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Stock Returns and Output Growth in Emerging and Advanced Economies

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Abstract

This paper studies the correlation between output growth and lagged stock returns in a panel of emerging market economies and advanced economies. It finds that the correlation is as strong in emerging market economies as in advanced economies. Asset prices therefore contain valuable information to forecast output also in emerging market economies. Moreover, the paper finds that the strength of the correlation between output growth and lagged stock returns is significantly related to a number of stock market characteristics, such as the number of listed domestic companies and initial public offerings and, especially, a high market capitalization to GDP ratio and English legal origin.

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"There is no sense in building up a new enterprise at a cost greater than that at which a similar existing enterprise can be purchased; whilst there is an inducement to spend on a new project what may seem an extravagant sum, if it can be floated off on the stock exchange at an immediate profit." (J. M. Keynes, *The General Theory of Employment, Interest and Money*, 1936.)

"Cause and effect run from the economy to the stock market, never the reverse." (John Kenneth Galbraith, 1955)

"The stock market has predicted nine out of the last five recessions." (Paul Samuelson, 1960)

I. INTRODUCTION

The recent financial crises and associated output declines experienced by a number of emerging market economies have raised anew the issue of the links between financial and real variables, notably between stock market performance and economic activity. The empirical association between real stock returns and real economic activity has been analyzed in depth in the case of the United States and, to a lesser extent, other developed countries. However, this relationship remains surprisingly unexplored in the case of emerging market economies.[2] Moreover, while a number of theories have been proposed to explain this empirical association, cross-country differences in its strength have not been used to discriminate among existing theories.

This paper analyzes the correlation between real stock returns and economic growth in a panel of emerging market and advanced economies. By doing so, it seeks to fill two gaps in the existing literature. First, it examines the extent of this correlation in emerging countries, and compares it to that observed in advanced countries. Second, it uses this larger group of countries to address the more general question of what type of countries tend to display a stronger association between output growth and lagged stock returns, and it relates the results to existing theories.

In the United States, the correlation between real economic activity and lagged real stock returns is positive and both statistically and economically significant. This correlation is well known and has been documented by several studies, including Fischer and Merton (1984), Barro (1990), Fama (1990), and Schwert (1990). A similar relationship holds in Canada (Barro, 1990), Japan, Germany, and the United Kingdom (Mullins and Wadhwani,

[2] More generally, studies on leading indicators in developing countries are relatively scarce. In a notable exception, Agenor, McDermott, and Prasad (1999) explore the extent to which a number of macroeconomic variables lead the economic cycle in developing countries.

1989), the G-7 (Choi et al., 1999), and several other European countries (Asprem, 1989, and Wasserfallen, 1989 and 1990).

Although the correlation is significant and stock returns provide valuable information about future economic activity, they are of course not perfect as a leading indicator, as suggested by Samuelson's oft-quoted adage reported above. Stock and Watson (1990 and 1998) show that the relationship between stock returns and economic growth has not been stable over time, and that the systematic predictive information of stock returns for future activity is also contained in other financial variables—such as yield spreads between 10-year and 3-month government bonds, or between T-bills and private commercial paper—in the case of the United States.[3] Hu (1993) shows that the yield spread between long-term and short-term government bonds is a better predictor of future economic activity than stock market returns in the G-7 countries.

Several theories (reviewed in the next section) have been put forward to provide a rationale for this empirically observed correlation. All theories allow for the possibility that news about future output growth is reflected in stock returns. Some authors (including John Kenneth Galbraith, as in the quote reported above) argue that this is the only mechanism underlying the correlation. This mechanism does not involve stock price changes "causing" changes in output in an economic sense, though of course it does involve Granger-causality, with lagged stock returns predicting output growth. Others argue that, in addition, stock price changes that are not justified by fundamentals may cause changes in output, through mechanisms that typically rely on stock markets being sufficiently developed in a number of respects discussed below.

There are three reasons why analyzing the link between stock returns and output growth is especially interesting for emerging markets. First, leading indicators are relatively scarce in emerging markets. In particular, relatively low financial market liquidity and frequent changes in financial structure imply that other financial variables such as yield spreads are unlikely to be successful predictors of output, and in any case it is usually difficult to identify a relevant yield spread for a sufficiently long sample period. Given the speed with which stock market prices become available, it seems that the stock market could be a helpful leading indicator in forecasting economic growth. Immediately following the onset of the Asian crisis in 1997, there was no consensus on how deep an impact the financial crisis would have on economic growth. At that time, the extent of the decline in stock price indices might have provided useful guidance in answering that question. Second, volatility of returns in emerging markets is higher than in mature markets (Richards, 1996) and the same is true of output. While this might reflect greater noise, it might also yield a wealth of information, even though data on emerging countries are usually available for shorter sample periods than data on advanced countries. Moreover, if one were to find that stock price

[3] Campbell (1999) analyzes the forecasting power of other financial variables in a number of advanced economies, and finds that the price-dividend ratio has low forecasting power, whereas the yield spread between long-term and short-term bonds performs better.

changes that are not justified by fundamentals really affected output, this would raise a number of policy issues that would be particularly relevant for emerging markets. Third, by expanding the sample of countries to include a number of emerging markets, it is possible systematically to address the question of whether the association between stock returns and output growth is stronger in some types of countries than others, depending not only on their level of economic development, but also on several indicators of the size and liquidity of, and legislation governing, their stock markets.

This paper presents two main findings. First, the empirical association between output growth and lagged stock returns is as strong in emerging countries as in advanced countries at the yearly frequency, and is still significant though somewhat weaker at the quarterly frequency. Second, the association is significantly stronger in countries that have high market capitalization, a large number of listed domestic companies and initial public offerings, and English (or non-French) origin of the regulations governing the stock market. Although all of these country characteristics are correlated, those with the best predictive power for whether a country has a strong association between output growth and stock returns are market capitalization and—a less robust finding—English (or non-French) legal origin of the regulations governing its stock market.

The remainder of this paper is organized as follows. Section II reviews existing theories of the link between stock returns and output growth and relates them to a number of characteristics of countries' stock markets. Section III describes the data on stock market returns and economic growth and reports the estimation results. Section IV concludes.

II. Theories on the Link Between Stock Returns and Output Growth

The observed correlation between economic growth and stock returns has prompted a debate on the causal direction of the underlying relationship. This section, which draws heavily on Morck, Shleifer, and Vishny (1990), reviews five existing theories of this link and briefly summarizes the empirical literature that tests them. It then conjectures which country characteristics may predict the strength of the association between stock returns and output growth, according to each theory. The theories may be grouped into those according to which stock price movements not reflecting changes in future "fundamentals" cannot predict changes in output (the "passive informant" hypothesis and the "accurate active informant" hypothesis), and those according to which they can (the "faulty active informant", the "financing" hypothesis, and the "stock market pressure on managers" hypothesis).

1) According to the *"passive informant" hypothesis*, the only mechanism underlying the correlation between stock returns and output growth is the following. Under the assumptions that stock prices reflect the present discounted value of all future dividends and that dividend growth is related to GDP growth, a correlation between this year's stock returns and next year's economic growth arises naturally: if next year's economic growth is buoyant, news revealed this year will typically be positive, resulting in large

stock price increases this year. All theories reviewed below also accept that the above mechanism plays a role, but they leave room for additional mechanisms.

2) Under the *"accurate active informant" hypothesis*, stock price changes provide managers with information about the market's expectations of future economic developments. Managers base their investment decisions upon that information, thereby justifying the market's expectations. The stock market therefore acts as a "sunspot," bringing about one of several possible self-fulfilling equilibria. In this case, stock price changes turn out to be perfectly correlated with fundamentals.

3) In the *"faulty active informant" hypothesis*, managers' decisions about investment are influenced by stock price movements, but managers cannot distinguish between movements reflecting fundamentals and those reflecting market "sentiment". Stock market movements that are not motivated by fundamentals can therefore mislead managers into overinvesting or underinvesting compared with what later turns out to be warranted by fundamentals.

4) The *"financing" hypothesis*, based upon Tobin's *q* theory (a formalization of Keynes' reasoning in the quote reported above), argues that when stock prices are high compared to the replacement cost of capital, entrepreneurs are more likely to expand their activities by investing in new physical capital (possibly financed by issuing new shares of their company) rather than by purchasing existing firms on the stock market. Therefore, high stock returns will tend to be followed by high investment and economic growth. There is a debate on whether this mechanism allows scope for irrational movements in stock prices to affect real economic activity, as suggested by Fischer and Merton (1984), or whether rational managers will choose not to act upon changes in financing costs resulting from market sentiment rather than fundamentals, as argued by Blanchard, Rhee, and Summers (1993).

5) Finally, the *"stock market pressure on managers" hypothesis* suggests that stock price changes can affect investment even if they neither convey information nor change financing costs. If investors hold negative views on a firm's prospects and drive down its stock price, managers may have to cut their investment projects to protect themselves from the possibility of being fired or taken over. Conversely, if investors are very optimistic about a firm's prospects and lead its stock price to soar, managers may decide to adopt an aggressive investment strategy to avoid appearing too cautious.[4]

Although lack of data on fundamentals (i.e., dividends) for a sufficient number of countries prevents direct testing of these theories using the large cross-country data set analyzed in this paper, each of these theories has different implications for the country

[4] It is not clear whether this mechanism would work symmetrically—it might be stronger when the stock price falls than when it rises.

characteristics that can be expected to be systematically related to a strong link between stock returns and output growth. In particular, the following conjectures can be made. (These are summarized in Table 1, which reports whether each of the five theories would predict a certain country characteristic to lead to a closer association between stock returns and output growth, holding other things equal—including the other characteristics in the table.)

- Under the "passive informant" hypothesis, most country characteristics are unlikely to predict the strength of the association between stock returns and output growth, because good news about output leads to a capital gain on stocks regardless of country characteristics. One possible exception is the extent to which the companies listed on the stock market are representative of the economy as a whole, which might be proxied by high market capitalization and a large number of listed companies. However it seems that, for most countries in the sample analyzed in this paper, the group of firms listed on the stock market is fairly representative of the economy as a whole.

- Similarly, under the "active informant" (whether "accurate" or "faulty") hypothesis, market capitalization might matter, because a larger stock market implies that stock price changes provide information that managers will consider more relevant. Other characteristics, such as the number of initial public offerings or the legal origin of regulations governing the stock market, would not matter under these theories.

Table 1. Implications of Various Theories for Strength of Growth-Returns Links

According to each theory, do the following country characteristics—holding other characteristics constant—make it more likely that a country will display a strong association between output growth and lagged stock returns?

	Country Characteristics					
Theory	Emerging/Advanced Or Per Capita GDP	Market Capitalization	Turnover	Initial Public Offerings	Listed Companies	Legal Origin
Passive Informant	No	Possibly	Possibly	No	Possibly	No
Accurate Active Informant	No	Possibly	Possibly	No	Possibly	No
Faulty Active Informant	No	Possibly	Possibly	No	Possibly	No
Financing	No	Yes	Yes	Yes	Yes	No
Stock Market Pressure	No	Yes	Possibly	No	Yes	Yes

- Under the "financing" hypothesis, countries with well-developed financial markets as proxied by high market capitalization and a large number of listed domestic companies and initial public offerings can be expected to display a stronger link between stock returns and growth. In fact, the financing mechanism is more likely to operate in these countries, because it relies on the possibility of issuing shares or taking over other companies.

