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Do the Macroeconomic Forces Affect Stock Market Development? An Empirical Investigation from G-10 Economies

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ABSTRACT

The theoretical and empirical literature has demonstrated the critical and significant role of the stock market in developing the economy. The relationship between stock market development (SMD) and macroeconomic variables is examined in the current study using panel data of the top 10 developed countries from 2000 to 2019. The data have been tested using the panel ARDL approach. This study discovered a significant relationship between gross domestic product, Inflation rate, banking sector development, and stock market liquidity and the stock market development. While foreign direct investment has an insignificant relationship with stock market development. The gross domestic product, banking sector development, and foreign direct investment have a positive impact on the stock market development while the inflation rate and stock market liquidity have a negative impact on the stock market development of the G-10 economies. The study has some important practical implications.

1 Introduction

It is impossible to overlook the stock market's influence on an economy. It is a major contributor to long-term financing for businesses, which leads to increased investment, career possibilities, output, and economic growth and development of the economy. It promotes saving, which uses idle money to create additional capital. Therefore, it's true to say that the growth of the share marketplace relates to the improvement of the economy. The majority of nations, both developed and developing, focus on financial mediators to finance the investments required to support wealth creation. The financial market supports the favorable effects of banking institutions on economic growth, according to Gaffeo and Garalova (2014) analysis. Akinlo (2009) cites three ways that the industry for stocks can stimulate an economic boom. Firstly, expanding the variety of investment options accessible encourage savers to increase their investment holdings, this one makes it easier to mobilize the balance of payments. Secondly, it enables people to share risks. Finally, it encourages the effective distribution of financial resources to profitable ventures and offers investment venues for both domestic and international investors. According to empirical research, the stock exchange is a reliable example of financial expansion (e.g.,Adjasi and Biekpe (2006), Arestis et al. (2001), Beck and Levine

(2004) (Levine & Zervos, 1996, 1998), Ngare et al. (2014). In this practice, it's fundamental to increase confidence in financial market investors. Numerous factors relating to the company as well as external factors might increase investor confidence. Demirgüç-Kunt and Levine (1996), Singh (1997), and Levine and Zervos (1998) investigated that the evolution of the financial economy is significant for forecasting long-term economic growth. Including components of that same evolution of the financial market, different types of elements that have an impact on equity markets include globalization and liquidity. In reality, there are many different aspects of SMD. Growth of the trading platform, openness, volatility, specialization, connectivity with global capital markets, market regulation, and market oversight can all be used to evaluate it, (Garcia & Liu, 1999). The research of (La Porta et al., 2000) indicated that a high degree of revenue also had a positive influence on share market improvement.

Further, the capital market is a platform where shares of publicly listed corporations are exchanged. A stock market permits investment bankers to exchange various assets. Singh (1997) suggested that the stock exchange is the top commercial bank because it offers a place where investors can quickly achieve their financial needs. Many academics begin their research by claiming that the stock marketplace has a positive influence on a country's expansion Demirgüç-Kunt and Levine (1996). Based on the participation of the International Finance Corporation in macroeconomics in May 1996, the financial growth of a country relies on financial markets. Any country's stock exchange has a positive influence on its financial progress. Many things influence the growth of stocks. Theoretical work indicates that the expansion of the stock exchange might drive up the long-term growth of the economy. Improvements in financial institutions are considerable for economic progress and stock market improvement as they provide shareholders with cash flow by extending loans and permitting deposits.

This research examines the influence of economic growth, indicated by GDP, inflation rate, denoted by INF, banking sector development, denoted by BSD, foreign direct investment, denoted by FDI, and stock market liquidity, denoted by SML, on the stock markets of the top ten nations. We predict that these macro drivers will improve the stock exchange of the top ten economies as well as boost their economic development.

The remainder of the paper is organized as follows. Section 2 addresses the review of past studies, section 3 consists of methods and econometric techniques employed in the study along with data description, section 4 is about the discussion of results and findings and, finally the section 5 constitutes the conclusion, implications, limitations and direction for future research.

