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Stock Market Development and Macroeconomic Performance in Thailand

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Rapid development of financial markets particularly stock markets has been a main feature of many emerging markets. The conventionally held view, which has a basis in the seminal work of Schumpeter (1911), is that the stock market development is beneficial to the economy since it provides liquidity and an avenue for risk sharing and diversification, allows efficient allocation of resources to productive investment, reduces information and transaction costs and, consequently allows firms to undertake profitable investments. This view has been supported by various early empirical studies noting a positive relation between stock market development and economic growth. It has also been supported by recent studies utilizing advanced time series econometrics and finding the causal influences of stock market development on economic performance. Still, against this view and empirical evidence, some have also noted potential detrimental effects of stock market development through saving reduction, facilitation of counterproductive corporate takeovers, attraction of speculative inflows and reversal of financial capitals.

The questions as to whether the stock market development influences macroeconomic performance and whether it can be employed as a development policy strategy are particularly relevant for emerging or developing economies. Over the past years, these economies have attempted to promote their stock markets with the objective of improving resource allocation and, consequently, of propelling their economic growth. However, after especially the liberalization of their financial markets, they have been exposed to sharp swings and wide fluctuations of their market performance, which may have inflicted detrimental impacts on macroeconomic performance. In this regards, the 1997/1998 Asian crisis, which started in Thailand and propagated to other Asian economies, is a good example.

In looking at whether stock market development contributes to macroeconomic performance, existing studies have mainly looked at the relation between stock market development indicators and measures of economic performance using a linear regression model or has ascertained the causal relations that run from the stock market development indicators to macroeconomic variables using such approached as Granger causality, vector error correction modeling (VECM) and vector autoregressive modeling (VAR). While it is essential to document a strong relation between them, the linear regression model is not sufficient to establish causation. Moreover, the employment of a dynamic model such as the VAR or VECM and the finding of a causal pattern that runs from the stock market development to economic growth are not sufficient for policy prescription. This stems from the fact their relation or causal influences may shift due to the shift in regimes, signifying that the stock market development cannot be employed as a policy variable. In short, their relations are the subject of the well-known Lucas critique.

In this paper, we utilize a 4-variable framework and quarterly data from 1993 to 2007 to examine the stock market and macroeconomic performance relation for Thailand. To this end, we first evaluate the causal patterns between a measure of stock market development and measures of macroeconomic performance, which is essential to evaluate whether stock market development 'causes' growth. Then, we assess whether the relations between the two main variables, i.e. measures of stock market development and macroeconomic performance, are structurally invariant to policy shifts. Hence, in addition to using standard time-series econometrics of cointegration and vector autoregressions (VAR), we alo examine within the error correction setting the superexogeneity of the stock market development. More specifically, to make a strong case for promotion of the stock market as a development strategy, the stock market development must be superexogenous since their relationship is structurally invariant to policy shifts and, accordingly, circumventing the famous Lucas critique in making policy recommendation.

The cointegration test results suggest the presence of a long run relationship among the variables, namely, real gross domestic product (GDP), market capitalization ratio, investment ratio, and the aggregate price level. Further, the impulse-response functions and variance decompositions simulated from the estimated VAR models clearly indicate positive and sizeable contributions of stock market development to real GDP as well as investment ratio. Finally, the superexogeneity test indicates that the stock market development is superexogenous in the system. Thus, the relation between economic development and stock market development is structurally invariant to policy shifts. In the case of Thailand, there is a strong case for policy prescription to promote the development of its stock market as a catalyst to economic growth.

Keywords: *Stock Market Development, Economic Growth, VAR, Superexogeneity, Thailand.*

Introduction

The role of financial markets in fostering macroeconomic performance has been well-stated in the literature. Arguably, the financial markets enhance economic performance through various channels. The

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financial markets allow investors to allocate their resources or savings to productive investments (Greenwood & Smith, 1997) and reduce information and transaction costs (Levine, 1997) and, consequently, make more funds available for investments. In addition, they also alleviate liquidity risk and allow risk sharing. Given that most investors are risk averse, they tend to prefer to hold liquid assets instead of locking in their capital in long term investments. In this regards, the financial markets provide liquid assets such as liquid bank deposits and easily tradable shares to investors and, through effective fund pooling, they provide an avenue for risk sharing and diversification (Enisan and Olifisayo, 2009). In the process, firms are able to undertake profitable investments through continual access to financial capital (Mazur and Alexander, 2001) and improve productivity through greater specialization of resources (Saint-Paul, 1992).

Recognition of these benefits has led many developing nations to develop their financial markets with the recent focus on stock markets as a catalyst to long term growth. However, the recurring financial crises in many part of the world have raised concern that the stock markets can also have adverse bearings on economic performance. A case in point is the 1997/1998 financial crisis in East Asia. Prior to the crisis, the development of stock markets in crisis-hit countries such as Indonesia, Malaysia, the Philippines, South Korea and Thailand had been impressive and in parallel with their economic development. However, following the stock market collapses in 1998, these economies recorded drastic drop in their real activities. The heightened stock market volatility in these markets as compared to the developed markets has also been noted to indicate destabilizing speculation and, accordingly, override any potential benefits of stock market development (Ibrahim, 2007). The detrimental effects of stock market development are further stressed by Devereux and Smith (1994), Shleifer and Summers (1988) and Singh and Weiss (1998). Respectively, they stress the effects of stock market in reducing savings, facilitating counterproductive corporate takeovers, and attracting speculative inflows and reversals of financial capitals.

