The Impact of Stockmarket Development on Economic Growth in Singapore. Econometric Study Based on an Autoregressive Distribution Lag (Ardl) Model Covering the Period From 1990 to 2020

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Abstract. *The main objective of this paper is to discuss and examine the relationship between the development of stock market and economic growth and to show if the economic growth is positively influenced by stock market development in Singapore. Theoretically, some economists postulate a bidirectional relationship between financial development and economic growth, while others consider that growth drives finance, but that financial development is only a minor growth factor. We used an econometric study based on an autoregressive distribution lag (ARDL) model covering the period from 1990 to 2020 which is supported by the Asian financial crisis of 1997, obtained from various sources, in particular World Bank data and International Monetary Fund reports. Economic growth is expressed by GDP per capita, while stock market development is measured by market capitalization of domestic listed companies (% of GDP), shares traded total value (% of GDP) and stocks traded turnover ratio of domestic shares (%). The results show that the capitalization of domestic listed companies and the turnover ratio of domestic stocks have a positive and significant effect on gross domestic product per capita in the short and long run. However, shares traded total value hasa negative impact on gross domestic product per capita in short and long term. The contribution of our results suggests that stock market development promotes short and long-run growth in Singapore. Our findings can be of direct value to developed or emerging countries while they are of indirect value to less developed economies that may be committed to certain policy or regulatory decisions,*

Introduction. The link between financial development and economic growth is a subject that still interests economists and public authorities. It is a broad topic, which has attracted much attention in the literature and empirical evidence because of its impact on development policies (HO, Pham, & Nguyen, 2021).The

importance of this subject and its relevance is due to the controversy of the results on causality as well as on the most favorable structure of the financial system for economic growth. There are many several views in previous research on how financial development relates to economic growth such as Goldsmith (1969); McKinnon (1973); Shaw (1973) and King & Levine (1993).

Financial development is an important tool for economic growth(Pinshi & Kabeya, 2020). Financial sector development refers to the stock market development and the growth of banking sector(Kumar & Paramanik, 2020). The main role of the financial market and the banking sector is to improve the efficiency of capital allocation and encourage the economic system, which promotes economic growth, resulting in greater mobilization of savings, risk management and transaction facilitation (Sekali & Bouzahzah, 2021). Although the literature provides important and extensive evidence on the role of the financial system in promoting economic development, but it should be noted that there is no consensus empirically on the effect of stock markets or banks on economic growth. In general, the study of financial market development is indispensable and can be motivated by different attributes (Yousfi, 2017).

Financial markets in Singapore are perfectly founded and the primary financial services contain principally investment banking, management of wealth and treasury, insurance and capital market services (Chow & Pei, 2018). Nowadays, the Islamic financial system is growing quickly at the side of the conventional financial system in Singapore. Efforts to expedite growth of the Islamic banking industry take back after the Asian financial crisis 1997/1998(Abd Majid & Kassim, 2015).

This paper is motivated to investigate empirically the causal relationship between financial development and economic growth in Singapore. Several studies have been conducted on industrial and developed countries, leading countries in Asian such as Indonesia, Malaysia, Thailand and Turkey, the region of MENA such as Algeria, Tunisia, Egypt and Bahrain.

The majority of these studies have used quantity-based indicators as measurement of FD: Liquid liabilities (LLY), domestic credit of the private sector to GDP (PRIVY), (PRIVATE) which measures the ratio of claims on the nonfinancial private sector to total domestic credit, Stock market capitalization relative to GDP (SMC), and the bond Market (BM).Case studies that use several indicators for financial development have significative potential to understand the meaning of the growth effects of financial development(Adu, Marbuah, & Mensah, 2013).

Singapore was chosen because of its well-developed financial sector and rapid economic growth rate that it has achieved in a few years, and it would be good to determine the causal influence between stock market development and economic growth.

Our results contribute to proving that the development of the stock market in Singapore enhances economic growth in the short and long term from 1990-2020. Our findings show a positive impact on GDP per capita in the short and long term through the capitalization of domestic listed companies and the turnover ratio of domestic stocks. The only variable that has a negative impact on GDP per capita in the short and long term is shares traded total value.

We have conceived this paper as follows: section 1 presents a literature review, section 2 presents the evolution of financial sector in Singapore, section 3 presents data and method, section 4 contains the results of the empirical study and section 5 discusses our results and conclusion.

1. Literature Review

Theoretically, Bagehot(1873) was one of the primary researchers who looked for the connection between finance and economic growth. He concluded that there is a significant contribution of financial development to stimulate economic growth through his famous book "A description of the Money Market".

In 1911, Schumpeter treated the financial development by studying the importance of bank loans in financing projects (Meskini & Msatfa, 2020). According to Schumpeter(1911), financial sector improves growth by supplying the needed financial services and resources. From the point of view of the two economists Robinson(1952) and Lucas (1988), financial development is only a minor growth factor; they argue that financial development follows economic growth, but the opposite is not true, and this view was defined recently as growth-led finance hypothesis.

From his side, Patrick(1966) had supposed two fundamental hypotheses: the demand-following hypothesis which postulates a positive causal relationship from economic growth to financial development, and the

supply-leading hypothesis which posits a positive causal relationship from financial development to economic growth, but it doesn't empirically resolved (Murinde & Eng, 1994). While Goldsmith (1969), McKinnon (1973) and Shaw (1973) had developed theoretical arguments examining the effects of government intervention on financial sector development. They argue that government restrictions on the banking system hinder financial development, as a result reducing economic growth (Aka, 2010), because financial development stimulates growth by directly increasing savings, and therefore, investment. Similar conclusions are also reached by the more recent endogenous growth literature, in which services provided by financial intermediaries (such as risk sharing, liquidity provision, etc) are specifically modeled (Khan & Senhadji, 2000)

By the 1980s, however research investigated the dynamic relationship between economic growth, financial and markets.The reasoning behind this approach is that a well-greased financial system reduced transaction and costs and interest rates, increased investments, increased allocation of resources, and thus increased economic efficiency and growth(Ekanayake & Thaver, 2021).

