Stock Market Development and Economic Growth in Thailand: An ARDL Approach

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ABSTRACT

The goal of this research is to explore the dynamic linkage of stock market development and economic growth during the global financial crisis in a developing country, namely Thailand. The data collection spanned the years 1991 through 2020, and it included monthly time series data which was divided into three periods: the period before the crisis, which ran from January 1991 to December 2000; the period during the crisis, which extended from January 2001 to December 2010; and the period after the crisis, which covered January 2011 to December 2020. The stock market turnover ratio, stock price index, and stock market total value exchanged versus the inflation rate were used as proxies for stock market development in the study. According to the findings, we discovered both negative and positive causality in stock market expansion for short-run economic growth dynamics and long-run economic development links. Furthermore, both on a short- and long-term basis, economic expansion is revealed to be the single cause of and negative association with liquidity.

1. INTRODUCTION

Since the pioneering works of [1] and [2], who argued that the financial sector fosters economic growth through increasing physical capital accumulation, the impact of the financial sector on economic development has gotten a lot of attention, and this discovery piqued the interest of researchers. As a result, various studies have sought to determine the causality between financial market development and economic expansion. Because it fosters the mobilization of otherwise dormant resources and their conversion into valuable and productive capital, the financial market is usually seen as vital for economic growth. Nonetheless, when an economy expands, a surplus is created, which feeds the financial sector's rise. Therefore, the causality pattern of financial market development and economic expansion remains inconclusive that has to be investigated empirically [3].

Recently, the number of empirical research examining the dynamic linkage of stock market development and economic expansion has risen. However, no decision has been made. Despite the fact that the empirical evidence is significantly slanted in favor of a positive effect [4-15], some studies found the opposite effect [16-24], while others found both positive and negative effects [25-26]. There is no consensus on whether stock market development drives economic growth, whether natural sector expansion causes stock market development, or whether bidirectional causality exists.

Over the last two decades, the literature on the application of cointegration, as well as the error correction model (ECM) proposed by [27] for establishing long-run relationships among variables, has grown. To apply these approaches, first examine the order of variables integration, and if they are all I(1), then test the cointegration of these variables. However, if they are not all I(1), the regression will be erroneous. It is bogus because the regression will almost certainly show a non-existent relationship in the long run. The presence of cointegration, as is well known, indicates a long-run dynamic linkage, while ECM explores short-run dynamics [24]. This paper will employ the autoregressive distributed lag (ARDL) bounds test proposed by [28] to perform an empirical examination of the long-run relationship between stock market development and economic expansion in Thailand.

The ARDL method is used instead of other methods such as the traditional [27] and [29] cointegration tests. Because it works better in a small sample size, the ARDL is a more practical approach. The ARDL approach can also be employed regardless of the order in which the variables are integrated. To establish the long-run relationship, the ARDL method employs the bound test for cointegration. After the bound test has established a long-run dynamic link, the ARDL estimation is evaluated. Following the

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ARDL estimation, an ECM is created to determine the short-run dynamic linkage of stock market development and economic expansion. The time it takes for the dependent variable to return to equilibrium after an independent variable change is calculated using the error correction term [23].

The stock market, as an important mechanism of the financial system, serves as a vehicle for transforming savings into capital for the economy. It is also critical to the growth and development of emerging countries' economies. As a result, many developing countries, including Thailand, have developed financial markets by focusing on stock exchange development [30]. However, financial crises worldwide, such as the Asian financial crisis of 1997, have repeatedly affected many countries. In addition, the global crisis of 2008 affected the whole world negatively in terms of its stock markets and economies. In 2008, the US suffered from a subprime mortgage crisis. The impact of this crisis extended to other types of credit, affecting the status of US financial institutions and leading to an insecure global financial system. Thailand was also affected by this crisis. At that time, the Stock Exchange of Thailand (SET) had a net outflow of foreign capital due to the increasing demand for the US dollar to increase the liquidity of troubled financial institutions, and the SET index fell by 50%.

