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THE RELATIONSHIP BETWEEN THE STOCK MARKET AND THE ECONOMY: EXPERIENCE FROM INTERNATIONAL FINANCIAL MARKETS[§]

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Abstract. A casual inspection of stock market prices and GDP in developed market economies reveals that these tend to move together over time. This raises the question as to what is the reason for such a relationship. Explaining such a relationship involves assessing the underlying direction of causality. Does the stock market affect GDP, or is the causality in the opposite direction, such that GDP triggers fluctuations in the stock market? This paper employs the Granger causality test in order to examine causality direction. The focus of the paper is on long-term trends and the evidence presented is garnered from five of the top ten stock markets in the world in terms of market capitalisation.

Introduction

The behaviour of aggregate stock prices is a subject of enduring fascination to investors, policymakers, and economists alike. A casual inspection of stock market prices and GDP in developed market economies reveals that these tend to move together. Countries doing well in terms of GDP performance tend to experience gains in domestic stock exchanges.

Two of the longest periods of economic weakness observed in the industrialised world during the twentieth century namely, the Great Depression in the US and the 'lost decade' of the 1990s in Japan, are often identified with the asset-price busts that preceded them. In both circumstances, rapidly falling prices marked the beginning of painfully

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long periods of economic setbacks. This could have been due to various reasons including pure coincidence, the working of the wealth effect, the stock market acting as a predictor of GDP or that the stock market does not move of its own accord but rather remains in line with physical production conditions.

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The paper is structured as follows. The next section reviews the basic elements of stock market principles and the relevant literature, whilst the third section sets out the methodology employed, the datasets used and the data testing procedures executed prior to the commencement of the Granger causality simulations. The evidence presented is garnered from five of the top ten stock markets in the world in terms of market capitalisation, as shown in Table 1. The fourth section outlines the Granger causality results, while the fifth section presents an analysis of the results attained. The last section summarises the main findings and presents some conclusions.

Table 1
Top Ten Biggest Stock Markets in the World (% of Total)

No.	Market	%
1	United States	47.6
2	Japan	10.2
3	United Kingdom	10.2
4	France	4.6
5	Canada	3.2
6	Germany	2.9
7	Switzerland	2.9
8	Italy	2.3
9	Australia	2.0
10	Netherlands	2.0

Source: Wren Research, June 2005

The Link Between Stock Prices and the Economy

Economic theory suggests that there should be a strong link between economic activity and security prices, given that the stock price is the discounted present value of the firm's payout. If this payout is ultimately a function of real activity, such a link should prevail. The standard discounted-cash-flow model implies that stock prices lead real economic activity if investors' expectations about firms' future payouts are correct on average. This is one theoretical argument as to how stocks and economic output may be related.

There are three other theoretical propositions as to how stock prices can have a direct affect on economic output, further strengthening the link in the relationship between these two variables.

The first link was suggested by Tobin (1969). It focuses on the impact that share prices have on the cost of capital, and is captured by a coefficient known as Tobin's Q, which is the ratio of the market value of current capital to the cost of replacement capital. When share prices are high, the value of the firm relative to the replacement cost of its stock of capital (Tobin's Q) is also high. Consequently, this leads to increased investment expenditure and thus to higher aggregate economic output as firms find it easier to finance investment expenditures. This occurs because investment would be easier as it would require a lower share offering in a situation of a high share price.

The second channel through which stock market performance may influence GDP was suggested by Modigliani (1971). His proposition operates through the impact that the wealth variable has on consumption. A permanent increase in security prices results in an increase in the individual's wealth holdings, and therefore in higher permanent income. Through the permanent income hypothesis, Modigliani postulated that intertemporally, consumers smoothen consumption in order to maximize their utility. An increase in permanent income will therefore enable consumers to re-adjust upwards their consumption levels in each period.

The third possibility through which stock prices impact output is referred to as the financial accelerator (Bernanke and Gertler, 1989; Kiyotaki and Moore, 1997). This channel focuses on the impact that stock prices have

on firms' balance sheets. Due to the presence of asymmetric information in credit markets, the ability of firms to borrow depends substantially on the collateral they can pledge. The collateral value firms can offer increases in scenarios where their stock price value increases. As the collateral they can offer increases, higher credit can be raised, which in turn can be used for investment purposes and thereby triggers an expansion in economic activity.

