



UNIVERSITI PUTRA MALAYSIA

***A TEST OF THEIR LINKAGE BETWEEN MONEY SUPPLY, LIQUIDITY, AND
SHARE PRICES***

CHUNG TIN FAH

GSM 2013 7



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By

CHUNG TIN FAH

**DOCTOR OF PHILOSOPHY
UNIVERSITI PUTRA MALAYSIA**

2013



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CHUNG TIN FAH

Thesis Submitted to the Graduate School of Management, Universiti Putra Malaysia
in fulfilment of requirement for degree of Doctor of Philosophy

April 2013

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DEDICATION

This thesis is dedicated to all who have helped me in my PhD journey, in particular, my wife Doris, children and parents.



Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of requirement for the degree of Doctor of Philosophy

A TEST OF THEIR LINKAGE BETWEEN MONEY SUPPLY, LIQUIDITY AND SHARE PRICES

By

CHUNG TIN FAH

April 2013

Chair : Professor Shamsheer Mohamad Ramadili Mohd, PhD

Faculty : Graduate School of Management, UPM

This thesis reports new evidence of a liquidity effect from money supply changes. From evidence, the money supply increases proposed by Friedman (1969) first lead to interest rate declines and inflation increases. Yet the proposition that money supply increase leads to liquidity surge and credit expansion in the banking sector ó has not yet received unanimous empirical support.

Monetary transmission mechanism is more and more turning to the credit channel to trace how money affects prices. That money is endogenously determined as in the writings of post-Keynesian (PK) economists, will be examined in this thesis by applying a 3-equations model. The empirical tests of the theories are conducted using quarterly data over 1960 and 2011 for the G-7 countries: Canada, France, Germany, Italy, Japan, the United Kingdom (UK) and the United States (US). These tests are conducted to determine whether (1) money is endogenous (bidirectional) or exogenous (unidirectional), (2) money supply causes liquidity, and (3) liquidity causes share price to change. The empirical tests are conducted after the usual statistical tests (unit root,

Granger causality, Johansen cointegration tests and VECM) are done on whether the data are stationary and cointegrated.

The results reported in this thesis are: i) bidirectional causality exists between GDP and money supply suggesting that money is endogenous; ii) there is a difference between long-term and short-term causality as in the cases of Canada, Italy, Japan accordance with the monetarist view; iii) liquidity is found to be a significant variable in most cases except Canada 2 (in sub-period 1991:1 to 2007:1) and Italy; and iv) for most G-7 countries, there is a relationship between money supply and share returns.

Finally, the findings using the panel data estimation method show that there is a *positive* relationship between money supply growth and share returns: it is *negative* between share returns and money supply growth, due to central bank changing interest rates to curb inflation. In this context, there is a bidirectional positive relation between GDP growth and money supply growth, which supports the PK theory of endogenous money. Thus, the money-to-share-price-returns relation is founded on money being endogenous. The findings of the thesis provides a link between money supply, liquidity and the real economy, unlike the more narrower-focused asset pricing theories that purport to explain asset prices as determined by just the financial factors.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**UJIAN KAITAN ANTARA BEKALAN WANG, HARGA SAHAM,
KECAIRAN DAN KADAR FAEDAH**

Oleh

CHUNG TIN FAH

April 2013

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Tesis ini melaporkan bukti baru berkenaan kesan kecairan daripada perubahan bekalan wang, kesan yang telah dicadangkan oleh Milton Friedman tetapi belum disahkan. Kita melanjutkan kesan kecairan dengan menguji kesan kecairan-kepada-harga saham sebagai lanjutan kepada teori yang sama. Impak bekalan wang pada kadar faedah dan kecairan telah pertama kali dicadangkan oleh Friedman (1969) dan terdapat bukti bahawa kenaikan bekalan wang membawa kepada penurunan kadar faedah dan kenaikan inflasi. Namun cadangan bahawa meningkatkan bekalan wang sepatutnya membawa kepada peningkatan kecairan - seterusnya pengembangan kredit dalam sektor perbankan - belum lagi menerima sokongan empirikal secara kesuluruhan nya.

Pakar-pakar ekonomi selepas Keynes (post-keynesian atau PK) telah mencadangkan bahawa bekalan wang dalam ekonomi ditentukan oleh tingkah laku bank-bank perdagangan ia itu apabila bank-bank menyesuaikan penciptaan wang dengan bertindakbalas kepada agen-agen ekonomi yang mengimbangkan semula portfolio susulan tindakan terhadap perubahan bekalan wang atau apabila bank-bank pusat

mengambil tindakan tangan di pasaran. Tesis ini mengkaji bagaimana, selepas mengambilkira tingkah laku penciptaan kredit bank seperti yang dicadang oleh PK, bekalan wang mempengaruhi pulangan saham dengan menggunakan model 3-persamaan. Sama ada perubahan bekalan wang berkelakuan secara endogeneity belum meluas diuji. Oleh itu, satu lagi matlamat tesis ini adalah untuk mengkaji hubungan ini antara bekalan wang endogen dan pulangan harga saham.