2. LITERATURE REVIEW

The dynamic linkage of the stock market and economic development has been explored by a number of researchers. Several researchers have, predictably, investigated the relationship between the development of the stock market and economic expansion. On the other hand, their conclusions were contradictory. Some studies found that stock exchange development was positively related to economic growth, while others found that stock exchange development was unrelated or even negatively related to economic growth. Nonetheless, a recent study has uncovered evidence of a dynamic linkage of stock market development and economic expansion. There are cross-country studies as well as time-series studies for particular countries in this body of work. We will go over the findings in further depth in this part. Unfortunately, the stock market and economic expansion relationship have relatively limited time-series evidence, and we seek to supplement this evidence in the case of Thailand in this paper.

The dynamic linkage of the development of the stock market and long-term economic expansion of 24 countries was examined by Levine and Zervos [31]. The findings revealed that the stock market development was related in a positive way to the expansion of the economy. This finding is consistent with [15] and [13], which investigated the linkage of capital market development and economic expansion in a number of Asian countries. The findings showed that the stock market's rise supported economic growth in both direct and indirect relationships. In several African countries, stock market expansion has a significant positive long-run linkage on economic expansion, according to [6] and [9]. Later, [4] examined the link between the stock market development and the economy's expansion. In a sample of 35 developing countries, the findings revealed that major stock market expansion could assist long-term economic progress. This finding backed up the premise that a functioning stock market might help drive economic growth. Recently, researchers have looked into whether there is a dynamic link between stock market and economic growth. Their findings give empirical evidence which supported such long-run relationship.

The ARDL approach was used by Osathanunkul, Fusrinual and Nimanussornkul [32] to analyses Thailand's stock market development and economic expansion dynamic linkage and discovered the positive relationship. According to the authors, a stock market with high liquidity may accelerate market capitalization growth, which stimulates economic activity and improves asset allocation, resulting in Thai economic expansion. Similarly, [33] examined if stock market expansion helps economic progress by examining the short- and long-term relationship using the ARDL method. However, [34] focused on determining the link between the financial sector and economic expansion in Taiwan, Korea, and Japan and discovered positive linkage only in Taiwan. This finding was similar to that of [15], who investigated the connection between these variables and discovered that, in some countries, short- and long-term economic growth might be assisted by the stock market. Meanwhile, no link has been found to such relationships in other countries.

The topic of whether and how stock market development affects economic expansion remains unsettled, according to these studies. As a result, the focus of this study will be on the development of Thailand's stock market and economic expansion. Monthly data were collected from 1991 to 2020. Thus, data were collected over three time periods: before, during, and in the aftermath of the global financial meltdown. ARDL bound testing was utilized to examine such a relationship.

3. DATA AND METHODOLOGY

3.1 Data

Secondary data from Datastream was included in this investigation. Monthly time series data were collected from 1991 to 2020. Data were divided into three time periods: before the crisis (January 1991 to December 2000), during the crisis (January 2001 to December 2010), and after the crisis (January 2011 to December 2020), for a total of 360 months.

Stock market development data were used as the dependent variable, whereas economic growth measurements were used as independent variables in this study. Stock market development was measured using three variables: stock market turnover ratio (*SMT*), stock price index (*SPI*), and stock market total value traded (*SVT*). The natural logarithms of all variables are used to compute the growth rate of key variables and solve heteroscedasticity. Furthermore, the inflation rate was used to measure economic growth in this study (*INF*). The *INF* is calculated using percent changes in the consumer price index-linked to economic growth. The trends in all variables are depicted in Figure 1. The graphs show that INF remained relatively flat, whereas the paths of ln*SMT*, ln*SPI*, and ln*SVT* showed some trends.