The purpose of this paper is to empirically examine this issue by focusing on the experience of Thailand, a country first hit by the Asian crisis. In the first quarter of 1993, the market capitalization of the Stock Exchange of Thailand (SET) was approximately 1,494.5 billion baht and, by the end of 2007, it climbed to 6,636.1 billion baht[1]. With this progress, the SET is viewed as one of the largest emerging markets in the region (see also Jirasakuldech et al., 2008). However, the market capitalization recorded drastic drop during the 1997/1998 Asian financial crisis and slight decline at the beginning of the 21st century. At its peak in the first quarter of 1996, the market capitalization was at 3,665.2 billion baht. Then, it dropped steadily to its lowest point at 898.6 billion baht in the third quarter of 1998 before it picked up again towards the current level. Over 1993-2007, the market also witnessed wide swings in its market index especially during the Asian financial crisis. Under this backdrop of market uncertainty, it would thus be interesting to examine whether the stock market development plays a crucial role in Thai economic performance or its potential benefits are dwarfed by excessive market risk.

Early analyses of finance – growth relations relied on cross-country regressions (see, for instance, Atje and Jovanovic, 1993 and Levine and Zervos, 1998). Based on the argument that the influence of financial development on economic performance is country-specific as well as on the need to disentangle their causal patterns, recent studies have adopted time series analyses of specific countries via principally a vector autoregression (VAR) framework. In the present analysis, we follow the convention by adopting standard time-series econometrics of unit root, cointegration and the vector autoregression (VAR) model to examine dynamic interactions between stock market development and real activity in Thailand. Then, to add credence to our analysis, we also address the issue of exogeneity in the stock market – economic performance relation. In the next section, we briefly review related literature. Then, we detail data and empirical approach. Estimation results are discussed next. The final section summarizes the main findings and provides concluding remarks.

Review of the Literature

The importance of the financial system in economic development hinges on the seminal work of Schumpeter (1911) and later Goldsmith (1969), McKinnon (1973) & Shaw (1973). While the predominant focus in the empirical literature is on measures of banking development such as monetary ratio and credit ratio and their relations to economic performance, some studies have also examined the development role of stock markets. Below, we provide illustrative studies that focus on the role of stock market development solely or in conjunction with banking sector development.

Early cross-country studies tend to provide affirmative evidence that the development of stock markets is critical for economic progress. Among them include Atje & Jovanovic (1993), Levine & Zervos (1996, 1998), Harris (1997), Rousseau and Watchel (2000) and Beck & Levine (2002). These studies have emphasized strong positive correlations between measures of stock markets, such as stock market size and liquidity, and economic growth. Moreover, some have hinted that stock market development may be important for certain groups of countries. For instance, Harris (1997) concludes that the stock markets tend to promote growth in developed countries. Meanwhile, Levine and Zervos (1998) note the relation between measures of economic activity and stock market liquidity to be particularly strong in developing countries.

With the need to disentangle the causal directions between finance and growth and the arguments that their

[1] SET market capitalization data are obtained from the Stock Exchange of Thailand website (www.set.or.th).

relations may be country-specific, some recent studies have subjected the analyses to experiences of individual countries. The time-series evidence based mostly on vector autoregression (VAR) framework, however, is not unequivocally supporting the finance-led growth thesis. Arestis et al. (2001) examine the role of stock markets on economic growth in five developed markets, Germany, the United States, Japan, the United Kingdom and France. In addition to stock market development measures, they also include measures of banking sector development and market volatility. Their results suggest the relative dominance of the banking sector development as compared to stock market development in their long run relations with economic performance. However, they do note the significant, albeit small, contribution of stock market to output growth in France, Germany and Japan. However, in the case of New Zealand, Mazur and Alexander (2001) find no significant role of stock market development on the level of real output. More recently, Dritsaki and Dritsaki-Bargiota (2005) examine the causal pattern between credit, stock market and economic development for Greece. They find evidence that the stock market development tends to follow credit market and economic development.

Some recent studies have also focused on emerging or developing economies. Notable among them are Kassimatis and Spyrou (2001), Caporale et al. (2005), N'zue (2006), Ibrahim (2007), and Enisan and Olufisayo (2009). Kassimatis and Spyrou (2001) examine the contribution of stock and credit market expansion to economic development in five emerging markets – Chile, India, Mexico, South Korea and Taiwan. They document the presence of long-run relations between measures of stock market, credit market and economic development in all countries. More importantly, they note positive contribution of the stock market development to the economic performance of Chile, Mexico and South Korea. While the stock market capitalization and real industrial production are independent in India, they are negatively related in Taiwan with a causal relation running from the former to the latter. Caporale et al. (2005) examine the causal pattern between real output, stock market development, and investment or investment productivity for four emerging markets – Chile, Korea, Malaysia and the Philippines. The evidence tends to support the finance-led growth from the stock market perspective in these countries. They further point out to the importance of investment productivity as a transmission channel from stock markets to economic growth in the long run.