2 Literature Review

The financial system's ability to foster GDP has sparked an investigation into the forces behind SMD, (Garcia & Liu, 1999). Note that the drivers of SMD could be evaluated from two viewpoints namely, macroeconomic and organizational. The organizational and macroeconomic elements that affect SMD were already investigated by several researchers in empirical studies. An empirical analysis of the macroeconomic factors influencing SMD is presented in this section. Furthermore, research (Levine & Zervos, 1996, 1998), & (Singh, 1997) stated that a significant relationship between financial revenue growth as well as the financial growth of the nation. Researchers highlighted that they have a relatively strong relationship between SML and the long-term economic development of the nation Numerous research demonstrates whether FDI doesn't significantly influence economic growth such as, (Levine & Carkovic, 2000). As a result, their guesses reveal ambiguous predictions about the effects of FID flows on GDP. Adam and Tweneboah (2009) acknowledged the presence of a statistical correlation between the 3 versus 1 side and FDI as well as the establishment of the share market. (1) stimulate FDI and capital formation. (2) motivate capital formation and the growth of the share market. As such, people argue that FDI enhances the progress of its stock market.

Basyariah et al. (2021), For the yearly periods 2002-2017, the growth of Sukuk serves as a term reference of financing in the International Islamic Financial Exchange. The statistical analyses were performed utilizing GMM, and the findings demonstrate that by influencing the workforce impact that is confirmed to be positive, per capita GDP and the legal system get a positive influence on the development of Sukuk, particularly when implementing workforce impacts as regressors, through which moreover determine the impact of each economic and financial consistency factor and organizational consistency on Sukuk growth, particularly wage growth, is discovered not to influence Sukuk growth. Ho and Odhiambo (2019), discover, using an autoregressive distributed lag-bounds testing method, that financial industry growth and income expansion have significant effects on share markets, while inflation (INF) and interest rates (IR) have insignificant influence on share market development in as well as short and long run. In particular, the data suggest that trade openness (TO) has a favorable long-run influence but an insignificant short run influence on SMD throughout the period 1992–2016.

Assagaf et al. (2019), This research includes secondary data throughout twenty months, between November 2016 till June 2018. Whereas other analytical approach employs relationship among variables analysis, this research indicated that macroeconomic factors, including INF, IR, money supply (MS), exchange rates (ER), and share price, had a substantial influence on firms in the Indonesian financial markets.

Bhuiyan and Chowdhury (2020), use monthly data from 2000 to 2018 to conduct a stationarity analysis to predict the connection among commercial output, MS, long-term IR, and other factors. Results reveal however there is one steady long-term association connection between the macroeconomic factors included in the research and distinct industry indicators for the United States but never for Canadians. However, the united states MS and rate of interest may not describe the Canadian financial markets. Asravor and Fonu (2021), adopt the ARDL cointegration approach to evaluate the short and long-term relationship among both macroeconomic variables and market returns and growth in Ghana. The research found that the log of the MS, the INF, and social resources harm the stock market in an emerging market while the log of foreign direct investment (FDI) and the IR has a favorable influence on the financial market.

Ho (2018), Using the Autoregressive Distributed Lag (ARDL) modeling method, can be seen that variables affecting the expansion of the South African stock exchange between 1995 and 2015 include INF, TO, EG, and financial intermediation. Shahbaz et al. (2016), prove that the evolution of Pakistan's SMD between 1974 and 2010 was influenced by EG, INF, the rise of financial intermediaries, investment, and TO using a vector error correction model (VECM). Dewandaru et al. (2014) Using pooled ordinary least squares (OLS) prediction, it is discovered that economic development, equity markets, and the establishment of commercial intermediaries have an impact on SMD in eleven Islamic nations between 1996 and 2011.