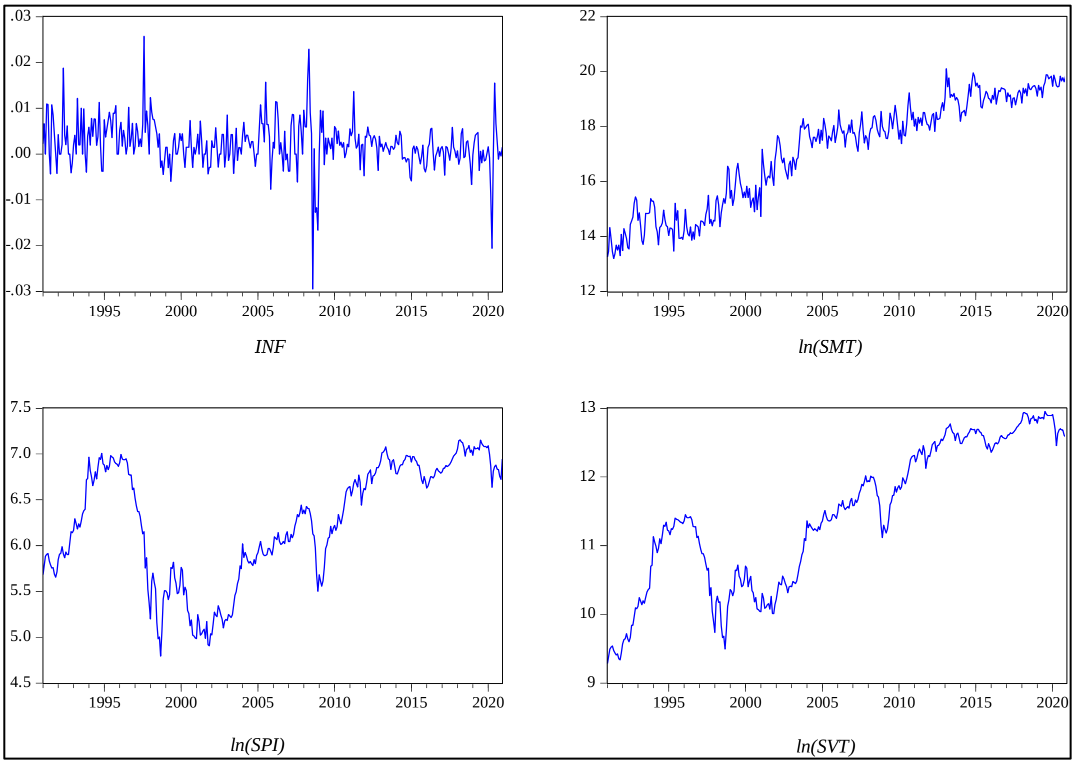

Fig. 1. Trends in *INF*, ln*SMT*, ln*SPI* and ln*SVT*.

Table 1: Descriptive statistics

Variables	Mean	Median	Max	Min	SD	Skewness	Kurtosis	JB
Before the crisis (1991-2000)								
INF	0.004	0.003	0.026	-0.006	0.005	1.037	5.882	63.048[a]
ln*SMT*	14.679	14.566	16.660	13.198	0.776	0.293	2.595	2.545
ln*SPI*	6.095	5.960	7.009	4.794	0.620	-0.042	1.819	7.009[b]
ln*SVT*	10.463	10.383	11.451	9.285	0.646	-0.064	1.820	7.045[b]
During the global financial crisis (2001-2010)								
INF	0.002	0.002	0.023	-0.029	0.006	-1.102	10.241	286.478[a]
ln*SMT*	17.554	17.685	19.228	14.730	0.730	-0.892	4.167	22.714[a]
ln*SPI*	5.823	5.932	6.637	4.905	0.454	-0.436	2.068	8.141[b]
ln*SVT*	11.261	11.394	12.307	10.009	0.628	-0.555	2.110	10.123[a]
After the crisis (2011-2020)								
INF	0.001	0.001	0.016	-0.021	0.004	-0.938	11.957	418.779[a]
ln*SMT*	19.076	19.126	20.104	17.819	0.542	-0.435	2.443	5.342[c]
ln*SPI*	6.877	6.876	7.154	6.442	0.153	-0.241	2.455	2.646
ln*SVT*	12.622	12.628	12.954	12.127	0.182	-0.173	2.485	1.926

Note: [a,b,c] indicate the statistical significance at 1%, 5% and 10% level, respectively.