Analyzing the relation between stock market and economic development for Côte D'Ivoire, N'zue (2006) documents evidence for their cointegration or long run relation particularly when their relation is framed in multivariate setting. He further notes long-run feedback effects between the two variables and short-run unidirectional causality from stock market development to real activity. Ibrahim (2007) further contributes to the subject by examining the experience of Malaysia using standard time-series econometrics. The findings tend to suggest the importance of the financial markets particularly the stock market in explaining Malaysia's macroeconomic performance. Most recently, Enisan and Olufisayo (2009) attempt to uncover the long run relation and causal nexus between stock market development and economic growth in seven sub-sahara African countries - Côte D'Ivoire, Egypt, Kenya, Morocco, Nigeria, South Africa, and Zimbabwe. Using the ARDL bounds testing procedure, they note the presence of cointegration in only Egypt and South Africa. Moreover, in a VECM setting, the finance-led growth hypothesis is further supported for the two countries. Finally, estimating VAR in first differences for the remaining countries, they note bi-directional causality between stock market development and economic performance for all cases except Nigeria.

The evidence from the aforementioned studies seems suggestive of the positive role of stock market development in the growth process of especially emerging markets. In the present paper, we extend the analysis to the case of Thailand, a country first hit by the Asian crisis. While the existing studies stop at examining the causal dynamic interactions between the variables under consideration, we append these conventional analyses with superexogeneity tests such that we can address the policy prescription based on finance-led growth in a satisfactory manner.

Methodology and Data

The focal variables in the analysis are measures of economic and stock market developments. We use real gross domestic products (GDP) as a measure of the level of economic development and market capitalization as a ratio of GDP (MC) to reflect the level of stock market development. The relations between these two variables are framed in multivariate setting by including other controlled variables to avoid possible omitted variable bias. The controlled variables that we employ are the investment to GDP ratio (INV) and the aggregate price level as measured by the GDP deflator (P). According to Levine and Renelt (1992), among various variables considered, the share of investment in GDP has a positive and robust relationship with economic growth. Moreover, as argued by Alexander (1997), the omission of this variable in many growth studies is not justifiable on theoretical grounds. In our context, including the investment ratio allows for the indirect relation between stock market development and economic development, i.e. via firms' investment[2]. The inclusion of the aggregate price level is based on various works that attempt linking inflation to economic growth (see, for instance, Ericsson et al., 2001 and Gillman et al., 2004). We take the price level to reflect monetary condition or macroeconomic uncertainty, which may play an intermittent role in the stock market – economic development relations. Thus, our framework contains four variables – real GDP, market capitalization ratio, investment ratio and the

[2] Various studies have directly evaluated the relation between private investments and stock markets. Among them include Durham (2002) and Laopodis (2009).

aggregate price level. These variables are expressed in natural logarithm.

The dynamic causal relations among these variables are assessed via a vector autoregression (VAR) framework. As imperative, we precede the VAR estimation with analyses of the variables' integration and cointegration properties. Briefly, a variable is classified according to the number of times differencing is needed for it to achieve stationarity. If a variable requires differencing d times to attain stationarity, it is said to be integrated of order d. This means that a variable integrated of order 1 or higher is non-stationary. Then, a set of non-stationary variables is said to be cointegrated or share a long run relation if their linear combination is stationary. In the analysis, we apply the commonly used augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests to determine the variables' stationarity property or integration order. As regards to cointegration, we implement the maximum likelihood approach to cointegration test developed by Johansen (1988) and Johansen and Juselius (1990).

Based on integration and cointegration test results, we proceed to VAR model estimation. Denote X = (GDP, MC, INV, P), the VAR model is written in levels as:

$$X_t = A_0 + \sum_{i=1}^{p} A_i X_{t-i} + e_t \qquad (1)$$

where A_0 is a 4×1 vector of constant terms, A_i is a 4×4 matrix of coefficients, e_t is a 4×1 vector of error terms, and p is the optimal lag order set to render the error terms serially uncorrelated[3]. From the estimated VAR, we simulate impulse-response functions (IRF) and variance decompositions (VDC) as a basis for inferences. The impulse-response functions trace temporal responses of a variable of interest to its own innovations and innovations of other variables in the model. Thus, from the IRF, we can note temporal responses of real activity (GDP) to innovations in stock market development (MC) and vice versa. Meanwhile, the VDC attribute the variable's forecast error variance to shocks in other variables and, accordingly, allow us to assess the relative importance of stock market development in accounting for variations in economic performance and vice versa. Based on these, inferences on causal patterns between the variables can be made.

We adopt Sims' (1980) strategy by using the so-called Cholesky orthogonalization to generate IRF and VDC. It needs mentioning that, given the recursive structure of shocks in the Cholesky orthogonalization, IRF and VDC simulation requires pre-specified causal ordering of the variables. A variable ordered first in the ordering is viewed to respond to other variables with lags while a variable ordered second responds contemporaneously to the first-ordered variable and with lags to the remaining variables. Needless to state, a variable ordered last is most endogenous since it reacts contemporaneously to other variables in the system. Based on these, our ordering of the variables is GDP, P, INV, and MC, which we believe to be sensible. At the same time, we append this strategy with the analysis of residuals' contemporaneous correlations. This is important as the results of IRF and VDC will only be marginally affected by the variables' ordering if these correlations are low or insignificant.

