STOCK MARKETS AND ECONOMIC GROWTH : A CAUSALITY TEST*

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Abstract: This article examines causality relationships between stock markets and economic growth based on the time series data compiled from 20 countries for the years 1981 through 1994 . Sims' causality test based on Granger definition of causality was used . At first, panel data covering all countries over the entire analysis period were used to detect the direction of causation. Secondly, causal relations were investigated for each country ,in isolation, using the respective time series data.

Analysis based on the panel data revealed a two-way causation between stock market development and economic growth. Country analyses, on the other hand, could not lead to precise conclusions, but suggested a somewhat stronger link between stock market development and economic growth in developing countries.

Key Words : *Stock markets, economic growth, causality test*

Özet : Bu makale 20 ülkeden 1981-94 yılları için toplanan zaman serilerini kullanarak, hisse senedi pazarlarının gelişmişlik derecesi ile ekonomik büyüme arasındaki nedensellik ilişkilerini incelemektedir. Bu amaçla Granger'in nedensellik tanımına dayanan Sims testi kullanılmıştır. İlk olarak tüm ülkeleri ve yılları kapsayan panel veri tabanı kullanılarak nedensellik yönü araştırılmış, daha sonra aynı ilişki ayrı ayrı her ülke için o ülkeye ait zaman serileri kullanılarak irdelenmiştir.

Panel veri tabanı kullanılarak yapılan analizde, borsaların gelişmişlik düzeyi ile ekonomik büyüme arasında geri besleme ilişkisi saptanmıştır. Ülke bazında yapılan analizlerde kesin sonuçlara ulaşılamamışsa da, borsalarla ekonomik büyüme arasındaki ilişkinin gelişmekte olan ülkelerde daha güçlü olduğu izlenimi edinilmiştir.

Anahtar kelimeler : *Hisse Senedi Pazarı, ekonomik büyüme, nedensellik testi*

I. INTRODUCTION

In an earlier article in this journal the impact of financial deepening on economic growth was tested , and some meaningful findings were presented for three Gulf countries(Gürsoy, Al-Aaali, 2000). This paper aims at going one step further , and investigating causality relationships between economic growth and stock market development based on the data of a group of selected countries.

The establishment of Istanbul Stock Exchange (ISE) in 1986, and the large momentum it has gained since then, has provoked considerable academic curiosity about the causal relationships between ISE and the country's economic growth. Broadly speaking, stock exchanges are expected to accelerate economic growth by increasing liquidity of financial assets, making global risk diversification easier for investors, promoting wiser investment decisions by saving-surplus units based on available information, forcing corporate managers to work harder for shareholders'interests, and channeling more savings to corporations.

Levine (1991) , and Benchivenga&Smith&Starr (1996) emphasize the positive role of liquidity provided by stock exchanges on the size of new real asset investments through common stock financing. Investors are more easily persuaded to invest in common stocks, when there is little doubt on their marketability in stock exchanges. This , in turn, motivates corporations to go to public when they need more finance to invest in capital goods. Although some contrary opinions do exist regarding the impact of liquidity on the volume of savings, arguing that the desire for a higher level of liquidity works against propensity to save (Benchivenga &Smith , 1991), (Japelli &Pagano 1994), such arguments are not well supported by empirical evidence.

The second important contribution of stock exchanges to economic growth is through global risk diversification opportunities they offer. Saint-Paul (1992), Deveraux&Smith (1994) and Obstfeld (1994) argue quite plausibly that opportunities for risk reduction through global diversification make high- risk-high-return domestic and international projects viable, and , consequently, allocate savings between investment opportunities more efficiently. Whether global diversification might reduce the rate of domestic savings (Deveraux & Smith 1994) seems to be a weak argument to us as it is not convincingly evidenced.

Stock prices determined in exchanges ,and other publicly available information help investors make better investment decisions. Better investment decisions by investors mean better allocation of funds among corporations and, as a result, a higher rate of economic growth. In efficient capital markets prices already reflect all available information, and this reduces the need for expensive and painstaking efforts to obtain additional information(Stiglitz 1994).

