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The Use of Economic Indicators as Early Signals of Stock Market Progress: Perspectives from Market Potential Index

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Abstract: The progress of financial markets depends on the way world investors foresee the market potential of the country of choice. Countries that are associated with favorable economic incentives are able to motivate investments in their respective stock markets. The objective of this paper is to examine the role of the many economic components which constitute the Market Potential Index in enhancing stock market progress. The methodology goes through testing and estimation. The tests include linearity versus nonlinearity (RESET), normality, and cointegration. The estimation includes cointegration regression and discriminant analysis to distinguish between high and low stock market progress. This study examines unbalanced panel data that covers the years 1996–2022 for 54 countries where a stock market exists. The results show the following: (a) increases in people's expenditure result in decreases in consumption of investment in financial securities; (b) the investments in infrastructure technology is positively associated with stock market progress; (c) the positive effect of economic freedom indicates that further adaptive trading regulations are beneficial to stock market progress; (d) increases in imports consume large proportions of people's income, coming at the expense of investment in financial securities; (e) stock markets that are associated with high country risk are characterized by a positive risk–return tradeoff, i.e., a high risk premium; (f) the stock markets listed in the MPI can reach high progress by improving three indicators, namely commercial infrastructure, market receptivity, and country risk. This paper offers a thorough and unique examination of the institutional arrangements and stock market progress. The paper offers a guide to policy makers about how economic institutional arrangements can be promoted in order to reach high stock market progress.

Keywords: Market Potential Index; stock market capitalization; number of listed firms; percentage of market capitalization to GDP; Z-score

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1. Introduction

Aggregate economic performance affects financial markets at large, specifically capital markets. Research on the potential impacts of aggregate economic indicators and the progress of stock markets is extensive. A number of relevant studies can be traced chronologically. Chen et al. (1986) concluded that the growth rates of industrial production, expected inflation, unexpected inflation, a bond default risk premium, and a term structure spread significantly affect stock market development. Hamao (1988) and Harris and Opler (1990) examined industrial production, inflation, interest rates, and oil prices. Muradoglu et al. (2000) examined the effects of inflation, interest rates, foreign exchange rates, and industrial production. Flannery and Protopapadakis (2002) reported the significance of six aggregate economic indicators as systemic risk factors including the consumer price index, the production price index, the balance of trade, unemployment rates, and housing starts. Jareño and Negrut (2016) and Jareño et al. (2019) reported the significant effects of aggregate indicators such as GDP growth, CPI, PPI, unemployment rate, and long-term interest rates to the stock market in the United States. Verma and Bansal (2021) reported

the significance of gross domestic product, foreign direct investment, foreign institutional investment, gold prices, interest rates, oil prices, inflation rates, money supply, and GDP. It is quite obvious that the macroeconomic indicators are numerous; thus, there is no consensus about certain indicators, and an on-going need exists to use a certain economic framework that is usually referred to as economic indices. In this regard, the Market Potential Index (hereafter referred to as MPI) offers a convenient aggregation of comprehensive economic indicators. In terms of stock market progress, the World Bank database (https://data.worldbank.org/indicator/CM.MKT.LCAP.GD.ZS (accessed on 25 August 2021)) includes a number of indicators: (a) percentage of stock market capitalization to gross domestic product; (b) amount of stock market capitalization of listed domestic companies; (c) total listed domestic companies. These indicators are considered universal in terms of being able to differentiate between developed and developing countries significantly. In this sense, Appendix A Table A1 reports the results of testing the difference between stock market progress indicators in the G7 economies and the rest of the world (in places where stock markets exist). The results in Appendix A Table A1 show significant differences between stock market progress in the G7 and developing countries. These results offer plausible research potential to further study the relationship between aggregate economic indicators and stock market progress. In this sense, as far as the literature includes diverse economic indicators, the authors utilize the components of the MPI as a proxy for aggregate systemic effects of economic indicators. The IMP is developed by Global EDGE (https://globaledge.msu.edu/mpi (accessed on 25 August 2012)) in cooperation with the International Business Center at Michigan State University. The index includes eight dimensions that provide a comprehensive profile of aggregate economic performance. These dimensions are reported in Appendix A Table A2. The results conclude that international stock market development can be promoted significantly when on-going progress is warranted in market size, market intensity, commercial infrastructure, the investments in commercial technological infrastructure, market receptivity, and country risk.

As far as the findings of the above-mentioned studies have reached, this paper aims at examining the relationship between MPI and stock market progress. This paper offers certain contributions that follow. First, this paper takes a forward look, bridging the gap between macroeconomic variables and their inherited systemic effects. This forward look differs from the related studies that examine merely the changes in the macroeconomic variables. This advantage is offered by the components of the MPI. Second, this paper offers an institutional treatment on how stock markets can be promoted. Third, the paper develops a Z-score model that offers a guide to policy makers about the components of market potential that help stock market progress.