Furthermore, Yartey (2010) is using the GMM approach to show that income level, investment, the growth of financial intermediaries, capital inflows, and are factors influencing the SMD in forty-two emerging nations between 1990 and 2004. Including the usage of something like the fixed effects (FE) method evaluation, Naceur et al. (2014) Show that public investment, economic intermediaries growth, saving rate (SR), TO, and equity market impact SMD in ten MENA economies during the period from 1960 to 2006 using the FE model estimation. Using the GMM estimation, Bayraktar (2014) To use the GMM best estimate, it is demonstrated that SMD in one hundred and four developing and developed nations between 1990 and 2012 is influenced by factors such as SML, EG, the development of financial intermediaries, saving rates, FDI, INF, IR, and income levels.

In one of the previous studies done by (Şükrüoğlu & Nalin, 2014) Between 1990 and 2011, the VECM approach was utilized to examine the relationship between GDP and the growth of Jordan's capital market. These results demonstrate that the Gross domestic product had a detrimental (insignificant)

effect on the growth of the SMD. And from the other side, the growth of the SMD is positively and significantly influenced by the MS, SML, Total capital production, INF, and national lending to the financial market. Panel vector autoregression (VAR) was used by Pradhan et al. in 2013 to examine the correlation relationship between SMD, INF, and financial growth in sixteen Asian nations (Hong Kong, China, India, Israel, Jordan, Korea, Pakistan, Sri Lanka, Bangladesh, Indonesia, Japan, Kuwait, Malaysia, Philippines, Singapore, Thailand, and Turkey) for the period 1988–2012. Their results demonstrated the presence of several correlations between inflation, economic growth, and SMD.

Billmeier and Massa (2009), Demonstrate that cash payments, income, investment, the growth of financial intermediaries, and SML are macroeconomic variables that impact SMD across seventeen Developing economies inside the Mideast and Central Asia provinces between 1995 through 2005 using the fixed effects model prediction model. In a group of towel MENA nations, Naceur et al. (2007) Using several datasets covering the 1979–1999 period, it is discovered through the fixed effects model estimate that the growth of financial intermediaries, saving rates, and stock market. Using this prediction from the random effects model, liquidity, and stable macroeconomics are crucial for the SMD. Using this prediction from the random effects, (Yartey, 2007) reveals that throughout the period from 1991 to 2001, in a panel data set of thirteen African nations, SMD is influenced by income level, investment, SML, and the development of financial intermediaries.

Quartey and Gaddah (2007), The growth of banking intermediaries, real earning, GDP, ER, & government bond yields is found to be long-run predictors of the growth of the Ghanaian SM during a quarterly time from 1991 to 2004 when using the Johansen cointegration approach. Boubakri and Hamza (2007), Show how the emergence of financial intermediaries and price affect the development of share markets in a group of thirty-seven developing markets from 1980 to 1998 using a dynamic panel two-stage linear least-squares estimator.

Table 1 represents the description of the empirical evidence on the SMD. This summary of empirical studies has based on 30 study findings those are followings:

Table 1

Summary of Empirical Studies

Sr #	Authors	Findings
1	Basyariah et al. (2021)	GDP (+), ER (+), INF (-)
2	Asravor and Fonu (2021)	MS, INF, and human capital have (-), FDI, and IR (-)
3	Ziaur REHMAN (2021)	GDP, INF, ER, and domestic private sector credit have (+), and broad money has (-)
4	Kalam (2020)	GDP, INF and FDI have (+), IR and ER have (-)
5	Bhuiyan and Chowdhury (2020)	Industrial production IP (+), MS (+), IR (-)
6	Assagaf et al. (2019)	INF and MS have (+), IR and ER have (-)
7	Isaac John (2019)	MS and ER have (+), INF and Interest rates have (-)
8	Demir (2019)	Interest rate (-), ER and FDI have (+)
9	Ho and Odhiambo (2019)	BSD, GDP, MO, and SML have (+), INF and ER have (-)
10	Ho (2018)	EG (+), INF (-) and TO have (+)