Stock markets are places where corporate control mechanism is at work. As the economic performance of corporations is reflected in, and measured by, stock

prices, corporate managers would try hard to minimize agency problems and to maximize shareholders' wealth. In a market economy the link between corporate profits and economic growth is quite obvious.

Finally, stock exchanges are expected to increase the amount of savings channelled to corporate sector. Some evidence can be found in the work of Greenwood&Jovanovich (1990).

There is not much empirical research investigating causal relationships between stock exchanges and economic growth . One study worth mentioning here belongs to Levine&Zervos (1996). The authors applied regression analysis to the data compiled from 41 countries for the years 1976 through 1993 to see the relationships between financial deepening and economic growth. One of the financial deepening indicators used in the analysis was the level of development of stock exchange measured by a composite index combining volume, liquidity and diversification indicators. Economic growth indicator selected, on the other hand, was the real growth rate in per capita GDP . Levine and Zervos reported a very strong positive correlation between stock market development and economic growth. The most interesting aspect of this study was the decrease in the statistical significance of other financial deepening variables after stock market development index was included in regression equation. According to the authors this was the proof that stock market development was more influential than other financial deepening indicators on the growth of the economy.

II. TESTING THE CAUSALITY RELATIONSHIP BETWEEN STOCK MARKETAND ECONOMİC GROWTH

2.1) Methodology

Although Levine&Zarvos study implies a causality direction from stock market to economic development, stronger evidence is needed to feel more confident about the existence and the direction of a causality relationship as such. We therefore choose ,in this article, to employ Sims (1972) test, based on Granger's (1969) definition of causality.

In Sims approach, Granger causality relationship is expressed in two pairs of regression equations by simply twisting independent and dependent variables as follows:

$$X_t= \theta_{1,1}X_{t-1}+\theta_{1,2}X_{t-2}+\ldots+\theta_{1,t}X_{t-p}+\theta_{2,1}Y_{t-1}+\theta_{2,2}Y_{t-2}+\ldots+\theta_{2,p}Y_{t-p}+u_{1,t} \qquad (1)$$
$$Y_t= \theta_{2,1}Y_{t-1}+\theta_{2,2}Y_{t-2}+\ldots+\theta_{2,p}Y_{t-p}+\theta_{1,1}X_{t-1}+\theta_{1,2}X_{t-2}+\ldots+\theta_{1,t}X_{t-p}+u_{2,t} \qquad (2)$$
$$X_t= \theta_{1,1}X_{t-1}+\theta_{1,2}X_{t-2}+\ldots+\theta_{1,t}X_{t-p} +u_{1,t} \qquad (3)$$
$$Y_t= \theta_{2,1}Y_{t-1}+\theta_{2,2}Y_{t-2}+\ldots+\theta_{2,p}Y_{t-p} +u_{2,t} \qquad (4)$$

Equations (1) and (2) are called unrestricted, (3) and (4) restricted.

According to Granger's definition of causal relationships:

Y does not cause X, if $\quad \theta_{2,1} = \theta_{2,2} = ... = \theta_{2,p} = 0$ $\hspace{2cm}$ (5)

and

X does not cause Y, if $\quad \theta_{1,1} = \theta_{1,2} = ... = \theta_{1,p} = 0$ $\hspace{2cm}$ (6)

In order to judge whether these conditions hold , Sims employ the following F-statistic to be applied to equations (1) and (2) relative to equations (3) and (4):

$$F = [(R^2_{UR} - R^2_{R}) / m] / [(1 - R^2_{UR}) / (n - 2m - 1)] \hspace{2cm} (7)$$

Where:

R^2_{UR} $\quad$ = the coefficient of determination of unrestricted equation
R^2_{R} $\quad$ = the coefficient of determination of restricted equation
n $\quad$ = the number of observations
m $\quad$ = the number of lagged periods