- Under the "stock market pressure on managers" hypothesis, countries in which managers are protected from shareholders, that is—according to La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, henceforth LLSV)—countries whose stock market regulations are of English origin as opposed to Scandinavian, German, or French origin (in increasing order of managers' protection), should display a stronger association between stock returns and output growth. In fact, if market sentiment brings about a decline in a given company's stock price, its managers will be able to continue pursuing a strategy of high investment only in countries where it would be difficult to fire them or to take over their firm.

- Under all of the theories above, stock market turnover, as a proxy for liquidity, would seem to be a potential determinant of the strength of the association between stock returns and output growth whereas, controlling for the other financial development indicators, the degree of economic development or the distinction between "emerging" and "advanced" countries would not matter.

A final observation is that the discussion above has focused on the investment component of GDP, because of its primary role in accounting for GDP growth developments.[5] However, stock price developments can affect consumption as well, through their impact on wealth, and one would expect this mechanism to be higher in countries where stocks constitute a large proportion of consumers' portfolios—which may be proxied by market capitalization as a share of GDP.[6]

Testing of these theories has thus far relied almost exclusively on data from the United States. Using both aggregate and firm-level data from the United States, Morck, Shleifer, and Vishny (1990) argue that the stock market is largely a "sideshow" which merely reflects changes in expected output growth. Blanchard, Rhee, and Summers (1992) broadly support this view by showing that stock price movements independent of fundamentals have only a small impact on economic activity.

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[5] The analysis of the relationship between stock returns and the growth of investment or the investment rate would be a natural extension of the present study.

[6] Data on the proportion of individuals' portfolios that is accounted for by stocks are only available for a small number of advanced countries.

To my knowledge, the only existing study that exploits cross-country differences in the link between output growth and stock returns is that by Mullins and Wadhwani (1989), who find that the link is stronger in the United States and the United Kingdom than in Japan or Germany. They attribute this difference to the fact that the Anglo-Saxon countries are characterized by a greater possibility of takeovers, lower gearing ratios, more pervasive use of stock option schemes in managers' remuneration, and a smaller role played by employees in decision making.

A possible reason why previous research has not focused on the link between stock returns and output growth in emerging markets might be a presumption that stock markets are smaller and less liquid in emerging markets than in advanced countries. Although indicators such as the ratio of market capitalization to GDP are, on average, higher in advanced economies than emerging markets, several emerging markets score much higher on these indicators than most advanced economies (Table 2). Indeed, there is considerable variation in market capitalization and turnover ratios, the number of listed domestic companies and initial public offerings, and legal origin among both emerging and advanced countries. This valuable information in used in the next section.

III. Data and Estimation

This section briefly describes the data[7] and reports the estimation results. It analyzes the association between output growth and lagged stock returns in the countries in the sample, focusing on whether its strength is the same for various groups of countries. First, it explores whether there are differences between emerging markets and advanced countries (following the definitions of the Investment Finance Corporation, IFC). The objective is to find out whether stock returns could help predict output growth in emerging countries. Second, it turns to possible differences among countries depending on variables that might be related to the strength of the association according to the theories discussed in Section II. The goal here is to understand the sources of the association rather than necessarily to make use of it to predict output growth.

Data on real stock returns (obtained as the difference between nominal stock returns and consumer price inflation) and real GDP growth are available at an annual frequency for a period of at least 22 years for eight emerging countries and 17 advanced countries. At a quarterly frequency, data on real stock returns and real GDP growth are available for at least ten years for six emerging countries and 18 advanced countries. To expand the number of

[7] A more detailed description of the data, including variable definitions and sources, is provided in Appendix I.

Table 2. Indicators of Stock Market Development, Size, Liquidity, and Legal Origin

	1988			1998							
Countries	NGDP per Cap (US$)	Mkt Cap (US$ mil)	Mkt Cap % of GDP	NGDP per Cap (US$)	Mkt Cap (US$ mil)	Mkt Cap % of GDP	Turnover Ratio	Listed Cos.	IPOs/ Pop	Legal Origin	Anti-Dir. Rights
Emerging Markets											
Argentina	4,047	2,025	2	9,518	45,332	13	28.8	130	0.20	FRA	4
Bangladesh	227	430	2	348	1,034	2	61.7	208	n.a.	n.a.	n.a.
Botswana	2,189	n.a.	n.a.	3,160	724	15	10.5	14	n.a.	n.a.	n.a.
Brazil	2,112	32,149	11	4,543	160,887	21	70.4	527	0.00	FRA	3
Bulgaria	5,113	n.a.	n.a.	1,356	992	8	2.4	998	n.a.	n.a.	n.a.
Chile	1,970	6,849	28	5,147	51,866	70	7.1	277	0.35	FRA	3
China, Mainland	278	n.a.	n.a.	772	231,322	24	130.1	853	n.a.	n.a.	n.a.
Colombia	1,297	1,145	3	2,404	13,357	15	9.4	163	0.05	FRA	n.a.
Cote d'Ivoire	948	437	4	699	1,818	16	2.5	35	n.a.	n.a.	n.a.
Czech Republic	5,246	n.a.	n.a.	5,169	12,045	23	38.2	261	n.a.	n.a.	n.a.
Ecuador	997	n.a.	n.a.	1,545	1,527	8	7.4	37	0.09	FRA	2
Egypt	1,698	1,760	2	1,297	24,381	30	22.2	861	n.a.	FRA	2
Ghana	368	n.a.	n.a.	374	1,384	19	4.8	21	n.a.	n.a.	n.a.
Greece	6,461	4,285	7	11,490	79,992	66	82.3	244	0.30	FRA	1
Hungary	2,995	n.a.	n.a.	4,734	14,028	29	111.3	55	n.a.	n.a.	n.a.
India	366	23,623	8	433	105,188	25	55.2	5860	1.24	GBR	2
Indonesia	674	253	0	435	22,104	25	37.9	287	0.10	FRA	2
Israel	9,888	5,458	12	15,485	39,628	43	26.6	650	1.80	GBR	3
Jamaica	1,501	796	23	2,784	2,139	30	1.9	49	n.a.	n.a.	n.a.
Jordan	2,031	2,233	37	1,486	5,838	78	11.6	150	n.a.	FRA	1
Kenya	379	474	6	315	2,024	20	4.1	58	n.a.	GBR	3
Korea	4,336	94,238	52	6,694	114,593	37	176.2	748	0.02	DEU	2
Lithuania	9,074	n.a.	n.a.	2,843	1,074	10	16.0	60	n.a.	n.a.	n.a.
Malaysia	2,048	23,318	67	3,072	98,557	146	30.0	736	2.89	GBR	3
Mauritius	1,958	n.a.	n.a.	3,451	1,849	46	5.8	40	n.a.	n.a.	n.a.
Mexico	2,190	13,784	8	4,326	91,746	22	27.3	194	0.03	FRA	0
Morocco	948	446	2	1,259	1,849	5	9.9	53	n.a.	n.a.	n.a.
Nigeria	279	960	4	298	2,887	8	4.9	186	n.a.	GBR	3
Pakistan	378	2,460	6	458	5,418	8	111.1	773	n.a.	GBR	4
Peru	1,201	n.a.	n.a.	2,434	11,645	18	19.0	257	0.13	FRA	2
Philippines	645	4,280	11	875	35,314	55	30.0	221	0.27	FRA	4
Poland	1,724	n.a.	n.a.	3,840	20,461	14	54.7	198	n.a.	n.a	n.a.
Portugal	5,033	7,172	15	11,618	62,954	58	93.4	135	0.50	FRA	2
Russia	5,990	n.a.	n.a.	1,921	20,598	7	9.1	237	n.a.	n.a.	n.a.
Saudi Arabia	5,076	n.a.	n.a.	6,164	42,563	34	26.9	74	n.a.	n.a.	n.a.
Slovenia	n.a.	n.a.	n.a.	10,044	2,450	12	34.4	28	n.a.	n.a.	n.a.
South Africa	2,488	126,094	143	2,553	170,252	146	29.1	668	0.05	GBR	4
Sri Lanka	421	471	7	825	1,705	11	14.8	233	0.11	GBR	2
Taiwan, Province of China	6,192	120,017	97	11,702	260,015	100	323.0	437	0.00	DEU	3
Thailand	1,131	8,811	14	1,906	34,903	30	71.0	418	0.56	GBR	3
Trinidad and Tobago	3,685	268	6	4,604	3,922	64	5.0	25	n.a.	n.a.	n.a.
Tunisia	1,299	612	6	2,172	2,268	11	8.2	38	n.a.	n.a.	n.a
Turkey	1,654	1,135	1	2,995	33,646	17	144.9	277	0.05	FRA	2
Venezuela	3,291	1,816	3	4,055	7,587	8	13.6	94	0.00	FRA	1
Zimbabwe	851	774	10	446	1,310	23	10.1	67	n.a.	GBR	3
Developed Markets											
Australia	15,666	138,283	53	19,249	874,283	240	51.9	1162	n.a.	GBR	4
Austria	16,739	8,862	7	26,217	34,106	16	47.4	96	0.25	DEU	2
Belgium	15,630	58,920	38	25,050	245,657	98	28.9	146	0.30	FRA	0
Canada	18,510	241,880	49	19,725	543,394	91	67.0	1384	4.93	GBR	4
China, Hong Kong	10,358	74,377	128	26,510	343,394	206	54.4	658	5.16	GBR	0
Denmark	21,669	30,178	27	32,942	98,881	57	n.a.	242	1.80	SCA	3
Finland	20,995	30,179	29	24,524	154,518	123	53.0	129	0.60	SCA	2
France	17,262	244,833	25	24,685	991,484	69	68.7	711	0.17	FRA	2
Germany	15,479	251,777	21	26,148	1,093,962	51	144.9	741	0.08	DEU	1
Ireland	9,819	n.a.	n.a.	22,146	29,956	38	81.8	79	0.75	GBR	3
Italy	14,754	135,428	16	20,657	569,731	49	104.1	320	0.31	FRA	0
Japan	23,813	3,906,680	134	29,957	2,495,757	66	40.3	2416	0.26	DEU	3
Netherlands	15,688	113,565	49	24,099	603,182	159	70.7	212	0.66	FRA	2
New Zealand	13,150	13,163	30	13,974	89,373	170	56.2	135	0.66	GBR	4
Norway	23,245	14,332	15	32,917	56,285	39	69.4	236	4.50	SCA	3
Singapore	9,875	24,049	94	26,423	94,469	112	50.5	321	5.67	GBR	3
Spain	9,014	91,118	26	14,281	402,180	72	201.9	484	0.07	FRA	2
Sweden	21,503	100,083	55	25,479	278,707	123	73.9	258	1.66	SCA	2
Switzerland	28,290	140,527	75	36,669	689,199	262	100.8	232	n.a.	DEU	1
United Kingdom	14,563	771,206	93	23,497	2,374,273	171	53.4	2399	2.01	GBR	4
United States	20,613	2,793,816	55	31,487	13,451,352	158	106.2	8450	3.11	GBR	5

Sources: *Emerging Markets Factbook*, IFC; *International Financial Statistics;* IMF; and LLSV (1997).