This paper is organized as follows. The second section discusses the empiricism and significance of the components of MPI. The third section describes the hypotheses, the variables, the data, and the statistical analysis. The fourth section offers a discussion of the results. The fifth section develops a Z-score model to monitor stock market progress. The sixth section concludes the paper.

2. The Empiricism of Market Potential Index

The index is quite informative to investors as the eight dimensions are composite of various economic indicators derived from a variety of sources. Indeed, the MPI offers comprehensive systemic effects of aggregate economic indicators being studied as follows.

In terms of the significance of "*Market Size*", a number of related studies have used size as a measure of market share and market power (Albin and Alcaly 1979; Caves et al. 1977; Mancke 1974; Shepherd 1972; Gale 1972; Hall and Weiss 1967; Conley 1973; Buzzell et al. 1975; Schoeffler et al. 1974).

The components of "Market Intensity" indicate the intensity of consumption being measured by GNP per capita and GDP consumption rate. This combined effect indicates the extent to which people spend on financial and non-financial products. Competitive intensity refers to the degree to which a firm faces competition in a market

(Grewal and Tansuhaj 2001; Jaworski and Kohli 1993). As Porter (1996) noted, competition in an industry continually works to drive down the rate of return toward the competitive floor rate of return. When competition in a market is intense, customers have many alternatives (Kohli and Jaworski 1990; Jaworski and Kohli 1993).

In terms of "Market Growth Rate", it is worth noting the negative relationship between volatility and growth (Jones et al. 1999; Jovanovic 2004; Bernanke 1983; Pindyck 1991; Aizenman and Marion 1993) depends on the dynamics of investments. Other studies emphasized the importance of costs associated with learning (Martin and Rogers 2000; Blackburn and Galindev 2003) and the importance of terms-of-trade fluctuations (Mendoza et al. 1997). A number of studies reported a beneficial impact of aggregate economic indicators on capital markets (Aghion et al. 2000; Blackburn and Pelloni 2004). Kormendi and Meguire (1985) and Grier and Tullock (1989) conclude that the growth-volatility tradeoff may imply positive association, while Borjas and Ramey (1995), Fatás (2002) and Hnatkovska and Loayza (2009) conclude the opposite.

As for "Market Consumption Capacity", the analysis presented by Besley and Persson (2010) suggests an important complementarity between public capital and state consumption capacity due to redistributable income.

Needless to say, "Commercial infrastructure" is essential in economic activities (Lynch 1996). In this sense, public–private partnerships play a significant role in economic growth. For instance, Canada has successfully financed infrastructure investments through domestic bond issues. In the US, the capital market financed 80% of Tennessee Valley Authority (Jacobson and Tarr 1995; Chen and Bartle 2022; Agrawal 2020).

In terms of "Market Receptivity", the economic systems of developed markets are well entrenched, and investors consider them as the safest investment destinations. In this sense, emerging markets usually go through progressive industrial growth, which is translated into high level of investment returns, although coupled with a higher level of risks than developed markets. The Frontier markets like Nigeria, Botswana, and Kuwait offer examples of that argument.

The impacts of "Economic Freedom" have been examined in the past few decades, concluding that countries with fewer restrictions on private investment are able to foster economic growth and development (Heckelman 2000; Holmes et al. 2008). Hayek (1942) argues that strong laws and regulations offer significant contributions to economic development in developed countries. Many studies that were inspired by the Hayekian theory examined the link between economic growth and freedom (Williamson and Mathers 2011). Countries with greater values in economic freedom enjoy lesser bond default risk (Roychoudhury and Lawson 2010). Christie (1982), and Cheung and Ng (1992) conclude that stocks' volatility rises as stock prices fall. Duffee (1995) recognized that high volatility is observed for both small-size firms and those associated with low leverage.

There are a number of measures of "Country Risk", including political risk, economic risk, financial risk, composite risk, and institutional investor's country credit ratings. Erb et al. (1996) concluded that financial risk indexes contain the highest future expected returns, and that political risk contains the lowest.