With Sims test ,the direction of causality is judged as follows:

The result of F test $\hspace{2cm}$ **Direction of Causality**

1) (5) holds, (6) does not hold : X causes Y (X→Y)
2) (5) does not hold, (6) holds : Y causes X (Y→X)
3) Both (5) and (6) hold $\hspace{0.5cm}$: Feedback between X and Y(X↔Y)
4) Neither(5) nor (6) holds $\hspace{0.3cm}$: X and Y are independent

2.2) Research Variables and the Data

Economic growh indicator used in this research is the real per capita gross domestic product(GDP). Per capita GDP has been calculated for the countries included in the analysis by dividing each year's GDP in constant dollars into the same year's population figure.

Devising an indicator for stock market development is not an easy task at all. Ideally, such an indicator should simultaneously reflect liquidity, volume of transactions, informational efficiency, degree of concentration, volatility, depth, legal and institutional and other factors that determine the overall performance of a stock exchange. Lack of sufficient information, however, led us to use a composite index comprising volume and liquidity indicators only. Nevertheless, we believe that such an index would perform quite satisfactorily, since both volume and liquidity indicators have a strong positive correlation with other stock exchange indicators as reported by Demirgüç&Kunt&Levine (1996).

Volume component of our composite index is "Total capitalization/GDP". For liquidity, two indicators have been used: "volume of transactions/GDP" which measures the size of stock market transactions relative to the size of the economy as

a whole, and the turnover ratio measured as "volume of transactions/total capitalization".

For each of these indicators , % deviations from the overall sample mean have been calculated. By doing so, the relative magnitude of each indicator in each country and in each year to the average of all countries and years has been determined. Finally, simple arithmetic average of the relative values of three indicators has been computed, and this average was called "stock market development index".

The panel data used in the research have been compiled from 20 countries with different stages of economic development for the years 1981 through 1994. The countries and the years covered are shown in Table-1.

Table 1 Countries Included and The Analysis Periods Covered

Country	Period	Country	Period
USA	1981-94	Spain	1981-94
Germany	1981-94	Sweden	1981-94
Australia	1981-94	Italy	1981-94
Austria	1981-94	Canada	1981-94
G.Britain	1981-94	Japan	1981-94
Belgium	1981-93	Norway	1981-93
France	1981-94	Pakistan	1984-94
South Africa	1981-94	Turkey	1983-94
India	1981-94	New Zealand	1984-94
Indonesia	1981-93	Greece	1981-94

Real GDP and population figures have been obtained from *United Nations Monthly Bulletin of Statistics*. The information needed for computing stock market development index were found in various issues of *IFC Emerging Markets Data Base* .

2.3) Research Findings

Table -2 summarizes the results of the research. As seen from the table, F-statistics with 2-year and 3-year time lags were calculated for the panel data as well as for each country based on respective time series. Per capita real GDP figures for the year 1995 were also added to the table for convenience.

F values computed with panel data and with the 3-year time lag indicate a causation from stock market development to economic growth at 5% α level, but an opposite direction at 1% α level. We tend to interpret this finding as a feedback phenomenon at 5% α level which supports Patrick's (1966) argument of two-way causation between financial and economic variables.

However, our findings with 2-year time lag do not comfortably support Patrick

argument. F-Statistics on panel data with a time lag of two years reveal that economic growth causes stock market development at 1 % α level, but the