Sr #	Authors	Findings
11	Shahbaz et al. (2016)	EG (+), INF (-), TO (-), and financial intermediary development have (-)
12	Dewandaru et al. (2014)	EG (+), Cash flows (-), and financial intermediary development have (-)
13	Şükrüoğlu and Nalin (2014)	EG (+) and Capital market development (-)
14	Naceur et al. (2014)	Government consumption (+), financial intermediary development (-), saving rate (+), TO (-)
15	Bayraktar (2014)	SML (-), EG (+), financial intermediary development (-), saving rate (+), FDI (+), INF (+), Interest rate (-) Income level (-)
16	Pradhan et al. (2013)	EG and INF both have a causal relationship
17	Cherif and Gazdar (2010)	BSD (+) Saving rate (+) SML (+) Income level (+) IR (-)
18	Billmeier and Massa (2009)	Remittances (+), income (-), investment (+), financial intermediary development (-), SML (+)
19	Billmeier and Massa (2009)	Remittance (+), Investment (+), Income (-), financial intermediary development (-), and SML (-)
20	Naceur et al. (2007)	financial intermediary development (-), saving rate (+), SML (+), macroeconomic stability (+)
21	Yartey (2007)	income level (-), investment (+), SML (+), financial intermediary development (-)
22	Quartey and Gaddah (2007)	financial intermediary development (-), real income (+), gross domestic saving (+), ER (+),
23	Boubakri and Hamza (2007)	Income (-), SR (+), financial intermediary development (-), SML (+)
24	El-Wassal (2005)	GDP (+), Foreign portfolio investment (+), Financial Policy (+)
25	Jeffus (2004)	FDI (+)
26	Minier (2003)	GDP (+)
27	Jefferis and Okeahalam (2000)	GDP (+) Real exchange rate (+) Real long-term interest rate (-)
28	Boyd et al. (2001)	Inflation (-)
29	Garcia and Liu (1999)	Income (-), SR (+), financial intermediary development (-), SML (+)

3 Methods

3.1 Data Collection

The research employed secondary data to illustrate the influence of macroeconomic variables on the SMD of the top 10 economies. These economies are chosen based on GDP per capita. The ARDL is employed in this investigation on the panel data from the top 10 economies over some time from 2000 to 2019. These top ten countries include Australia, Belgium, France, Germany, Japan, Netherlands, Norway, Switzerland, the UK, and the USA. Select these nations, as they are major developing countries, and statistics are available about each other. This information was taken from the World Bank database. Macroeconomic variables included GDP, INF, BSD, FDI, and SML.

Econometric Model

This study utilized the ARDL-bound testing approach using panel data to evaluate the connection between the macroeconomic component and SMD. Before estimating the ARDL bound testing approach first VAR model is run to evaluate the optimal lag length (OLL). After choosing OLL then will be able to run the ARDL bound testing method. The following is the general equation for panel linear regression:

$$Y_{it} = \beta_0 + \beta_1(GDP)_{it} + \beta_2(INF)_{it} + \beta_3(BSD)_{it} + \beta_4(FDI)_{it} + \beta_5(SML)_{it} + \varepsilon_{it} \qquad (1)$$

Where: SMD is indicated by Y, economic growth is indicated by GDP, the inflation rate is indicated by INF, banking sector development is indicated by BSD, foreign direct investment is indicated by FDI, stock market liquidity is indicated by SML, and the error term is indicated by ε. The coefficient $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \ and\ \beta_5$, reflect the coefficients of the various explanatory variables, and exhibit the kind of link between every one of the explanatory and dependent variables. With this approach, the researchers could identify the estimates of the independent factors and forecast future features.