Notes: Mkt Cap is market capitalization. NGDP per cap is nominal GDP per capita. The turnover ratio is total value traded during the year divided by average market capitalization. Listed Cos is the number of listed domestic companies. IPOs/Pop is the ratio of initial public offerings to population (in millions). GBR is English, FRA is French, DEU is German, and SCA is Scandinavian. Anti-Dir. Rights is the index of antidirector rights from LLSV (1997).

emerging markets for which quarterly data are available, industrial production growth is also used, adding another seven emerging countries to the sample.

This paper uses stock returns instead of a variable such as q, which might be considered to have more solid theoretical underpinnings as a determinant of output growth, owing to two practical considerations. First, data on the replacement cost of capital, which are needed to construct q, are not available for the sample of countries considered. Second, Barro (1990) and Blanchard, Rhee, and Summers (1992) show that, in the United States, economic growth is more highly correlated with lagged stock returns than with a constructed q variable.

When testing whether the association between output growth and lagged stock returns is the same for different groups of countries, two estimation strategies are used: (i) individual-country regressions, followed by computing the average slope coefficient[8] on lagged stock returns and, for univariate regressions, the average R^2 coefficients for each group; and (ii) panel regressions allowing for individual-country fixed effects but restricting the slope coefficients to be the same for all countries belonging to the same group.

A. Emerging versus Advanced Countries

Considering the 25 countries for which at least twenty annual observations are available, the univariate correlation between real economic growth and real stock returns (lagged by one year) is positive in all countries except India, and significantly positive in five out of eight emerging markets and ten out of 17 advanced countries (Table 3).[9] In the case of the advanced countries, the estimates are similar to those reported by previous studies. The slope coefficient typically ranges between 0.01 and 0.09, and amounts to 0.034 averaging over all countries in the sample. An increase in real stock returns by 10 percentage points is therefore typically associated with higher real economic growth by 0.34 percentage point. In seven out of the 25 countries considered, the R^2 coefficient is 0.3 or higher. The average slope coefficient is slightly higher in emerging countries than advanced countries, though this

[8] That is, the mean group estimator—an unbiased estimator of the coefficient for the group of countries even when the regressions include the lagged dependent variable (Pesaran and Smith, 1995).

[9] The results are similar when the years of the emerging market crisis, 1997-98, are excluded. When the relationship is estimated over 1977-98 for all countries, it is positive and significant in eight out of 17 advanced countries.

Table 3. Output Growth and Lagged Stock Returns, Individual Country Regressions, 1971-98

	Number of Observations	R^2	Durbin-Watson	Constant	Lagged Stock Returns
Emerging market countries					
Argentina	22	0.03	1.72	1.81	0.011
				(1.46)	(0.61)
Chile	22	0.39	1.67	3.67	0.085
				(2.23)	(2.09) *
Greece	22	0.05	1.57	2.10	0.012
				(4.91)	(1.15)
India	22	0.11	2.11	5.71	-0.041
				(13.58)	-(2.12)
Korea	22	0.40	2.12	6.66	0.078
				(10.19)	(3.03) **
Mexico	22	0.13	1.40	2.79	0.035
				(3.08)	(2.08) *
Thailand	22	0.58	1.46	6.00	0.078
				(8.05)	(3.15) **
Zimbabwe	22	0.22	1.76	2.71	0.041
				(2.79)	(3.53) **
Average coefficient	...	0.22[1/]	...	3.93	0.037
Advanced Countries					
Australia	28	0.32	2.79	2.95	0.092
				(6.94)	(2.25) *
Austria	28	0.05	1.89	2.64	0.020
				(6.93)	(1.51)
Belgium	28	0.12	1.76	2.02	0.032
				(4.83)	(1.75)
Canada	28	0.15	0.99	2.94	0.056
				(4.34)	(1.97) *
Denmark	28	0.14	1.56	2.06	0.026
				(5.85)	(2.18) *
France	28	0.02	1.20	2.36	0.008
				(6.12)	(0.69)
Germany	27	0.08	1.42	2.07	0.022
				(4.89)	(1.43)
Italy	28	0.02	1.71	2.37	0.008
				(5.65)	(0.84)
Japan	28	0.33	1.27	3.16	0.053
				(6.88)	(3.50) **
Netherlands	28	0.13	0.88	2.26	0.026
				(5.08)	(2.31) *
Norway	28	0.06	0.90	3.46	0.012
				(7.46)	(1.29)
Singapore	28	0.32	1.29	7.33	0.046
				(12.53)	(3.31) **
Spain	28	0.12	0.69	2.79	0.028
				(4.95)	(3.43) **
Sweden	28	0.09	1.15	1.49	0.022
				(3.28)	(2.01) *
Switzerland	28	0.06	1.37	1.37	0.029
				(2.14)	(1.21)
United Kingdom	28	0.20	1.51	1.97	0.036
				(4.67)	(4.80) **
United States	28	0.30	1.28	2.40	0.069
				(5.68)	(3.79) **
Average coefficient	...	0.15	...	2.68	0.034
All countries					
Average coefficient	...	0.17[1/]	...	3.08	0.035

Sources: MSCI web site, *Emerging Markets Factbook*, IFC and *International Financial Statistics*, IMF.
Note: Newey-West corrected t-statistics in parentheses.

[1/] The average R^2 is computed setting the R^2 in India to zero.

* indicates that the coefficient is significant at the 5 percent level.

** indicates that the coefficient is significant at the 1 percent level.

result is reversed when the regression includes lagged growth as an additional independent variable (see below). Similarly, the R^2 coefficient is higher, on average, in emerging countries than in advanced countries (setting the R^2 coefficient to zero in the case of India).[10]

Following the existing literature, this paper focuses on the relationship between stock returns and economic growth by regressing real GDP growth in year *t* on GDP growth and stock returns in year *t-1*. While this functional form is intuitively appealing, it might seem somewhat restrictive, raising a number of issues involved in the econometric estimation. In particular, both real GDP and an index of real stock prices have unit roots. In most countries considered, tests of whether there is a long-run relationship between real GDP and real stock prices (based on cointegration using the Johansen approach or on the estimation of parameters in an autoregressive distributive lag regression) fail to yield a clear-cut long-run relationship with sensible coefficients. Appendix Table 14 reports the results obtained by estimating the relationship between the logarithms of real GDP and real stock prices using an unrestricted ARDL(2,2) form. In most cases, the restrictions needed to obtain the conventional form in log-differences used in the literature do not seem to be rejected.

Controlling for lagged economic growth, real economic growth and real stock returns (lagged by one year) at the annual frequency are positively and significantly associated in four out of eight emerging market countries and ten out of 17 advanced countries (Table 4). Again, the only country displaying a negative association between growth and lagged stock returns is India. Using this specification, the coefficient on lagged stock returns is, on average, slightly higher in advanced countries than in emerging market countries.

The results obtained with individual-country regressions are confirmed by estimating panel regressions with individual-country intercepts but constraining the slope coefficients to be the same for all countries. In a regression of real economic growth on lagged real stock returns, the estimated slope coefficient amounts to 0.034 and is highly significant (Table 5). When the slope coefficient is allowed to differ between emerging country and advanced country groups (though constrained to be the same for all countries within a group), the coefficient turns out to be higher in emerging countries (0.035) than in advanced countries (0.032), though not significantly so. The results are robust to changes in sample period, e.g., excluding 1997-98 (the years the Asian crisis) or the years up to 1977 for the advanced markets. The slope coefficient is somewhat higher in the first half of the sample period than in the second half, but not significantly so. Controlling for one lag of the dependent variable, the results remain similar, although a well-known disadvantage of panel estimation is that when the regression includes lags of the dependent variable the common slope coefficients

[10] Even though it is not always clear whether a given country ought to be classified as emerging or advanced, small changes in classification do not alter the group averages significantly. This result holds when the emerging market crisis years of 1997-98 are excluded from the sample.

Table 4. Output Growth on its Lag and Lagged Stock Returns, Individual Country Regressions, 1971-98

	Number of Observations	R^2	Durbin-Watson	Constant	Lagged Output Growth	Lagged Stock Returns
Emerging market countries						
Argentina	22	0.03	1.84	1.68	0.077	0.012
				(1.36)	(0.42)	(0.62)
Chile	22	0.39	1.79	3.24	0.099	0.080
				(2.66)	(0.66)	(1.74)
Greece	22	0.15	2.18	1.44	0.298	0.016
				(3.64)	(1.76)	(1.24)
India	22	0.13	1.92	6.55	-0.161	-0.043
				(10.46)	-(1.35)	-(2.22)
Korea	22	0.40	2.09	7.12	-0.061	0.081
				(3.84)	-(0.23)	(2.54) *
Mexico	22	0.22	1.99	1.83	0.295	0.037
				(1.65)	(1.16)	(2.41) *
Thailand	22	0.77	1.45	0.27	0.817	0.045
				(0.17)	(4.99)	(2.96) **
Zimbabwe	22	0.22	1.90	2.55	0.063	0.040
				(2.98)	(0.23)	(3.21) **
Average coefficient	...	0.29	...	3.08	0.178	0.033
Advanced countries						
Australia	28	0.37	2.53	3.75	-0.230	0.079
				(4.85)	-(1.64)	(2.29) *
Austria	28	0.06	2.13	2.35	0.105	0.019
				(3.20)	(0.39)	(1.40)
Belgium	28	0.14	2.14	1.67	0.134	0.036
				(2.55)	(0.58)	(1.77)
Canada	28	0.26	1.65	1.84	0.342	0.056
				(2.55)	(1.93)	(2.23) *
Denmark	28	0.16	1.77	1.76	0.135	0.026
				(3.41)	(0.82)	(2.41) *
France	28	0.22	2.10	1.26	0.416	0.016
				(2.83)	(3.00)	(1.14)
Germany	26	0.18	1.86	1.27	0.341	0.030
				(1.92)	(1.81)	(1.36)
Italy	28	0.02	1.87	2.14	0.091	0.009
				(2.46)	(0.39)	(0.93)
Japan	28	0.40	1.76	2.06	0.290	0.051
				(2.21)	(1.42)	(3.25) **
Netherlands	28	0.40	1.82	0.74	0.533	0.042
				(1.28)	(3.08)	(4.29) **
Norway	28	0.25	1.56	1.92	0.436	0.012
				(2.47)	(2.80)	(1.76)
Singapore	28	0.47	1.76	4.12	0.405	0.039
				(4.98)	(3.85)	(3.06) **
Spain	28	0.59	2.04	0.82	0.664	0.032
				(2.12)	(5.99)	(4.68) **
Sweden	28	0.26	1.52	0.67	0.395	0.032
				(1.09)	(2.17)	(2.48) *
Switzerland	28	0.20	1.94	0.66	0.374	0.041
				(0.97)	(2.72)	(1.42)
United Kingdom	28	0.30	2.10	1.24	0.326	0.037
				(2.11)	(1.80)	(3.99) **
United States	28	0.34	1.52	1.84	0.200	0.071
				(3.58)	(2.15)	(3.74) **
Average coefficient	...	0.27	...	1.77	0.292	0.037
All countries						
Average coefficient	...	0.28	...	2.19	0.255	0.036

Sources: MSCI web site, *Emerging Markets Factbook*, IFC and *International Financial Statistics*, IMF.
Note: Newey-West corrected t-statistics in parentheses.
* indicates that the coefficient is significant at the 5 percent level.
** indicates that the coefficient is significant at the 1 percent level.