Some Empirical Studies

Campbell (1998) uses the log-linear asset pricing framework to study the empirical relationship between stock prices and output. In his work, the log-price dividend ratio is regressed against output growth. The results are statistically insignificant in France, Germany, the UK, Japan and the US. According to Campbell, stock prices have little predictive content with respect to output. Binswanger (2004) comes to a different conclusion. In his paper he uses the OLS method and runs regressions using growth rates of industrial production as the dependent variable and contemporaneous and lagged real stock returns as the explanatory variables on datasets for the G7 countries. A statistically significant relationship between the variables is found in all the G7 nations except for Italy and France.

Stock and Watson (2001) use a forecasting regression consisting of real GDP against lagged explanatory variables that are theoretically relevant predictors for each of the seven most industrialised economies (Canada, France, Germany, Italy, Japan, the UK and the US) and find results that provide some evidence that stock prices have a small marginal predictive content for output at the two, four and eight quarter horizon. However the ability of stock prices as predictors varies across countries and over decades.

Humpe and Macmillan (2005) analysed the extent to which macroeconomic variables explained stock market movements in the US and Japan. Using a log-linear model, they found that a 1 per cent increase in industrial production triggered a 1.09 per cent increase in US stock prices whilst a 1 per cent increase in Japanese industrial production triggered a 0.4 per cent increase in Japanese stock prices. Both parameters were highly statistically significant.

Schwert (1989) attempted to study the relationship between economic activity and stock returns by examining the correlation between volatility in economic activity and volatility in stock prices. Schwert finds evidence that stock market volatility depends on the health of the economy. Using monthly data the model showed that average volatility increased by a significant 189 per cent in times of recession. Hence, given these divergent views and results, the debate in the literature on the link between stock prices and the economy remains inconclusive.

Methodology

Two variables are considered in this study, namely nominal GDP and stock market indices, with the relationship between them being tested by the Granger Causality test. The data used is tested for stationarity, which is a basic requirement for this type of analysis, especially in view of the fact that asset prices, such as stock prices rates, follow a random walk, that is, they are non-stationary (Phylaktis and Ravazzolo, 2002). Econometric literature points to the fact that the direction of causality established by Granger tests may depend critically on the number of lagged terms included (Thornton and Batten, 1984). In this study, the number of lagged terms included in all Granger tests conducted was determined on the basis of the Schwarz Bayesian Criterion, which is widely used in applied econometric applications of this kind (Pindyck and Rubinfeld, 1998).

Data Set Used in Models

GDP quarterly data was obtained from the IMF International Financial Statistics (IFS) for all 5 countries under scrutiny. For the US, the stock market index used in the analysis was the Dow Jones Industrial Average, whilst the FTSE 100 was used in the case of the UK. Quarterly data for these two indices was obtained from Wren Research (available at www.wrenresearch.com.au/downloads/index.htm). For France, Germany and Japan, the stock market index used was obtained from the IFS Statistics Database. The analysis carried out for the US employed data ranging from 1957:Q1 to 2005:Q2 whereas data ranging from 1957:Q1 to 2004:Q4 was used for Japan. The analysis conducted for France, Germany and the UK utilises data from 1970:Q1 to 2004:Q4.

Testing for Stationarity

A method employed extensively in the literature to infer whether data is stationary or otherwise is to determine whether the plot of the data suggests that the mean and variance changes for different sub-samples of the time series. A more formal and less arbitrary method, based on the testing for the presence of a unit root, was developed by Dickey and Fuller. The Dickey-Fuller (DF) test results indicated that all macroeconomic and stock market data are I(1) which means that the actual data are integrated of order 1. They are therefore non-stationary but their first differences are stationary.

The Causality Results

Table 2 reports the F-statistics for the Granger causality tests between the stock market and GDP and between the GDP and the stock market in the various countries under consideration, using first differences. In the case of the US, the bivariate test suggests the presence of a unidirectional causality from the Dow-Jones stock index to GDP. In other words, in the US, stock price movements cause movements in GDP. Moreover the results indicate that there does not appear to be any causality from GDP to the stock index. A similar tendency emerged for the UK where the leading stock index, namely the FTSE 100, Granger causes GDP. In the case of the US the reverse causality namely from GDP to stock prices does not appear to be present.