The endogenous growth theory Lucas (1988) and Romer (1986) had also showed great interest in the role that financial development played in increasing economic growth (Matei, 2020)

Furthermore, the causal relationship between financial development and real GDP had been examined by Demetriades & Hussein (1996), so they found significant evidence of a bidirectional relationship and a few evidence of reverse causality (HO, Pham, & Nguyen, 2021)

Beck, Levine, & Loayza (2000), Rioja & Valev (2004), Campos & Kinoshita (2008) had also confirmed this positive connection between finance and growth (Matei, 2020). Detragiache, Gupta, & Tressel (2005)had argued that political instability and corruption are the main cause behind the poor financial system (Bist, 2018).

Empirically in this context, an immense number of studies based on cross section and panel Data have examined the effects of FD on economic growth (Adu, Marbuah, & Mensah, 2013). Most of these studies confirm the well-functioning financial markets in the developed countries. Cross-country comparison in FD and economic growth has found that the mixture of financial markets, instruments and intermediaries has a major role in economic growth(Malarvizhi, Zeynali, Al Mamun, & Bin Ahmed, 2019)

The panel study of Apergis, Filippidis, & Economidou (2007) on 65 OECD and non-OECD countries, Colombage & Halabi (2012) panel study on emerging ASEAN economies, Sethi & Acharya (2018) study on 31 developed and developing countries affirmed the causality between financial development and economic growth and vice versa (Naqeeb & Hysa, 2021).

Focusing on ASEAN countries, several studies had showed a positive relationship between financial development and economic growth. HO, Pham, & Nguyen (2021) examine the causal relationship between financial development and economic growth through trade openness for the leading ASEAN countries (Indonesia, Philippines, Malaysia, Singapore, Thailand, and Vietnam) from 1995 to 2019. The results show that REM is chosen based on the Hausman test result, suggesting that the trade openness has a positive association with growth whereas the financial development is positively, but insignificantly associated with growth. The reason for this is that the financial development and economic growth may be related to each other. Malarvizhi, Zeynali, Al Mamun, & Bin Ahmed (2019) explore the relationship between financial sector development and economic growth, using a sample of ASEAN-5 countries (Malaysia, Indonesia, Singapore, Thailand, and Philippines) from 1980 to 2011. The study investigates whether higher levels of financial development are significantly and robustly correlated with faster current and future rates of economic growth, physical capital accumulation and economic efficiency improvements. Findings of this study revealed that FD has a significant positive effect on economic growth. However, the estimated models show that the influence of FD, as a determinant for economic growth of ASEAN-5 countries, is less than that of domestic investment and export. Murinde & Eng (1994) investigate empirically two competing hypotheses regarding financial development and economic growth, within the context of supply-leading and demand-following finance in Singapore. Their Hypotheses are formulated within a statistical framework, namely a bivariate vector autoregressive (BVAR) model. Econometric techniques are applied to check for stationarity, cointegration, and Granger-causality. The evidence supports the supply-leading hypothesis only broad monetary aggregates, and a monetization variable are employed as substitutions for financial development. Gemma, Park, & Ramayandi (2010) conclude that the region's financial systems have become deeper and more diversified since the early 1990s. A more formal econometric analysis on a panel data of

125 ASEAN countries confirms that financial development has a significant positive effect on growth, especially in developing countries. The results also indicate that the impact of financial development on the region's growth is not noticeably different than elsewhere, and the impact has weakened since the Asian financial crisis. Abd Majid & Mahrizal (2007) examine empirically the short- and long-run finance-growth nexus during the post-1997 financial crisis in the ASEAN-4 countries (Indonesia, Malaysia, Thailand and the Philippines). Based on the ARDL models, the study documents a long-run equilibrium between economic growth, finance depth, share of investment and inflation. They also find that the common sources of economic progress/regress among the countries are price stability and financial development. Granger causality tests based on the VECM further reveals that there are: no causality between finance-growth in Indonesia, a unidirectional causality running from finance to growth in Malaysia, a bidirectional causality between finance-growth in Thailand, and a unidirectional causality stemming from growth to finance in the Philippines. Cao & Quek (2010) examine factors that contribute to rapid financial deepening in Singapore. They find that economic growth), prudent government policies, other self-generating pull factors coupled with the push factors of other countries seem to contribute to Singapore's financial growth. On the other hand, statistical tests indicate that financial liberalization in the form of freeing up interest rates does not play a crucial role in financial growth.

1.1. Indicators of financial development and economic growth

1.1.1 Financial development's indicators

Financial development's degree has been fixed by comparing prices or quantities, specifically rate of interest spreads or stock-flow ratios within which money or debt aggregates are compared with GDP.

Quantity-based indicators of financial development. Depend on stock-flow ratios constructed with balance-sheet stock and national-income-accounts flow variables. They are affected by financial innovations, institutional structure and statistical classifications. Their ability to reveal the level of broad-based financial development thus is unstable according to the degree of development of countries (Furstenberg & Fratianni, 1996).

A large number of development studies employed the model developed by Solow (1956), as the theoretical base to specify their model. This theory offers a method, which is useful to incorporate different variables as determinants for economic growth. Based on that some economists like King & Levine (1993), incorporate the factor of FD in their model (Malarvizhi, Zeynali, Al Mamun, & Bin Ahmed, 2019)

The development of financial markets can be estimated bydifferent indicators (primary market, secondary market, equity market and bond market)(Sene & Thiam, 2018). According to our data in the Singaporean context, we only focus on the size of the stock market using the following indicator of financial market's development.