Table 5. Panel Estimation of Relationship between Output Growth and Lagged Stock Returns 1/

Sample Period	Estimation Method	Countries	Number of Observations	Lagged Stock Returns	Lagged Output Growth
1971-98	*Fixed Effects*	All 25 (20+yr)	651	0.034	
				(10.1)	
		Emerging 8	176	0.035	
				(5.37)	
		Advanced 17	475	0.032	
				(8.34)	
		All 41 (10+yr)	846	0.030	
				(10.5)	
		All 25 (20+yr)	650	0.033	0.210
				(10.17)	(5.68)
		Emerging 8	176	0.033	0.203
				(5.04)	(2.72)
		Advanced 17	372	0.034	0.220
				(9.06)	(5.25)
		All 41 (10+yr)	845	0.029	0.201
				(10.38)	(5.97)
	SURE	All 25 (20+yr)	651	0.031	
				(20.53)	
		Emerging 8	176	0.030	
				(5.83)	
		Advanced 17	475	0.028	
				(12.89)	
		All 25 (20+yr)	650	0.031	0.217
				(20.04)	(7.21)
		Emerging 8	176	0.031	0.212
				(6.01)	(3.05)
		Advanced 17	474	0.031	0.258
				(14.25)	(6.9)
1977-96	*Fixed Effects*	All 25 (20+yr)	499	0.027	
				(7.33)	
		Emerging 8	160	0.029	
				(4.31)	
		Advanced 17	339	0.024	
				(5.54)	
		All 41 (10+yr)	662	0.023	
				(7.32)	
		All 25 (20+yr)	498	0.026	0.199
				(7.26)	(4.82)
		Emerging 8	176	0.027	0.151
				(4.12)	(1.99)
		Advanced 17	338	0.026	0.285
				(6.26)	(6.16)
		All 41 (10+yr)	661	0.022	0.190
				(7.11)	(5.26)
	SURE	Emerging 8	160	0.027	
				(5.34)	
		Advanced 17	339	0.024	
				(13.05)	
		Emerging 8	160	0.027	0.170
				(5.48)	(2.44)
		Advanced 17	474	0.026	0.291
				(15.28)	(9.01)

Sources: MSCI web site, *Emerging Markets Factbook,* IFC and *International Financial Statistics*, IMF.
1/ All 25 (20+yr) are the 25 countries (eight emerging and 17 advanced) with more than 20 years of data. All 41 (10+yr) are the 41 countries with more than ten years of data. t-statistics are reported in parentheses.

are not estimated consistently (Pesaran and Smith, 1995).[11] However, an advantage of panel estimation is that it makes it possible to use also the information available from those countries that have a smaller number of observations. When the estimation is conducted using all 41 countries for which at least ten observations are available, the coefficients are once again similar to those reported above. (The estimates are similar when an alternative minimum number of observations is used.)[12] Estimation as a system of seemingly-unrelated regressions (SURE) reduces the standard errors of the estimated coefficients considerably (especially for advanced countries).

Panel estimation shows that lagged stock returns remain significantly associated with output growth in both advanced and emerging countries when controlling for lagged values of other leading indicators, including real short-term[13] interest rates, and the real growth rate of both narrow and broad money (Table 6). Narrow and broad money growth are used as controls because they have been found to be useful leading indicators for developing countries (Agenor, McDermott and Prasad, 1999) and there is a large literature on interest rates and the term structure as predictors of output (Estrella and Hardouvelis, 1991). The present paper confirms that low real interest rates and high real money growth tend to be followed by rapid output growth. These associations are significant, although narrow money has more predictive power in emerging countries, whereas broad money has more predictive power in advanced countries.[14] The slope coefficient on lagged stock returns is, once again,

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[11] Judson and Owen (1999) show that, using a root mean square error criterion, for unbalanced panels with a number of observations similar to that in this paper, the least squares dummy variable model performs just as well or better than alternative estimation techniques such as GMM or Anderson-Hsiao.

[12] Using panel estimation with this relatively large data set, it is possible to test whether the relationship between stock returns and output growth is linear, that is, whether output tends to ignore (or be particularly sensitive to) large swings in stock prices, and whether there are any asymmetries in the relationship, that is, whether stock price declines are better predictors than upswings. No evidence of asymmetries is found, but some nonlinearity seems to be present: stock price booms and crises are associated with output growth to a lower extent than relatively small changes in stock prices. (When the square of the stock return—multiplied by minus one when the return is negative—is introduced in the regressions, its estimated coefficient is found to be negative and significant.) This does not seem to affect the results in the next sections, which maintain a hypothesis of linearity for the sake of simplicity.

[13] As mentioned above, long-term interest rates are not considered because they are not available for a sufficiently large sample of emerging countries.

[14] Controlling for narrow and broad money growth, private credit growth has a negative sign and is therefore omitted from the estimates. This does not affect any of the results related to stock returns.

Table 6. Panel Regressions of Output Growth on Lagged Stock Returns and other Leading Indicators 1/

Sample	Estimation Technique	Number of Observations	Stock Returns	Stock Returns Times Emerging Market Dummy	Short-Term Interest Rate	Narrow Money Growth	Broad Money Growth
All 24	Least squares	503	0.0280		-0.1263	0.0837	0.0339
1977-98	country dummies		(7.26)		(-5.54)	(5.97)	(2.06)
7 Emerging	Least squares	130	0.0328		-0.1216	0.1071	-0.0002
1977-98	country dummies		(3.89)		(-2.97)	(3.81)	(-0.01)
17 Advanced	Least squares	373	0.0220		-0.1387	0.0445	0.1147
1977-98	country dummies		(5.54)		(-4.48)	(2.78)	(4.84)
All 24	Least squares	503	0.0303		-0.1205	0.0766	0.0268
1977-98	country and year dummies		(7.19)		(-5.13)	(5.40)	(1.61)
7 Emerging	Least squares	130	0.0306		-0.1302	0.1245	-0.0035
1977-98	country and year dummies		(3.15)		(-3.13)	(4.06)	(-0.11)
17 Advanced	Least squares	373	0.0271		-0.1160	0.0180	0.0840
1977-98	country and year dummies		(5.44)		(-2.75)	(1.09)	(3.51)
All 24	SURE	503	0.0285		-0.1208	0.0735	0.0301
1977-98	country and year dummies		(21.26)		(-15.11)	(21.07)	(5.95)
7 Emerging	SURE	130	0.0252		-0.1277	0.1203	-0.0008
1977-98	country and year dummies		(3.68)		(3.58)	(4.93)	(0.03)
17 Advanced	SURE	373	0.0269		-0.1233	-0.0008	0.0888
1977-98	country and year dummies		(12.14)		(7.47)	(-0.10)	(9.59)
All 24	Least squares	503	0.0227	0.0109	-0.1286	0.0814	0.0332
1977-98	country dummies		(4.36)	(1.50)	(-5.64)	(5.78)	(2.02)
All 24	Least squares	503	0.0292	0.0021	-0.1211	0.0762	0.0270
1977-98	country and year dummies		(4.76)	(0.27)	(-5.13)	(5.32)	(1.61)
All 24	SURE	503	0.0269	0.0004	-0.1217	0.0729	0.0301
1977-98	country and year dummies		(17.92)	(1.58)	(-15.47)	(21.16)	(6.11)
All 24	SURE	589	0.0219	0.0058	-0.1301	0.0617	0.0513
1971-98	country and year dummies		(9.98)	(1.25)	(-8.78)	(7.83)	(5.17)
All 24	SURE	457	0.0258	0.0018	-0.1192	0.0660	0.0315
1977-96	country and year dummies		(22.75)	(0.75)	(-18.91)	(21.33)	(7.49)

Sources: MSCI web site, *Emerging Markets Factbook,* IFC and *International Financial Statistics*, IMF.
1/ All right-hand side variables are in real terms and lagged by one year.

similar in separate panels of advanced and emerging countries. In panels of all 24 countries[15] for which data are available for at least twenty years, an interaction term of lagged stock returns times an emerging market dummy is not significant. The results are robust to changes in estimation technique (using individual-year dummies, and SURE) and sample period. On the whole, therefore, stock returns provide useful information to predict output growth, over and above that contained in other variables, not only in advanced countries but also in emerging countries, and the value of this information does not seem to be different in the two types of countries.

The evidence on the relationship between lagged stock returns and output growth at a quarterly frequency confirms the key findings obtained with annual data, though the proportion of countries in which the relationship is significant is lower among emerging market countries than among advanced countries. The correlation is analyzed between real stock returns over the twelve months prior to time t and the growth rate of real GDP or industrial production (depending on data availability) between, in turn, the quarter prior to t and the quarter following t; the two quarters prior to t and the two quarters following t; the three quarters prior to t and the three quarters following t; and the four quarters prior to t and the four quarters following t. An appropriately lagged dependent variable and seasonal dummies are included in the estimates. In other words, the estimated equations are the following:

$$(400/j)\ \log[(\sum_{i=1}^{j} Y_{i-1})/\sum_{i=1}^{j}(Y_{-i})] = \alpha_0 + \alpha_1 \log[(S/P)_{-j}/(S/P)_{-j-4})] + \beta(400/j)\ \log[(\sum_{i=1}^{j} Y_{-j+i-1})/\sum_{i=1}^{j}(Y_{-j-i})] + \varepsilon$$

where Y is real GDP (or industrial production), S is the nominal stock price index, P is the consumer price index, and j =1,..4. The correlation tends to be stronger, the longer the forecast horizon. Considering the case of j=1 (quarter-on-quarter growth), the correlation is positive and significant in nine out of 18 advanced countries, and two out of six emerging markets, using real GDP; and 13 out of 18 advanced countries, and four out of 13 emerging markets, using industrial production (Table 7).[16]

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[15] Argentina is omitted from the sample in these estimates because its hyperinflation was mirrored in extremely negative measured real interest rates and money growth, which result in implausible coefficients on those variables in the panels. Nevertheless, none of the results related to the coefficient on lagged stock returns are affected by its inclusion in the sample.

[16] The fact that the proportion of countries where the relationship is significant is larger for advanced countries than for emerging countries is only partially due to the greater number of observations for advanced countries. When the advanced country regressions are estimated for the most recent 70 observations (a sample period roughly equivalent to that available for the emerging countries) the associations are significant in eight out of 18 advanced countries, whether using real GDP or industrial production.

