

: . .

Unit Pengajian Siswazah Jabatan Hal Ehwal Akademik (Graduate Studies Unit) Academic Affairs Department Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PROJEK

(Certification of Project Paper)

YEAP SIN YEAN		
calon untuk ljazah (candidate for the degree of)	DMICS	
telah mengemukakan kertas projek yang bertajuk (has presented his/her project paper of the following titl	е)	
Monetary Policy, Inflation Rate, and	d Stock Market in Malaysia	
seperti yang tercatat di muka surat ta (as it appears on the title page and fro bahawa kertas projek tersebut boleh diterima dari segi ilmu dengan memuaskan.	ont cover of project paper) bentuk serta kandungan dan meliputi bidan	
	ara aras a cameración, rasconscago es uso mesas	
· • • • • •	A >' A	
(that the project paper acceptable in form and content a covered by the project paper). Nama (Penyelia Utama/Principal Supervisor)	h i r	
covered by the project paper). Nama : Prof. Madya Dr. Mohd Zaini Abd. Karim	A ~ A	

PERMISSION TO USE

In presenting this thesis, the author agrees that Universiti Utara Malaysia's library may make this thesis freely available for reference and inspection. The author further agrees that permission for photocopying of this thesis in any manner, in whole or in part, for scholarly purposes may be granted by the author's supervisor or, in her absence, by the Dean of the Faculty of Information Technology. It is understood that any photocopying, publication, use of this thesis, or parts thereof for financial gain shall not be allowed without the author's written permission. It is also understood that, due recognition shall be given to the author and Universiti Utara Malaysia for any scholarly use of the materials presented in this thesis.

Permission for photocopying or other use of materials in this thesis, in whole or in part, should be addressed to:

Dean of Faculty of Economics
Universiti Utara Malaysia
06010 UUM Sintok
Kedah Darul Aman

ABSTRACT

The purpose of this study is to examine the relationship between monetary policy inflation rate, and stock market in Malaysia. The techniques used in this study are Unit Root test, Johansen's Cointegration test, Pairwise Granges Causality test, Multivariate VAR tests, Impulse Response, Variance Decomposition, and Multivariate Error Correction Model (ECM) tests. Five variables used in this study are exchange rate, lending rate, consumer price, and aggregate money supply. Data will be collected monthly and the data will be divided into two periods. The first period will be from January 1980 until August 1998 representing the period before the government pegged the exchange rate. The second period will start from September 1998 until September 2003 representing the period after the government had pegged the exchange rate. The major findings are: (i) there exist a dynamic interaction between monetary policy, inflation rate, and stock market in Malaysia, and (ii) there is a linkage between the variables and stock market before and after the government had pegged the exchange rate.

ABSTRAK

Tujuan penyelidikan ini ialah mengkaji perhubungan di antara polisi kewangan, kadar inflasi dan pasaran saham. Teknik yang digunakan dalam kajian ini ialah "Unit Root test", "Johansen's Cointegration test", "Pairwise Granges Causality test", "Multivariate VAR tests", "Variance Decomposition", "Impulse Response", dan "Multivariate Error Correction Model tests". Lima pembolehubah telah digunakan dalam kajian ini adalah indeks komposit, kadar pertukaran wang asing, kadar pinjaman bank, indeks harga pengguna, dan penawaran wang agregat. Data yang dikumpulkan secara bulanan dan ia dibahagikan kepada dua tempoh. Tempoh pertama bermula dari Januari 1980 hingga Ogos 1998 yang menggambarkan keadaan sebelum kerajaan menetapkan kadar pertukaran wang asing. Tempoh kedua bermula dari September 1998 hingga September 2003 yang menggambarkan keadaan selepas kerajaan menetapkan kadar petukaran wang asing. Kesimpulan penyelidikan ini ialah (i) terdapat perhubungan di antara polisi kewangan dengan pasaran saham, (ii) polisi kewangan, kadar inflasi dan pasaran saham di Malaysia adalah saling menpengaruhi di antara satu sama lain.

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere gratitude to my supervisor, Prof. Madya Dr. Mohd Zaini Abd. Karim for helped me throughout this study. My thanks also goes to the staff of Sultanah Bahiyah Library, Faculty of Economics, Graduate School, and the Computer Lab, for all their friendships help, support and guidance during my study.