3. Hypotheses, Variables, Data, and Methods of Estimation

3.1. Research Hypotheses

The above-mentioned studies have examined various macroeconomic factors without considering explicitly their impacts on deepening the market. That is, GDP, inflation rates, and other macroeconomic factors usually deepen an economy in various aspects that were not examined in previous studies. Those aspects are included in the MPI. Therefore, this paper formulates the two following hypotheses:

H1. *A significant and positive relationship exists between market potential and stock market capitalization (Kormendi and Meguire 1985; Grier and Tullock 1989; Duffee 1995; Marcelo et al. 2016; Di Liddo et al. 2019).*

H2. *A significant and positive relationship exists between market potential and the number of listed firms in the stock market (Albalate et al. 2010; Cerra et al. 2017; Marcelo et al. 2016; Di Liddo et al. 2019; Hammami et al. 2006).*

3.2. Dependent Variables

This paper examines three indicators that measure different aspects of stock market progress. These indicators are as follows:

1. The percentage of market capitalization to GDP (MCGDP%).
2. The natural logarithms of market capitalization (LnMC) of listed domestic companies (current USD).
3. The natural logarithm of total listed domestic companies (LnNum).

The three indicators are well known in other related studies in the literature (Beck et al. 2000; Atje and Jovanovic 1993; Naceur et al. 2007; Arestis et al. 2001; Fagbemi et al. 2021; Kapaya 2020; Levine and Zervos 1996; El-Wassal 2013). Table 1 reports the results of testing the differences between the three indicators using the Kruskal and Wallis (1952) test. The objective is to examine whether the three indicators are distinct from each other and, therefore, whether they offer unbiased estimates.

Table 1. Kruskal and Wallis (1952) test for the differences between stock market progress indicators.

Stock Market Progress Indicators	(Chi-Square, df)
The percentage of market capitalization to GDP (MCGDP%).	(11.892, 1); *p*-Value = 0.0000
The natural logarithms of market capitalization (LnMC) of listed domestic companies (current USD).	(12.631, 1); *p*-Value = 0.0000
The natural logarithm of total listed domestic companies (LnNum).	(5.004, 1); *p*-Value = 0.0091

The results in Table 1 show that the three indicators differ from each other significantly. Therefore, the results offer a comprehensive profile about the determinants of stock market progress.

3.3. Independent Variables

The independent variables include eight indicators of MPI. The index is created and compiled by Global EDGE (1996–2022) in cooperation with the International Business Center at Michigan State University. The definition and measurement of each indicator are reported in Appendix A Table A2.

3.4. Data

The data about the MPI are compiled by Global EDGE via the International Business Center of Michigan State University. This paper examines an unbalanced panel of 54 countries covering 1996–2022 on an annual basis. Appendix A Table A3 includes list of the countries being included in the MPI.

4. Results and Discussion

4.1. Cointegration Regression

The objective of this stage is to examine the effects of the components of MPI on stock market progress. Table 2 reports the results for a cointegration regression.

The dependent variables are (a) the percentage of market capitalization to GDP (MCGDP%), (b) the natural logarithms of market capitalization (LnMC) of listed domestic companies (current USD), and (c) the natural logarithm of total listed domestic companies (LnNum). The normality of the data is examined with reference to the work of Anderson and Darling (1952, 1954). The results show that the variables are not normally distributed. Therefore, the van der Waerden method is carried out to approximate the data to a normal distribution (Conover 1980; Van der Waerden 1927, 1930, 1931; Wright 2000) based on

smoothed ranks. The stationarity is examined using an augmented Dickey–Fuller approach (Dickey and Fuller 1979, 1981). The F statistics (MacKinnon one-sided) are as follows: (a) the percentage of market capitalization to GDP [109.006 ***], (b) the natural logarithms of market capitalization of listed domestic companies (current USD) [121.3 ***], and (c) the natural logarithm of total listed domestic companies [118.61 ***]. The results show that the data have to be lagged (first difference). The results of the Regression Equation Specification Error Test, RESET (Ramsey 1969; Thursby and Schmidt 1977; Thursby 1979; Sapra 2005; Wooldridge 2006), show the following to be important: the percentage of the market capitalization to GDP [F(2, 460) = 38.29 ***], the natural logarithms of the market capitalization of the listed domestic companies (current USD) [F(2, 460) = 18.411 ***, and the natural logarithm of the total listed domestic companies [F(2, 460) = 33.57]. Therefore, the assumption of nonlinearity fits the data; thus, the independent variables are treated as nonlinear in statistical analysis. The Johansen cointegration test (Johansen and Juselius 1990; Johansen 1988, 1995, 2012) is carried out between MPI and each of the three measures of stock market progress. The results show that the trace method confirms that the eight indicators of MPI are significantly cointegrated with MCGDP%. Nevertheless, the maximum Eigenvalue method confirms that country risk (CR) is cointegrated with MCGDP%, significantly indicating that country risk is quite relevant to MCGDP%. The estimation method is fully modified least squares (FMOLS). Outliers are detected and removed. Multicollinearity is examined. All variables are associated with VIF < 5. The long-run covariance estimate is Bartlett kernel, with Andrews bandwidth = 7.00.

Table 2. Institutional determinants of stock market progress.

