSITY CONSTRAINT

By

LAM SHI XIANG

January 2013

Chair: Hishamuddin B. Zainuddin, PhD

Faculty: Institute for Mathematical Research

The main study of this thesis is the topological properties of the Malaysian stock market correlation network. In the first part of this study, two sets of networks are constructed to respectively capture the fluctuation of stock prices during the bearish market period (June 2007 - May 2009) and bullish market period (May 2009- March 2011). The correlation networks constructed during the bearish market period have higher clustering coefficient, stronger disassortativity and the stocks in the largest component of the network develop more correlation relationships with greater correlation strength among each other. Both network constructed during the bullish or bearish market period belong to the class of disassortative network with disassortative hubs.

In the second part of this study, the correlation network is constructed based on the stock prices between the period of May 2002 to May 2012. When the market mode is removed from the correlation matrix, the constructed network

has lower clustering coefficient, and lesser intra-connection of edges between the stocks in the largest component. In addition, the network has also become assortatively mixed with assortative hubs in comparison to disassortatively mixed network with the presence of *market mode*.

The stability of the correlation network structure is studied in terms of two different types of attack, namely attack based on removal of vertices from the network and attack by perturbation (*Gaussian attack* on the time series of stocks return). The Malaysian stock market is more vulnerable to preferential removal of vertices when the edge density of the network is decreased. In the context of perturbation, the stocks traded in Malaysian stock market are more sensitive to *perturbation* and have stronger clustering property in comparison to stocks of NYSE.

In the last part of this study, the time shift 1 day cross-correlation of stock prices between Malaysian stock market and New York Stock Exchange (NYSE) is analyzed. The time-lag behavior of the stocks traded in NYSE (as the mature market) is organized differently compared to Malaysian stock market (as the emerging market), in particular the in-degree disassortative hubs of the correlation network of NYSE remain as in-disassortative which is in contrast with the in-degree hubs in the network of Malaysian stock market that become in-assortative as the edge density of the network increases from 0.0014 to 0.0046.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia
sebagai memenuhi keperluan untuk ijazah Master Sains

**ANALISA STRUKTUR RANGKAIAN BAGI PASARAN
SAHAM MALAYSIA MELALUI SEKATAN KETUMPATAN
SISI**

Oleh

LAM SHI XIANG

Januari 2013

Pengerusi: Hishamuddin Zainuddin, PhD

Fakulti: Institut Penyelidikan Matematik

Kajian utama tesis ini adalah mengenai ciri-ciri struktur rangkaian bagi pasaran Bursa Saham Malaysia. Dalam bahagian pertama kajian ini, dua set rangkaian telah dibina yang masing-masing menggambarkan ciri-ciri turun naik harga saham semasa tempoh pasaran menurun (Jun 2007 - Mei 2009) dan tempoh pasaran meningkat (Mei 2009 - Mac 2011). Rangkaian korelasi yang dibangunkan bagi tempoh pasaran menurun didapati mempunyai pekali pengelompokan lebih tinggi dengan sifat stok dalam komponen terbesar membentuk lebih banyak hubungan korelasi dengan kekuatan korelasi lebih tinggi. Kedua-dua rangkaian korelasi untuk pasaran menurun dan pasaran meningkat didapati tergolong dalam kelas rangkain tak berisihan dengan hab tak berisihan.

Dalam bahagian kedua kajian ini, kami bangunkan rangkaian korelasi bagi harga penutup pasaran bagi keseluruhan tempoh Mei 2002 ke Mei 2012.

Apabila mod pasaran dibuang daripada matriks korelasi, didapati rangkaian yang dibina mempunyai pekali pengelompokan yang lebih rendah dan hubungan-intra antara stok dalam komponen terbesar rangkaian juga telah menjadi lebih jarang berbanding dengan rangkaian yang dibina dengan mod pasaran. Selain itu, rangkaian juga telah bertukar ke ciri berisihan dengan hab berisihan apabila mod pasaran dibuang berbanding dengan rangkaian tak berisihan sebelum itu.

Seterusnya, kestabilan rangkaian telah dibandingkan melalui dua jenis serangan terhadap rangkaian yang dibina, iaitu serangan berdasarkan pemindahan titik rangkaian dan serangan berdasarkan usikan sejagat (serangan penggantian Gaussian ke atas siri masa pulangan stok). Rangkaian saham Bursa Malaysia adalah lebih terdedah terhadap titik permindahan bersengaja apabila ketumpatan sisi menurun. Dalam konteks usikan sejagat, stok yang terlibat dalam usikan sejagat dalam Bursa Malaysia lebih sensitif terhadap usikan dan mempunyai pekali pengelompokan yang lebih tinggi berbanding dengan NYSE.