Ujian empirikal teori ini dijalankan menggunakan data suku tahunan sepanjang tahun 1960 hingga 2011 bagi negara-negara G-7 : Kanada, Perancis, Jerman, Itali, Jepun, United Kingdom (UK) dan Amerika Syarikat (AS). Disebabkan siri data ini adalah untuk tempoh yang panjang, perubahan rejim-dasar monetari yang signifikan ó terutamanya dalam tempoh-tempoh masa pendek di Kanada, UK dan Amerika Syarikat - diambil kira dalam ujian empirikal hipotesis asas. Kajian ini dijalankan untuk menentukan (1) sama ada wang adalah endogen (dwiarah) atau luaran (satu arah) bermakna (2) penambahan bekalan wang menyebabkan kecairan, dan (3) Perubahan dalam harga saham berasaskan bekalan wang menyebabkan kecairan.

Ujian empirikal yang dijalankan bermula dengan ujian akar unit dan ujian kointegrasi Johansen bagi kepegungan pembolehubah dan sama ada pembolehubah berkointegrasi, diikuti oleh vektor pembedahan ralat model (vector error-correction models atau VECM) dan Ujian Sebab-Musabab Granger untuk menguji sama ada terdapat satu arah atau sebab-musabab dwiarah dalam jangka masa panjang dan jangka pendek. Ujian Trivariate VAR yang dibina oleh Toda dan Yamamoto (1995) digunakan untuk menguji sama ada kecairan adalah pembolehubah penting dalam sebab-musabab antara bekalan wang dan KDNK.

Model 3-persamaan serentak dibina dan digunakan untuk meneroka kemungkinan hubungan serentak antara agregat bekalan wang dan pulangan harga saham, dan kemudiannya kesan bekalan wang atas kecairan. Ini diuji menggunakan Generalized Method of Moments (GMM), yang sesuai diguna apabila jumlah sampel ada (N) adalah kurang dari jumlah tempoh masa (T). Sebelum anggaran model, ujian panel akar unit persamaan yang diguna oleh Maddala dan Wu (1999) dan Choi (2001) digunakan bagi kepegunan dalam pembolehubah; Kointegrasi panel Pedroni (1997) digunakan untuk menguji jika pembolehubah adalah berkointegrasi. Ujian sebab-musabab VECM dan Granger digunakan untuk sama ada terdapat sebab-musabab antara pembolehubah didalam persamaan. VECM telah digunakan untuk mengenalpasti kesan jangka pendek dan jangka panjang.

Penemuan menunjukkan beberapa petunjuk baru yang penting dan berguna. Pertama, KDNK didapati menyebabkan perubahan bekalan wang, sebab-musabab dwiarah wujud antara KDNK dan bekalan wang mencadangkan bahawa wang adalah endogen (kecuali untuk beberapa tahun - Kanada 1, Perancis, Jerman, UK 1 dan AS1). Kedua, keputusan menunjukkan bahawa terdapat perbezaan di antara sebab-musabab jangka panjang dan jangka pendek: sebagai contoh, terdapat sokongan untuk sebab-musabab dwiarah dalam jangka masa panjang, bukti menyokong pandangan PK dalam jangka pendek, seperti dalam kes-kes di Kanada, Itali, Jepun dan Amerika Syarikat, manakala dasar monetari Perancis dan Jerman nampaknya selaras dengan pandangan monetaris. Ketiga, seperti yang ditunjukkan oleh keputusan yang teguh ujian trivariate VAR, kecairan didapati merupakan pembolehubah penting dalam semua negara kecuali Kanada 2 (dalam tempoh kecil 1991:1 untuk 2007:1) dan Itali. Keempat, ia mendapati bahawa, untuk semua G-7 negara, terdapat hubungan antara bekalan wang dan pulangan saham.

Akhirnya, penemuan yang menggunakan kaedah anggaran data panel menunjukkan bahawa terdapat hubungan yang positif antara pertumbuhan bekalan wang dan pulangan saham: ia adalah negatif antara pulangan saham dan pertumbuhan bekalan wang. Hasil kedua boleh dijelaskan sebagai kesan bank pusat menukar kadar faedah dengan tujuan mengawal inflasi. Tindakan ini membawa kepada peningkatan dalam kadar faedah dan seterusnya kepada pengurangan bekalan wang. Didapati juga, dalam konteks ini, bahawa terdapat hubungan dwiarah positif antara pertumbuhan KDNK dan pertumbuhan bekalan wang, yang menyokong teori wang endogen PK. Oleh itu, hubungan wang-kepada-harga saham-pulangan diasaskan pada wang berendogen, bererti bahawa penciptaan kredit bank adalah sumber kesan bekalan wang kepada pulangan saham. Hubungan bekalan wang kepada pulangan saham telah diuji untuk ketegapan menggunakan tiga ujian yang berbeza. Semua ujian yang dikemukakan mengesahkan hubungan.