Independent Variables	**Coefficients**		
	MCGDP%	**LnMC**	**LnNum**
Constant	−0.841 (−9.872) ***	−0.6232 (−7.829) ***	−0.5778 (−10.493) ***
Market Size	−0.5771 (−4.602) ***	−0.7011 (−5.6620) ***	−0.8942 (−0.7840)
Market Growth Rate	−0.0520 (−1.027)	−0.1823 (−1.233)	0.0334 (1.085)
Market Intensity	−0.8727 (−2.8901) **	−1.9832 (−2.7218) **	0.0877 (0.5230)
Market Consumption Capacity	−0.1128 (−1.0091)	−0.2971 (−3.233) ***	−1.203 (−3.884) ***
Commercial Infrastructure	0.9812 (1.0081)	0.4671 (5.107) ***	0.1144 (3.8849) ***
Economic Freedom	0.0578 (0.6641)	0.1334 (2.782) **	−0.3971 (−2.5114) **
Market Receptivity	−0.3491 (−4.1136) ***	−0.2783 (−2.879) **	−0.1273 (−2.675) **
Country Risk	0.2557 (3.1182) ***	0.5639 (5.1166) ***	0.1863 (2.8734) **
Country Effect (Dummy, Respective country = 1, otherwise = 0)	Yes	Yes	Yes
$\overline{R}^2$	0.8566	0.8583	0.9611
N	460	460	460
S.E. of regression	0.4293	0.4140	0.247
Durbin–Watson stat	1.7261	1.5482	1.5338
Long-run variance	0.1346	0.1783	0.0962

*** Significant at 1%; ** Significant at 5%;

Table 2 shows the results of regressing the eight indicators of MPI against each of the three measures of stock market progress. The discussion of the results of each indicator of MPI is as follows excluding the effects of market growth rate as the results show insignificant coefficient across the three models of stock market progress.

4.2. Market Size and Indicators of Stock Market Progress

The potential role of market size has been examined in many studies in the literature. The results reported in Table 2 offer evidence that supports the latter argument. That is, stock market progress (in terms of percentage of market capitalization to GDP and number of listed firms) is negatively associated with the market size. That is, the countries that are characterized by a relatively small market size depend relatively highly on equity financing. At the same time, countries that are characterized by large market sizes do not offer as much stock market progress as a means of equity financing (Gompers and Lerner 1999; Freear et al. 1997).

4.3. Market Intensity and Indicators of Stock Market Progress

The components of market intensity indicate the intensity of consumption being measured by GNP per capita and GDP consumption rate. These combined effects indicate the extent to which people spend on financial and non-financial products. As far as this paper is concerned with investment in financial securities, the negative and significant coefficients with MCGDP% and LnMC indicate that an increase in people's expenditures is associated with a decrease in consumption of investment in financial securities. The above-mentioned results can be constructively linked to many studies in the literature that offer good insights regarding the connection between competition in the non-financial and financial products. In this case, the authors of the current paper argue that the low competitive rates of return discourage investors from investing in financial securities which results in, as the above results show, an aggregate consequence of low MCGDP% and low market capitalization.

4.4. Market Consumption Capacity and Indicators of Stock Market Progress

Table 2 reports negative and significant coefficients of market consumption capacity and two indicators of stock market progress, namely market capitalization (lnMC) and number of listed firms (LnNum). Indeed, these results provide validation to the above-mentioned results regarding "Market Intensity." It is obvious that market consumption results in a reduction in investments in financial securities.

The market intensity has been related to the market consumption capacity (Congressional Research Service 2018) report, where it indicated that, before the economic reform, China maintained restricted and poor regulation that affected its economy, as represented by poor per-capita income. On the other hand, the policies have changed after the economic reform, where China became one of the fastest growing economies in 2016 with nearly 10% growth in GDP. This can be seen as a support for our results regarding the relation between the market consumption capacity and the market capitalization.

4.5. Commercial Infrastructure and Measures of Stock Market Progress

As far as commercial infrastructure refers to the advances in common technology and communication devices, the results reported in Table 2 show that investments in infrastructure technology are positively associated with stock market progress. These results indicate that investments in commercial technological infrastructure help the national stock market grow significantly (Albalate et al. 2010; Cerra et al. 2017; Marcelo et al. 2016; Di Liddo et al. 2019; Hammami et al. 2006). Brealey et al. (1996) conclude that the relation between investment in infrastructure and the effect on the growth domestic per-capita as a percentage of the GDP is nonlinear; the studies have been applied from 1990 to 2009 and they concentrated on the private equity participation in country infrastructure.