To add further credence to our analysis, we also address the weak exogeneity and superexogeneity of stock market development variable in accounting for macroeconomic performance. While the IRF and VDC can provide insight on the causal relations between stock market development and economic performance, they may not be sufficient for policy analysis (Yang and Yi, 2008). Hoover and Perez (1994a, 1994b) note the need to look at what is termed as "control causality", a concept parallel to superexogeneity defined by Engle et al. (1983).[4] Indeed, to make a strong case for stock market development as a catalyst to growth, it needs to be superexogenous since the relationship between real output and stock market development is structurally invariant to policy shift. Otherwise, the Lucas (1976) critique applies. That is, policy recommendations based on econometric estimation using past data and assuming constant parameters are suspicious (Engle et al., 1983).

The exogeneity test is straightforward and can be implemented in a cointegrating framework by focusing on the significance of the error correction term (Urbain, 1992 and Harris, 1995). More specifically, as noted by Johansen (1992), to ascertain whether the stock market development is exogenous, we need to test the significance of the error correction term in the stock market equation. The recent work by Darrat et al. (2000), to which we follow, applies this approach in looking at the export-led growth hypothesis for Taiwan. Thus, we estimate the following error correction model for stock market development:

$$\begin{aligned} \Delta MC_t &= \alpha + \sum_{i=1}^{p1} \beta_i \Delta GDP_{t-i} \\ &+ \sum_{i=1}^{p2} \phi_i \Delta INV_{t-i} + \sum_{i=1}^{p3} \varphi_i \Delta MC_{t-i} \\ &+ \sum_{i=1}^{p4} \theta_i \Delta P + \lambda_1 EC_{t-1} + e_t \end{aligned} \qquad (2)$$

where Δ is the first-difference operator and EC is the error correction term. In implementing (2), we set the maximum lag-order to 4 and apply the general-to-specific procedure by sequentially deleting insignificant lags. Then, following Darrat et al. (2000), we subject the final model to various diagnostics tests to first evaluate the model adequacy.

Based on (2), the stock market development is said to be weakly exogenous if the error-correction term is

[3] It should be noted that the level VAR is valid in the context of cointegrated series. See the arguments given by Ramaswamy and Slok (1998)

[4] Control causality is defined by Hoover (1988, p. 173) as "A causes B if control of A renders B controllable. A causal relation, then, is one that is invariant to interventions in A in the sense that if someone or something can alter the value of A the change in B follows in a predictable fashion."

insignificantly different from zero. Then, to test for superexogeneity, we add the error correction squared in equation 2, i.e. $\lambda_2 EC_{t-1}^2$, and apply F-test for the joint significance of EC_{t-1} and EC^2_{t-1} . The stock market development is superexogenous if they are jointly insignificantly different from zero. Finally, we also apply the same procedure to the real GDP equation since the exogeneity of market capitalization does not mean real GDP is endogenous. In short, both can be exogenous in the system.

Empirical Findings

Data Preliminaries

The data are quarterly spanning the period 1993.Q1 to 2007.Q4. We obtain real GDP, investment and GDP deflator from the Bank of Thailand website (www.bot.or.th). Meanwhile, the market capitalization data are from the Stock Exchange of Thailand website (www.set.or.th), which provides market capitalization from 1993 onwards. We do not extend the sample beyond 2007 since 2008-2009 GDP are preliminary figures. All variables are expressed in natural logarithm. Table 1 provides descriptive statistics of these variables in the first difference. Despite episodes of uncertainties, such as the Asian crisis, global oil price uptrend and current global financial upheavals, Thailand exhibited an average annualized growth rate of 4.1% over 1993 to 2007. The inflation rate experienced by Thailand is considered low, recording an average rate of 3.2% per year. The market capitalization also witnessed an upward trend at the rate of 2.8% per year. However, the investment ratio dropped over 1993-2007. As should be expected, the change in the investment ratio is relatively more volatile than the GDP growth rate. Noticeable from the descriptive statistics is the high variation in market capitalization ratio, making the concern on stock market.

Table 1

Descriptive Statistics

	DGDP	DINV	DMC	DP
Mean	0.0102	-0.0099	0.0070	0.0080
Median	0.0127	-0.0017	-0.0021	0.0107
Maximum	0.0624	0.1308	0.6266	0.0470
Minimum	-0.0511	-0.1673	-0.4260	-0.0365
Std. Dev.	0.0193	0.0572	0.1989	0.0176
Skewness	-0.8695	-0.9135	0.4520	-0.3227
Kurtosis	5.8843	4.8765	4.0723	3.2699

Note: The prefix "D" denotes first difference

As a preliminary analysis, we first subject each time series to ADF and PP unit root tests and report the results in Table 2. We include both the drift and constant terms in the test equation and use the AIC for the optimum lag order in the ADF test. We may observe from the table that both tests are in agreement in classifying all variables to be non-stationary integrated of order 1. Accordingly, we proceed to the Johansen-Juselius cointegration test and provide the trace and maximal eigenvalue test statistics and 5% critical values in Table 3. In the test system, we set the lag order to 3, which we find sufficient to whiten the noise process. In addition, we also include the crisis dummy variable, taking the value 1 for 1997.Q3 and 1998.Q4, as an exogenous regressor[5]. Both statistics indicate the presence of cointegration or long run relations among the four variables. Namely, while the trace statistics suggests two cointegrating vectors, the maximal eigenvalue statistics indicates a unique cointegrating vector. Take note that adjusting the two statistics by (T – np)/T, as suggested by Reinsel and Ahn (1992), to correct small sample bias does not overturn the cointegration results. T is the number of observations, n is the number of variables and p is the lag orders. The finding of cointegration rules out non-causality among the variables in that there must be causality in at least one direction, the issue that we address next using variance decompositions and impulse-response functions.