Table 7. Output Growth at Different Forecasting Horizons, and Lagged Stock Returns

	Industrial Production									GDP								
		j=1		j=2		j=3		j=4			j=1		j=2		j=3		j=4	
Model	Regobs	RSTK(-1)	t-stat	RSTK(-2)	t-stat	RSTK(-3)	t-stat	RSTK(-4)	t-stat	Regobs	RSTK(-1)	t-stat	RSTK(-2)	t-stat	RSTK(-3)	t-stat	RSTK(-4)	t-stat
Emerging market countries																		
Chile	89	0.124	2.27 *	0.093	2.39 *	0.077	2.02 *	0.080	2.42 *	74	0.108	2.57 *	0.091	2.06 *	0.078	1.83	0.061	1.61
Colombia	52	0.097	3.16 **	0.090	3.36 **	0.069	3.60 **	0.045	3.42 **									
Greece	89	0.002	0.06	0.007	0.30	0.013	0.72	0.008	0.52									
India	89	-0.055	-1.48	-0.032	-1.36	-0.028	-2.08	-0.021	-1.81									
Jordan	75	0.058	0.41	0.056	0.64	0.025	0.41	0.003	0.07									
Korea	75	0.060	0.98	0.074	1.55	0.087	2.36 *	0.094	2.81 **	89	0.141	1.90	0.143	4.29 *	0.088	4.23 **	0.064	3.90 **
Malaysia	52	0.188	3.05 **	0.161	4.02 **	0.137	2.83 **	0.094	2.61 **									
Mexico	89	0.036	1.54	0.037	1.91	0.039	2.16 *	0.039	2.16 *	75	0.026	1.37	0.022	1.71	0.023	2.06 *	0.022	1.92
Pakistan	52	0.035	0.46	0.030	0.76	0.023	0.82	0.016	0.67									
Philippines	53	0.058	0.84	0.063	1.27	0.064	1.42	0.059	1.57	52	0.031	1.44	0.028	2.05 *	0.019	1.99 *	0.019	2.27 *
Portugal	43	0.015	0.33	0.035	1.36	0.056	2.67 **	0.069	4.09 **	43	0.060	2.26 *	0.062	3.71 *	0.069	6.18 **	0.059	6.70 **
Turkey	45	0.008	0.23	-0.013	-0.51	-0.006	-0.30	-0.006	-0.42	44	0.000	0.00	0.008	0.25	0.005	0.27	-0.002	-0.13
Zimbabwe	71	0.106	2.21 *	0.086	1.91	0.086	2.13 *	0.067	2.48 *									
Advanced countries																		
Australia	113	0.097	2.71 **	0.091	3.21 **	0.096	3.90 **	0.086	3.58 **	113	0.232	1.57	0.140	2.18 *	0.096	2.50 *	0.078	2.63 **
Austria	112	0.055	1.89	0.040	1.60	0.044	1.76	0.048	2.00 *	90	0.014	0.84	0.028	2.14 *	0.019	2.16 *	0.018	2.25 *
Canada	113	0.164	3.48 **	0.153	3.49 **	0.161	4.51 **	0.146	4.81 **	113	0.049	2.63 *	0.054	2.81 *	0.058	3.23 **	0.056	3.30 **
Denmark	113	0.162	3.14 **	0.119	3.09 **	0.109	3.14 **	0.098	3.37 **	112	0.021	0.74	0.018	0.86	0.024	1.19	0.026	1.29
Finland	41	0.089	3.07 **	0.097	4.54 **	0.117	5.76 **	0.128	6.14 **	39	0.099	3.61 *	0.064	3.82 *	0.074	4.17 **	0.080	4.16 **
France	112	0.087	2.34 *	0.071	2.15 *	0.068	2.36 *	0.059	2.39 *	113	0.018	1.62	0.015	1.50	0.016	1.76	0.015	1.73
Germany	112	0.089	3.93 **	0.071	2.96 **	0.075	3.30 **	0.071	3.49 **	46	0.010	0.24	0.019	0.76	0.008	0.49	0.011	0.92
Italy	112	0.052	1.31	0.042	1.37	0.041	1.43	0.037	1.47	110	0.014	1.57	0.018	1.57	0.020	1.64	0.016	1.39
Japan	113	0.165	3.15 **	0.132	3.19 **	0.146	3.49 **	0.144	3.68 **	112	0.052	2.07 *	0.036	2.23 *	0.033	2.34 *	0.035	2.52 *
Netherlands	112	0.126	3.13 **	0.101	3.01 **	0.101	3.33 **	0.088	3.45 **	86	0.054	2.41 *	0.051	2.75 *	0.044	2.79 **	0.044	2.75 **
New Zealand	41	0.080	1.40	0.120	2.14 *	0.110	3.45 **	0.084	3.03 **	41	0.118	2.24 *	0.100	3.04 *	0.087	3.75 **	0.077	4.23 **
Norway	112	0.075	3.15 **	0.046	2.96 **	0.037	2.64 **	0.036	2.72 **	112	0.042	1.49	0.030	1.63	0.017	1.37	0.013	1.41
Singapore	113	0.124	3.11 **	0.133	4.15 **	0.131	5.36 **	0.120	6.00 **	53	0.102	3.55 *	0.037	2.81 *	0.031	2.80 **	0.032	2.99 **
Spain	112	0.011	1.63	0.024	2.41 *	0.034	2.98 **	0.042	3.34 **	112	0.012	3.33 *	0.019	4.04 *	0.025	4.59 **	0.028	4.72 **
Sweden	112	0.105	3.00 **	0.064	3.66 **	0.068	4.07 **	0.067	4.00 **	112	0.041	1.86	0.038	2.68 *	0.031	3.32 **	0.030	3.74 **
Switzerland	113	0.152	1.55	0.114	1.66	0.097	1.77	0.089	1.96 *	113	0.048	1.32	0.049	1.64	0.052	1.77	0.051	1.78
United Kingdom	113	0.083	3.09 **	0.083	3.22 **	0.070	3.91 **	0.060	4.63 **	113	0.061	3.66 *	0.048	4.37 *	0.042	3.96 **	0.041	4.18 **
United States	113	0.174	3.15 **	0.163	3.46 **	0.160	4.38 **	0.146	4.39 **	113	0.071	3.35 *	0.062	3.57 *	0.065	4.01 **	0.061	3.90 **

Sources: MSCI web site, *Emerging Markets Factbook,* IFC and *International Financial Statistics,* IMF.

Notes: The t-statistics are Newey-West corrected. Seasonal dummies and one lag of the dependent variable are included in the set of independent variables.

*indicates that the coefficient is significant at the 5 percent level.

**indicates that the coefficient is significant at the 1 percent level.

The association between (quarter-on-quarter) output growth and lagged stock returns is robust to controlling for other variables. (All regressions include seasonal dummies and one lag of the dependent variable.) The slope coefficient on lagged stock returns (over the previous year) is significantly different from zero in eight out of 18 advanced countries and three out of six emerging markets, using GDP, and in 13 out of 18 advanced countries and three out of 13 emerging markets using industrial production, controlling for the real growth rate of credit to the private sector (Table 8); and in nine out of 18 advanced countries and three out of six emerging markets, using GDP, and in 15 out of 18 advanced countries and three out of 13 emerging markets using industrial production, controlling for the real growth rate of broad money (Table 9).

When the four quarterly real stock returns prior to time t are entered separately as right-hand-side variables in the regression, the returns during the second and third quarters prior to t usually display the highest correlation with output growth. The estimated equations are the following (they also include seasonal dummies):

$$400*\log(Y/Y_{-1}) = \alpha + \sum_{j=1}^{4} \beta_j * \log[(S/P)_{-j}/(S/P)_{-j-1})] + \sum_{j=1}^{4} \gamma_j * \log[(M/P)_{-j}/(M/P)_{-j-1})] + \delta * 400 * \log(Y_{-1}/Y_{-2}) + \varepsilon$$

where M is either credit to the private sector or broad money. Controlling for the previous four quarters of the real growth rate of credit to the private sector, the sum of the coefficients on the four quarterly real stock returns is again significantly different from zero in seven out of 18 advanced countries, and three out of six emerging markets using GDP, and in 12 out of 18 advanced countries, and two out of 13 emerging markets, using industrial production (Table 10); and, controlling for the real growth rate of broad money, in eight out of 18 advanced countries, and three out of six emerging markets, using GDP, and 13 out of 18 advanced countries, and two out of 13 emerging markets, using industrial production (Table 11).[17]

B. Country Characteristics and the Strength of the Growth-Returns Link

This section generalizes the question of what type of country is more likely to display a strong association between stock returns and output growth. It considers a variety of

[17] An alternative way of summarizing the association between output growth and stock returns, which is particularly useful in the case of quarterly data, is to estimate a vector autoregression system of output growth (quarter-on-quarter) and stock returns (over the previous year) and to use the resulting impulse response functions to analyze the impact of a shock to stock returns on output growth. The peak impact is usually positive, and it is significant in about one third of the countries considered. The peak impact is usually reached two or three quarters after the initial shock to stock returns. Once again, the speed and magnitude of the impact does not differ in any obvious way between emerging versus advanced countries.

Table 8. Output Growth, Lagged Stock Returns, and Private Credit Growth, Constrained

Model	Industrial Production					GDP				
	Observ.	Stock Returns		Private Credit Growth		Observ.	Stock Returns		Private Credit Growth	
		Coefficient	t-stat	Coefficient	t-stat		Coefficient	t-stat	Coefficient	t-stat
Emerging market countries										
Chile	77	0.082	1.710	-0.294	-2.454	74	0.097	2.478 *	-0.088	-0.696
Colombia	32	0.160	3.463 **	0.162	0.727					
Greece	88	0.009	0.228	0.002	0.017					
India	89	-0.056	-1.508	0.009	0.476					
Jordan	75	0.030	0.212	0.286	1.270					
Korea	75	0.063	0.966	0.464	1.294	89	0.141	1.939	0.175	0.347
Malaysia	52	0.189	3.071 **	0.033	0.265					
Mexico	89	0.035	1.482	0.012	0.341	75	0.025	1.362	0.014	0.378
Pakistan	52	0.031	0.409	-0.247	-0.512					
Philippines	47	0.014	0.140	0.312	1.056	46	0.077	4.364 **	0.036	0.474
Portugal	43	0.057	1.257	-0.542	-2.347	43	0.057	2.552 *	-0.397	-1.716
Turkey	45	0.007	0.183	0.022	0.133	44	-0.001	-0.030	0.016	0.126
Zimbabwe	64	0.099	2.131 *	-0.035	-1.753					
Advanced countries										
Australia	113	0.097	2.703 **	0.024	0.297	113	0.229	1.556	0.202	0.761
Austria	112	0.051	1.724	0.141	0.843	90	0.010	0.546	0.156	1.553
Canada	113	0.154	3.440 **	-0.125	-0.947	113	0.046	2.255 *	-0.031	-0.488
Denmark	113	0.189	3.700 **	-0.189	-1.714	112	0.023	0.778	-0.014	-0.360
Finland	41	0.075	2.568 *	-0.199	-2.791	39	0.098	2.649 **	-0.010	-0.062
France	111	0.084	2.197 *	0.051	0.929	111	0.016	1.374	0.034	1.394
Germany	112	0.086	3.661 **	0.131	0.804	46	0.007	0.137	-0.058	-0.177
Italy	111	0.056	1.493	0.442	1.966	109	0.016	1.671	0.091	1.559
Japan	113	0.091	2.210 *	0.662	2.922	112	0.016	0.711	0.310	3.288
Netherlands	109	0.143	3.439 **	0.190	1.701	83	0.065	2.451 *	0.143	2.454
New Zealand	41	0.046	1.165	-0.146	-2.956	41	0.125	1.996 *	0.023	0.398
Norway	108	0.063	2.475 *	0.128	1.294	108	0.037	1.233	0.044	0.455
Singapore	113	0.149	3.232 **	-0.295	-1.372	53	0.103	3.442 **	0.093	0.687
Spain	112	0.011	1.582	-0.003	-0.099	112	0.011	2.891 **	0.019	1.194
Sweden	112	0.104	2.920 **	-0.053	-0.406	112	0.043	1.923	0.064	0.956
Switzerland	113	0.144	1.634	0.173	0.574	113	0.041	1.228	0.179	2.707
United Kingdom	113	0.082	2.909 **	0.098	1.797	113	0.061	3.582 **	0.074	2.641
United States	113	0.174	3.118 **	0.228	1.589	113	0.073	3.267 **	0.168	2.222

Sources: MSCI web site, *Emerging Markets Factbook,* IFC and *International Financial Statistics,* IMF.