Table 1 presents some descriptive statistics (means, medians, maximum and minimum values, and standard deviations) for *INF*, ln*SMT*, ln*SPI*, and ln*SVT*. Over the sample period, we observe that before the crisis period had the highest inflation rate (2.6%), the global financial crisis period had the lowest (-2.9%). In terms of stock market development, we found that ln*SMT* experienced the highest post-crisis (20.10), while ln*SPI* experienced the lowest before the crisis (4.79). The lower standard deviation results also suggest that the time series of the data is consistent. Furthermore, the results of skewness, kurtosis, and the Jarque-Bera test demonstrate the data's normality.

In this study, time-series data were used. Generally, the time-series data fluctuated and were non-stationary, meaning that unreliable statistical values could be used to figure out how the variables are related, leading to incorrect conclusions about the relationship. Hence, it was necessary to carry out a unit root test before the analyses. Unit root tests could be run utilizing the augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The results of t-statistic for the ADF and PP tests were examined and compared to the MacKinnon critical value. Any non-stationary data were adjusted with first or higher-order differences until they became stationary.

3.2 Methodology and Model Specification

To capture the relationships between the variables, the study proposes the following generic model. The estimating equation is specified as follows:

$$INF_t = \beta_0 + \beta_1 \ln SMT_t + \beta_2 \ln SPI_t + \beta_3 \ln SVT_t + \varepsilon_t \quad (1)$$

where β_0 is constant parameter. β_1, β_2 and β_3 are parameters for stock market turnover ratio (*SMT*), stock price index (*SPI*), and stock market total value traded (*SVT*), respectively. t and ε_t indicates the white noise term as well as the time trend, respectively.

The ARDL bound testing approach proposed by [28] was utilized to assess the dynamic linkage of Thai stock market and economic expansion in this study. The ARDL bound testing method has advantages over other methods in cointegration testing. First, ARDL method produces valid findings whether or not the variables are I(0), I(1), or a combination of two, whereas other cointegration techniques impose a stringent requirement that the integration of all variables must be done in the same order. Furthermore, it generates remarkable results that are efficient in large or small sample sizes. Second, by incorporating a proper number of lags, the ARDL model captures the process of data generation from a generic framework for modeling. Finally, we assume that all variables are endogenous, and the linear transformation technique is used to produce both short-run and long-run estimates concurrently. Finally, in the small sample size, the ARDL technique is the optimal option [35]. The equation (2) used in this investigation is represented in ARDL as follows:

$$\Delta INF_t = \alpha_0 + \alpha_1 INF_{t-1} + \alpha_2 \ln SMT_{t-1} + \alpha_3 \ln SPI_{t-1} + \alpha_4 \ln SVT_{t-1} + \sum_{i=1}^{n} \beta_1 \Delta INF_{t-i} + \sum_{j=0}^{n} \beta_2 \Delta \ln SMT_{t-j} + \sum_{k=0}^{n} \beta_3 \ln SPI_{t-k} + \sum_{m=0}^{n} \beta_4 \ln SVT_{t-m} + \varepsilon_t \quad (2)$$

where Δ presents the first difference, α_0 denotes the constant parameter. Summation signs represent the dynamics of error correction whereas α_1, α_2, α_3 and α_4 are long-run multipliers that correspond to long-run connections. The joint significance of the lagged values of the variables is tested using the Wald *F*-test, which is employed to test the null hypothesis that the variables do not have a long-run relationship. We will reject the null hypothesis for any test when the *F*-statistic exceeds the upper critical value, implying a long-run association between the economic expansion indicator and the development of stock market indicators. If the *F*-statistic is smaller than the lower critical value, however, there is no long-run link. Otherwise, the outcome is inconclusive. The following is how the error correction model is used to estimate short-run relationships:

$$\Delta INF_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta INF_{t-i} + \sum_{j=0}^{n} \beta_2 \Delta \ln SMT_{t-j} + \sum_{k=0}^{n} \beta_3 \Delta \ln SPI_{t-k} + \sum_{m=0}^{n} \beta_4 \Delta \ln SVT_{t-m} + \lambda ECT_{t-1} + \varepsilon_t \quad (3)$$

where λ is the negative error correction coefficient which represents that any short-run disequilibrium between the variables will return to the long-run equilibrium connection.