Not forgetting, my special thanks also goes to Mr. Pokar A/L Vellaykuti, Mr. Tang Boon Guan, Miss Chan Sok Gee, Miss Yu Chin Chin, and all my friends who have helped me by giving me encouragement, motivation, and valuable ideas to complete this study.

Last, but not least, I would like to dedicate this special work to my parents, Mr. Yeap Heng Eam and Mrs. Ooi Chau Ling for their never-ending love and supports.

TABLE OF CONTENTS

		Page
PER	RMISSION TO USE	i
ABS	STRACT	ii
ABS	STRAK	iii
ACK	KNOWLEDGMENTS	iv
TAB	BLE OF CONTENTS	· v
LIST	T OF TABLES	vii
LIST	T OF FIGURES	ix
LIST	T OF ABBREVIATIONS	x
LIST	T OF APPENDICES	xi
CHA	APTER ONE: INTRODUCTION	
1.1	Introduction	1
1.2	Problem Statement	3
1.3	Objectives of the study	4
	1.3.1 General Objective	4
	1.3.2 Specific Objectives	4
1.4	Significance of the Study	4
1.5	Structures of the Study	5
СНА	APTER TWO: LITERATURE REVIEWS	
2.1	Introduction	6
2.2	Literature Reviews	6
2.3	Conclusion	13

CHA	APTER THREE: METHODOLOGY	
3.1	Introduction	14
3.2	Methodology	14
3.3	Scope of the Study	14
3.4	Model Specification	15
3.5	Theoretical Model	17
3.6	Hypothesis	18
3.7	Data	. 19
3.8	Conclusion	19
СНА	PTER FOUR: DATA ANALYSIS	
4.1	Introduction	20
4.2	The Long-Run Trends	20
4.3	Unit Roof Test	27
4.4	Johansen's Cointegration Test	31
4.5	Pairwise Granger Causality Test	34
4.6	Multivariate Vector Autoregression (VAR) Tests	39
4.7	Impulse Response	46
4.8	Variance Decomposition	50
4.9	Multivariate Error Correction Model (ECM) Tests	53
CHAI	PTER FIVE: CONCLUSIONS AND RECOMMENDATION	ONS
5.1	Conclusions	60
5.2	Recommendations	61
REFE	ERENCES	62
APPE	ENDICES	68

LIST OF TABLES

Table	Title	Page
4.1	ADF and PP Tests for the Period between 1980/1 to 1998/8	28
4.2	ADF and PP Tests for the Period between 1998/9 to 2003/9	29
4.3	ADF and PP Tests for the Period between 1980/1 to 2003/9	30
4.4	Johansen's Cointegration Test for the Period between 1980/1 to 1998/8	31
4.5	Johansen's Cointegration Test for the Period between 1998/9 to 2003/9	32
4.6	Johansen's Cointegration Test for the Period between 1980/1 to 2003/9	33
4.7	Pairwise Granger Causality Test for the Period between 1980/1 to 1998/8	34
4.8	Pairwise Granger Causality Test for the Period between 1998/9 to 2003/9	36
4.9	Pairwise Granger Causality Test for the Period between 1980/1 to 2003/9	37
4.10	Multivariate VAR Test for the Period between 1980/1 to 1998/8	39
4.11	Multivariate VAR Test for the Period between 1998/9 to 2003/9	42
4.12	Multivariate VAR Test for the Period between 1980/1 to 2003/9	44
4.13	12-month Variance Decompositions of LGER, LGLR, LGCP, and LGM1 Accounted by the LGIC Innovation for the Period between 1980/1 to 1998/8	50
4.14	12-month Variance Decompositions of LGLR, LGCP, and	50
	LGM1 Accounted by the LGIC Innovation for the Period	
	between 1998/9 to 2003/9	
4.15	12-month Variance Decompositions of LGER, LGLR, LGCP,	51
	and LGM1 Accounted by the LGIC Innovation for the Period between 1980/1 to 2003/9	

4.16	12-Month Variance Decomposition of LGIC to LGER, LGLR,	52
	LGCP, and LGM1 for the Period between 1980/1 to 1998/8,	
	1998/9 to 2003/9, and 1980/1 to 2003/9	
4.17	Multivariate ECM Tests for the Period between 1980/1 to 1998/8	54
4.18	Multivariate ECM Tests for the Period between 1998/9 to 2003/9	56
4.19	Multivariate ECM Tests for the Period between 1980/1 to 2003/9	58