IRF and VDC

With the finding of cointegration, we estimate a level VAR to discern dynamic causal interactions among the variables in the system. The crisis dummy variable is also incorporated in the VAR. It is pleased to note that its exclusion only further strengthens our main results. The VAR lag order is set to 4, in line with the above cointegration test, to render the error terms serially uncorrelated. From the estimated VAR, we generate IRF and VDC with the following variables' ordering: GDP, P, INV and MC. Figure 1 plots the impulse response functions while Table 4 presents corresponding variance decompositions.

Several aspects of the results are noteworthy. Note that, the impulse-response functions tend to indicate bi-directional causal relations between GDP and MC. Following innovations in MC, GDP reacts positively and significantly up to 6-quarter horizon. From the variance decompositions in Table 4, more than 40% of GDP forecast error variance is attributable to innovations in MC after 12-quarter horizon. At the same time, roughly 20% of the variations in MC is explained by GDP shocks over the same horizon. From these results, it seems that stock market development does contribute positively to growth

[5] It is pleased to note that the cointegration test results are robust to the inclusion or exclusion of the crisis dummy variable.

and, at the same time, economic progress tends to necessitate the advancement of the stock market. The important role of the stock market is further reflected by positive responses of INV to MC (Figure 1) and sizeable percentage of INV variations accounted by MC innovations, i.e. 29% after 12 quarters. It should be noted from the results that INV also contributes positively to stock market development in Thailand.

Table 2

ADF and PP Unit Root Tests

	Level		First Difference	
Variable	ADF	PP	ADF	PP
GDP	-1.803	-1.573	-4.945*	-4.928*
INV	-1.902	-1.172	-3.390**	-6.641*
MC	-1.632	-1.641	-4.598*	-8.848*
P	-2.107	-2.453	-3.738**	-7.607*

*Note: the test equations include both drift and trend terms. The lag order in the ADF test equation is based on AIC. * and ** denote significance at 1% and 5% respectively*

Table 3

Cointegration Tests

Null	**Test Statistics**		**Critical Values (5%)**	
Hypothesis	**Trace**	**Max Eigen**	**Trace**	**Max Eigen**
None	65.388	35.559	47.856	27.584
At most 1	29.829	19.068	29.797	21.132
At most 2	10.761	10.758	15.495	14.265
At most 3	0.003	0.003	3.841	3.841

Note: the lag order in the test system is set to 3, which is sufficient to render the error terms uncorrelated.

Apart from these main results, we also note bi-directional causal relation between GDP and INV, further adding credibility to our empirical results. As can be observed from Figure 1, in response to investment shocks, GDP increases. Likewise, investment reacts positively to GDP innovations. Then, while investment explains roughly 8% of the GDP forecast error variance, GDP contributes about 20% of the variations in investment after 12-quarter horizon. This causal relation should be expected as investment is considered to be significant and robust determinant of growth and GDP should stimulate investment as suggested by the accelerator model of investment. In light of the noted causal findings between INV and MC, the stock market development also plays an indirect role in stimulating economic growth via its impact on investments. Finally, we also note positive responses of the price level to innovations in GDP and MC (Figure 1). From Table 4, both tend to account for sizeable percentages in the forecast error variance of the price level. Innovations in GDP may reflect aggregate demand shocks. Meanwhile, the stock market development may have eased liquidity constraint and increased wealth. These would have resulted in upward pressure on the price level, as captured by the impulse-response functions.

To see whether our reported results may be sensitive to the chosen variables' ordering, we report the VAR residual correlation matrix in Table 5. The correlations among the error terms, i.e. the off-diagonal elements, seem low. The exception may be between INV and MC residuals, which have a correlation of 0.36. This means that the ordering between INV and MC can have potential effects on the results. Thus, we re-simulate the IRF and VDC by placing MC before INV[6]. The aforementioned results generally prevail in this alternative ordering, except the causal role that runs from INV to GDP and from INV to MC. In this alternative ordering, we document only a uni-directional causal relation from GDP to INV and from MC to INV. Central to our theme, the causal relation between GDP and MC remains robust. Based on this, the causal role of the stock market development in economic development is further substantiated[7].

Exogeneity Tests

As a final analysis to add further credence to our noted results on the significant role of stock market development in fostering economic performance, we examine the issue of whether the stock market development is superexogenous in the system. We follow the approach taken by Darrat et al. (2000) by estimating an error correction model of the stock market development as specified in (2). We fix the maximum lag order of first-differenced terms to 4 and apply the general-to-specific procedure to trim insignificant lags. The results of the error-correction model are given in Table 6, panel (a). The model passes all diagnostic tests including the LM test for serial correlation, ARCH test for autoregressive conditional heterosekadasticity, the Jarque-Bera (JB) test for the error normality, and the RESET test for model misspecification. We also check for the structural stability of the model using CUSUM and CUSUMSQ and find it to be stable (see Figure 2).