Notes: Seasonal dummies and one lag of the dependent variable are included as independent variables. Output growth is quarter-on-quarter; stock returns and private credit growth refer to the full preceding year.

*indicates that the coefficient is significant at the 5 percent level.

**indicates that the coefficient is significant at the 1 percent level.

Table 9. Output Growth, Lagged Stock Returns, and Broad Money Growth, Constrained

	Industrial Production					GDP				
		Stock Returns		Broad Money Growth			Stock Returns		Broad Money Growth	
Model	Observations	Coefficient	t-stat	Coefficient	t-stat	Observations	Coefficient	t-stat	Coefficient	t-stat
Emerging market countries										
Chile	77	0.107	2.547 *	-0.607	-2.050	74	0.103	2.771 **	-0.256	-1.037
Colombia	32	0.163	3.595 **	0.456	1.719					
Greece	88	0.005	0.145	0.202	1.265					
India	89	-0.057	-1.484	0.062	0.198					
Jordan	75	0.048	0.338	0.119	0.254					
Korea	75	0.054	0.886	0.317	0.898	89	0.130	1.641	0.185	0.365
Malaysia	52	0.211	3.349 **	-0.307	-1.608					
Mexico	89	0.033	1.384	0.046	1.256	75	0.024	1.338	0.040	0.932
Pakistan	52	0.036	0.476	-0.084	-0.212					
Philippines	47	0.006	0.068	0.321	0.551	46	0.077	4.282 **	0.094	0.556
Portugal	43	0.020	0.460	-0.824	-2.206	43	0.061	2.292 *	-0.222	-1.208
Turkey	45	0.018	0.502	0.395	1.270	44	0.007	0.239	0.347	1.740
Zimbabwe	67	0.062	1.457	0.261	1.381					
Advanced countries										
Australia	113	0.089	2.686 **	0.256	1.511	113	0.200	1.553	0.670	1.402
Austria	112	0.059	2.063 *	0.461	1.523	90	0.020	1.198	0.462	2.450
Canada	113	0.159	3.286 **	-0.090	-0.488	113	0.050	2.327 *	0.009	0.107
Denmark	113	0.112	2.278 *	0.380	1.900	112	0.011	0.351	0.073	1.145
Finland	41	0.087	2.995 **	-0.164	-1.460	39	0.110	3.737 **	0.382	2.011
France	111	0.089	2.170 *	0.310	2.600	111	0.018	1.451	0.151	2.469
Germany	112	0.085	3.791 **	0.267	1.770	46	0.012	0.275	0.031	0.166
Italy	112	0.074	2.051 *	0.722	3.910	110	0.021	2.231 *	0.225	5.148
Japan	113	0.071	1.918	0.917	3.918	112	0.024	1.132	0.244	2.223
Netherlands	109	0.136	3.266 **	0.369	1.413	83	0.057	2.235 *	0.302	2.411
New Zealand	41	0.055	1.421	-0.153	-3.566	41	0.118	2.021 *	0.000	-0.005
Norway	108	0.062	2.388 *	0.293	1.600	108	0.027	0.988	0.438	2.214
Singapore	113	0.094	2.048 *	0.304	1.458	53	0.092	2.929 **	0.196	0.572
Spain	47	0.040	2.330 *	0.120	1.127	47	0.019	3.656 **	0.059	1.130
Sweden	112	0.104	2.993 **	0.074	0.981	112	0.041	1.826	0.023	0.423
Switzerland	98	0.060	0.678	0.751	1.609	98	-0.009	-0.376	0.182	2.644
United Kingdom	113	0.078	2.883 **	0.105	1.844	113	0.059	3.406 **	0.078	3.021
United States	113	0.125	2.394 *	0.485	2.570	113	0.044	2.093 *	0.287	3.606

Sources: MSCI web site, *Emerging Markets Factbook, IFC and International Financial Statistics,* IMF.

Notes: Seasonal dummies and one lag of the dependent variable are included as independent variables. Output growth is quarter-on-quarter; stock returns and broad money growth are in real terms and refer to the full preceding year.

*indicates that the coefficient is significant at the 5 percent level.

**indicates that the coefficient is significant at the 1 percent level.

Table 10. Output Growth, Lagged Stock Returns, and Private Credit Growth, Unconstrained

	Industrial Production					GDP				
		Stock Returns		Private Credit Growth			Stock Returns		Private Credit Growth	
Model	Observ.	Sum of Coeffs	p-value	Sum of Coeffs	p-value	Observ.	Sum of Coeffs	p-value	Sum of Coeffs	p-value
Emerging market countries										
Chile	77	0.308	0.123	-1.281	0.020	74	0.426	0.008 **	-0.421	0.527
Colombia	27	0.480	0.217	1.348	0.444					
Greece	88	0.073	0.528	0.095	0.841					
India	89	-0.227	0.115	0.059	0.108					
Jordan	75	0.258	0.646	1.043	0.220					
Korea	75	0.257	0.329	2.580	0.101	89	0.407	0.141	1.498	0.459
Malaysia	52	0.775	0.000 **	0.292	0.647					
Mexico	89	0.126	0.137	0.059	0.639	75	0.080	0.287	0.088	0.571
Pakistan	52	0.100	0.752	-0.175	0.907					
Philippines	45	0.018	0.975	0.637	0.587	44	0.307	0.002 **	0.372	0.268
Portugal	43	0.382	0.075	-2.628	0.011	43	0.223	0.012 *	-1.021	0.080
Turkey	45	0.135	0.282	0.000	1.000	44	0.135	0.212	0.044	0.861
Zimbabwe	64	0.418	0.020 *	-0.212	0.012					
Advanced countries										
Australia	113	0.409	0.005 **	0.077	0.818	113	0.929	0.101	0.595	0.503
Austria	112	0.198	0.095	0.499	0.467	90	0.045	0.557	0.518	0.216
Canada	113	0.575	0.002 **	-0.376	0.437	113	0.178	0.045 *	-0.069	0.778
Denmark	113	0.767	0.001 **	-0.820	0.107	112	0.061	0.704	-0.120	0.547
Finland	41	0.299	0.054	-0.856	0.010	39	0.353	0.030 *	-0.224	0.650
France	111	0.330	0.036 *	0.174	0.398	111	0.062	0.174	0.128	0.187
Germany	112	0.360	0.000 **	0.499	0.440	46	0.038	0.854	-0.024	0.985
Italy	111	0.227	0.142	1.797	0.054	109	0.054	0.088	0.302	0.144
Japan	113	0.350	0.045 *	2.598	0.004	112	0.068	0.404	1.246	0.002
Netherlands	109	0.578	0.001 **	0.724	0.109	83	0.253	0.022 *	0.572	0.018
New Zealand	41	0.027	0.864	-0.471	0.028	41	0.337	0.250	0.294	0.377
Norway	106	0.245	0.025 *	0.678	0.134	106	0.124	0.286	0.155	0.674
Singapore	113	0.560	0.001 **	-1.148	0.181	53	0.335	0.015 *	0.255	0.623
Spain	112	0.046	0.120	-0.008	0.957	112	0.045	0.007 **	0.072	0.270
Sweden	112	0.422	0.006 **	-0.255	0.624	112	0.173	0.068	0.225	0.353
Switzerland	113	0.562	0.076	0.768	0.444	113	0.160	0.249	0.683	0.022
United Kingdom	113	0.325	0.008 **	0.331	0.086	113	0.248	0.000 **	0.289	0.013
United States	113	0.604	0.008 **	1.033	0.073	113	0.255	0.002 **	0.800	0.008

Sources: MSCI web site, *Emerging Markets Factbook, IFC and International Financial Statistics*, IMF.

Notes: Seasonal dummies and one lag of the dependent variable are included as independent variables. Output growth is quarter-on-quarter; stock returns and private credit growth are in real terms.

The sum of the four coefficients on the four quarters of returns and private credit growth. The p-value refers to the null hypothesis that the sum of the four quarterly coefficients equals zero.

*indicates that the coefficient is significant at the 5 percent level.

**indicates that the coefficient is significant at the 1 percent level.

Table 11. Output Growth, Lagged Stock Returns, and Broad Money Growth, Unconstrained

	Industrial Production					GDP				
		Stock Returns		Broad Money Growth			Stock Returns		Broad Money Growth	
Model	Observ.	Sum of Coeffs	p-value	Sum of Coeffs	p-value	Observ.	Sum of Coeffs	p-value	Sum of Coeffs	p-value
Emerging market countries										
Chile	77	0.380	0.030 *	-2.474	0.068	74	0.384	0.011 *	-1.217	0.322
Colombia	27	0.446	0.289	2.340	0.023					
Greece	88	0.049	0.677	0.775	0.203					
India	89	-0.236	0.137	0.171	0.891					
Jordan	75	0.464	0.416	0.705	0.714					
Korea	75	0.263	0.196	1.161	0.428	89	0.469	0.070	0.948	0.615
Malaysia	52	0.963	0.000 **	-1.018	0.167					
Mexico	89	0.118	0.180	0.177	0.244	75	0.115	0.157	0.203	0.199
Pakistan	52	-0.037	0.890	-0.195	0.910					
Philippines	45	0.079	0.893	0.677	0.751	44	0.305	0.001 **	0.638	0.366
Portugal	43	0.133	0.468	-3.087	0.032	43	0.239	0.015 *	-0.632	0.377
Turkey	45	0.175	0.177	0.293	0.813	44	0.033	0.801	0.610	0.340
Zimbabwe	67	0.251	0.117	0.818	0.272					
Advanced countries										
Australia	113	0.361	0.010 **	0.959	0.147	113	0.888	0.085	2.738	0.085
Austria	112	0.211	0.057	1.931	0.095	90	0.074	0.328	1.904	0.014
Canada	113	0.577	0.004 **	-0.346	0.626	113	0.189	0.026 *	0.051	0.884
Denmark	113	0.403	0.059	1.520	0.076	112	0.013	0.927	0.356	0.260
Finland	41	0.385	0.004 **	-1.077	0.062	39	0.501	0.000 **	0.534	0.319
France	111	0.342	0.030 *	1.152	0.017	111	0.064	0.181	0.591	0.020
Germany	112	0.344	0.000 **	1.024	0.092	46	0.027	0.886	0.257	0.716
Italy	112	0.304	0.046 *	2.910	0.000	110	0.078	0.024 *	0.804	0.000
Japan	113	0.319	0.050	3.595	0.000	112	0.103	0.227	1.007	0.042
Netherlands	109	0.547	0.002 **	1.238	0.269	83	0.222	0.029 *	1.207	0.038
New Zealand	41	0.103	0.477	-0.608	0.002	41	0.359	0.134	0.072	0.751
Norway	106	0.238	0.035 *	1.498	0.066	106	0.070	0.504	1.965	0.025
Singapore	113	0.434	0.021 *	0.845	0.313	53	0.356	0.012 *	0.812	0.575
Spain	47	0.162	0.032 *	0.566	0.187	47	0.084	0.002 **	0.286	0.248
Sweden	112	0.407	0.008 **	0.614	0.344	112	0.164	0.072	0.176	0.678
Switzerland	93	0.194	0.574	1.333	0.202	93	0.002	0.985	0.758	0.009
United Kingdom	113	0.311	0.008 **	0.357	0.077	113	0.238	0.001 **	0.311	0.003
United States	113	0.464	0.014 *	1.851	0.012	113	0.161	0.046 *	1.173	0.000

Sources: MSCI web site, *Emerging Markets Factbook, IFC and International Financial Statistics*, IMF.