Stock market capitalization relative to GDP: The market capitalization has been led by the rapid development of stock markets. The listed shares divided by GDP being added to the primary stock-flow measures used to represent the volume of the financial sector (Sene & Thiam, 2018). As the stocks of large companies dominate this measure, the number of listed companies and total value traded over GDP are amongst the secondary measures that were proposed to qualify the first measurement. If domestic credit is added to the private sector scaled by GDP to market capitalization, the measurement covers the entirely the market value of publicly held firms (Furstenberg & Fratianni, 1996).

Stocks traded, turnover ratio of domestic shares (%): The World Bank define this indicator as the value of domestic shares traded divided by their market capitalization.

Stocks traded, total value (% of GDP): This indicator is defined by the World Bank as the total number of domestic and foreign shares traded, multiplied by their respecting matching prices.

Private Bond Market Capitalization to GDP: Calculated by the total amount of outstanding domestic debt securities released by private or public domestic entities divided by GDP (World Bank).

Three other measurements were used to measure the development of banking market: Liquid Liabilities expressed by (LLY), Domestic Credit of the private sector to GDP expressed by (PRIVY), and (PRIVATE) which measures the ratio of claims on the nonfinancial private sector to total domestic credit as quantity-based indicators of banking market development and this would be as follow:

LLY as Measurement for Financial Development: According to King & Levine (1993), the measurement for 'financial depth' can be calculated using the financial system ratio's liquid liabilities to GDP, which is named by LLY. The currency held outside the banking system is represented by the liquid liabilities besides the interest-bearing liabilities and demands of banks and non-banking financial mediators. This measure could be equivalent to the economic indicator of M2.

PRIVY as Measurement for Financial Development: This form of measurement uses the ratio of claims of the non-financial **private** sector to the GDP and could be equal to the domestic credit of the private sector (% of GDP) (Malarvizhi, Zeynali, Al Mamun, & Bin Ahmed, 2019)

PRIVATE as Measurement for Financial Development: King & Levine (1993) called this indicator PRIVATE and utilized the ratio of claims on the nonfinancial private sector to total domestic credit (excluding credit to money banks).

Price-based indicators

Price-based indicators go directly to the financial efficiency by relating it to the narrowness of the equilibrium level of the spread between the social rate of return on physical and human capital and the real net rate of return on financial saving.

To identify the spread, we start with the rate of return on investment, then to the real financing rate of business and finally to the net rate of return on financial savings (Furstenberg & Fratianni, 1996).

Development economists had a difficulty to apply this approach for lack of suitable data on market-determined rates. Even when market-based prices were available, quantity-based measurement often remained the preferred tool.

In addition to the previous indicators, the following variables can be added:

➢ **FinTech:** Financial technology and digital platforms offer innovative solutions to deal with financial issues in order to secure financial inclusion, and sustainable growth (Rose, Sawada, & Sonobe, 2021).Fintech stimulate financial development with respect to access, depth and stability. The broadest measure of FinTechis the Digital Financial Inclusion Index that touches on different dimensions of FinTech development such as depth of use, mobile payments, insurance, cash funds, investment, credit, and level of digitization (Muganyi, Yan, Yin, Sun, Gong, & Taghizadeh-Hesary, 2022).

➢ **Regtech:** Relyingon regulatory technology, regulators may have a transparent and complete financial market data. Policy decisions will be more effective by using artificial intelligence algorithms. Regtech improves financial development outcomes, and it is measured by fiscal expenditure on financial regulatory matters (Muganyi, Yan, Yin, Sun, Gong, & Taghizadeh-Hesary, 2022).

➢ **Rule of law / Regulatory quality**: This indicator is related to the quality of contract enforcement, property law, police, and courts. It captures the ability of government to formulate good regulations that promote economic practice. It measures the contribution of the legal, regulatory and institutional framework to the development of financial systems (Cezar, 2012).

1.1.2. Economic growth's indicators

Principal variables which had used in most studies and measure economic growth are:

➢ **Gross Domestic Product per Capita (GDP):** This notion derives from the models of Solow (1956) and Swan (1956)
➢ **The variable (FDI):**to account for the importance of foreign direct investment in the process of economic growth
➢ **The rate of trade openness (Open):** measured by the sum of imports and exports in relation to GDP
➢ **Gross fixed capital formation :**(Gross domestic investment % of GDP).
➢ **Inflation rate (INF):** measured based on the consumer price index (El Moustapha, 2012)
➢ Unemployment rate and General government consumption expenditure.

2.   Evolution of financial sector in Singapore

The Republic of Singapore consists of one main island covering a total land area of 618,3 square Kilometers. Its population exceeds 5 million people (Mohamed El Ameri, 2018). Singapore's economy is

largely dependent on the expansion of the financial industry in order to become the world's largest smart offshore financial center and achieve sustainable economic growth(Chow & Pei, 2018).

Bye virtue of the successful and balanced policies that has been applied, Singapore has become one of the most powerful economies in the world in few years ago (Mohamed El Ameri, 2018). When it has found itself alone after its separation from Malaysia, it had to find solutions to the major problems and face the political, social and economic difficulties. A Financial Sector Review Group (FSRG) was formed in 1997 to lead a comprehensive review of Singapore's financial sector which was guided by the Deputy Prime Minister Mr. Lee Hsien Loong Chairman of the Monetary Authority of Singapore (MAS)from 1998 to 2004(Chow & Pei, 2018). Themain objective of the Singapore government after the 1997 financial crisis was the growth of the financial sector because it had been one of the key contributors to national economic growth of Singapore. This growth could be achieved by creating a more conducive regulatory environment, liberalizing the financial sector (Banks and capital markets), taking a more strategic and proactive approach to development (Loong, 2002).