Selain daripada bukti empirikal yang penting dalam tesis ini yang menyokong teori PK untuk negara-negara maju G-7, penemuan tesis mempunyai implikasi penting kepada kecairan dan penilaian harga saham. Bank pusat dan institusi pengambilan deposit bukan hanya pemancar dasar monetari tetapi juga penyebab penting dalam pertumbuhan wang melalui penciptaan pinjaman, yang membawa kepada perubahan bekalan wang, kecairan dan perubahan harga saham. Tesis ini menyediakan pautan kepada bekalan wang dan kecairan (faktor kewangan) dan ekonomi sebenar (KDNK, IPP) untuk pembentukan harga aset. Kefahaman yang diperoleh daripada penemuan kami membantu untuk mengembangkan pemahaman kita tentang bagaimana harga aset (saham) dibentuk dan kaitannya dengan ekonomi sebenar dan ekonomi.

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kp" hkpku jkp i " v j ku" rctv" qh" o { " nkhgou" lqwtpg { " chvgt" 62" { gctu=" hqt" v j ku. " K" y kmn" dg" gvgtpcmn { "
grateful and obedient.

I certify that a Thesis Examination Committee has met on **24th April, 2013** to conduct the final examination of Chung Tin Fah on his thesis entitled “**A Test Of Their Linkage Between Money Supply, Liquidity, and Share Prices**” 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 Degree of **Doctor of Philosophy**.

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CHAPTER ONE

RESEARCH PROBLEM IDENTIFICATION

1.1 Introduction

The objective of this thesis is to examine the relationships among money supply, liquidity, and share prices after controlling the already-verified known effects of interest rates and inflation (Fisher, 1933). These theoretical and empirical relationships purportedly exist between the still unproven liquidity-to-money supply¹ at the macroeconomic level on the one hand and liquidity-to-asset prices (share prices) on the other hand. The relationship between share prices and interest rates has been fully explored in share price valuation models in finance (Black et al., 1972). However, verification of the likely link between banking liquidity at the macroeconomic level and share prices in asset markets requires that the money supply effect on banking liquidity (thus credit creation in the economy) is first proven before exploring a link among money supply, liquidity and share prices (with controls for interest rate and inflation effects). Financial economists explore the link between the real economy and financial aggregates of money supply, liquidity and interest rates as these influence asset price formation studied in finance. This thesis is therefore an attempt to link the macro-economic aggregates of money supply and banking liquidity to asset (share) prices.

¹ Liquidity in this context refers to liquidity in the financial system created by deposit taking financial institutions and the central bank. The finance concept of liquidity is discussed at length on Page 36 of this thesis.

Htkgf o cpøu"3;89) suggestions of a negative money supply effect on interest rate and a positive effect on inflation have been verified in a number of studies while his suggestion of a positive money supply effect on banking liquidity has yet been supported unanimously.² The phrase liquidity effect was introduced by Friedman to describe the first of three effects from money supply changes caused by an unexpected exogenous change in the money supply (the other two being income and inflation expectation effects). The linkage between money supply and interest rates has been recognized among policy makers on the basis of evidence of its interest rate effect.

The channels of influence can be categorised as either *direct* or *indirect*. The indirect effect of money supply upon share prices is the conventional framework comprising the effects of liquidity, earnings and risk premium. Past studies made use of the Markowitz (1952) portfolio model as also explored by Brunner (1961), Friedman (1969), Friedman and Schwartz (1963) and Cagan (1972). In this model, an investor reaches an equilibrium position in which, in general, she holds a number of assets including money in his portfolio of assets and any unexpected changes in money has profound influences on banking credits.

The *direct* channel, using the theoretical framework presented by monetarists about the relationship between money supply and asset prices (stock price being a subset of asset prices) is from the quantity model (Sprinkel, 1964) or the more sophisticated portfolio theory model (Cooper, 1972). An increase in money supply is expected to increase excess supply of money balance, which in turn leads to excess demand for

² The empirical literature on the liquidity effect dates back at least to Cagan and Gandolfi (1969), Gibson (1970a,b), Leeper and Gordon (1992), Goodfriend (1997), Pagan and Robertson (1995), Christiano, Eichenbaum and Evans (1996), Hamilton (1997), Thornton (2001) Carpenter and Demiralp (2006) and Thornton (2007).

shares. Share prices are expected to rise as a result. This channel of interaction has been described as a direct channel for the first time in Sprinkel (1964). As the supply of money expands, the portfolio of desired versus actual cash holding is thrown out of balance. Since the stock of money must be held by the agents, the prices of other assets and goods and services for consumption are bid up to a new equilibrium level. This theory is still in vogue although the question of how the money supply influences through what channel(s) influence the asset prices has newer interpretations, as for example, in Effa, Ariff and Khalid (2013; 2011) for banking assets.