LIST OF FIGURES

Figur	e Title	Page
4.1	The Short-Run Relationship between IC, ER, LR, CP, and M1	40
	for the Period between 1980/1 to 1998/8.	
4.2	The Short-Run Relationship between IC, ER, LR, CP, and M1	41
	for the Period between 1980/1 to 1998/8 at the 1% significance level.	
4.3	The Short-Run Relationship between IC, ER, LR, CP, and M1	43
	for the Period between 1998/9 to 2003/9	
4.4	The Short-Run Relationship between IC, ER, LR, CP, and M1	45
	for the Period between 1980/1 to 2003/9.	
4.5	Impulse Response of Stock Market to One Standard Innovation in	46
	Exchange Rate, Leading Rate, Consumer Rate, and Aggregate	
	Money Supply for the Period between 1980/1 to 1998/8.	
4.6	Impulse Response of Stock Market to One Standard Innovation in	47
	Leading Rate, Consumer Rate, and Aggregate Money Supply	
	for the Period between 1998/9 to 2003/9.	
4.7	Impulse Response of Stock Market to One Standard Innovation in	48
	Exchange Rate, Leading Rate, Consumer Rate, and Aggregate	
	Money Supply for the Period between 1980/1 to 2003/9.	
4.8	The Long-Run Relationship between IC, ER, LR, CP, and M1	55
	for the Period between 1980/1 to 1998/8	
4.9	The Long-Run Relationship between IC, LR, CP, and M1	57
	for the Period between 1998/9 to 2003/9	
4.10	The Long-Run Relationship between IC, ER, LR, CP, and M1	59
	for the Period between 1980/1 to 2003/9	

LIST OF ABBREVIATIONS

ADF Augmented Dickey-Fuller Test

AIC Akaike Info Criterion

BNM Bank Negara Malaysia

CP Consumer Price

ECM Error Correction Model Test

ER Exchange Rate

GDP Growth Domestic Product

GLS Generalized Least Squares

IC Stock Market

IFS International Financial Statistic

KLCI Kuala Lumpur Composite Index

KLSE Kuala Lumpur Stock Exchange

LGCP Logarithm Consumer Price

LGER Logarithm Exchange Rate

LGIC Logarithm Stock Market

LGLR Logarithm Lending Rate

LGM1 Logarithm Aggregate Money Supply

LR Lending Rate

LR Likelihood Ratio Test

M1 Aggregate Money Supply

OLS Ordinary Least Square

PP Phillips-Perron Test

VAR Vector Autoregression Test

LIST OF APPENDICES

Appendix Title		Page
A	Monthly Data for the Period between 1980/1 to 1998/8	68
В	Monthly Data for the Period between 1998/9 to 2003/9	74
C	Variance Decomposition of D(LGIC), D(LGER), D(LGLR),	77
	D(LGCP), and D(LGM1) for the Period between 1980/1 to 1998/8	
D	Variance Decomposition of D(LGIC), D(LGLR), D(LGCP),	80
	and D(LGM1) for the Period between 1998/9 to 2003/9	
E	Variance Decomposition of D(LGIC), D(LGER), D(LGLR),	83
	D(LGCP), and D(LGM1) for the Period between 1980/1 to 2003/9	

CHAPTER ONE

INTRODUCTION

1.1 Introduction

The aim of this study is to examine the monetary policy, inflation rate, and stock market in Malaysia. The issue of monetary policy, inflation rate and stock market has become an important topic in Malaysia's economic environment. The central bank, Bank Negara Malaysia (BNM), is entrusted with the responsibility for the formulation and implementation of monetary policy to attain price stability in the country.

Monetary policy, specifically interest rates, is an important tool to ensure growth and stability in the economy of a country. The government will set the interest rate according to the prevailing economic conditions. If they feel that there are significant inflationary pressures in the economy, they will tend to increase the level of interest rates. This will discourage borrowing and therefore reduce aggregate demand.