Singapore enjoys an advanced economy because it is a famous financial center and has the largest and busiest ports in the world, in addition to the privileged location to attract investments from more than 3,000 international companies from the United States, Japan and Europe (Smai & Guechrou, 2015).

The development of financial market of Singapore was distinguished by an exceptional range of innovate financial products and instruments over the last three decades. According to the MAS, Singapore has great capabilities due to asset management, derivatives, insurance and risk financing, as well as FinTech and innovation.

The financial sector continued to develop after the establishment of the International Monetary Exchange (SIMEX)in Singapore in 1984 called now SGX-DT (Singapore Exchange Derivatives TradingLimited). It began to encourage local stock exchanges to merge, access global stock exchanges, and lift restrictions on foreign ownership of domestic bank shares.

The presence of several financial markets such as, the Asian Dollar market, the AsianDollar bond market, the money market, the foreign exchange market, the capital market,the stock market, the gold market and the financial futures market,was an imporant indicator of the degree of financial system development(Cao & Quek, 2010).

In 1997, the Asian financial crisis highlights the critical problem of the absence of development in the domestic bond market and capital that has negatively affected Singapore's economic development (Kok, 2007).

In 1999, Singapore was able to get a significant number of foreign stocks to the stock market with 56 listed companies and with a capitalization equivalent to 30% of the total, while derivatives markets included 19 interest rate contracts (Eurodollar, Euro yen, Japanese Government Bonds…etc) or stock market indices (Nikkei, MSCI, etc). Twenty-four Million transactions had realized between 1994 and 1997, increased in 1999 to26 Million transactions. Also, the Asian-Dollar Bond Market (ABM)was still active during the Asian crisis (More than 5 billion issued in Debt Market) (Collin & Gonsard, 2001).

In 2001, foreign companies contributed about one-third of total market capitalisation in the SGX securities trading (SGX-ST) main board while the Singapore stock exchange listed a total of 491 companies with market capitalisation of S\$331.7 billion. Financial derivatives trading volume reached 31 billion and the outstanding debt stood at S\$49.5 billion in 2000(Hew, 2005)

In 2006, stock-market capitalization and the bond market reached respectively S\$589.6 billion and S\$12.51 billion. Over the same period, stock-market turnover achieved S\$300 billion. The ratios of stock-market capitalization/GDP and stock-market turnover/GDP are higher over the period 1999-2006 than before which indicates a high level of intermediation by the stock market during the Asian financial crisis(Kok, 2007).

In 2015, Singapore's foreign exchange market is ranked third in the world with a listing of close to 800 companies. The average daily volume of foreign exchange turnover and foreign exchange derivatives turnover reached 419.2 Milliard USD and 87.3 Milliard USD in April 2016(Chow & Pei, 2018). While total corporate debt capitalization got a record high of S\$200 billion with a record number of 149 issuers by the end of 2014 (MAS, 2015).

In 2021, the financial sector held will account for nearly 16% of GDP. It contained more than 459 listed domestic companies (Bank World, 2021) and 200 banks operating. The three main domestic banks which are DBS Bank Ltd (DBS), Overseas-Chinese Banking Corporation Ltd (OCBC) and United Overseas Bank Ltd (UOB) (Chow & Pei, 2018).

The narrowness of domestic market of Singapore does not allow it to have a market capitalization at the height of other major financial centers (French Treasury, 2022). A big step to Islamic finance industry has moved Singapore to a large development with the first listing of a Sharia-compliant Exchange Traded Fund (ETF) on 27 May 2008 (Khan & Bashar, 2008).

According to the latest Global Financial Center Index 2022, Singapore is ranked 6th in the world financial center and 3rd in Asia, behind Hong Kong and Shanghai.

The Figures below show the evolution of Market Capitalization of listed domestic companies (% of GDP), Stock traded turnover ratio of domestic shares (%), Shares traded total value (% of GDP) during the period 1990-2020.
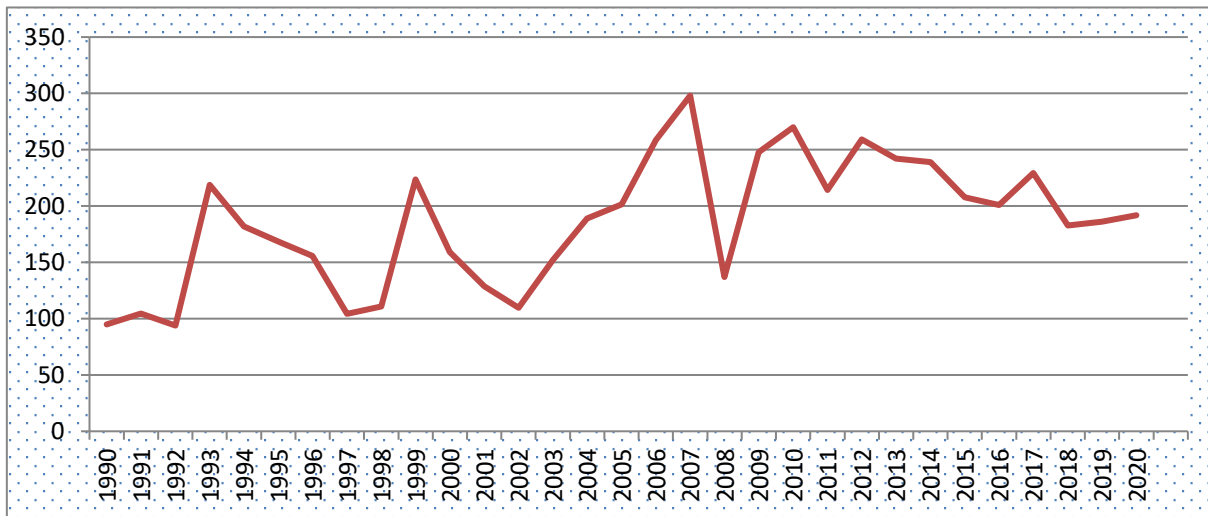

Figure 1. Market capitalization of listed domestic companies (% of GDP)

Source: (World Bank, 2021), World Development Report.