The motivation for this thesis is therefore to explore and provide answers to three related questions: (i) Is money supply endogenous or exogenous; (ii) Is there a positive money-to-liquidity effect on share returns? (iii) Is there a significant positive effect of liquidity on share returns? In the process of carrying out our research, this thesis will link the real economic aggregates (using IPI as a proxy for earnings) and the financial aggregates (money supply, interest rates and liquidity) to asset prices (share prices) in G-7 countries.

1.1.1 Nature of the Study

This study is a quantitative exploratory attempt using available data applying correlation and regression analyses. Therefore, the research design in this study would also include causality tests and comparative analyses. The reason for employing the causal comparative design is that the independent variables of the study cannot be manipulated experimentally, so it is not possible to investigate the relationship between the dependent variable and the independent variables through experimental designs.

1.2 Research Questions

This thesis aims to answer three main research questions.

Money Supply and GDP: Do changes in money supply cause changes in GDP, which is evidence in support of money exogeneity? This test will be done for each of the G-7 countries over test period. This research question has been addressed for some of the G-7 countries but not all. We cover a very long period including a period since 2005, involving the years after the Global Finance Crisis (GFC).

Money Supply and Liquidity: Htkgf ocpøu" rtqrqukvkqp" vjcv" o qpg{" uwr rn{" ecwugu" liquidity is the second research question. We also test whether liquidity causes money supply by testing for evidence of bidirectional causality.

Share Price and Liquidity: Credit expansion (shrinkage) from changes in banking liquidity cause earnings to rise (fall) and earnings in turn causes share prices to rise (fall). As in the earlier hypotheses, we also test for bidirectional causality between share price and liquidity to verify for money endogeneity.

In addressing the above questions, the thesis will examine on how share returns, money supply and liquidity are linked together in a macroeconomic framework. The attempt to address this question forms the central focus of this thesis. This thesis will use a system of equations approach to answer the question of simultaneous relationship among share price returns, money supply and liquidity.

Subsidiary questions are:

i) What are the expected and the empirical relationships between the growth of the money supply and share returns? To reinvestigate the relationship between money supply and share returns to ascertain whether dependence can be established and in which direction the causality is manifested.

ii) Is there a long-run relationship and what are the short-run dynamics like, using the later econometric techniques? In order to investigate the causal relationship between share returns and money supply, one must determine the existence and direction of causality between the unexplained variations in both series.

iii) To explore the relationship between the endogeneity of money and the pricing of share returns. Following answers to the above question, to relate different variants of money supply to share returns: To investigate and relate variants of money supply to share returns within the tests of endogeneity or exogeneity.

iv) What is meant by liquidity and how is it to be measured? In the financial press and other market commentaries by analysts, asset price bubbles are sometimes attributed to excess liquidity in the financial system using such metaphors as the financial markets being awash with liquidity or liquidity sloshing around. However, the precise meaning can only be understood as the rate of growth of aggregate money which will be reflected in the rate of growth of aggregate balance sheets of financial intermediaries. The financial intermediaries hold surplus capital and they will attempt to find ways in which to they can employ their surplus capital.

v) What are the expected and the empirical relationships among inflation, income, interest rates, share price returns, money supply and liquidity?

The financial economics literature is replete with a considerable number of studies that examine share price behaviour. In this, an important area of focus that has received increasing attention from economists and policy makers is to understand the dynamic linkages between macroeconomic variables and asset (share) returns.

Few events are watched by market participants with more interest than decisions of the monetary authority (especially the Federal Reserve) regarding monetary policy. This interest stems from a significant impact of news about the Federal Reserve policy on asset prices. For example, Fleming and Remolona (1997) show that federal funds target rate announcements tend to cause large price changes in the US Treasury market. Fair (2002) reports that more than 30 percent of identifiable events that caused a large immediate price change in the stock market were monetary announcements. Bernanke and Kuttner (2005) show that an unexpected 25-basis point cut in the federal funds target rate leads to a one percent increase in the level of stock prices on average.

Policymakers recognize that the share market is an important conduit of monetary policy that can be used to influence real economic activity in the transmission mechanism. Share prices affect the real economy through a number of channels. new capital and invest, and through the wealth effect on consumption and economic growth.

In tracing the impact of monetary policy, the first step in the channels, however, is the effect of monetary policy on the share market, through bank credit from money changes. A review of Federal Open Market Committee (FOMC) meeting transcripts shows that the Fed officials are often concerned about the possible impact of policy actions on the share market and the resulting effects on consumption and investment.