4.6. Economic Freedom and Measures of Stock Market Progress

Table 2 reports significant and positive coefficient of economic freedom with market capitalization. It is worth noting that economic freedom is statistically significant to two indicators of stock market progress, which can be considered reliable indicators that economic freedom is associated with people's autonomy and political freedom. The latter offer opportunities to invest freely without complexities. Many related studies in the literature extend this argument. Roychoudhury and Lawson (2010) report a negative relationship between economic freedom and sovereign bond default risk. In addition, Blau et al. (2014) and Yang et al. (2023) concluded that market freedom has an impact on market development and economic freedom. Economic freedom encourages investment and enhances the portfolio structure to avoid risks and increase the return of the investors.

4.7. Market Receptivity and Measures of Stock Market Progress

Table 2 reports significant and negative coefficients of market receptivity with percentage of stock market capitalization to GDP. The above-mentioned definition of market receptivity refers to the percentage of imports to gross domestic product. That is, the increases in imports consume large proportions of people's income that comes at the expense of investment in financial securities. This trend exacerbates when countries are not producing products that replace imported products. Chen et al. (1986) reached the same conclusion using other variables like the consumer spending and the gross domestic purchases in the U.S. market, only covering a period of 50 years (1959–2009); they linked the market receptivity and intensity to the market capitalization.

4.8. Country Risk and Measures of Stock Market Progress

Table 2 shows that country risk is positively and significantly associated with the three measures of stock market progress. These results indicate that investors are able to benefit from risk–return tradeoffs in a way that they demand high returns in countries where political instability is recognized. In this regard, Ferson and Schadt (1996) argued that stock valuation should take a country's dynamic risk function into consideration. Erb et al. (1996) also find a relation between dynamic risk with respect to world benchmark and expected returns. Barber and Lyon (1997) report a significant impact of the country risk on the capital market performance. Erb et al. (1996) examine the country risk (represented by economic, political, and financial risks) through international country risk guide, using stock prices as a proxy. The results support the finding of the current paper.

5. How Can Aggregate Economic Potential Help Stock Markets Progress?

This section aims to examine the extent to which the indicators of the Market Potential Index help achieve progress in the stock market. This objective requires the use of a discriminant analysis (Hair et al. 1995; Manly 1998) in order to reach a Z score model that discriminates between low and high levels of measures of stock market progress.

5.1. Estimates of the Discrimination Analysis

The discrimination analysis is quite effective for modeling the difference between classes of data (Abdi 2007). However, discrimination models require a test for validity, content, and construct (Podsakoff and Organ 1986). The author develops two groups of low and high levels of stock market progress. The low level in each measure is equal to the 1st quartile of the data. The high level is equal to the 4th quartile of the data. The two groups satisfy the issue of validity as far as the indicators of MPI measure multi-dimensional aspects. That is, MPI provides a good basis for content validity (Nunnally 1978).

The process of developing a discriminant function requires a grouping variable that includes ordinal values: 1 = low level and 2 = high level of stock market progress measures. The use of discriminant analysis is well known in the literature, with diversified applications from conventional bankruptcy predictions to non-bankruptcy applications,

such as monitoring the internationalization progress and growth of a firm (Eldomiaty 2005; Eldomiaty and Rashwan 2013).

5.2. Results and Discussion of Discriminant Estimates: Z-Score Model

The results include three discriminating functions that move from low to high stock market progress based on the scores of the MPI.

Table 3 shows the significant coefficients (at 5% significance level) of market potential determinants of stock market progress. Statistically, the reported market potential indicators are significant predictors as far as the Chi-Square (x^2) reflects a highly adequate model fit. Table 4 reports the cut-off point for low–high stock market progress. The results in Table 3 offer significant evidence that many macroeconomic components contribute positively to stock market progress. That is, market size, market growth rate, economic freedom, and market receptivity contribute positively to stock market progress. These results extend the conclusions reported in related studies such as Chen et al. (1986) and Cheung and Ng (1998). Furthermore, the positive contribution of country risk to the three indicators of stock market progress extends the conclusions in other studies related to country risk premia, such as Chaieb et al. (2021) and Cooper et al. (2020).

Table 3. The components of the discriminant models for monitoring the move from low to high stock market progress.

Components of the Z Models	Equation Coefficients[1]		
	Low–High MCGDP%	**Low–High LnMC**	**Low–High LnNum**
Constant	−1.872	−2.893	−2.764
Market Size	---	4.118	2.764
Market Growth Rate	0.8921	1.0762	11.143
Market Intensity	−2.346	---	---
Market Consumption Capacity	---	2.107	---
Commercial Infrastructure	−3.321	−1.447	−2.437
Economic Freedom	1.558	---	1.6721
Market Receptivity	4.172	3.782	3.764
Country Risk	2.973	3.440	2.872
Eigenvalue[2]	0.977	0.792	0.663
% of Variance	100%	100%	100%
Canonical Correlation	0.861	0.771	0.713
Wilks-Lambda	0.782	0.641	0.783
χ^2	104.87 ***	99.112 ***	86.631 ***
N	92	92	92

*** Significant at 1% significance level.

Table 4. The cut-off point for low–high stock market progress.