From figure 2, we note that market capitalization of listed domestic companies in Singapore as a percentage of GDP reached its highest level in 2007 and this indicates a higher level of financial intermediation by the domestic finance companies after the Asian financial crisis period. It is clear to us from the same figure, that the decrease of these rates is due to the repercussions of various crisis that occurred in 1997 and 2008,so this percentage decreased from 155, 81 % of GDP in 1996 to 104, 30% of GDP in 1997 and from 297, 98% of GDP in 2007 to 136, 85% of GDP in 2008.
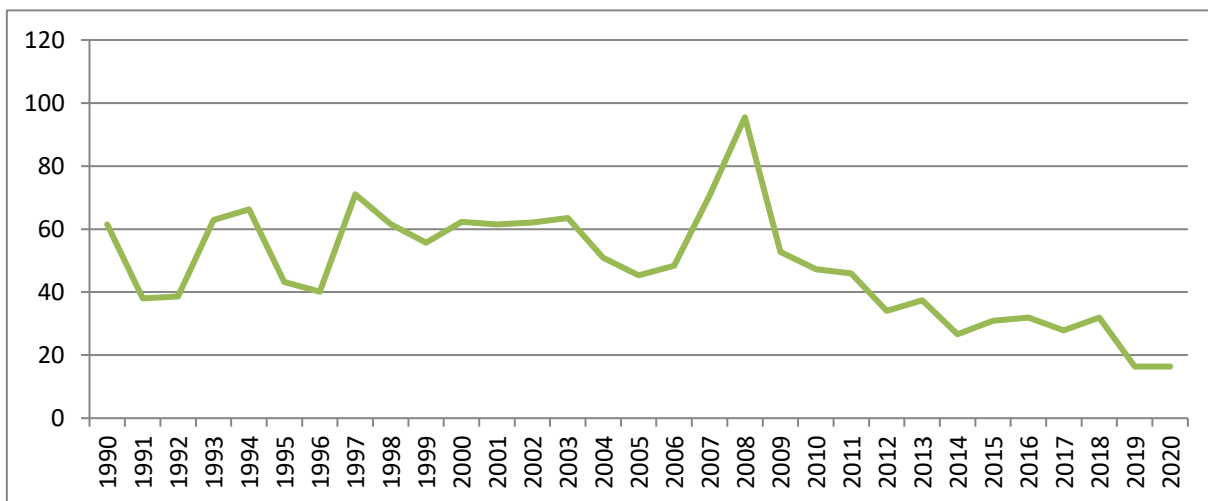

Figure 2. Stocks traded, turnover ratio of domestic shares (%)

Source: (World Bank, 2021), World Development Report.

We observe from the above Figure that the domestic stock turnover ratio fluctuated between ups and downs from 1990 to 2005. It reached its highest value in 2008 at 95.49% and this indicates a higher level of financial intermediation in the financial market in Singapore after the Asian financial crisis. This rate trended to decline until 2014. It was stabilized in 2019 and 2020 at 16.37% coinciding with the Covid-19 period.
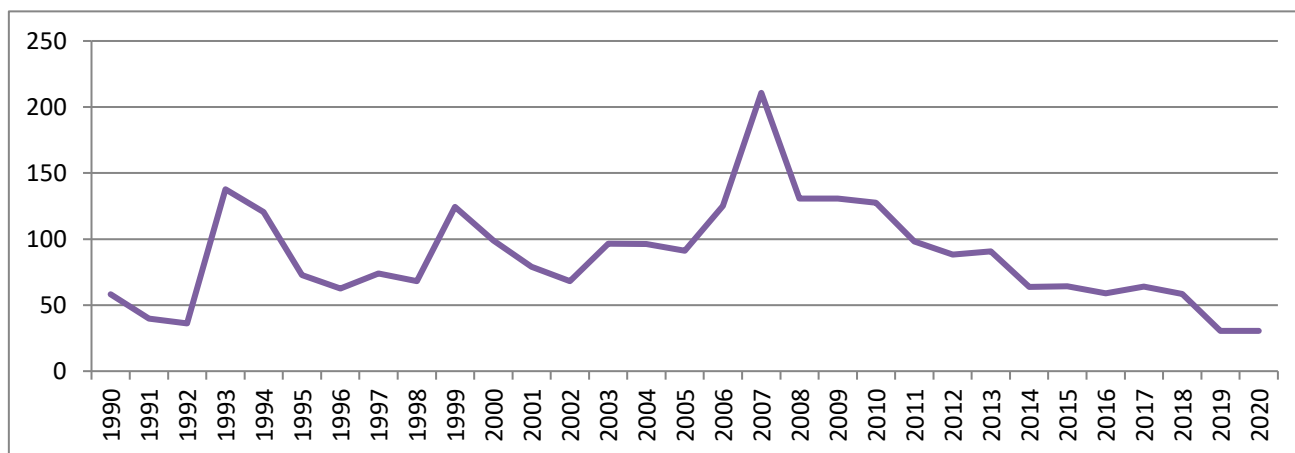

Figure 3. Shares traded, total value (% of GDP)

Sources: (World Bank, 2021), World Development Report.