Therefore, policy makers are keen to understand what determines the magnitude of the significant cyclical variation in the impact of monetary policy on share prices. In these studies, the size of the response of share returns to monetary shocks is more than twice as large in recessions and tight credit conditions than in good economic times.

In the finance literature share valuation model, macroeconomic forces may have systematic influences on share prices via their influences on expected discounted future cash flows. Alternatively, a study of the relations between them could be motivated using the arbitrage pricing theory (APT) model developed by Ross (1976). In the financial economics literature, the standard aggregate demand and aggregate supply (AD/AS) framework also allows for the roles of equity markets especially in the specification of money demand (Friedman, 1988). This linkage has also been labelled as the monetary transmission mechanisms (Mishkin, 1998) (please see Section 2.7). These models provide a basis for the long-run relationship and short-run dynamic interactions among macroeconomic variables and stock prices. The main emphases have generally been on asset pricing, return predictability, stock market efficiency and equity price channel of monetary transmission mechanisms.

The motivation of this thesis is to make a contribution to the literature on share market ó macroeconomic variable linkages via monetary transmission. The specific issues that we attempt to address are monetary transmission to the equity market mechanism via bank credits to share price.

1.2.1 General Framework of Equity Pricing Analysis

In an informationally efficient market, excess returns (on share price) are possible only if shares are mispriced, probably because the current price does not reflect unanticipated future growth from positive net present value, NPV, projects or a sudden change in interest rate policy leads to changed corporate investments. In the 1940s and 1950s, prior to the development of the Capital Asset Pricing Model, the dominant paradigm for estimating expected returns presupposed that the return that investors required of an asset depended on the manner in which the asset was financed. There was a cost of equity capital and a cost of debt capital and the weighted average of these costs ó based on the relative amounts of debt and equity financing ó representing the average cost of capital. A popular method of estimating the cost of equity is the Gordon and Shapiro (1956) moden0" k p " kv. " kh " c " hkt o øu " g z r g e v g f " f k x k f g p f " r g t " u j c t g " v q " infinity is D , and the share price of the firm is P , then the cost of equity capital r is the dividend yield plus the dividend growth rate: $r = D/P + g$. However, Modigliani and Miller have shown that in a frictionless world, the value of the firm does not depend on how it is financed. This means the cost of equity capital is likely determined by the cost of capital of the assets rather than the other way round.

While the most common aspect of equity valuation is their payment of dividends, another typical characteristic is that the holders of the equity own a portion of the firm,

and this ownership can be of value. The book value of the firm, which represents a

enck o " qp" vjg" hkt o øu" cuugvu." o c {" dg" o qtg" ko rortant to the shareholder than a token dividend. In the broadest sense, ownership of a stock gives the holder a claim on the assets of the firm and all cash flows that these assets might generate. The value of the share should be worth at least the current book value per share since this amount represents a claim against existing assets. This accounting model is so well known that it need not be defined here: (Ohlson, 1995).

The works of Gordon and Ohlson on equity valuation are widely recognised as the theoretical literature for equity valuation. It indicates that the current price of a security (P) is a function of a number of variables, $P = f(D, G, V, L, S)$, where D is dividends, G is growth in dividends (or earnings), V is variability of earnings, L is leverage and S is size.

The market system can be described as

$$(v_1, \dots, v_n) = f(x_1, \dots, x_m) \quad (1.1)$$

where v_i , ($i = 1, \dots, n$) are the values of the assets whose values are determined by the market, and x_j ($j = 1 \dots m$) are the stimuli variables that influence the values.

Lintner (1969) has defined these stimuli varicdngu" cu" dgkpi" vjg" kpfkxkf wcnøu risk aversions, assessments both of the mean and variance of future prices, and wealth. To date, the main focus of the empirical researcher in the field of finance has been to determine what measurable quantities would serve either as proxies or determinants of these stimuli.

The empirical literature has focused nearly exclusively on various formulations of the set of stimuli variables. The major thrust has been the testing of whether past and/or present dividend and/or debt policies have been significant in their effect upon the assessments of future values and thus upon present security values. Nearly all emphasis has been in the formulation of the stimuli variables, while the reaction variable has appeared in the published literature solely as a transformation of a single firm's value such as share return.

Many of the earlier models on equity pricing are premised on an ideal (perfect) capital market as conditioned by: i) Capital markets are frictionless (no taxes and transaction costs); ii) all market participants share homogeneous expectations; iii) all market participants are atomistic so they are price takers; iv) expected returns are fixed and known; v) the market is in equilibrium. This led to the next stage of research on evaluating the impact of market imperfections (such as taxes and bankruptcy costs) upon the financing and distribution problems. Indeed, many of the interesting areas of finance necessitate the study of capital markets which are imperfect (bid-ask spread effects, non-marketable assets such as human capital, and anomalies such as events, value effect, firm size, day of week effect and momentum). This led to the CAPM, and with simpler assumption, still later it led to the Arbitrage Pricing Theory (Ross, 1976).