Table 2
F-Tests Results

	Causality: Stock Index to GDP	Causality: GDP to Stock Index
US	GDP = f(DowJones) F=2.903*	DowJones = f(GDP) F=1.068
UK	GDP = f(FTSE100) F=2.357*	FTSE100 = f(GDP) F=0.393
Japan	GDP = f(Japan IFS Stock Index) F=3.649*	Japan IFS Stock Index = f(GDP) F=0.065
France	GDP = f(France IFS Stock Index) F=2.429*	France IFS Stock Index = f(GDP) F=0.170
Germany	GDP = f(German IFS Stock Index) F=0.405	German IFS Stock Index = f(GDP) F=1.225

** Significant at the 0.05 level*

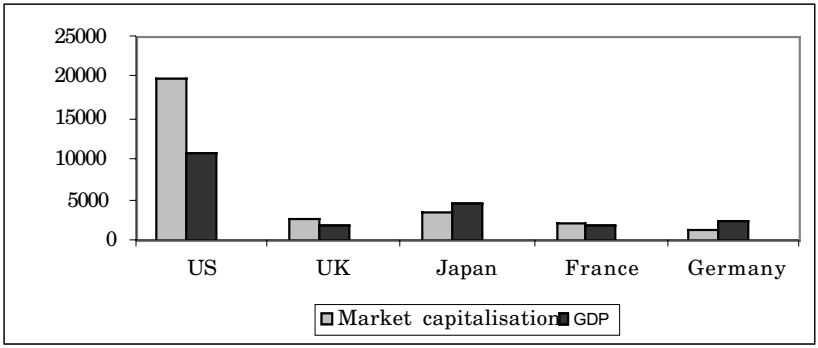
The analysis for Japan points to the same conclusion derived in the UK and the US, in that on the basis of the F-statistic the null hypothesis that stock index movements do not Granger cause GDP is rejected. In other words, a unidirectional relationship similar to that in the previous two countries is established, whereby the causality runs from stock prices to GDP. Moreover, no causality was found in the reverse direction. In the case of France, the picture that emerges is similar to that prevailing in Japan, the UK, and the US. A unilateral causality is found to exist from the stock index to GDP. On the other hand, no reverse linkage is found from GDP to the stock market. Germany is the only country that does not follow the tendency that emerges from this study. In the case of Germany, movements in stock prices and GDP are found to be independent of one another. This emerges clearly in the results outlined where the null hypothesis of no causality is accepted for both directions of causality in that both the F-statistics calculated are statistically insignificant.

Comments on the Results

Although the robustness of results differs from one country to another, some tendencies have emerged from the analysis undertaken. For all countries except Germany it has been determined that stock prices Granger cause GDP. A reverse causality, from GDP to stock prices has not been established in any of the countries under scrutiny, and hence the study points towards a unidirectional causality from the stock market to the economy. When causality is established, it suggests that one can use a variable, in this context the stock market index, to better predict the other variable namely GDP, than simply the past history of the latter variable. The lack of causality from stock prices to GDP that has been found in Germany may be due to the fact that its stock market capitalisation is relatively small in relation to the level of economic activity. This is shown in Figures 1 and 2, where the German stock market is the smallest when compared to the value added generated in the country.

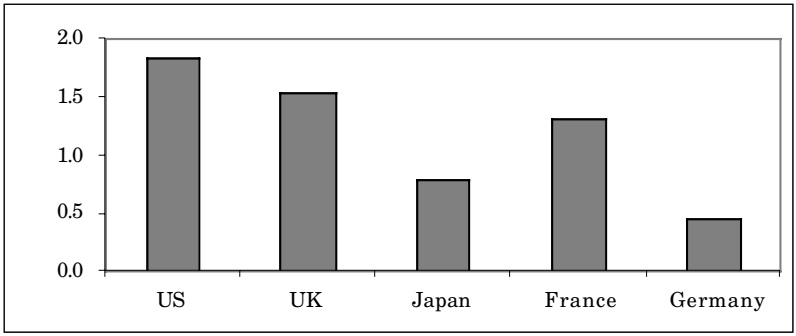
The relative smallness of the market may result in a lack of causality between the stock market and the economy since a small stock market implies that stock price movements have a potentially smaller impact on aggregate household wealth, than is the case in other countries where the ratio of market capitalization to GDP is higher.