Before the mid-1990s, monetary policy strategy was based on monetary aggregates targeting. Monetary aggregates targeting ensure that the excess liquidity does not translate into acceleration in loans, which will in turn expand money supply beyond its target rate and hence fuel inflation. However, subsequent developments in the economy and the financial system during the early 1990s weakened this relationship and highlighted the problems associated with using monetary aggregates as policy targets.

Towards the mid-1990s, BNM shifted its focus from monetary aggregates targeting to interest rate targeting. BNM still monitors, very closely, monetary aggregates, credit

The contents of the thesis is for internal user only

References

- Archer, W. R. & Ling, D. C. (1995). The effect of alternative interest rate processes on the value of mortgage-backed securities. *Journal of Housing Research*, (2).
- Bakshi, G. S. & Chen, Z. (1996). Inflation, asset prices, and the term structure of interest rates in monetary economies. *The Review of Financial Studies Spring*, 9(1), 241-275.
- Bank for International Statement. (2001). International banking and financial market developments. *BIS Quarterly Review*.
- Bank Negara Malaysia. (1999). The central bank and the financial system in Malaysia: a decade of change 1989-1999. Kuala Lumpur.
- Bernanke, B. & Gertler, M. (1999). Monetary policy and asset price volatility. *Economic Review (Federal Reserve Bank of Kansas City)*, 84(4).
- Bernanke, B. S. (2003). Monetary policy and the stock market some empirical results. Retrieved February 16, 2004, from www.federalreserve.gov/BoardDocs/Speeches/2003/20031002
- Bohl, M. T. & Siklos, P. L. (2003). Do central banks react to the stock market? The case of the Bundesbank. Retrieved February 16, 2004, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=459272
- Bomfim, A. N. (2000). Pre-announcement effects, news, and volatility: monetary policy and the stock market. Retrieved February 16, 2004, from http://www.federalreserve.gov/pubs/feds/2000/200050/200050pap.pdf
- Bondt, G., Mojon, B., & Valla, N. (2002). Interest rate setting by universal banks and the monetary policy transmission mechanism in the euro area. Retrieved February 16, 2004, from http://www.cepr.org/meets/wkcn/5/583/papers/valla%20paper.pdf
- Booth, J. R. & Booth, L. C. (1997). Economic factors, monetary policy, and expected returns on stocks and bonds. *Economic Review (Federal Reserve Bank of San Francisco)*, (2). Retrieved February 16, 2004, from Business Source Premier database, Article No. 03630021.
- Boyle, G. W. (1990). Money demand and the sock market in a general equilibrium model with variable velocity. *Journal of Political Economy*, 98, 1039-1053.

- Choi, W. G. & Oh, S. (2003). A money demand function with output uncertainty, monetary uncertainty, and financial innovations. *Journal of Money, Credit, and Banking, 35*(5), 685. Retrieved February 16, 2004, from Business Source Premier Database, Article No. 00222879.
- Clarida, R., Gali, J., & Gertler, M. (1999). The science of monetary policy: a new Keynesian perspective. *Journal of Economic Literature*, 37(4). Retrieved February 16, 2004, from Business Source Premier database, Article No. 00220515.
- Craine, R. & Martin, V. (2003). Monetary policy shocks and security market responses. Retrieved February 16, 2004, from http://emlab.berkeley.edu/users/webfac/craine/e237 sp03/craine.pdf
- Darrat, A. F. & Dickens, R. N. (1996). Financial deregulation, monetary policy, and stock market (in)efficiency. *Quarterly Journal of Business & Economics*, 35(4). Retrieved February 16, 2004, from Business Source Premier database, Article No. 07475535.
- Dasgupta, P. & Sendarma, R. (2002). Monetary policy and predictability of stock returns: evidence from a liberalizing economy. Social Science Research Network Electronic Paper Collection. Retrieved February 16, 2004, from http://ssrn.com/abstract=314141
- Davidson, L. S. & Froyen, R. T. (1982). Monetary policy and stock returns: are stock markets efficient? Retrieved February 16, 2004, from http://research.stlouisfed.org/publications/review/82/03/Monetary Mar1982.pdf
- Devereux, M. B. (2003). A macroeconomic analysis of EU accession under alternative monetary policies. *Journal of Common Market Studies*, 41(5), 941-961.
- Dickinson, D. G. (2000). Stock market integration and macroeconomic fundamentals: an empirical analysis, 1980-95. *Applied Financial Economics*, 10(3). Retrieved February 16, 2004, from Business Source Premier database, Article No. 09603107.
- Durham, J. B. (2001). The effect of monetary policy on monthly and quarterly stock market returns: cross-country evidence and sensitivity analyses. Retrieved February 16, 2004, from http://www.federalreserve.gov/Pubs/Feds/2001/200142/200142pap.pdf
- Durham, J. B. (2003). Does monetary policy affect stock prices and treasury yields? An error correction and simultaneous equation approach. Finance and Economics Discussion Series. Retrieved February 16, 2004, from http://www.federalreserve.gov/pubs/feds/2003/200310/200310abs.html