4. EMPIRICAL RESULTS

4.1 Unit Root Tests

To ensure that the variables utilized were not integrated at I(2), the ADF and PP tests were employed before running the bounds tests for cointegration, because the critical boundaries are predicted assuming that the variables are I(0), I(1), or both, the *F*-test would be invalid if the variables were stationary at the second difference. The ADF and PP unit root tests' findings are presented in Table 2. It can be seen that the following series are found to be stationary at level or first difference: *INF*, ln*SMT*, ln*SPI*, and ln*SVT*. The ARDL bound testing can be run to assess whether or not a long-run relationship exists because none of the variables are integrated at the second difference.

Table 2: Unit root tests

Variables	ADF test				PP test			
	Level		First Difference		Level		First Difference	
	C	C&T	C	C&T	C	C&T	C	C&T
Before the crisis (1991-2000)								
INF	-8.885[a]	-8.999[a]			-8.967[a]	-9.027[a]		
ln*SMT*	-3.508[a]	-5.036[a]			-3.264[b]	-5.044[a]		
ln*SPI*	-0.535	-1.431	-9.984[a]	-10.277[a]	-0.718	-1.416	-9.968[a]	-10.263[a]
ln*SVT*	-1.883	-1.344	-10.134[a]	-10.441[a]	-1.883	-1.420	-10.132[a]	-10.455[a]
During the global financial crisis (2001-2010)								
INF	-7.632[a]	-7.603[a]			-7.699[a]	-7.670[a]		
ln*SMT*	-3.903[a]	-5.662[a]			-3.569[a]	-5.552[a]		
ln*SPI*	-1.082	-2.001	-10.925[a]	-10.878[a]	-1.237	-2.369	-11.009[a]	-10.968[a]
ln*SVT*	-1.054	-1.856	-10.469[a]	-10.431[a]	-1.144	-2.200	-10.591[a]	-10.554[a]
After the crisis (2011-2020)								
INF	-8.056[a]	-8.546[a]			-6.837[a]	-6.991[a]		
ln*SMT*	-1.968	-3.518[b]	-16.270[a]		-2.736[c]	-5.332[a]		
ln*SPI*	-2.647[c]	-2.880		-10.636[a]	-2.647[c]	-2.843		-10.639[a]
ln*SVT*	-2.257	-2.966	-10.663[a]	-10.614[a]	-2.173	-2.937	-10.672[a]	-10.615[a]

Note: [a,b,c] indicate the statistical significance at 1%, 5% and 10% level, respectively.

Table 3: Results of long-run relationship and bound test

	Before the crisis		During the crisis		After the crisis	
β_0	0.016	(0.013)	0.044	(0.030)	0.009	(0.056)
$\ln SMT_t$	-0.001	(0.001)	-0.001	(0.002)	-0.003[b]	(0.001)
$\ln SPI_t$	0.001	(0.002)	0.021[c]	(0.012)	-0.005	(0.012)
$\ln SVT_t$	0.001	(0.002)	-0.013	(0.009)	0.007	(0.012)
F-statistics	17.644[a]		13.010[a]		15.427[a]	
Actual sample: 120		Critical bound value		10%	5%	1%
Finite sample: 80		I(0)		2.474	2.920	3.908
k = 3		I(1)		3.312	3.838	5.044

Notes: Standard error in parentheses, [a,b,c] indicate the statistical significance at 1%, 5%, and 10% level, respectively.

4.2 ARDL Bound Testing

This paper employs the ARDL bound testing approach to determine the long-term link between stock market development and the growth of economy. *F*-statistics are compared to critical values in the bound testing strategy. Because the value of *F*-statistics is affected by the number of lags applied to the differenced variables, this study uses the Akaike information criterion (AIC) as advised by [28] to determine the optimal order of lags. The optimal lag meets the lag selection criteria. The equations in levels are demonstrated with a corresponding level of significance. The results of the bound tests are presented in Table 3. During and after the global financial crisis, we discovered the evidence supporting a long-run dynamic linkage between ln*SPI* and ln*SMT* on *INF*, as well as a long-run relationship between ln*SPI* and ln*SMT*. ln*SMT*, ln*SPI*, and ln*SVT*, on the other hand, do not appear to have a dynamic relationship with *INF* before the global financial crisis. According to the bound test results, the *F*-statistics are 17.644, 13.010, and 15.427 for before, during, and after the global financial crisis, respectively, at the 1% significance level, which is greater than the critical values. As a result, the null hypothesis of no cointegration is rejected in all three periods. This suggests that a long-run cointegration relationship between the stock market and economic expansion exists in Thailand.