Investors are also expected to behave rationally, which implies that investors seek to maximize a utility function over a number of arguments. It is expected that irrational investor would lose out to rational investors, so that in the long run equilibrium, the rational investors' actions would dominate. This irrationality assumption is relaxed in the works of Summers (1986), Black (1986), deBondt and Thaler (1985), Shefrin and

Stratman (1985), and new pricing models have been developed to take into account irrational or noise traders in the equilibrium pricing relationships (DeLong et al., 1987).

The general problem for the empirical researcher in finance is the specification and estimation of the following structure:

$$(v_{1j} - \beta_j x_j) = f(\beta_1, \dots, \beta_m) + \epsilon_j \quad (1.2)$$

where v_{1j} is the return on security j , x_j is the vector of variables used to explain the return, $f(\beta_1, \dots, \beta_m)$ is the regression function, and ϵ_j is the error term. $j = 1, \dots, m$.

The issue that this thesis focuses on is whether the specification of (1.2) should be such that j is univariate (as in ordinary cross-sectional least squares regression) or is multivariate (to be expanded into a system of equations). The bivariate relation between security prices and accounting earnings is one of the most explored areas of accounting and finance research. A variety of models have been proposed to characterize this relationship with either security returns (e.g., Ball and Brown, 1968) or earnings (e.g., reverse regressions) as the dependent variable. Despite the variety of specifications, one common feature shared by these prior studies is the adoption of a single-equation estimation approach and most such studies focused on risk that is priced in the market. There may be factors that accounted for substantial return co-movements like macro variables but those are not priced. Although these non-priced factors do not determine the average returns, they are nonetheless important for investors who wish to control portfolio risk.

The model developed and tested in this thesis views three items as involved in this relation: cross-sectional asset price changes, money supply and liquidity changes, all of them as being jointly determined. Hence, the popular approach in finance of treating the asset prices as formed by stimuli variables mostly by financial factors can be expanded to include the real sector and the monetary sector variables as being linked together. This represents a new approach to understanding the bivariate price earnings relation and thus econometrically captures two important features.

First, share price changes, money supply changes and liquidity changes are each influenced by factors that do not affect the others. Second, share price changes, money supply changes and liquidity changes are jointly influenced by a set of informational variables that are difficult to specify explicitly. As a result, the traditional single equation approaches potentially suffer from under-identification and partially biased formulae. Empirical tests for endogeneity indicate that share price changes, money supply and liquidity changes act as if they are endogenously determined. A system of simultaneous equations is introduced to mitigate this biasness. This thesis expects that the sensitivity coefficients of money supply, liquidity and share price return obtained from this approach will be larger than those obtained from single-equation approaches (cross-section or pooled time series).

For many years, the economic impact of changes in the money supply has been debated in academia. Research by Brunner, Friedman-Schwartz, Tobin and others has established that a relationship exists between changes in the money and changes in the prices of other assets held in an investor's portfolio. Economists disagree about appropriate response of monetary policy to such asset price booms (Bordo and Wheelock, 2004). Some argue that financial markets are inherently volatile and that

market prices often stray from fundamentals, suggesting that policy makers could improve welfare by deflating asset price booms, especially if sudden asset price declines are likely to depress economic activity (Bordo and Wheelock, 2004). Other economists claim that financial markets process information efficiently or that policy makers usually cannot determine when assets are mispriced and, hence, that they cannot enhance aggregate welfare by reacting to asset price movements (on EMH). These episodes have fascinated researchers and their research into these phenomena have yielded important information about the transmission mechanism of monetary policy to asset prices, financial markets and asset price booms. Generally, there has been wide agreement among economists that changes in the quantity of money have important influences on the movement of share prices (assets).

1.2.2 Efficient Market Hypothesis, Portfolio Theory and Capital Asset Pricing Model (CAPM)

The financial models discussed above serve as the precise statements or models of market fundamentals in finance. An important issue in financial markets is the relationship between market prices and fundamental values. Do market prices reflect fundamental value only? If there are deviations from fundamental value, are the deviations large? Does the market incorporate all relevant information in forming expectations that determine fundamental value? A related issue, which has been studied extensively over the last 30 years, concerns the informational efficiency of financial markets. If financial markets do not incorporate all relevant information in the formation of expectations, traders can act to earn arbitrage profits or excess profits on the basis of other available information. However, the availability of this information does not account for or define the relationship between market prices and fundamental value.

It is possible to have markets in which all information is reflected in current prices ó that is, expectations are formed rationally ó and the market price can still deviate substantially from fundamental value. The literature on the January effect, the size effect and the price-earnings ratio effect is considerable. The principal findings are that stock returns tend to be high in January for small stocks, and a trading strategy based on price-earnings ratios (buy shares with the lowest price-earnings ratio) can outperform the market. DeBondt and Thaler (1985, 1987) and Lehmann (1990) have presented profitable trading strategies that suggest overreaction in the stock market.