- Durham. J. B. (2003). Monetary policy and stock price returns. *Financial Analysts Journal*, 59(4), 26. Retrieved February 16, 2004, from Business Source Premier Database, Article No. 0015198X.
- England, S. F. (2003). The federal reserve board and the stock market bubble. *Business Economics*, 38(2). Retrieved February 16, 2004, from Business Source Premier database, Article No. 0007666X.
- Ewing, B. T. (2001). Monetary policy and stock returns. *Bulletin of Economic Research*, 53(1). Retrieved February 16, 2004, from Business Source Premier database, Article No. 03073378.
- Friberg, R. & Nydahl, S. (1997). Openness and the exchange rate exposure of national stock markets a note. Working Paper Series in Economics and Finance No. 195, Stockholm School of Economics. Retrieved February 16, 2004, from http://swopec.hhs.se/hastef/papers/hastef0195.pdf
- Friedman, M. (1961). The lag in effect of monetary policy. *Journal of Political Economy*, 447-66.
- Goodfriend, M. (1998). Using the term structure of interest rates for monetary policy. Economic Quarterly (Federal Reserve Bank of Richmond), 84(3).
- Granger, C. W. J. (1988). Some recent developments in the concept of Causality. Journal of Econometrics, 36, 199-211.
- Hafer, B. W. (1986). The response of stock prices to changes in weekly money and the discount rate. Retrieved February 16, 2004, from http://research.stlouisfed.org/publications/review/86/03/Response Mar1986.pdf
- Haron, S. & Ahmad, N. (2000). The effects of conventional interest rate and rate of profit on funds deposited with Islamic banking system in Malaysia. *International Journal of Islamic Financial Services*, 1(4).
- Hasan, Z. (2000-2001, July-September). Recent financial crisis in Malaysia: response, results, challenges. *The Indian Economic Journal*, 49(1), 38-49. Retrieved February 16, 2004, from http://www.indianeconomics.org/material/j-s-01-5.pdf
- Hayford, M. D. & Malliaris, A. G. (2001). Asset prices and federal reserve behavior. Social Science Research Network Electronic Paper Collection. Retrieved February 16, 2004, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=263170#PaperDownload
- Hess, P. J. & Lee, B. S. (1999). Stock returns and inflation with supply and demand disturbances. *The Review of Financial Studies*, 12(5), 1203-1218.