Table-2 F-Statistics Computed

Country	Time Series	3-Year Time Lag		2-Year Time Lag		1995 per capita GDP($)
		SE→EG	EG→SE	SE→EG	EG→SE	
USA	1981-94	0,98259	0,15018	2,07741	0,15040	26993
Germany	1981-94	0,40262	15,72883**	0,69808	3,8394*	27589
Australia	1981-94	2,63407	0,26232	0,28440	0,1531	18721
Austria	1981-94	3,01346	1,13809	0,39026	2,97699	26900
Belgium	1981-93	1,86023	2,22447	0,14935	4,67108*	18790
G.Britain	1981-94	1,36669	0,08410	0,45656	0,42783	24798
France	1981-94	0,49586	2,91337	0,17096	1,78176	24954
S.Africa	1981-94	0,37855	1,46022	0,20785	0,71122	3175
India	1981-94	0,62428	0,83070	0,35244	0,76441	328
Indonesia	1981-93	0,67915	0,37126	3,97061*	0,05956	981
Spain	1981-94	0,41006	0,16669	0,51516	0,50415	13577
Sweden	1981-94	13,67889**	4,96008*	7,73893**	4,69887*	23751
Italy	1981-94	0,96277	0,89151	2,48143	1,21668	19026
Canada	1981-94	1,05539	0,83454	2,56338	0,72835	19375
Japan	1981-94	4,19959*	0,27548	3,57293*	1,08243	39645
Norway	1981-93	2,27653	0,85148	5,54394**	0,32112	31210
Pakistan	1984-94	38,42050*	646,5 ***	4,5986*	0,54188	462
Turkey	1983-94	17,86860*	2,94217	1,01852	1,09121	2749
N.Zealand	1984-94	2,12629	2,26194	0,02894	0,22314	14592
Greece	1981-94	4,23957*	0,63978	3,95648	1,35956	8211
Panel Data		3,11276**	7,039 ***	1,04293	5,54715***	

SE = Stock exchange, EG= Economic Growth
* Significant at 10 % α level
**   "   "   5 % α level
***   "   "   2 % α level

hypothesis that stock market development does not lead to economic growth can not be rejected even at 10 % α level. The conflicting results obtained from the analyses with 2- and 3-year time lags might be interpreted as different causation directions in the short and long runs: Causation runs from economic growth to stock market development both in the short and long runs, but from stock market development to economic growth in the long run only.

Table 3, summarizes the number of cases detected for the countries grouped as to the level of development using World Bank criteria for 1995. As seen from the Table, it is very difficult to draw generalizations about the direction of causality for countries falling into different income groups. Nevertheless, relative number of cases reflecting unidirectional and feedback relationship is seemingly higher in

medium and low income countries. The number of cases reflecting independency in high income countries, on the other hand, is overwhelmingly high. These figures might be taken as an indication of stronger relationships between the stock market and the real sector in developing countries.

Table 3 Causality Relationships Detected By Country Groups

Direction of Causation	Low Income Countries	Medium Income Countries	High Income Countries	Total
a)TimeLag : 3 years				
SE $\rightarrow$ EG	0	2	1	3
EG $\rightarrow$ SE	0	0	1	1
EG $\leftrightarrow$ SE (Feedback)	1	0	1	2
Independent	1	2	11	14
Total	2	4	14	20
b)TimeLag : 2 years				
SE $\rightarrow$ EG	1	2	2	5
EG $\rightarrow$ SE	0	0	2	2
EG $\leftrightarrow$ SE (Feedback)	0	0	1	1
Independent	1	2	9	12
Total	2	4	14	20

III. CONCLUSIONS

Sims'test was applied to the data compiled from 20 countries in order to determine Granger causality relationships between stock market development and economic growth.

The analysis based on the panel data covering all countries for the years 1981-94 with a time lag of three years have indicated a feedback phenomenon between stock market development and economic growth at 5% α level. With a two-year time lag, on the other hand, causation ran from economic growth to stock market development at 1% α level.

Time series analyses for individual countries have not yielded conclusive results. Nevertheless there was slightly stronger evidence supporting a closer link between stock market and real economic indicators in developing countries.

Findings of this research must be interpreted with caution because of certain constraints faced to, such as insufficient data for some years in some countries, small number of developing countries included in the research, subjectivity in the selection of time-lag periods, and the shortness of time series used due to the lack of monthly or quarterly information.

The need for further research is obvious in order to get more evidence about the impact of stock markets on economic growth or vice versa.

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