As may be noted from the table, the error correction coefficient is significant at only 10% significance level. Thus, the evidence in support of the weak exogeneity of the stock market development seems not strong. To test for superexogeneity, we incorporate the error correction term squared and test the joint significance of the error

[6] These results are not reported to conserve space but are available from the author upon request.

[7] As a further experimentation, we also simulate generalized impulse-response functions (GIRF) as suggested by Pesaran et al. (2001). The GIRF does not require a pre-causal ordering of the variables and allow all variables to contemporaneously respond to other shocks in the system. It is pleased to note that the results are qualitatively similar to the reported ones.

correction term and error correction term squared. The results are given in panel (b) of the Table. From the F test, we fail to reject the superexogeneity of the stock market development. Indeed, the null hypothesis for their joint significance can not be rejected at even 10% significance level. These tests are repeated for the real GDP equation, since real GDP can also be exogenous in the system. The evidence indicates that real GDP is not weakly exogenous and it is not superexogenous. More specifically, the t-ratio for the error correction coefficient is -2.658. Meanwhile, the joint test of error correction term and error correction term squared yields the F statistics of 4.026. These statistics are significant at 5% significance level. Thus, we can state that the relation between economic performance and stock market development is structurally invariant to policy or regime shifts. In the case of Thailand, there is a strong case for policy recommendation to further develop the stock market as a driver of economic performance.

Table 4

Variance Decompositions

	Explained by innovations in			
Period	**GDP**	**INV**	**MC**	**P**
(a) Variance Decomposition of GDP				
1	100.000	0.000	0.000	0.000
3	80.114	8.556	10.661	0.669
6	53.920	9.665	35.115	1.300
12	44.813	8.171	45.719	1.297
20	41.913	6.727	49.508	1.852
(b) Variance Decomposition of INV				
1	2.475	97.498	0.000	0.0289
3	17.209	68.662	11.162	2.967
6	16.771	57.913	23.074	2.241
12	19.818	48.088	29.180	2.914
20	20.110	46.717	28.011	5.162
(c) Variance Decomposition of MC				
1	6.922	12.768	79.768	0.395
3	19.163	13.564	66.482	0.791
6	18.279	12.709	67.605	1.407
12	19.791	12.012	66.674	1.524
20	20.366	11.827	66.304	1.503
(d) Variance Decomposition of P				
1	1.370	0.000	0.000	98.630
2	4.232	5.667	1.562	88.540
6	15.303	4.423	14.166	66.107
12	23.717	3.280	41.379	31.624
20	27.352	2.717	50.374	19.546

Note: the variables' ordering is GDP, P, INV and MC.

Table 5

Residual Correlation Matrix

	GDP	**INV**	**MC**	**P**
GDP	1	--	--	--
INV	0.1573	1	--	--
MC	0.2631	0.3973	1	--
P	-0.1171	-0.0350	-0.0932	1

Table 6

Exogeneity Tests of Stock Market Development

(a) Weak Exogeneity Test

$\Delta MC_t = -0.049 + 2.920\Delta GDP_{t-1} + 0.955\Delta INV_{t-1} - 0.676\Delta INV_{t-3} - 2.057\Delta INV_{t-4}$
(0.065) (0.033) (0.041) (0.093) (0.000)

$- 0.261\Delta MC_{t-1} + 1.655EC_{t-1}$
(0.039) (0.068)

LM(3) = 3.803 ARCH(3) = 1.942 JB = 0.758 Adjusted-R^2 = 0.3982
(0.283) (0.584) (0.685)

LM(6) = 4.308 ARCH(6) = 4.253 RESET = 0.146
(0.635) (0.642) (0.840)

(b) Superexogeneity Test

$\Delta MC_t = -0.031 + 2.676\Delta GDP_{t-1} + 0.870\Delta INV_{t-1} - 0.810\Delta INV_{t-3} - 2.084\Delta INV_{t-4}$
(0.309) (0.053) (0.065) (0.055) (0.000)

$- 0.221\Delta MC_{t-1} + 1.055EC_{t-1} - 10.505EC^2_{t-1}$
(0.090) (0.101) (0.273)

LM(3) = 4.475 ARCH(3) = 0.197 JB = 0.762 Adjusted-R^2 = 0.3262
(0.214) (0.978) (0.683)

LM(6) = 5.286 ARCH(6) = 3.437 RESET = 0.242
(0.508) (0.752) (0.786)

$F(H_0: \lambda_1 = \lambda_2 = 0) = 2.365$ (0.105)

Note: the numbers in parentheses are p-values. LM is the LM test for serial correlation; ARCH is ARCH test for conditional heteroskedasticity, JB is Jarque-Bera test for normality; and RESET is model misspecification test.

Conclusions

This paper empirically analyzes the relationship between stock market development and real activity for the case of Thailand. The analysis is framed in multivariate setting consisting of real GDP, market capitalization ratio, investment ratio, and the aggregate price level. Following the convention, it applies time series econometrics of unit root, cointegration and vector autoregressions to examine the long run relation among the variables and discern their dynamic causal interactions. In addition, we address whether the Lucas (1976) critique applies to the policy prescription based on the finance-led growth analysis by examining the superexogeneity of the stock market development. The superexogeneity tests of both stock market development and real GDP are implemented in error-correction setting.