The model may be estimated using the ARDL approach because *INF* and ln*SMT*, ln*SPI*, and ln*SVT* are all cointegrated. ARDL(1,0,0,0), ARDL(1,0,0,0), and ARDL(1,0,0,1) are the ideal lag lengths for before, during, and after the global financial crisis, respectively, based on AIC. This section covers the ECM-based causality test and short-run dynamics. The causality test is calculated employing the lagged *ECT* and the significance of independent variables. Table 4 summarizes these findings. To begin, data suggests that lagged differenced *INF*, differenced ln*SMT*, differenced ln*SPI*, and differenced ln*SVT* are only associated with differenced *INF* following the global financial crisis. Second, according to the lagged *ECT* value, stock market development converges on economic expansion with a coefficient of approximately -0.924, -0.687, and -0.918 for before, during, and after the crisis, respectively. This finding represents that the long-run equilibrium is rapidly approaching, from stock market development to economic expansion.

5. CONCLUSION AND RECOMMENDATIONS FOR POLICY

This article examines the relative impact of the development of stock market on Thai economic expansion during three time periods, including before, during, and following the global financial crisis. The relationship's nature between financial sector development and economic expansion has been the main focus of several studies. Even though numerous studies have been conducted, empirical findings have proved inconclusive. In this study, which used monthly time series data spanning these decades (1991-2020), the ARDL bound testing approach was employed to evaluate such dynamic linkage. The study also used three stock market proxies: stock market turnover ratio, stock price index, and total value transacted on the stock market.

The long-run equilibrium test results of the ARDL bound testing approach show that, in the short and long term, there is a negative and positive causal dynamic linkage of stock market development and economic expansion. The findings align with both [25] and [26] findings and support the supply leading causality hypothesis. As a result, policymakers should concentrate their efforts on enhancing stock market regulations and boosting information flow. If rules, regulations, and laws are in place, the stock market can help more efficiently mobilize domestic resources and distribute them to productive areas of the economy to channel growth.

As a result, the findings of this study complement Thailand's financial growth strategies even more. Since it has been demonstrated that the financial sector has an impact on economic growth, regulators in Thailand are advised to seek policies that strengthen the stock market. However, policymakers can examine credit allocation and identify potential bottlenecks that prevent the advantages of a banking sector from reaching the real economy.

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Table 4: Short-run dynamics and ECM

	Before the crisis ARDL(1,0,0,0)		During the crisis ARDL(1,0,0,0)		After the crisis ARDL(1,0,0,1)	
β_0	-0.001	(0.001)	-0.001	(0.001)	-0.001	(0.001)
ΔINF_{t-1}	0.058	(0.093)	-0.044	(0.095)	0.283^{a}	(0.084)
$\Delta \ln SMT_t$	-0.001	(0.001)	-0.002	(0.001)	-0.002^{b}	(0.001)
$\Delta \ln SPI_t$	-0.018	(0.014)	0.001	(0.045)	-0.107^{c}	(0.060)
$\Delta \ln SVT_t$	0.016	(0.014)	0.016	(0.045)	0.126^{b}	(0.059)
$\Delta \ln SVT_{t-1}$					0.003	(0.005)
ECT_{t-1}	-0.924^{a}	(0.125)	-0.687^{a}	(0.114)	-0.918^{a}	(0.100)
R^2	0.440		0.379		0.514	
Adjusted R^2	0.415		0.352		0.488	
SE of Regression	0.005		0.006		0.003	
F-statistics	17.909^{a}		13.820^{a}		19.719^{a}	
DW-statistics	1.974		2.028		2.048	
AIC	-7.854		-7.500		-8.678	

Notes: Standard error in parentheses, ^{a,b,c} indicate the statistical significance at 1%, 5%, and 10% level, respectively.

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