As shown in figure 4, Shares traded total value fluctuated between ups and down all the period 1990-2004.From 2005 to 2009, we observe a continuous increase in valuesrefer to the attraction of foreign and local investors in the Singaporean financial market. Over the period 2010-2019Shares, traded total value tended to present long-term negative trends and this is due to the repercussions of financial crisis 2008 and the pandemic of Covid-19. Throughout this period, Shares traded recorded three increases in 2013; 2015 and 2017.The interpretation of this figure is identical to the previous one.
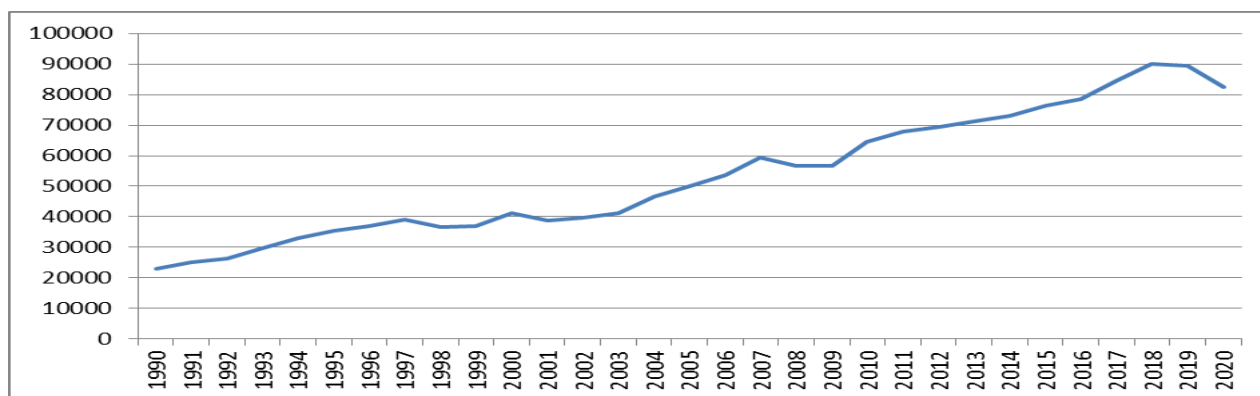

Figure 4. GDP per capita (current LCU)

Sources: (World Bank, 2021), World Development Report.

From figure 1, we note the increase in GDP per capita during the period 1990 to 2020 from 23133.98 current LCU to 82502.95 current LCU, and these values fluctuated during periods of crisis (1997 Asian financial turmoil, the global financial crisis in 2008, and the pandemic of COVID-19 in 2020). This unprecedented growth in GDP per capita goes back to the increase in the number of goods and services produced in Singapore, the huge number of international companies that invest in the country, and the importance of its financial center.

3.   Data and method

The aim objective of this study is to measure and analyze the impact of the development of the stock market on economic growth in Singapore , based on annual data , covering the period from 1990 to 2020 , obtained from various sources , particularly from world bank data and IMF reports, and by estimating the relationship between economic growth and the development of the stock market in the short and long term through the Autoregressive Distributed lag (ARDL) model .This technique was selected for three main reasons. First it is premised on the stationarity of series at the level and first difference. In other words, it is

effective in estimating the relationships between the different variables that do not have the same order of integration. Second, the ARDL approach is suitable for small sample size study. Third, the ARDL/Bounds testing cointegration procedure is useful to estimate the long run and short run relationships and dynamic interaction among the variables. However, it can remove the problem of the order of integration associated with the Johansen likelihood approach. (*Pesaran & al, 2001*)

The statistical and analytical method was used to collect and analyze information for discussion the results of study. The research variables are generally grouped into dependent variable (economic growth) and independent variables (the development of the stock market). The economic growth is measured by GDP per capita. On the other hand, the development of stock market includes variables such as Market capitalization of listed domestic companies (% of GDP), Shares traded. Total value (% of GDP) and Stocks traded turnover ratio of domestic shares (%). It is important to clarify that this study adopted only the variables which were stationary at zero and first difference and for which data were available throughout the study period. Based on the above variables and after converting the regression equation to a logarithm formula, the ARDL model is written as:

$$\log(dgdpp_t)=c+\beta_0\log(gdpp_{t-1})+\beta_1\log(cap_{t-1})+\beta_2\log(shar_{t-1})+\beta_3\log(turn_{t-1})+$$

$$\sum_{i=0}^{k}\propto_{1i}\log(dgdpp_{t-i})+\sum_{i=0}^{k}\propto_{2i}\log(dcap_{t-i})+\sum_{i=0}^{k}\propto_{3i}\log(dshar_{t-i})+\sum_{i=0}^{k}\propto_{4i}\log(dturn_{t-i})+\text{\euro} \qquad (1)$$

where:

GDPP: represents GDP per capita as proxy Singapore economic growth,

CAP: represents capitalization of listed domestic companies (% of GDP),

SHAR: represents shares traded total value (% of GDP)

TURN: represents stocks traded turnover ratio of domestic shares (%)

LOG: represents logarithm

€: error terms

4. Results

4.1. Study of the stationarity of time series

We used the Phillips -Perron (PP) test to confirm the stationarity of the data series. The outcome of the unit root test is presented in Table 1 as below:

Table 1. Results of Phillips - Perron Unit Root Test

Variables	Model	PP Level	5% Critical Value	Prob	PP 1st Diff	5% Critical Value	Prob		PP 1st diff
LGDPP	T+C	-2.355	-3.568	0.39	-4.317	-3.574	0.0098		data
	C None	-1.802 4.077	-2.963 -1.952	0.37 0.99	-4.117 -3.048	-2.967 -1.952	0.0034 0.0036	data	data
LCAP	T+C C None	-3.908 -3.330 0.806	-3.568 -2.963 -1.952	0.024 0.022 0.88	- - -	- - -	- - -		
LSHAR	T+C C None	-1.688 -1.885 -0.542	-3.568 -2.963 -1.952	0.73 0.47 0.61	-14.959 -5.997 -6.132	-3.574 -2.967 -1.952	0.0000 0.0000 0.0000		
LTURN	T+C C None	-1.934 -0.938 -1.406	-3.568 -2.963 -1.952	0.61 0.76 0.14	-18.674 -6.693 -6.597	-3.574 -2.967 -1.952	0.0000 0.0000 0.0000		

Sources: developed/compiled/systematized by the authors based on (Eviews, 10).