Furthermore, the SMD is the dependent variable. GDP, INF, BSD, FDI), and SML these all five variables that are used as independent variables. The ARDL bound testing model equation is following:

$$\begin{aligned}\Delta InSMD_t = \alpha_0 &+ \sum_{i=0}^{p} \alpha_1 \Delta InSMD_{t-i} + \sum_{i=0}^{q} \alpha_2 \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \alpha_3 \Delta InINF_{t-i} \\ &+ \sum_{i=0}^{q} \alpha_4 \Delta InBSD_{t-i} + \sum_{i=0}^{q} \alpha_5 \Delta FDI_{t-i} + \sum_{i=0}^{q} \alpha_6 \Delta InSML_{t-i} + \delta_1 InSMD_{t-1} \\ &+ \delta_2 InGDP_{t-1} + \delta_3 InINF_{t-1} + \delta_4 InBSD_{t-1} + \delta_5 FDI_{t-1} + \delta_6 InSML_{t-1} \\ &+ \varepsilon_t \qquad (2)\end{aligned}$$

Where the p is the OLL of the DV, q_1 to q_5 are the OLL for the regressor variables, Δ is the first difference operators, $\alpha_1\ to\ \alpha_6$ are the short-run coefficient, and δ_1 to δ_6 are the long-run coefficient for the model. The AIC estimation is used to decide on the model's appropriate variable number of lags.

If the cointegration of the factors is established, researchers proceed to evaluate the short-run correlations using an ECM, as illustrated below:

$$\begin{aligned}\Delta InSMD_t = \alpha_0 &+ \sum_{i=0}^{p} \alpha_1 \Delta InSMD_{t-i} + \sum_{i=0}^{q} \alpha_2 \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \alpha_3 \Delta InINF_{t-i} \\ &+ \sum_{i=0}^{q} \alpha_4 \Delta InBSD_{t-i} + \sum_{i=0}^{q} \alpha_5 \Delta FDI_{t-i} + \sum_{i=0}^{q} \alpha_6 \Delta InSML_{t-i} + \delta ECM_{t-1} \\ &+ \varepsilon_t \qquad (3)\end{aligned}$$

Where: ECM_{t-1} is the coefficient, and its anticipated sign is negative. This indicates that the factors may easily diverge from their equilibrium values when those who differ with them in the short run.

Description of the Variables and Hypothesis

Stock Market Development (SMD)

Dealing with historical analysis, SMD is estimated utilizing market capitalizations as an extent of GDP. In additional contentions, the value of the market rises to the worth of recorded shares isolated from the gross domestic product. The critical person of a share trade is to convey a stage whereby protections may be executed. Claessens et al. (1995) expressed financial exchange is a significant piece of any monetary framework wherein possession can be traded.

Economic Growth (GDP)

Real Gross Domestic Product is utilized to evaluate economic growth. The annual significant variation in real gross domestic product. Researchers have also employed this measure in other

papers, including to gauge the state of the economy, Levine and Zervos (1998), Deb and Mukherjee (2008), and Carp (2012) were used.

H1: There is a relationship between GDP and SMD.

Inflation Rate (INF)

The consumer price index (CPI) determines the yearly % change and serves while proxies for the INF. The cost of buying a selection of products and services for the typical customer may be constant or vary on an annual basis. Additionally, these proxies have been utilized in studies such as Shan et al. (2001) and Marques et al. (2013).

H2: There is a relationship between INF and SMD.

Banking Sector Development (BSD)

The research utilizes economic funding to Gross domestic product to quantify banking sector development. Further, the study evaluates the expansion of the banking industry by comparing national financing to GDP. This ratio is known as the financing to GDP for capital adequacy as well as other corporate organizations. Using proxies has indeed been utilized in various investigations, including such of Levine et al. (2000), Beck et al. (2007), and Sehrawat and Giri (2016).

H3: There is a relationship between BCD and SMD.

Foreign Direct Investment (FDI)

The assertion portrays this FDI indicates the critical job in the arising countries. Solid national government venture execution is a sign of significant profit to investment, which thusly will welcome extra unfamiliar speculation. The unfamiliar direct venture has likely to build the development of nearby organizations through correlatively in assembling and effectiveness. Using confidential capital streams as a percentage of GDP, FDI was calculated (Yartey, 2010).