Notes: Seasonal dummies and one lag of the dependent variable are included as independent variables. Output growth is quarter-on-quarter; stock returns and broad money growth are in real terms. The sum of the four coefficients on the four quarters of returns and broad money growth. The p-value refers to the null hypothesis that the sum of the four quarterly coefficients equals zero.

*indicates that the coefficient is significant at the 5 percent level.

**indicates that the coefficient is significant at the 1 percent level.

country groupings, depending on market capitalization and turnover ratios, the number of listed domestic companies and initial public offerings, and the legal origin of the regulations governing the stock market. It then relates the results to the theories presented in Section II.

Beginning with the univariate regressions presented in Table 3, again the average R^2 and the average slope coefficient on lagged stock returns that are obtained in individual-country univariate regressions can be compared for different groups of countries. These groups include: high market capitalization versus low market capitalization (depending on whether their average capitalization to GDP ratio in 1980-98 is above or below 30 percent); high versus low turnover ratio (above or below 50 percent); large versus small number of initial public offerings (above or below 0.3 IPOs as a share of total population expressed in millions); large versus small number of listed domestic companies (above or below 300); English versus non-English origin of the legal system, and French versus non-French origin.[18] Using the same groups of countries, panel regressions are also run constraining the slope coefficient to be the same for all countries within a group. Loglikelihood ratio tests are then conducted of the null hypothesis that the slope coefficient is the same in both groups. All results are presented in Table 12.

Some of the country characteristics used for constructing groups of countries (market capitalization, the origin of the legal system, the number of IPOs, and the number of listed domestic companies) do predict whether a country tends to have a strong returns-growth association, whereas others (market turnover) do not. Countries with high market capitalization, a large number of initial public offerings and listed domestic companies, and an English or a non-French origin all have significantly higher (by 50 to 100 percent higher) slope coefficients in the panel regressions and average (cross-country) slope coefficients in the individual country regressions. The same characteristics also tend to predict a noticeably higher average R^2 in the individual country regressions.[19]

Given that market capitalization, the number of IPOs, the number of listed domestic companies, and the origin of the legal system are all strongly correlated with each other, it is difficult to tell what the key characteristics are that best predict the strength of the returns-growth association. In panel regressions including stock returns and stock returns interacted with each of market capitalization as a share of GDP, a dummy for English (or, alternatively, non-French) legal origin, the number of initial public offerings as a share of population (in

[18] The cutoff points split the sample approximately in half. Small changes in the numerical cutoffs do not affect the results, as can be seen by considering the country characteristics in Table 2 together with the individual country regressions results reported in Table 3.

[19] If a market capitalization to GDP ratio of 60 percent in 1998 is used as a cutoff point, the slope coefficients are still significantly different, but the average R^2 coefficients are not considerably different in the two groups.

Table 12. Regressions of Output Growth on Lagged Stock Returns, Various Country Groups, 1971-98

Individual Country Regressions	Average Slope Coefficient	Average R^2
Emerging markets	0.037	0.22
Advanced countries	0.034	0.15
Low stock market capitalization	0.020	0.11
High stock market capitalization	0.045	0.21
Low number of listed domestic companies	0.029	0.12
High number of listed domestic companies	0.041	0.22
Low turnover ratio	0.040	0.18
High turnover ratio	0.034	0.17
English Law	0.047	0.26
Non-English Law	0.030	0.13
French Law	0.027	0.11
Non-French Law	0.040	0.21
Low IPOs/POP	0.030	0.13
High IPOs/POP	0.035	0.20

Panel Regressions

	Coefficient	Std. Error	Chi-Square Test 1/
Emerging markets	0.035	0.007	not significant
Advanced countries	0.032	0.004	
Low stock market capitalization	0.022	0.005	significant
High stock market capitalization	0.056	0.005	
Low number of listed domestic companies	0.027	0.005	significant
High number of listed domestic companies	0.045	0.005	
Low turnover ratio	0.031	0.006	not significant
High turnover ratio	0.036	0.004	
Low IPOs/POP	0.024	0.005	significant
High IPOs/POP	0.040	0.005	
English Law	0.049	0.006	significant
Non-English Law	0.027	0.004	
French Law	0.024	0.005	significant
Non-French Law	0.043	0.004	

Sources: MSCI web site, *Emerging Markets Factbook,* IFC, *International Financial Statistics,* IMF, and LLSV (1997).

Emerging vs. advanced countries following the IFC definitions. Low vs. high stock market capitalization depending on whether stock market capitalization averaged more than 30 percent as a share of GDP over 1980-98. Low vs. high number of listed domestic companies depending on whether number exceeded 300 in 1998. Low vs. high turnover depending on whether turnover ratio exceeded 50 percent in 1998. Low vs. high IPOs depending on whether ratio to population (in millions of inhabitants) exceeded 0.3. English vs. non-English and French vs. non-French legal origin from LLSV (1997).

1/ Log-likelihood ratio test of the null hypothesis that the slope coefficient is the same in both groups of countries. The significance level used is 5 percent.

millions of inhabitants),[20] and the logarithm of the number of listed domestic companies, the interaction terms with market capitalization and an English (or a non-French) legal origin are positive and significant (Table 13).[21] (The interaction term with the number of IPOs takes a negative and significant value, but this result is reversed if this is the only interaction term in the regression).

Taken literally, for exposition purposes, the panel results (SURE with year dummies) that use market capitalization and English origin as interaction terms suggest that the magnitude of a country's slope coefficient in the returns-growth regressions would approximately double if a country were to double its market capitalization to GDP ratio, and it would increase by almost three quarters if a country of non-English origin were to move to English-style stock market regulations.

The interaction term on market capitalization is robust to specification changes, such as introducing short-term interest rates and broad and narrow money growth as additional controls, whereas the individual significance of the interaction term on English origin is not robust to this specification change. In fact, when these controls are introduced in the regression, the coefficient on the interaction term on English origin changes sign.[22] An alternative to the English origin dummy is LLSV's (1997) anti-director rights' index, which has the advantage of being more precisely measured (it takes a value between 0 and 5), but also the disadvantage that it is not clear whether an increase from—say—0 to 1 has the same meaning as an increase from 4 to 5. When the interaction term with the index of antidirector rights is used as an alternative, the estimated coefficient is positive, but its significance is not robust to specification changes. On the whole, there is tentative evidence that legal origin matters, but the estimated coefficient on the interaction term with market capitalization is much more robust to changes in specification.

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[20] The number of IPOs is considered as a share of population following LLSV (1997).

[21] Owing to data limitations, the 1998 observations of these variables are used for the turnover ratio and the number of listed domestic companies. The number of IPOs is from LLSV (1997) and refers to June 1995–July 1996. All of these variables seem to be strongly autocorrelated, although there are exceptions in which countries' relative positions changed over time.

[22] Using the market capitalization to GDP ratio in 1998 instead of the 1980–98 average leads the estimated coefficients on the interaction terms with both market capitalization and English origin to be always positive, and more significant, in all specifications.

Table 13. Panel Regression Results with Interaction Terms, 1971-98 1/

Estimation Technique	Fixed Effects No Year Dummies					Fixed Effects with Year Dummies					SURE with Year Dummies				
Stock returns	0.0337	0.0208	0.0285	0.0206	0.0125	0.0318	0.0226	0.0177	0.0223	0.0171	0.0284	0.0181	0.0071	0.0165	0.0112
	(10.1)	(4.3)	(1.2)	(3.9)	(1.7)	(8.7)	(4.7)	(0.8)	(4.1)	(2.4)	(17.7)	(8.2)	(0.7)	(6.2)	(3.6)
Stock returns times Market Capitalization/GDP		0.0232	0.0523	0.0213	0.0129		0.0197	0.0471	0.0195	0.0119		0.0239	0.0438	0.0273	0.0193
		(2.2)	(3.4)	(2.2)	(1.3)		(1.9)	(3.2)	(2.0)	(1.2)		(4.3)	(5.9)	(4.5)	(3.4)
Stock returns times English Origin Dummy		0.0155	0.0135	-0.0040			0.0102	0.0076	-0.0087			0.0127	0.0044	-0.0065	
		(2.0)	(1.1)	-(0.5)			(1.4)	(0.7)	-(1.2)			(2.9)	(0.8)	-(1.3)	
Stock returns times number of IPOs/Population			-0.0079					-0.0078					-0.0055		
			-(2.8)					-(2.8)					-(5.3)		
Stock returns times log of listed dom. Companies			-0.0016					0.0008					0.0017		
			-(0.4)					(0.2)					(1.0)		
Stock returns times index of antidirector rights					0.0045					0.0023					0.0029
					(1.6)					(0.8)					(2.1)
Real interest rates				-0.1374	-0.1359				-0.1194	-0.1193				-0.1239	-0.1269
				-(6.7)	-(6.6)				-(5.2)	-(5.2)				-(8.4)	-(8.6)
Real narrow money growth				0.0872	0.0870				0.0773	0.0769				0.0634	0.0625
				(6.3)	(6.3)				(5.5)	(5.5)				(8.1)	(8.0)
Real broad money growth				0.0525	0.0499				0.0380	0.0359				0.0501	0.0492
				(3.3)	(3.1)				(2.3)	(2.2)				(5.2)	(5.1)
Number of observations	651	651	573	589	589	651	651	573	589	589	651	651	573	589	589

Sources: *Emerging Markets Factbook,* IFC, *International Financial Statistics,* IMF, and LLSV (1997).

1/ Left-hand side variable: output growth. All right-hand-side variables are lagged by one year.

Notes: All panel regressions include individual country dummies. t-statistics are reported in brackets.