Prior Probability	Low (1st Quartile)	High (4th Quartile)	Cut-Off Point
MCGDP%	0.5	0.5	0
LnMC	0.5	0.5	0
LnNum	0.5	0.5	0

5.3. The Relative Contribution of Market Potential Indicators to Stock Market Progress

The relative contribution is worked out using Mahalanobis D^2 distance between the centroids of the two constituent groups (Mosteller and Wallace 1963; Taffler 1981), as follows:

$$p_j = \frac{c_j\left(\bar{r}_{jf} - \bar{r}_{js}\right)}{\sum_{i=1}^{4} c_i\left(\bar{r}_{jf} - \bar{r}_{js}\right)}$$

where P_j = the proportion of the D^2—distance accounted for by ratio j, $\bar{r}_{if}$; $\bar{r}_{is}$ = the means of the group for ratio i, respectively.

The results reported in Table 5 show that three market potential indicators are reliable for achieving stock market progress. These indicators are commercial infrastructure, market receptivity, and country risk. Nevertheless, the measure of stock market progress requires certain indicators. That is, market capitalization as a percentage of GDP (MCGDP%) requires improvements in market receptivity and country risk (the relative weights are 23.49% and 22.67%, respectively). The increase in market capitalization (LnMC) requires improvements in market size and country risk (the relative weights are 38.61% and 31.44%, respectively). The increase in the number of listed firms (LnNum) requires improvements in the market growth rate (the relative weight is 64.21%). These results extend the conclusion of other studies that macroeconomic variables play a pivotal role in stock market progress (Hondroyiannis and Papapetrou 2001; Ibrahim and Aziz 2003; Rashid 2008). Nevertheless, the results in Table 5 offer a practical guide to policy makers in terms of setting priorities that help stock market progress. That is, market growth rates are associated with the highest contribution (64.21%) to increase the number of listed companies, followed by the market size, being associated with next highest priority (38.61%), helping to increase the stock market capitalization.

Table 5. The relative contribution of the models' discriminatory power.

Market Potential Indicators	Relative Contribution (%) *		
	MCGDP%	LnMC	LnNum
Market Size	0%	38.61%	3.38%
Market Growth Rate	1.996%	2.870%	64.21%
Market Intensity	15.48%	0%	0%
Market Consumption Capacity	0%	1.944%	0%
Commercial Infrastructure	21.47%	10.35%	3.27%
Economic Freedom	14.89%	0%	3.27%
Market Receptivity	23.49%	14.79%	0.23%
Country Risk	22.67%	31.44%	25.63%
Total Contributions	100%	100%	100%

* Mosteller–Wallace measure.

5.4. The Prediction Power of Groupings (Low–High Stock Market Progress)

An additional advantage of the discriminant analysis is that it offers a measure of the extent to which market potential indicators are able to discriminate between the two groups under consideration: low–high stock market progress. Table 6 shows the accuracy matrix of the Z model. The discriminant analysis produces a measure of success which is a classification table (or accuracy matrix).

Table 6 shows that the discriminant models are associated with a relatively high percentage of discriminatory power. These results indicate that the Z-score models can be used operationally to discriminate between low and high stock market progress significantly. The results also indicate that the components of MPI contribute to higher percentages of

stock market progress using the above-mentioned three indicators (83.00%, 61.4%, and 62.5%, respectively). As far as the components of MPI are considered institutional factors, the improvements in the components of MPI are positively associated with stock market progress, which extends the conclusion reported by Fuchs-Schündeln and Funke (2003), Atje and Jovanovic (1993), Bekaert et al. (2001), and Henry (2000).

Table 6. Lachenbruch (1967) holdout test for predicting stock market progress.

Predicted Group Membership (No. of Cases = 92)				
Measures of Stock Market Progress	**Actual Group Membership**	**Low**	**High**	**Total Percentage of Membership**
Percentage of Market Capitalization to GDP (MCGDP%)[3]	Low	76	16	
	High	82.61%	17.39%	100%
Natural log of Market Capitalization (LnMC)[4]	Low	15	77	
	High	16.30%	83.70%	100%
Natural Log of Number of listed firms in national stock market (LnNum)[5]	Low	83	9	
	High	90.22%	9.78%	100%

6. Limitations and Conclusions

6.1. Limitations

The analysis and results being presented in this paper are subject to two limitations. First, the time period that covers the years 1996–2022. Second, the countries being included in the MPI. Indeed, the third limitation may offer a further chance for authors to consider other indicators of stock market progress. The expected results offer a methodological advantage of validating the results being documented in this current paper.