H4: There is a relationship between FDI and SMD.

Stock Market Liquidity (SML)

We utilized two measurements of SML. The first is the income proportion, characterized as the all-out worth of homegrown offers exchanged separated by the value of the market. It shows the exchange volume of the securities exchange compared with its size. The second is the worth exchanged proportion, which rises to the complete worth of homegrown values exchanged on every nation's significant stock trade as a level of GDP. We anticipated that this action should decidedly affect financial exchange capitalization because a lot of reserve funds are diverted through securities exchanges.

H5: There is a relationship between SML and SMD.

Table 2 represents the description of factors consistent with the research. This summary includes dependent variables and independent variables, proxy, and references of the variables.

Table 2

Variables Used in This Study

Variables	Proxy	References
Stock market development (DV)	LN % of GDP	Levine and Zervos (1998), Yartey (2010), Claessens et al. (1995)
IV's		
Economic growth (GDP)	LN GDP per capita	Levine and Zervos (1998), Deb and Mukherjee (2008) , Carp (2012)

Inflation rate (INF)	Consumer price index (CPI) Annual % change	Shan et al. (2001) and Marques et al. (2013)
Banking sector development (BSD)	LN domestic credit to the private sector (% of GDP)	Levine et al. (2000), Beck et al. (2007), Sehrawat and Giri (2016)
Foreign direct investment (FDI)	FDI net inflows (% of GDP)	Yartey (2010).
Stock market liquidity (SML)	LN stock market turnover ratio	Levine et al. (2000)

4 Results & Discussion

Descriptive Statistics:

The statistical methods of the data for the years 2000 to 2019 are shown in Table 3. In this table SMD indicates stock market development, GDP indicates economic growth, INF indicates inflation rate, BSD indicates banking sector development, FDI indicates foreign direct investment, and SML indicates stock market liquidity. The median is between 10.76 (GDP) to 4.30 (SML). The range of the standard deviation measures dispersion or deviation from the mean, 0.28 (GDP) to 0.63 (SML). Skewness represents that GDP and FDI have right tail skewed distribution (Answer is greater than 0). And INF, BSD, and SML have left tail skewed distribution (Answer is negative). Kurtosis measured the peaked Ness and spread Ness among the distribution. When the value of Kurtosis equals 3, the normal distribution and pattern are referred to as mesokurtic. The pattern is referred to as leptokurtic and is connected to a simultaneous peak and fat tail if indeed the value is higher than 3. However, when the kurtosis value falls below 3, it is referred to as platykurtic and is correlated with both a less pronounced peak and a thinner tail. The answers of kurtosis represent that the GDP and INF values below 3 mean it is referred to as platykurtic and is correlated with both a less pronounced peak and a thinner tail. If FDI and SML values are greater than 3 it means it is referred to as leptokurtic and is connected to a simultaneous peak and fat tail with a maximum value is 86.58 (FDI), and a minimum value is -39.56.

Table 3

Descriptive Statistics

Variables	SMD	C	GDP	INF	BSD	FDI	SML
Mean	4.500	1.000	10.767	4.591	4.778	5.693	4.309
Median	4.481	1.000	10.690	4.604	4.800	2.587	4.332
Maximum	6.781	1.000	11.389	4.789	5.357	86.589	6.010
Minimum	3.393	1.000	10.355	4.309	4.002	-39.565	1.665
Std. Dev.	0.511	0.000	0.287	0.101	0.332	11.477	0.638
Skewness	0.404	NA	0.649	-0.299	-0.471	2.672	-0.795
Kurtosis	4.064	NA	2.247	2.473	2.396	17.711	5.834
Jarque-Bera	14.888	NA	18.802	5.311	10.438	2041.453	88.059
Probability	0.000	NA	0.000	0.070	0.005	0.000	0.000
Sum	900.034	200.000	2153.440	918.345	955.637	1138.729	861.945
Sum Sq. Dev	52.099	0.000	15.447	2.055	21.984	26212.77	81.079
Observation	200	200	200	200	200	200	200

Source: Authors' own compilation

Panel Unit Root Test Results

Results of stationary tests such as ADF- Fisher Chi-square, & PP Fisher Chi-square were utilized in this research to summarize the findings of panel unit root tests. The SMD and FDI are stationary at the level shown in Table 4. The GDP, INF, BSD, and SML are stationary at 1st difference shown in Table 4.