Figure 1
Market Capitalisation and GDP in $ Billions



Source: See text

Figure 2
Ratio of Market Capitalisation in Relation to GDP (%)



Source: See text

The results produced in this study are consistent with Aslanidis *et al.* (2002) and Schwert (1990) who come to a similar conclusion albeit employing a different methodology. It is pertinent to point out however, that the results obtained are contrary to those suggested by Campbell (1998) who also employed a different methodological approach and used the log-linear asset pricing framework.

Policy Implications

The results obtained in this paper have a number of policy implications for both the monetary authorities and the national governments. The fact that stock prices Granger cause GDP can be due to two underlying reasons. The first reason may be that the stock market is a good predictor of GDP emanating from the fact that, in line with Equity Valuation Models, stock price valuation depends on expected future dividends. Hence, such causality may possibly result from the fact that expected future dividends are a good proxy of future economic activity as measured by GDP. Different stock market analysts use a myriad of different techniques in order to project the future trading prices of specific stocks. Some involve complex algorithms while others are based on intuition and market experience.

Hence for example, the world's most successful investor, and one of the richest man on earth, Warren Buffett, contends that throughout his lifetime, he has been able to forecast future stock trading prices with reasonable accuracy. His method involves estimating the annual compounding growth in earnings per share (eps) registered in the past 10 years and projecting this compound growth over the next 10 years. The (eps) of the tenth year into the future is then multiplied by the average price-earnings ratio registered over the last ten years, and the result would give the estimated stock trading price in 10 years time. In this way the price of current stock prices, which are a reflection of investor demand and supply could potentially contain information and expectations of future economic activity.

This argument earns greater credibility if one considers the fact that stock indexes include the largest companies in the country, which when taken together are likely to account for a considerable proportion of the aggregate value added generated in a given country.

There could however, be a second element in play. This is the wealth effect, in line with the Permanent Income Hypothesis suggested by Friedman (1957) and the life-cycle hypothesis postulated by Modigliani (1986). These pointed out the importance of assets for consumption decisions. According to these hypotheses, household expenditure in the economy is not only a function of income but also of asset values such as stock holdings.

Therefore in countries where the stock market capitalisation in relation to GDP is high, this wealth effect is likely to be more pronounced, as results for the US, UK, France and Japan demonstrate. In view of the importance of the contribution of domestic consumption to economic growth in the economies of the most developed countries, such a wealth effect could severely affect a country's economic growth when asset prices exhibit major corrections. This is particularly true in the case of the US, where domestic consumption has been the major driver of economic growth in recent years. In turn, this calls for greater scrutiny of the underlying movements in asset markets by monetary authorities. In this regard the greater emphasis on financial stability within supervisory and regulatory bodies is encouraging. Furthermore, within this context, the concern currently prevailing within international financial markets that the housing slump in the US could trigger the domestic economy into recession and reduce the pace of world economic growth, is plausible.

Conclusion

The observed unidirectional causality between GDP and stock prices implies that the level of economic activity in a country, can potentially depend on the stock market amongst other variables. The observed phenomenon hinted in the introduction, that long periods of weaknesses such as the Great Depression and the 'lost decade' in Japan are identified with the asset-price busts that preceded them, could therefore be no mere coincidence. The significant contraction in asset values, triggered a subsequent contraction in consumption and economic activity levels. Hence a large downfall in stock prices caused a similar decrease in economic activity.

The findings therefore call for an effective and efficient regulatory framework that prevents the occurrence of runaway prices in domestic stock markets. Given that stock prices appear to Granger cause GDP, the occurrence of bubbles and busts in financial markets is likely to exacerbate volatility in economic activity. Comments such as those made by the retired Fed Chairman Alan Greenspan in 1996 hinting at 'irrational exuberance' in stock markets are therefore understandable and necessary in curtailing the transmitting of volatility from stocks to the wider economy.

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