The unit root test shows that only one variable (LCAP) was stationary at order zero (at level).

The non-stationary variables (LGDPP, LSHAR, LTURN) were proof stationary at order one (at their first differences) prior to estimations of the ARDL to prevent false regressions results.

4.2. Estimation of the ARDL model

4.2.1. ARDL Bounds Test for Co-integration

Table 2. Results of ARDL Bounds Test

F-BoundsTest				
Test Statistic	Value	Signif	I(0)	I(1)
F-Statistic	6.131106	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

The ARDL bounds test result showed that F.statistic of 6.131106 is bigger than the upper bound critical value of 3.67 at 5 percent level of significance; therefore the null hypothesis of no co-integration is rejected which confirm the presence of the long run relationship between GDP per capita, capitalization of listed domestic companies, shares traded total value and turnover ratio of domestic shares.

4.2.2. The Empirical Results of ARDL Estimation

Table 3. Results of Short –Run ARDL Error Correction Model

ARDL Error Correction Regression				
Dependent Variable:D(LGDPP)				
Selected Model; ARDL(1,3,4,3)				
Case 2: Restricted constent and No Trend				
Saple:1990 2020				
Included observation: 27				
Variable	Coefficient	Std.Error	t-Statistic	Prob
D (LCAP)	0.973446	0.386488	2.518698	0.0270
D (LCAP(-1))	-3.178541	0.695524	-4.569996	0.0006
D (LCAP(-2))	-1.378498	0.510064	2.702596	0.0192
D (LSHAR)	0.865840	0.385268	-2.247370	0.0442
D (LSHAR(-1))	3.133633	0.669129	4.683149	0.0005
D (LSHAR(-2))	1.302481	0.500420	2.602777	0.0231
D (LSHAR(-3))	-0.043235	0.025100	-1.722553	0.1106
D (LTURN)	0.833523	0.385468	2.162366	0.0515
D (LTURN(-1))	-3.239049	0.683210	-4.740926	0.0005
D (LTURN(-2))	-1.385350	0.497433	-2.785001	0.0165
CointEq(-1)*	-0.239807	0.037509	-6.393281	0.0000
R-squared	0.795719			
Adjusted R-squared	0.668043			

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

Table 4. Results of ARDL Long Run Coefficients

Variable	Coefficient	Std.Error	t-Statistic	Prob
LCAP	23.90275	7.304577	3.272297	0.0067
LSHAR	-22.80561	7.270417	-3.136768	0.0086
LTURN	23.01234	7.438353	3.093741	0.0093
C	-100.6218	34.31435	-2.932355	0.0125

Sources: developed/compiled/systematized by the authors based on (Eviews, 10).

Based on the Table 3 and Table 4 we concluded the following results:

➢ The coefficient of determination (R2) is very high. It shows that about 79 percent of the total variation in GDPP is explained by all the exogenous variables.
➢ The coefficient of the error correction term has a negative and significant coefficient (-0.239807) at 5 percent level of significance. This means that the dynamic model has 23 % speed of adjustment.
➢ Capitalization of listed domestic companies has a significant positive impact on gross domestic product

per capita in short and long term.

➢ Shares traded total value has a significant negative impact on gross domestic product per capita in short and long term.

➢ Turnover ratio of domestic shares has a significant positive effect on gross domestic product per capita in short and long term.

4.2.3. Diagnostic tests

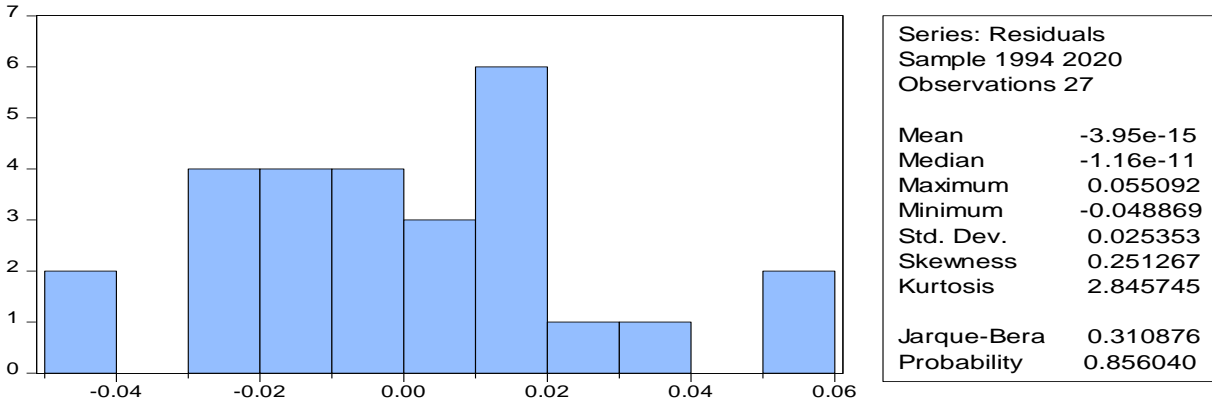### 4.2.3.1. Normality test

Figure 5. Results of Normality test

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

The normality test as shown in Figure 5, showed that the probability value of Jarque –Bera statistic of 0.85 exceed the 0.05 critical value. Therefore, the residuals are normally distributed.