Table 4

Panel Unit Root Tests Result in Level and at 1st Differences

	At levels *I(0)*		At 1st differences *I(1)*	
Variables	**Intercept and trend**	**Probability**	**Intercept and trend**	**Probability**
ADF – Fisher Chi-square				
SMD	-3.673	0.000	NA	NA
GDP	NA	NA	-4.731	0.000
INF	NA	NA	-5.616	0.000
BSD	NA	NA	-5.644	0.000
FDI	-5.008	0.000	NA	NA
SML	NA	NA	-6.836	0.000
PP – Fisher Chi-square				
SMD	-3.674	0.000	NA	NA
GDP	NA	NA	-5.158	0.000
INF	NA	NA	-5.235	0.000
BSD	NA	NA	-5.613	0.000
FDI	-6.074	0.000	NA	NA
SML	NA	NA	-10.075	0.000

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.
Source: Authors' own compilation

Vector Autoregressive Model

The relationship between distinct values as they shift over time is depicted utilizing a systematic method describes as vector autoregression (VAR). VAR is a specific form of a single factors model. VAR models expand the single-factors (linear regressions) econometric technique by accommodating multimodal data sets. VAR models are commonly used in both the natural sciences and the area of economics. Like the autoregressive model, every factor has an equation that indicates how it develops. This equation comprises an error term, the factors that tend to lag (previous) relationships, and the lagged values of the other model factors. VAR models don't demand as much knowledge of the factors affecting factors as hypotheses with algebraic expressions do. The single pre-requisite knowledge is a collection of forces that may be considered to communicate over time. The VAR model is used within the studies to identify the appropriate lag duration.

VAR Lag Order Selection Criteria

After the evaluation of the VAR model, Lag length criteria are checked using the VAR lag order selection criteria. So, I will choose the no. 2 lag length criterion known as the Akaike information criterion (AIC).

Table 5

VAR Lag Length Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-102.216	NA	2.63e	1.340	1.436	1.379
1	1121.204	2355.084	8.20e	-13.640	-13.063	-13.405
2	1221.987	187.708	3.18e*	-14.587*	-13.530*	-14.158*

Note * indicates lag order selected by the criterion
Source: Authors' own compilation

ARDL Model: Long-Run Results

The ARDL approach indicates the short and long-run estimation of the results. The SMD as capitalization is considered to be the dependent variable. The GDP, INF, BSD, FDI, and SML these all five variables that are used as independent variables. The model selection method is SC, and the total observation is 180 with 2 lags. Let's come to the interpretation of the long-run results, the GDP p-value is 0.0000 is less than 5%. It indicates there is a significant relationship between GDP and SMD with a positive coefficient impact which show that if there is a 1-unit change in GDP the SMD will increase by 2.61 unit. The INF p-value is 0.0000 is less than 5%. It means there is a significant relationship between INF and SMD with a negative impact. The BSD p-value is 0.0000 is less than 5%. It means there is a significant relationship between BSD and SMD with a positive impact. The FDI p-value is 0.0644 is higher than 5%. It means there is an insignificant relationship between FDI and SMD with a positive impact. The SML p-value is 0.0000 is less than 5%. It means there is a significant connection between SML and SMD with a negative impact.