According to Fama (1970), efficient market hypothesis means that securities prices reflect information. Fama made a distinction between three forms of EMH: (a) the weak form, (b) the semi-strong form, and (c) the strong form. However, it is the semi-strong form of EMH that has formed the basis for most empirical research.

The strong form suggests that securities prices reflect all available information, as well as available private information. Seyhun (1986, 1998) provides sufficient evidence that insiders profit from trading on information not already incorporated into prices. Hence the strong form does not hold in a world with an uneven playing field. The semi-strong form of EMH asserts that security prices reflect all publicly available information. There are no undervalued or overvalued securities and thus, trading rules are incapable of producing superior returns. When new information is released, it is fully incorporated into the price rather speedily. The availability of intraday data enabled tests which offer evidence of public information impacting share prices within minutes (Patell and Wolfson, 1984, Gosnell, Keown and Pinkerton, 1996). The weak form of the hypothesis suggests that past prices or returns reflect future prices or returns. The inconsistent performance of technical analysts suggests this form holds.

While the semi-strong form of EMH has formed the basis for most empirical research, recent research has expanded the tests of market efficiency to include the weak form EMH. There continues to be disagreement on the degree of market efficiency or inefficiency. This is compounded by the joint hypothesis problem. Tests of market efficiency must be based on an asset-pricing model. If the evidence is against market efficiency, it may be because the market is inefficient, or it may be that the model is incorrect.³

The foundations for the development of asset pricing models were laid by Markowitz (1952) and Tobin (1958). Early theories suggested that the risk of an individual security is the standard deviation of its returns ó a measure of return volatility. Thus, the larger the standard deviation of returns, the greater is the risk of an asset. An portfolio of securities, the portfolio. In the landmark portfolio theory of Markowitz (MPT), the concept of diversification was operationalised using portfolio variances and co-variances between pairs of constituent securities. Markowitz was the first to develop a specific measure of portfolio risk and to derive the expected return and risk of a portfolio. The Markowitz model generates the efficient frontier of portfolios and the investors are expected to select a portfolio, which is the most appropriate for them, from the efficient set of portfolios available to them. Tobin (1958) suggested a course of action to identify the appropriate portfolios among the efficient sets.

³ However, Fama (1991) expanded the concept of the weak form to include predicting future returns with the use of accounting or macroeconomic variables. The evidence of predictability of returns provides an argument against the weak form.

Y jkng" rqtvhqkq" vjgqt{ " fgcnv" y kvj" vjg" kpfkxkfwcno" rqtvhqkq" fgekukqp, it provided the intuition and the basis for an equilibrium asset pricing model ó the capital asset pricing model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966). The MPT did not provide a pricing model as its scope was limited to normative prescriptions as to how an investor should operate in order that a risk averse, wealth maximizer might maximize his or her utility. Sharpe (1964) developed a computationally efficient method, the Single Index Model, where the return on an individual security is related to the return on a common index. The common index may be any variable thought to be the dominant influence on stock returns and it need not be a stock index (Jones, 1991). By identifying risks with the dispersion of returns, it is possible to develop mean variance efficient sets with the introduction of risk-free borrowing and lending opportunities, resulting in a separation theorem, which can be derived in mean-standard deviation space. The capital asset pricing model assumes that all investors maximize utility of terminal wealth defined over the mean and variance of portfolio returns and that all investors have unconditional homogeneous expectation of means variances and co-variances. The capital market is assumed to be perfect.

Essentially, the only risk that is priced at equilibrium in the capital market is covariance or systematic risk (risk that cannot be diversified away). A feature underlying many finance theories is that the reward or expected return is a linear function of several risk factors, following the general specification in (1.2). Since much of the essence of finance dealt with risk and its interaction over time, this became the focal point of asset pricing theories in an efficient market neglecting to study the link asset prices have to i) real economy and ii) monetary aggregates. Thus, a wide class of financial models are of the form:

$$R_i = R_f + \beta_1 (R_j - R_f) + \beta_2 (R_{j+1} - R_f) \dots \dots \quad (1.3)$$

These are models that are based on: i) theoretical economic considerations (market equilibrium pricing model) and ii) models that are empirically derived as in Fama and French (1994) (*ad hoc* empiricism): R_i = security i; R_j = factor index; R_f = risk-free rate

The capital asset pricing model (CAPM) developed by Sharpe (1964), Lintner (1965) and Mossin (1966) relates the expected rate of return of an individual security to a measure of its systematic risk. The CAPM has become an important tool in finance for assessment of cost of capital, portfolio performance, portfolio diversification, valuing investments and choosing portfolio strategy among others. The last half-century has witnessed the proliferation of empirical studies testing the validity of the CAPM. A growing number of studies found that the cross-asset variation in expected returns could not be explained fully by systematic risk alone. Because of the failure of market beta alone to explain all cross-sectional variation in security returns, multifactor models emerged. These models incorporate fundamental variables such as size and price-to-earnings ratio in addition to the market beta. Therefore, a variety of models has been developed to predict asset returns.