The data are quarterly running from the first quarter of 1993 to the fourth quarter of 2007. From the analysis, we uncover the following results:

- There is a cointegrating relation that ties the four variables together in the long run.
- The IRF functions tend to indicate bi-directional causality between stock market development and real GDP. Both variables exhibit positive and significant responses to innovations in the other variables.
- This bi-directional causal pattern is further substantiated by variance decompositions, where sizeable percentage of the variations in real GDP is accounted by shocks in stock market development and vice versa.
- There is also a causal link between stock market development and investment ratio that runs from the former to the latter.
- The stock market development is found to be superexogenous in the system. Meanwhile, the superexogeneity of real GDP is rejected.

Apart from these main results, we also note the presence of bi-directional causality between real GDP and investment ratio and substantial contributions of both real GDP and stock market development to variations in the aggregate price level.

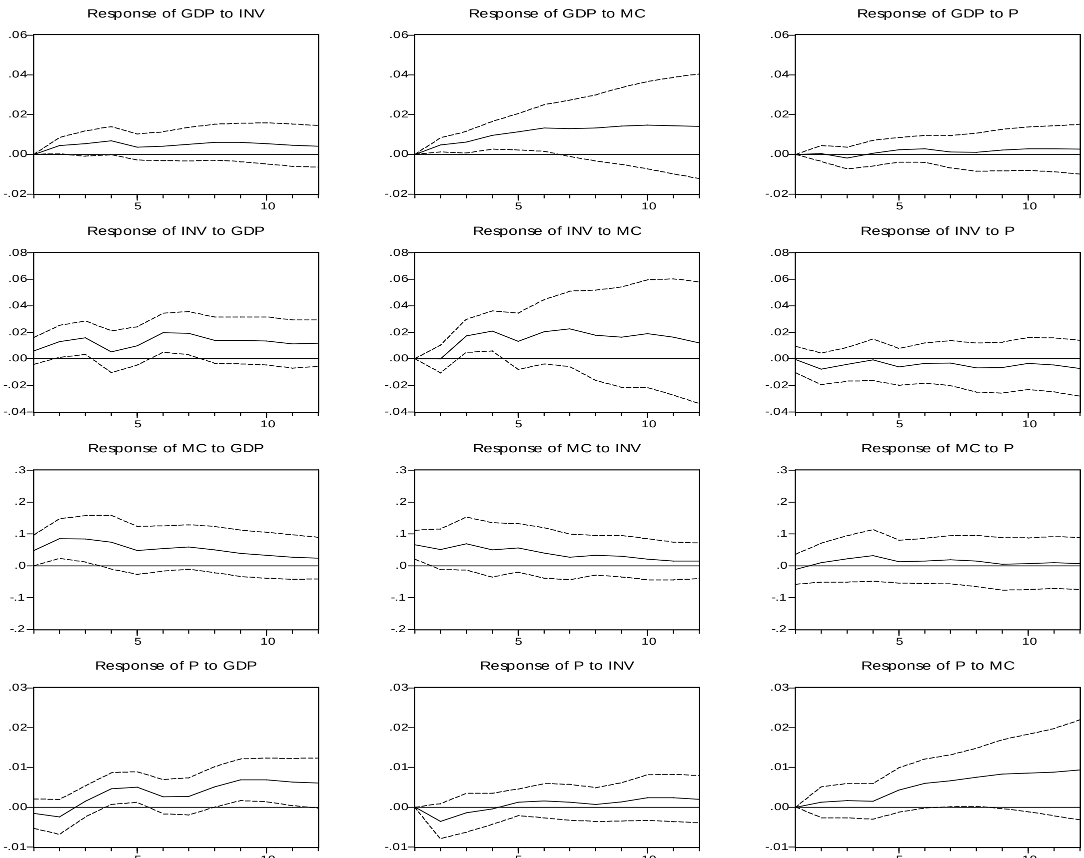

Figure 1. Impulse-Response Functions

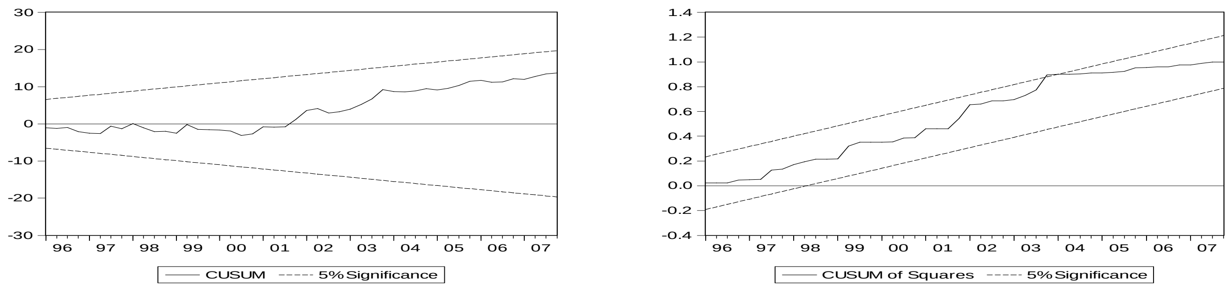

Figure 2. Stability Tests of MC Error Correction Equation

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Mansor H. Ibrahim

Akcijų rinkos ir makroekonomikos plėtojimasis Tailande

Santrauka

Spartus finansinių, ypač akcijų, rinkų plėtojimasis buvo pagrindinis atsirandančių rinkų bruožas. Įprastas požiūris, kurio pagrindai pateikti Schumpeter (1911) darbuose, – akcijų rinkos plėtojimasis yra naudingas ekonomikai, nes jis užtikrina likvidumą, rizikos mažinimą ir įvairovę, leidžia efektyviai išdėstyti išteklius produktyvioms investicijoms, mažina informaciją, operacijų sąnaudas ir sudaro sąlygas firmoms imtis pelningų investicijų. Šį požiūrį parėmė aibė empirinių tyrimų, parodančių santykį tarp akcijų rinkos plėtojimosi ir ekonomikos augimo. Šį požiūrį taip pat patvirtino pastarieji tyrimai ekonometrikoje, kurie parodė akcijų rinkos plėtojimosi įtaką ekonomikai. Tačiau buvo taip pat pateiktas akcijų biržos žalingas poveikis vykdant taupymo mažinimą, neproduktyvų atskirų padalinių perėmimą, spekuliatyvų įplaukų pritraukimą, prieštaringas finansines operacijas.

Klausimai, ar akcijų rinkos plėtojimasis veikia makroekonomikos pokyčius ir ar ją galima taikyti kaip plėtojimosi politikos strategiją, ypač susiję su besivystančiomis ekonomikomis. Per pastaruosius metus šios ekonomikos bandė pateikti akcijų rinkoms išteklius išdėstymo gerinimo strategiją, taip skatindamos ekonominį augimą. Tačiau liberalizavus finansines rinkas, šios ekonomikos patyrė didelius sukrėtimus ir rinkų svyravimus. Tai susiję su 1997–1998 m. Azijos krize, kuri prasidėjo Tailande ir išplito į kitas Azijos ekonomikas.