6.2. Conclusions

The components of MPI offer a useful framework for examining the aggregate macroeconomic indicators. The construction of the MPI extends the usefulness of the macroeconomic indicators linking them to market indicators. The latter extends our understanding of the generic associations between financial markets, which is documented by Samli (1977). This paper examined the effect of the components of MPI on stock market progress. The data covers the years 1996–2022. Although the MPI index includes 97 countries, a sample of 54 countries are examined where stock market data are available. The general results show significant effects of the aggregate economic potential on stock market indicators. In terms of market size, countries that are characterized with relatively small market size depend relatively high on equity financing. The plausible interpretation rests on the cost of financing. That is, smaller firms prefer avoiding debt financing that carries financial burdens on profitability (Albin and Alcaly 1979; Caves et al. 1977; Mancke 1974; Heidrick and Keddie 2000; Moritz et al. 2015; Wilson and Kacer 2019; Amarteifio et al. 2023).

In terms of market intensity, the increases in people's expenditure are associated with decreases in investment in financial securities. This finding is documented intrinsically in developing countries (Ganioğlu and Yalçın 2015; Alper 2018). Indeed, this finding offers extending evidence on how developing economies stay developing and developed economies stay developed (Goldin 2019).

In terms of commercial infrastructure, investments in commercial technological infrastructure significantly help the national stock market grow. Interestingly, the components of MPI reflect evidence being documented in the literature (Aker and Mbiti 2010; Bhunia and Ghosal 2011; Chien et al. 2020; Dolatabadi et al. 2013; Igwilo and Sibindi 2022). Indeed, national as well as foreign investors in financial securities require strong infrastructure for managing trading either within or outside a country.

In terms of economic freedom, people's autonomy and political freedom offer opportunities to invest freely without complexities. Intrinsically, investors in financial securities prefer a stock market surrounded by much political stability and less bureaucracy. The growing literature has offered support for this conclusion (Blau et al. 2014; Eleswarapu and Venkataraman 2006; Pastor and Veronesi 2012).

In terms of market receptivity, the increases in imports consume large proportions of people's income; this comes at the expense of investment in financial securities. In this sense, the above-mentioned interpretations apply. The increasing expenditure on consumer goods and services is usually associated with less saving, thus less investments in financial securities (Ganioğlu and Yalçın 2015; Alper 2018; Goldin 2019).

In terms of country risk, investors are able to benefit from risk–return tradeoffs in a way that investors demand high returns in countries where political instability is recognized. This finding extends the conclusions of related studies such as Blau et al. (2014), Eleswarapu and Venkataraman (2006), and Pastor and Veronesi (2012).

The authors note that the consensus of significant effects of economic potential on different indicators of stock market progress offer an intrinsic sense of validity. That is, whatever indicator of stock market progress that a country focuses on, there is always a need to improve and sustain the economic potential indicators in order to sustain the progress of the stock market.

In sum, policy makers must pay significant attention to the above-mentioned economic indicators that offer significant early signals of stock market progress.

6.3. Future Research

Although the components of MPI offer a useful framework for examining the aggregate economic influences on stock market progress, future research is warranted for quantifying the effect of individual subcomponents of MPI on stock market indicators. In this sense, the results would offer an action plan to policy makers regarding the efficient management of each subcomponent.

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Appendix A

Table A1. The significance of the differences between stock market progress indicators in G7 and developing economies.

Stock Market Progress Indicators	Levene's Test for Equality of Variances	Mann–Whtiney Test for Equality of Medians
The percentage of market capitalization to GDP (MCGDP%).	(F = 15.723); *p*-value = 0.00)	Mann–Whitney U (Z = −4.226); *p*-Value = 0.00
The natural logarithms of market capitalization (LnMC) of listed domestic companies (current USD).	(F = 13.448); *p*-value = 0.00)	Mann–Whitney U (Z = −4.721); *p*-Value = 0.00
The natural logarithm of total listed domestic companies (LnNum).	(F = 12.449); *p*-value = 0.00)	Mann–Whitney U (Z = −2.963); *p*-Value = 0.004

Table A2. Dimensions, definitions and measures of Market Potential Index.