4.2.3.2. Breusch-Godfrey Serial Correlation LM Test

Table 5. Results of Breusch-Godfrey Serial Correlation LM Test

Breusch-Godfrey Serial Correlation LM Test			
F-Statistic	0.413916	Prob. F (2,10)	0.6719
Obs*R-squared	2.064261	Prob.Chi-Square(2)	0.3562

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

The Table 5 showed that Chi-Square(X^2) probability value of 0.35 is greater than the 0.05 critical value. This means that error terms are not serially correlated.

4.2.3.3. Heteroskedasticity Test

Table 6. Results of Heteroskedasticity Test

Heteroskedasticity Test: ARCH			
F-Statistic	0.779299	Prob. F (1,24)	0.3861
Obs*R-squared	0.817690	Prob.Chi-Square(1)	0.3659

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

The Table 6 showed that Chi-Square(X^2) probability value of 0.36 is greater than the 0.05 critical value. This means that Heteroskedasticity does not occur in the model.

4.2.3.4. Stability Test

Table 7. Results of Stability Test

Ramsey RESET Test			
	Value	df	Probability
t-statistic	1.742652	11	0.1092
Obs*R-squared	3.036837	(1,11)	0.1092

Source: developed/compiled/systematized by the authors based on (Eviews, 10).

The Table 7 showed that the Ramsey RESET Test probability value of 0.10 exceed the 0.05 critical value.

This means that the estimated model is stable   .

Following from the above findings we accepted the estimated ARDL model of this study.

Discussion and conclusion

Most theoretical or applied research on the role of financial development in economic growth admits its positive impact. On the other hand, some studies point to the often negative effect of some other macroeconomic variables. To reconcile these two strands of the literature, we investigated the link between the level of stock market development and its impact on economic growth.

This Study examined the effect of stock market development on economic growth in Singapore for the period 1990-2020. The Study shows that (i) Capitalization of listed domestic companies has a significant positive impact on gross domestic product per capita in short and long term (ii) Turnover ratio of domestic shares has a significant positive effect on gross domestic product per capita in short and long term .

We can explain these results economically that the size of the stock market in Singapore is positively related to its stability to increase capital and convert it into productive investments and diversify risks as the stock market is the official source through which we can know the amount of interest shown by investors in buying and selling shares of a listed company.

We can say that the financial sector in Singapore relies on domestic financial intermediation more than foreign one, meaning that the market value of domestic companies and domestic traded shares are the basis for the development of the Singaporean stock market, perhaps because Singapore has become giving great importance to Islamic finance, and this does not attract much foreign countries, similar to Islamic countries, or else, the narrowness of its domestic market does not allow it to have a market capitalization at the height of other major financial centers.

In general, the results obtained from the ARDL model show a positive link between stock market development and economic growth, which is consistent with most previous studies in Singapore. Using an ARDL model, Azam et al (2016) had suggest that there is long-term cointegration among economic growth and stock market capitalization of listed companies. Based on panel data analysis, the results of Muhammad Aamir Ali & Nazish Aamir (2014) showed that GDP per capita is significantly explained by market capitalization ratio and stocks traded in Singapore, also the study of (El Moustapha (2012) had similar results using the same indicators which we have used.An empirical analysis based on a panel data of 125 Asian countries applied by Gemma, Park & Ramayandi (2010)confirms that stock market development explained by stock market capitalization has a significant positive effect on growth. The study ofTan Khay Boon (2005) supported the role of stock market over the long termin promoting economic growthusing VECM.

Our findings can be of direct value to developed or emerging countries while they are of indirect value to less developed economies that may be committed to certain policy or regulatory decisions, or follow another financial system that is not based on the financial market. We can say that the results obtained can be largely applied to develop and developing countries because they reflect the important role that the stock market plays in increasing economic growth.

Based on the above findings, it can be concluded that stock market development has supported economic growth in Singapore.Financial development should be encouraged but it should be as regular as possible, which means that the financial liberalization policy should not be implemented under any circumstances because it is conditional on strong, stable and orderly financial development.

The beneficial effect of financial development on economic growth, risks being significantly weakened in the absence of an adequate supervisory and regulatory framework for financial systems. Indeed, two effects can undermine the stability of financial development. Firstly, high inflation, and secondly a poor rule of law. A stable macroeconomic policy ensures that financial development will be conducive to economic growth and poverty reduction that financial openness will be gradual and that financial and monetary system will be subject to supervision. However, the question of what kind of financial and monetary regulatory framework is adequate and what kind of financial markets and banks are capable of ensuring stable financial development remains an unresolved issue.

We focus on the stock market in Singapore because the ARDL model was valid only with the data of this market, which prevented us from studying the impact of the development of the banking market and the

bond market on the economic growth in Singapore.

Various elements have led us to the hypothesis that the greater the intensity of financial development, the stronger the economic growth. Always and in the same context, we hope to study in our future research the impact of the development of the Islamic financial market in developing countries relying on other indicators that we did not focus on in our current research, in order to know the extent to which Islamic finance contributes to promoting economic growth,

Author Contributions

Conceptualization: D.B. and L.I.B**.; methodology:** D.B. and L.I.B**.; software:** L.I.B.; **validation:** D.B., L.I.B**.** and M.B.; **formal analysis:** D.B. and L.I.B**.;investigation:**D.B., L.I.B**.** and M.B.; **resources:** D.B.,L.I.B**.** and M.B**; data curation:** L.I.B.; **writing-original draft preparation:**D.B.,L.I.B**.** and M.B.; **writing -review and editing:** D.B., L.I.B**.** and M.B.; **visualization:** D.B. andL.I.B**.; supervision:** M.B. and D.B.; **project administration:** D.B.,L.I.B. and M.B**.**

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