Stebint, ar akcijų rinkos plėtojimasis daro įtaką makroekonomikai, galima teigti, kad atlikti tyrimai buvo skirti santykiams tarp akcijų rinkos plėtojimosi rodiklių ir ekonomikos augimo priemonių pagal linijinės regresijos metodą arba šie tyrimai patvirtino spėjimus apie atsitiktinę priklausomybę tarp akcijų rinkos plėtojimosi rodiklių ir makroekonomikos kintamųjų pagal Granger modelį. Kadangi labai svarbu patvirtinti stiprią, jau minėtų aspektų priklausomybę, linijinės regresijos modelis nėra pakankama priemonė priežastingumui nustatyti. Be to, dinaminio modelio taikymas ir priežastinio ryšio tarp akcijų rinkos plėtojimosi ir ekonomikos augimo nustatymas nėra pakankamas politikai nustatyti. Tai išplaukia iš argumento, kad jų priklausomybė arba sąlyginė įtaka gali keistis priklausomai nuo režimų pasikeitimo, o tai rodo, kad akcijų rinkos plėtojimasis negali būti taikomas kaip politinis kintamasis. Trumpai tariant, jų santykis yra gerai žinomas Luko kritikos objektas.

Straipsnyje naudojama keturių kintamųjų sistema ir ketvirčių duomenys nuo 1993 iki 2007 m. tiriant akcijų rinkos santykį su makroekonomikos augimu Tailande. Šiuo tikslu pirmiausia vertinamas priežastinis ryšys tarp akcijų rinkos plėtojimosi ir makroekonomikos, nes jis yra svarbiausias vertinant, ar akcijų biržos augimas sukelia plėtojimąsi. Tada įvertinama, ar santykis tarp dviejų pagrindinių kintamųjų, t. y. tarp akcijų rinkos plėtojimosi priemonių ir makroekonomikos augimo, ir jų kitimo priklauso nuo politikos kaitos. Taikomais metodais buvo atsakyta į daugelį klausimų. Galima teigti, kad norint paversti akcijų rinkos plėtojimąsi strategija, akcijų rinkos plėtojimasis turi būti ypač atsparus politikos pokyčiams.

Integracijos testų rezultatai rodo, kad egzistuoja ilgalaikiai santykiai tarp kintamųjų, t. y. tarp bendrojo vidaus produkto, rinkos santykio, investicijų santykio ir kainų lygio. Atsakomosios funkcijos ir įvairūs neatitikimai gauti taikant modelius aiškiai rodo teigiamą ir svarų akcijų rinkos plėtojimosi indėlį į bendrą vidaus produktą ir investicijų santykį. Testai rodo, kad akcijų rinkos plėtojimasis yra ypač nepastovus visoje sistemoje. Todėl priklausomybė tarp ekonominio augimo ir akcijų rinkos plėtojimosi struktūriškai nesikeičia atsižvelgiant į politikos pokyčius. Tailando atveju politika yra smarkiai akcentuojama procesuose, kai siekiama užtikrinti akcijų rinkos plėtojimąsi kaip ekonominio augimo katalizatorių.

Raktažodžiai: *akcijų rinkos plėtojimasis, ekonomikos augimas, VAR, Tailandas.*

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