Theoretical models include the general equilibrium (macro and micro) pricing theories, the Sharpe-Lintner CAPM, Ross's arbitrage pricing theory, Merton's intertemporal CAPM, and Breeden's version of the consumption-based CAPM. The principal results of these models are expressions for equilibrium expected returns, and none of them directly addresses the problem of determining equilibrium asset prices. In fact, these models provide very little insight into the determination of equilibrium asset prices. Take, for example, the Sharpe-Lintner CAPM; its basic result is the

following statement about equilibrium expected returns: $E(R_i) = R_f + \beta_i (E(R_m) - R_f)$, where the expected return on the market and the risk-free rate are determined outside the model. The empirical ones (Market Based Research) include multi-factor models and Fama-French model of Momentum Trading.

1.3 Usefulness and Significance of Study

The pricing of assets such as shares and bonds that trade in the capital market is one of the most important areas of finance and investment disciplines that affects the economic lives of both individuals and organizations. Therefore, the findings of this research especially on the causal impact that monetary growth has on fluctuations in share prices and the significance of these fluctuations on real activity, ought to have years after the GFC, policymakers have been confronted with unusual developments in share prices, during strong booms and busts, making it more important to understand what determine share price movements, to interpret the message they contain about the future and to incorporate them into policy decisions. We intend to study the major markets, namely the G-7 markets since these markets are known to be efficient, so that we may add other efficient markets, if feasible.

The outcome of this study can change (i) the way in which central banks conduct their monetary policies with different monetary framework, (ii) individual and institutional investors make investment decisions, (iii) the process that mutual funds select their portfolio managers and investment advisors, and (iv) capital budgeting and capital expenditure decisions of public corporations. These changes in turn could lead to

significant changes in the resource allocation, potential outputs and composition, and in the employment structure of the economy.

The outcome of this study can also assist investors and portfolio managers to identify the state of the share market and make appropriate investment decisions from a top-down approach in asset selection. The top-down approach based on current knowledge could be improved by the linked models used in this thesis and tested in this thesis. Performance measurement is especially important in mutual fund performance disclosures; and the outcome of this study can provide the real sector or monetary sector impact on mutual fund performance to assess performance in connection with the amount of risk taken.

1.4 Organization of Thesis

The objectives of this thesis are (i) to contribute to the body of knowledge about asset pricing, in particular the role of macroeconomic variables of money supply and liquidity for asset price formation using a 3-equations model and (ii) to conduct robustness tests about causality, response (coefficients) and effect propositions found in the mainstream finance literature.

All data for variables are downloaded from the Datastream database and the macroeconomic variables are verified against the International Financial Statistics (IFS) database of the International Monetary Fund (IMF) for consistency to ensure that there are no errors. The empirical analysis is conducted using quarterly data for different sample periods. It is important to note that income is included as an explanatory variable in some models specified here. Real gross domestic product

(GDP) is used as a proxy for income and only quarterly data is available for income. This thesis hopes to make a modest original contribution to the financial economics literature using more recent statistical techniques, such as system of equations, VAR, VECM, panel modelling and cointegration to obtain more accurate and robust test results hitherto not possible. The newer methods are likely to yield more robust test statistics for a comparison to earlier studies done by researchers.

In Chapter 2, the reader will find a survey of a literature review on asset pricing theories beginning with dividend, earnings, and the inclusion of more macro factors such as money supply, liquidity, industrial production index, GDP and inflation in multifactor models. The survey will end with a discussion of the transmission mechanism of money to share prices. Chapter 3 is a summary of the monetary institutions, policies and regimes in each of the G-7 countries. The research questions, hypotheses, methodology and models are developed in Chapter 4. A description of the data used in this thesis is also provided in this chapter. Chapter 5 is devoted to the discussion of the results of the empirical tests. It presents summary results obtained from cointegration and vector error-correction models to determine whether money supply is exogenous or endogenous. Prior to doing those two tests, the stationary property of the variables is examined and the results discussed and presented.

Chapter 6 contains the detailed results of the model developed in Chapter 4, which tests the effects of the money supply on the share price index. Panel unit root test are performed and the results analysed to examine whether the variables are stationary. A description of the panel cointegration tests and the results are also included in this chapter. Vector error-correction models are determined if the variables used in the

simultaneous equations model developed in Chapter 4 cause the endogenous variables.

Results of the robustness tests are also included in the chapter.

The thesis ends in Chapter 7 with a summary of the main findings to show the linkage of these findings. The chapter also identifies the limitations of this research and the scope and avenue for future research.



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