C. Interpretation

Relating these results to the theories presented above, it is possible to draw the following conclusions:

- The fact that several countries with very low market capitalization (such as Mexico and Zimbabwe) display a strong growth-returns association seems to show that the association reflects in large part the mechanism emphasized by the "passive predictor" hypothesis. In fact, it does not seem plausible that economic causality would run from stock returns to output growth in countries with such low market capitalization. Regardless of country characteristics such as market capitalization, news about next year's growth is revealed during the course of this year, and is reflected in this year's stock price changes.[23]

- The finding that market capitalization is a useful predictor of whether a country will tend to have a strong growth-returns association is consistent with all theories outlined above. Those who believe in the "passive predictor" or the "active informant" hypotheses would probably interpret this finding as reflecting the fact that as market capitalization increases, companies listed on the stock market become more and more closely representative of the economy as a whole. By contrast, proponents of the "financing" or "stock market pressure on managers" mechanisms would probably point out that market capitalization is a proxy for a well-developed stock market where takeovers and share issues, both of which underlie these mechanisms, can easily be undertaken. Whether one interprets with finding as evidence in favor of the "financing" and "stock market pressure on managers" hypotheses therefore depends on one's view of the extent to which the firms listed on the stock market are representative of the economy as a whole, and it seems likely that, for practically all the countries in the sample, the firms listed on the stock market are representative of the economy as a whole.

- The fact that, controlling for market capitalization, neither the number of IPOs nor the number of listed domestic companies seem to predict the strength of the growth-returns association implies that there is no evidence in favor of the "financing" hypothesis, although it might be argued that the number of IPOs and domestic companies are not good enough proxies for the variable that one would ultimately want to capture, namely the ease of takeovers and new share issues.

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[23] Of course, it might be argued that a (positive) bubble in stock returns may be associated with a bubble in other asset prices, which would raise the value of collateral and facilitate borrowing from banks. However, the empirical correlation between output growth and stock returns is also analyzed controlling for credit growth.

- The result that, controlling for other country characteristics such as market capitalization, the legal origin of the regulations governing the stock market seems to matter has a more straightforward interpretation, as it identifies a role for the "stock market pressure on managers" hypothesis. Countries in which managers are less protected from stockholders tend to display a closer association between output growth and lagged stock returns, presumably because when market sentiment turns against a firm, resulting in a fall in stock prices, managers cut their investment plans to protect themselves against the possibility of a takeover or of being fired. However, as this result is not robust to specification changes, the evidence in favor of the "stock market pressure on managers" hypothesis is tentative.

IV. Concluding Remarks

This paper has shown that there is a positive and significant correlation between output growth and lagged stock returns in several countries, including both advanced countries with highly developed stock markets and developing countries with emerging (but still relatively undeveloped) stock markets. The presence of this association in a variety of countries at different stages of economic and financial development suggests that the relationship is fairly robust, and that developments in stock prices should be taken into account in forecasting output, in both advanced and emerging countries. The result that the correlation is strong even in some countries with relatively small market capitalization also seems to lend support to the view that the correlation between output growth and stock returns is, to a considerable extent, due to a simple causal link from news about output growth to stock returns. Nevertheless, it is important to bear in mind that any empirically observed relationship whose underlying causal basis is not entirely understood may easily cease to exist in the future.

The paper finds that a number of characteristics of countries' stock markets are good predictors of the strength of the correlation between output growth and stock returns. Countries with a high market capitalization to GDP ratio, a large number of listed domestic companies and initial public offerings, and English origin of the regulations governing the stock market tend to display a significantly stronger correlation. In particular, both market capitalization and—less robustly—English origin are found to play an individually significant role. The significant and robust role of stock market capitalization is not surprising, as it is to be expected on the basis of several theories. The role of English legal origin is more intriguing, as it would tend to support the view that "stock market pressure on managers" mechanisms help explain the link between output growth and lagged stock returns, but the evidence is tentative.

DATA DESCRIPTION

Data on real stock returns (obtained as the difference between nominal stock returns and consumer price inflation) and real GDP growth are available at an annual frequency over 1970-98 for Australia, Austria, Belgium, Canada, Denmark, France, Germany (omitting 1991—the observation affected by unification), Italy, Japan, the Netherlands, Norway, Singapore, Spain, Sweden, Switzerland, the United Kingdom, and the United States; 1976-98 for Argentina, Chile, Greece, India, Korea, Mexico, Thailand, and Zimbabwe; 1979-98 for Jordan; 1980-98 for Brazil; 1985-98 for Colombia, Malaysia, Nigeria, Pakistan, the Philippines, Taiwan Province of China, and Venezuela; 1987-98 for Portugal; 1988-98 for Finland, Indonesia, Ireland, New Zealand, and Turkey.

At a quarterly frequency, data on real stock returns and real GDP growth are available since 1970 for Australia, Austria, Canada, France, Germany (omitting the first quarter of 1991—the observation affected by unification), Italy, Japan, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States; since 1976 for Korea; since 1977 for the Netherlands; since 1980 for Chile and Mexico; since 1984 for Singapore; since 1985 for the Philippines; since 1986 for Portugal; since 1987 for Denmark and Turkey; and since 1988 for Finland, Malaysia, and New Zealand. To expand the number of emerging markets for which quarterly data are available, industrial production growth is also used. This is available for at least forty observations for Colombia, Greece, India, Jordan, Pakistan, and Zimbabwe in addition to the countries listed above.

All stock price indices are in local currency. The stock price indices for the advanced countries are drawn from the web site of Morgan Stanley Capital International (MSCI) (www.mscidata.com). They include dividend payments. For the emerging markets, the stock price indices are the IFC Global Indices, which cover 70-75 percent of total market capitalization and are drawn from the data bank of the International Finance Corporation (IFC). For a number of countries, both MSCI and IFC indices are available; in those cases, the correlation between the price indices is very high (always above 0.95).

The data on stock market capitalization, turnover ratio, and number of listed domestic companies are drawn from the International Finance Corporation's *Emerging Markets Factbook* and the International Federation of Stock Exchanges, FIBV (www.fibv.com). The data on the number of initial public offerings of equity (in July 1995-June 1996) as a ratio of a country's population (in millions of inhabitants), and on the stock market regulations' legal origin are from LLSV (1997).

The data on real GDP, industrial production, consumer prices, narrow money, broad money, and private credit are drawn from the International Monetary Fund's *International Financial Statistics*. The data set on industrial production is complemented by data from the OECD Analytical Database. The inflation rate, the growth rate of real GDP, and rates of return on stocks are obtained as log-differences.

Table 14. Output on its Lags and Lagged Stock Prices, Individual Country Regressions, 1971-98[1/]

	Number of Observations	Durbin-Watson	Constant	Output Lagged 1 Year	Output Lagged 2 Years	Stock Prices Lagged 1 Year	Stock Prices Lagged 2 Years
Emerging market countries							
Argentina	22	1.99	0.32	0.894	-0.086	0.034	0.008
			(0.51)	(0.23)	(0.24)	(0.02)	(0.02)
Chile	22	2.01	-0.10	0.955	0.075	0.101	-0.095
			(0.29)	(0.15)	(0.19)	(0.05)	(0.06)
Greece	22	2.06	0.18	1.125	-0.164	0.022	-0.014
			(0.18)	(0.21)	(0.18)	(0.01)	(0.01)
India	22	2.02	0.29	0.779	0.155	-0.028	0.060
			(0.13)	(0.14)	(0.13)	(0.01)	(0.03)
Korea	22	2.00	0.17	0.863	0.106	0.083	-0.062
			(0.11)	(0.25)	(0.27)	(0.04)	(0.04)
Mexico	22	1.95	0.68	0.927	-0.102	0.039	-0.015
			(0.22)	(0.19)	(0.17)	(0.01)	(0.02)
Thailand	22	1.46	0.06	1.846	-0.861	0.039	-0.039
			(0.15)	(0.16)	(0.14)	(0.01)	(0.01)
Zimbabwe	22	1.94	0.19	1.044	-0.085	0.042	-0.038
			(0.36)	(0.29)	(0.30)	(0.01)	(0.02)
Average coefficient	...	...	0.22	1.054	-0.120	0.041	-0.024
Advanced countries							
Australia	28	2.60	0.36	0.697	0.212	0.112	-0.075
			(0.13)	(0.13)	(0.12)	(0.04)	(0.04)
Austria	28	2.12	0.40	0.669	0.237	0.038	-0.010
			(0.09)	(0.14)	(0.13)	(0.01)	(0.01)
Belgium	28	1.95	0.71	0.559	0.272	0.042	-0.015
			(0.09)	(0.12)	(0.11)	(0.02)	(0.02)
Canada	28	1.73	0.26	1.102	-0.161	0.072	-0.062
			(0.05)	(0.13)	(0.12)	(0.02)	(0.03)
Denmark	28	1.80	0.29	1.031	-0.102	0.035	-0.016
			(0.20)	(0.15)	(0.15)	(0.01)	(0.02)
France	28	1.89	0.36	1.003	-0.086	0.026	-0.012
			(0.06)	(0.10)	(0.09)	(0.01)	(0.01)
Germany	28	1.88	0.48	1.060	-0.180	0.029	0.019
			(0.21)	(0.11)	(0.08)	(0.02)	(0.03)
Italy	28	1.89	0.25	0.868	0.081	0.019	-0.019
			(0.09)	(0.23)	(0.22)	(0.02)	(0.02)
Japan	28	1.78	0.31	0.914	0.011	0.057	-0.036
			(0.10)	(0.12)	(0.12)	(0.02)	(0.02)
Netherlands	28	1.68	0.45	1.174	-0.281	0.053	-0.034
			(0.09)	(0.12)	(0.11)	(0.01)	(0.01)
Norway	28	1.63	0.10	1.364	-0.383	0.014	-0.014
			(0.03)	(0.14)	(0.14)	(0.01)	(0.01)
Singapore	28	1.85	0.04	1.462	-0.451	0.029	-0.047
			(0.04)	(0.12)	(0.11)	(0.02)	(0.01)
Spain	28	1.96	0.17	1.322	-0.363	0.041	-0.030
			(0.05)	(0.15)	(0.14)	(0.01)	(0.01)
Sweden	28	1.46	0.46	1.203	-0.311	0.039	-0.027
			(0.22)	(0.13)	(0.15)	(0.01)	(0.01)
Switzerland	28	1.91	0.41	1.263	-0.357	0.052	-0.039
			(0.18)	(0.16)	(0.14)	(0.03)	(0.03)
United Kingdom	28	2.14	0.44	1.098	-0.211	0.050	-0.024
			(0.15)	(0.25)	(0.24)	(0.01)	(0.01)
United States	28	1.84	0.27	1.147	-0.210	0.094	-0.082
			(0.07)	(0.10)	(0.10)	(0.02)	(0.02)
Average coefficient	...	...	0.34	1.055	-0.134	0.047	-0.031
All countries							
Average coefficient	...	...	0.30	1.055	-0.130	0.045	-0.029

Sources: MSCI web site, *Emerging Markets Factbook*, IFC and *International Financial Statistics*, IMF.

Note: Newey-West corrected standard errors in parentheses.

1/ All variables in logarithms.

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