Dimension	Definitions	Indicators and Weights
Market Size	The Global EDGE weighs market size as the most important of the indicators. This indicator uses proxies such as urban population numbers and the amount of electricity consumed.	25/100 • Electricity Consumption (2021) [a] • Urban Population (2021) [a]
Market Intensity	Market intensity is figured by blending two statistics. First, an analyst must divide the gross national income by the population figures. Second, the statistician needs to calculate how much of the gross domestic product is being consumed in the private sector.	15/100 • GNI per Capita Estimates Using PPP (2021) [a] • Private Consumption as a percentage of GDP (2021) [a]
Market Growth Rate	The market growth rate is based on a historical five-year average, along with a one-year current statistic. Growing markets will show increasing demand for products.	12.5/100 • Average Annual Growth Rate of Primary Energy Use (Between years 2016–2021) [b] • Real GDP Growth Rate (2016-2021) [a]
Market Consumption Capacity	Analysis of the national income and consumption is necessary to ascertain the market consumption capacity. Determining the market share of the middle-class factors into the overall market.	12.5/100 • Consumer Expenditure (2021) [d] • Income Share of Middle-Class (2019) [a] • Median Disposable Income per Household (2021) [d]
Commercial Infrastructure	This statistic is calculated by examining the saturation and availability of common technology and communication devices. Ratios are based on the number of TVs, telephone lines, personal computers, cell phones, internet users, paved road density and percentage of people per retail outlet.	10/100 • Airport Connectivity (2020) [k] • Cellular Mobile Subscribers (2012) [c] • Fixed Broadband Subscriptions (2021) [c] • Fixed Broadband Internet Speed (2021) [m] • Logistics Performance Index (2021) [l] • Paved Road Density (2021) [d] • Population per Retail Outlet (2021) [d]
Market Receptivity	Some high-consuming countries rely heavily on imports, while others are able to produce the majority of products within the national borders. Reviewing the amount of imports in relation to the gross domestic product might reveal how willing the country is to try new foreign products.	10/100 • Per Capita Imports from US (2021) [g] • Trade as a Percentage of GDP (2021) [a]
Economic Freedom	Economic freedom relates to the degree of citizens' autonomy. Included in this weighted ratio is the degree of political freedom the residents enjoy.	7.5/100 • Economic Freedom Index (2021) [e] • Political Freedom Index (2013) [f]
Country Risk	Euromoney magazine calculates investment risk factors for many countries around the world. Local conditions may simultaneously create a low-risk opportunity in one country while producing a dangerous market in another.	7.5/100 • Business Risk Rating (2022) [h] • Country Risk Rating (2022) [i] • Political Risk Rating (2022) [j]

[a] Source: World Bank, *World Development Indicators*; [b] Source: U.S. Energy Information Administration, *International Energy Annual*; [c] Source: International Telecommunication Union, *ICT Indicators*; [d] Source: Euromonitor International, *Global Market Information Database*; [e] Source: Heritage Foundation, *The Index of Economic Freedom*; [f] Source: Freedom House, *Survey of Freedom in the World*; [g] Source: U.S. Census Bureau Foreign Trade Division, *Country Trade Data*; [h] Source: Swiss Export Risk Insurance, *Country Risk Survey*; [i] Source: Coface, *Country Risk Survey;* [j] Source: Credendo, *Country Risk Survey*; [k] Source: World Economic Forum, *Global Competitiveness Report*; [l] Source: World Bank, *Logistics Performance Index;* [m] Source: Ookla, *Speed Test Global Index.*

Table A3. List of the countries in the Market Potential Index being examined in this paper.

1	Argentina	28	Japan
2	Australia	29	Malaysia
3	Austria	30	Mexico
4	Bahrain	31	Morocco
5	Bangladesh	32	Netherlands
6	Belgium	33	New Zealand
7	Brazil	34	Nigeria
8	Bulgaria	35	Norway
9	Canada	36	Oman
10	Chile	37	Pakistan
11	China	38	Peru
12	Colombia	39	Philippines
13	Costa Rica	40	Poland
14	Croatia	41	Portugal
15	Cyprus	42	Qatar
16	Czech Republic	43	Russia
17	Egypt	44	Saudi Arabia
18	France	45	Singapore
19	Germany	46	Slovenia
20	Greece	47	South Africa
21	Hong Kong	48	Spain
22	Hungary	49	Sri Lanka
23	India	50	Switzerland
24	Indonesia	51	Thailand
25	Ireland	52	Turkey
26	Israel	53	Ukraine
27	Italy	54	United Arab Emirates

Notes

[1] Standardized Canonical Discriminant Function Coefficients.

[2] The variance in a set of variables explained by a factor or component and denoted by lambda. An eigenvalue is the sum of squared values in the column of a factor matrix, or $\lambda_k = \sum_{i=1}^{m} a_{ik}^2$ where a_{ik}^2 is the factor loading for variable i on factor k, and m is the number of variables.

[3] Percent of grouped cases correctly classified: 83%.

[4] Percent of grouped cases correctly classified: 76.7%.

[5] Percent of grouped cases correctly classified: 73.9%.

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