ARDL Model: Short-Run Results interpretation

The short-run result of SMD indicates that the first result of the short-run is COINTEQ01 (ECM) defined as it means its error correction model term which means the DV converge to equilibrium or diverge to equilibrium (In simple word it means the speed of adjustment). If the finding sings is (-) it is going to converge and if the result sings are (+) it is gone diverge. And its value is around about 0 to 1. So, the result value is -1.344 (convert 134 numbers in percentage the answer is 74.63%) which means the SMD is going to converge with a 74.63% percent equilibrium every year. Let's convert 74% in a year (100/74=1.3) and the result is our equilibrium is converging within 1 year and 3 months. The current year's (CY) GDP is negative and the previous year's (PY) GDP is a positive influence on the SMD. Both the CY and PY are the insignificant relationships of the GDP on the SMD.

The CY and PY INF is a negative impact on the SMD. CY is a significant relationship and PY is an insignificant relationship between INF and SMD. The CY and PY BSD is a positive impact on the SMD. And CA and PY is an insignificant relationship between BSD and SMD. The CY FDI is negative and PY FDI is a positive impact on the SMD. And CY and PY also insignificant relationship between FDI and SMD. The last variable SML both CY and PY is a positive impact on the SMD. Also, CA is insignificant and PY is a significant relationship between SML and SMD.

Table 6

Long-Run and Short-Run Results of the Selected Model

Variables	Coefficient	Std. Error	T-Statistic	Probability
The long-run results dependent variable is lnSMD				
GDP	2.615	0.216	12.097	0.000
INF	-0.695	0.115	-5.995	0.000
BSD	0.781	0.100	7.753	0.000

FDI	0.001	0.000	1.881	0.064
SML	-0.082	0.023	-3.424	0.001
The short-run results dependent variable is ΔlnSMD				
COINTEQ01(ECM)	-1.344	0.836	-1.607	0.112
Δ(SMD (-1))	0.603	0.279	2.154	0.034
Δ(GDP)	-5.461	4.150	-1.315	0.192
Δ(GDP (-1))	1.743	2.867	0.608	0.545
Δ(INF)	-14.347	5.118	-2.802	0.006
Δ(INF (-1))	-1.286	4.506	-0.285	0.776
Δ(BSD)	2.039	1.372	1.485	0.142
Δ(BSD (-1))	3.794	2.703	1.403	0.165
Δ(FDI)	-0.008	0.028	-0.318	0.751
Δ(FDI (-1))	0.006	0.011	0.603	0.548
Δ(SML)	0.075	0.118	0.638	0.525
Δ(SML (-1))	0.359	0.113	3.154	0.002
C	-31.384	19.435	-1.614	0.111

*Note: p-values and any subsequent tests do not account for model selection.
Source: author's calculation

5 Conclusion, Implications, Limitations and Future Research Directions

This study looked into the top ten countries' stock market developments from a macroeconomic perspective. In the top 10 countries, stock market development has been crucial. The top 10 countries include such as Malaysia, Belgium, France, Germany, Japan, Netherlands, Norway, Switzerland, the UK, and the USA. This study evaluates the macroeconomic forces affecting SMD from the year 2000 to 2019.

This particular study underlines the need for the practical application of economic policies to fully capitalize on the stock markets. By acknowledging the macroeconomic properties of the chosen economies and the variations generated by these elements in each country's stock market such research may aid the general public and shareholders in determining wiser judgments.

Researchers discovered several limitations throughout this work, including the following: The information for the top 10 nations' SMD from 1980 and the data for the majority of the factors from 2020 were initially unavailable, therefore we had to limit our sampling from (1980-2020) to (2000-2019). Exchange rate information was not easily accessible. Data are not available on the world bank website of these countries such as AFG, China (due to COVID-19), Ukraine, Vietnam, Turkey, Sub Sahara Africa, Thailand, and Sweden. Singapore, Saudi Arabia, Oman, New Zealand, Nepal, Nigeria, Maldives, Mexico, Italy, etc. For some more reliable outcomes future studies should use variables with monthly or weekly data can be used. Emerging and developed economies, such as Pakistan and the United States, can be compared by upcoming studies.

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