Dalam bahagian terakhir kajian ini, korelasi silang harga stok dengan susulan masa sehari bagi Bursa Malaysia dan NYSE telah dianalisis. Kami dapat tunjukkan bahawa sifat susulan masa bagi stok yang didagangkan di NYSE (sebagai pasaran matang) disusun berbeza daripada stok di Bursa Malaysia (sebagai pasaran munculan). Khususnya, hab darjah ke dalam tak berisihan bagi NYSE akan kekal sebagai hab darjah ke dalam tak berisihan sedangkan hab derjah ke dalam bagi rangkaian Bursa Malaysia berubah kepada hab de-

rajat ke dalam bersisihan apabila ketumpatan sisi meningkat dari 0.0014 ke 0.0046.



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I certify that a Thesis Examination Committee has met on 9 January 2013 to conduct the final examination of Lam Shi Xiang on his thesis entitled "A Network Structural Analysis of Malaysian Stock Market with Edge Density Constraint" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

Members of the Thesis Examination Committee were as follows:

Noor Akma Ibrahim, PhD

Professor
Faculty of Science
Universiti Putra Malaysia
(Chairman)

Kamel Ariffin Mohd Atan, PhD

Professor
Faculty of Science
Universiti Putra Malaysia
(Internal Examiner)

Zuriati Ahmad Zulkarnain, PhD

Associate Professor
Faculty of Computer Science and Information Technology
Universiti Putra Malaysia
(Internal Examiner)

Sithi V. Muniandy, PhD

Professor
Faculty of Science
University of Malaya
(External Examiner)

SEOW HENG FONG, PhD

Professor and Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

Hishamuddin Zainuddin, PhD

Associate Professor
Institute for Mathematical Research
Universiti Putra Malaysia
(Chairman)

Mahendran Shitan, PhD

Associate Professor
Institute for Mathematical Research
Universiti Putra Malaysia
(Member)

Isthrinayagy Krishnarajah, PhD

Senior Lecturer
Institute for Mathematical Research
Universiti Putra Malaysia
(Member)

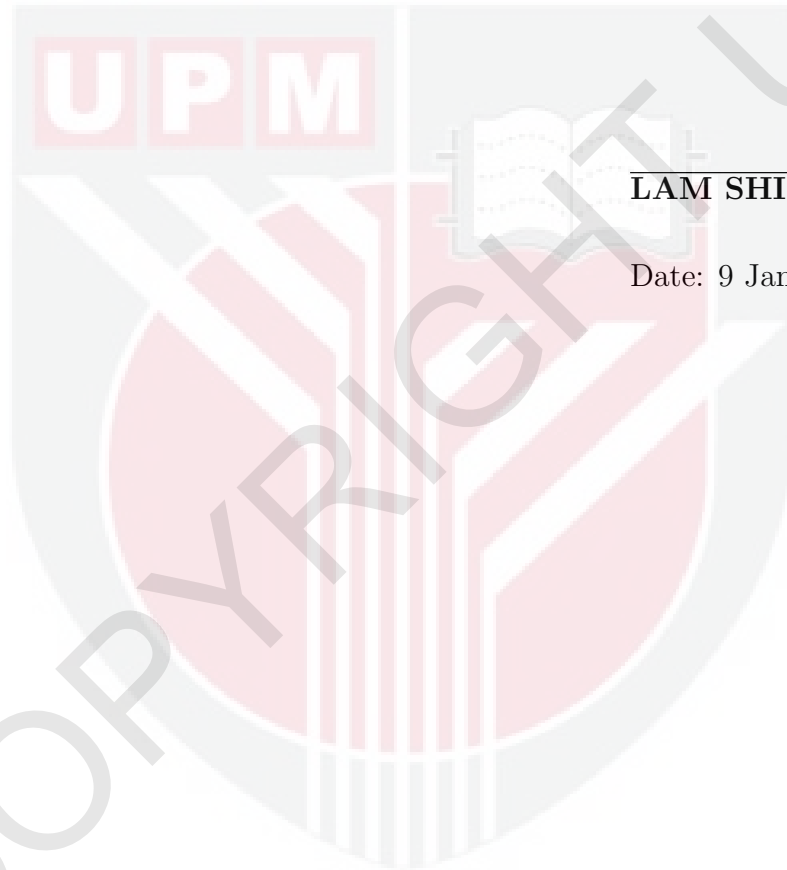
BUJANG BIN KIM HUAT, PhD

Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date:

DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



LAM SHI XIANG

Date: 9 January 2013

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