- Hui, B. T. & Baharmshah, A. Z. (1999). Dynamic causal chain of money, output, interest rate and prices in Malaysia: evidence based on vector error correction modeling analysis. *International Economic Journal*, 103-120.
- Ibrahim, H. M. (1999). Macroeconomic variables and stock prices in Malaysia: an empirical analysis. *Asian Economic Journal*, 13(12), 219-231.
- Jensen, G. R. & Mercer, J. M. (2002). Monetary policy and the cross-section of expected stock returns. *Journal of Financial Research*, 25(1). Retrieved February 16, 2004, from Business Source Premier database, Article No. 02702592.
- Johnson, R. R. & Jensen, G. R. (1998). Stocks, bonds, bills and monetary policy. *Journal of Investing*, 7(3).
- Laurenceson, J. (2002). The impact of stock markets on China's economic development: some preliminary assessments. Retrieved February 16, 2004, from http://eprint.uq.edu.au/archive/00000434/01/DP302Jan02.pdf
- Leng, L. C. (1994). Fiscal policy, prices & inflation. Bank Negara Malaysia, Kuala Lumpur.
- McCornac, D. C. (1991). Money and the level of stock market prices: evidence from Japan. *Quarterly Journal of Business & Economics*, 30(4).
- Mookerjee, R. and Yu, Q. (1997). Macroeconomic variables and stock prices in a small open economy: the case of Singapore. *Finance Pacific Basin Journal*, 5, 377-388.
- Morley, B. & Broome, S. (2000). Long-run and short-run linkages between stock markets and interest rates in the G-7 economies. *Applied Economics Letters*, 7, 321-323.
- Nath, G. C. & Samanta, G. P. (2003). Dynamic relation between exchange rate and stock prices a case for India. Retrieved February 16, 2004, from http://www.nse-india.com/content/press/feb2003c.pdf
- Panetta, F. (2002). The stability of the relation between the stock market and macroeconomic forces. Review of Banking, Finance and Monetary Economics, 31(3), 417-450.
- Park, K. & Ratti, R. A. (2000). Real activity, inflation, stock returns, and monetary policy. *Financial Review*, 35(2). Retrieved February 16, 2004, from Business Source Premier database, Article No. 07328516.
- Phylaktis, K. & Ravazzolo, F. (2000). Stock prices and exchange rate dynamics. Retrieved February 16, 2004, from http://www.staff.city.ac.uk/s.hwang/opdf/sp.pdf

- Rigobon, R. & Sack, B. (2001). Measuring the reaction of monetary policy to the stock market. Retrieved February 16, 2004, from http://www.nber.org/papers/w8350.pdf
- Rigobon, R. & Sack, B. (2002). The impact of monetary policy on asset prices. *Finance and Economics Discussion Series*. Retrieved February 16, 2004, from http://www.federalreserve.gov/pubs/feds/2002/200204/200204abs.html
- Rozeff, M. S. (1974). Money and stock prices: market efficiency and the lagged effect of monetary policy. *Journal of Financial Economics*, 1, 245-302.
- Sadorsky, P. (2001). Broken trend output in a model of stock return and economic activity. *Applied Financial Economics*, 11, 17-21.
- Schwartz, A. J. (2003). Asset price inflation and monetary policy. *Atlantic Economic Journal*, 31(1). Retrieved February 16, 2004, from Business Source Premier database, Article No. 01974254.
- Sellin, P. & Riksbank, S. (2001). Monetary policy and the stock market: theory and empirical evidence. *Journal of Economic Surveys*, 15(4).
- Simpson, J. & Evans, J. (2003). Banking stock returns and their relationship to interest rates and exchange rates: Australian evidence. Retrieved February 16, 2004, from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=443302
- Smithers, A. & Wright, S. (2002). Stock markets and central bankers: the economic consequences of Alan Greenspan. *World Economics*, 3(1).
- Sourial, M. S. (2002). The future of the stock market channel in Egypt. Retrieved February 16, 2004, from http://econwpa.wustl.edu/eps/fin/papers/0204/0204002.pdf
- Sprinkel, B. W. (1964). *Money and stock prices*. Homewood, Illinois: Richard Irwin, Inc.
- Svensson, L. E. (2002). Indicator Variables for Optimal Policy. *The Journal of Monetary Economic*, 1-36.
- Tatom, J. A. (2002). Stock Prices, Inflation and Monetary Policy. *Business Economics*, 37(4). Retrieved February 16, 2004, from Business Source Premier database, Article No. 0007666X.
- Thorbecke, W. (1995). On stock market returns and monetary policy. Working Paper No. 139. Retrieved February 16, 2004, from http://econwpa.wustl.edu/eps/mac/papers/9812/9812009.pdf

- Thorbecket, W. & Coppocktt, L. (1995). Monetary policy, stock returns, and the role of credit in the transmission of monetary policy. Working Paper No. 133. Retrieved February 16, 2004, from http://econwpa.wustl.edu/eps/mac/papers/9902/9902006.pdf
- Turnbull, S. M. & Milne, F. (1991). A simple approach to interest-rate option pricing. *The Review of Financial Studies*, 4(1), 87-120.
- Yakob, N. A. (2001). Monetary uncertainty and stock prices: the case of Malaysia. Retrieved February 16, 2004, from http://www.economia.uniroma2.it/ceis/conferenze_convegni/banking2001/papers/giovedi/AzuddinYacob-Giov.pdf