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Financial Development and Economic Growth: The Role of Stock Markets

Utilizing time series methods and data from five developed economies, we examine the relationship between stock market development and economic growth, controlling for the effects of the banking system and stock market volatility. Our results support the view that, although both banks and stock markets may be able to promote economic growth, the effects of the former are more powerful. They also suggest that the contribution of stock markets on economic growth may have been exaggerated by studies that utilize cross-country growth regressions.

THE GROWING IMPORTANCE of stock markets around the world has recently opened a new avenue of research into the relationship between financial development and economic growth, which focuses on the effects of stock market development.[1] In this context, various stock market development indicators have been found to explain part of the variation of growth rates across countries, in some cases over and above the effects of the banking system (Atje and Jovanovic 1993; Levine and Zervos 1998). Since these results have been obtained from cross-country growth regressions, they can at best provide only a broad-brush picture of the relationship between stock markets and growth, the details of which may reasonably be expected to vary considerably across countries, depending on institutional characteristics and circumstances. Furthermore, given the widespread skepticism concerning the robustness of econometric results derived from cross-country growth regressions, these results must be viewed with some caution (Levine and Renelt

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1. World stock market capitalization grew from $2 trillion in 1982 to $4.7 trillion in 1986, $10 trillion in 1993 and $15.2 trillion in 1996, implying an average annual growth rate of 15 percent; emerging market capitalization grew from less than 4 to 13 percent of total world capitalization (Demirgüç-Kunt and Levine 1996; Singh 1997).

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1992; Arestis and Demetriades 1997; Luintel and Khan 1999).[2] In the specific context of the cross-country relationship between stock market development and growth, for example, the presence of endogeneity has been shown to considerably weaken the estimated effect of stock market indicators (Harris 1997). There are, therefore, important econometric advantages in examining the role of stock markets in the relationship between financial development and growth using time series methods. Besides being better able to address issues of causality and endogeneity, they are also less likely to suffer from other limitations of cross-country growth regressions.[3] Even setting aside econometric issues, time series methods can provide useful insights into differences of this relationship across countries and may illuminate important details that are hidden in averaged-out results.

This paper utilizes time series methods to reexamine the relationship between economic growth and stock market development, while controlling for the effects of the commercial banking sector and stock market volatility. Inevitably, a time series analysis has its own limitations. Specifically, the need to obtain a long time series of stock market development indicators narrows down the focus of the empirical analysis to five developed economies, namely, Germany, the United States, Japan, the United Kingdom, and France. While the absence of less-developed economies from our sample means that no direct inferences can be made about the contribution of stock markets at early stages of economic development, our findings nevertheless have implications for the debate on bank-based versus capital-market-based financial systems (see, for example, Rajan and Zingales 1995 and 1996; Horiuchi and Okazaki 1994; Edwards and Fischer 1994; Corbett and Jenkinson 1994). Thus, our results could be indirectly valuable for less-developed economies, in that they may inform policy decisions relating to the adoption or otherwise of specific types of financial system.

The rest of the paper is structured as follows. In section 1 we provide a discussion of the role of stock markets and banks in the process of economic growth and summarise the existing empirical literature. In section 2 we outline our data and econometric methodology. In section 3 we present our findings and discuss their implications for the debate on financial systems. Finally in section 4 we provide a summary and some concluding remarks.

1. STOCK MARKETS, BANKS, AND ECONOMIC GROWTH

Positive Effects of Stock Markets

Recent theoretical contributions suggest that stock markets may promote long-run growth. Stock markets encourage specialization as well as acquisition and dissemi-

2. Quah (1993) emphasizes the nonexistence of balanced growth paths, Caselli, Esquivel, and Lefort (1996) and Levine and Renelt (1992) focus on omitted variable bias or misspecification, Evans (1995) and Pesaran and Smith (1995) dwell on the heterogeneity of slope coefficients across countries, while problems of causality and endogeneity are explored by Demetriades and Hussein (1996) and Harris (1997).

3. The view that time series studies of economic growth offer important advantages over cross-country growth regressions is gaining acceptance. See, for example, Jones (1995), Evans (1997), Kocherlakota and Yi (1997), and Klenow and Rodriguez-Clare (1997).

nation of information (Diamond 1984; Greenwood and Jovanovic 1990; Williamson 1986) and may reduce the cost of mobilizing savings, thereby facilitating investment (Greenwood and Smith 1997). Well-developed stock markets may enhance corporate control by mitigating the principal-agent problem through aligning the interests of managers and owners, in which case managers would strive to maximize firm value (Diamond and Verrecchia 1982; Jensen and Murphy 1990).

Stock Market Liquidity

Levine (1991) and Bencivenga, Smith, and Starr (1996) suggest that stock markets make financial assets traded in them less risky because they allow savers to buy and sell quickly and cheaply when they wish to alter their portfolios. Companies at the same time enjoy easy access to capital through equity issues. Less-risky assets and easy access to capital markets improve the allocation of capital, an important channel of economic growth. More savings and investment thereby may also ensue, further enhancing long-term economic growth. It is conceded, though, that increased liquidity can also influence growth negatively (see, for example, Levine 1997). There are three channels through which this may take place (Demirgüç-Kunt and Levine 1996). The first is that greater stock market liquidity, by increasing the returns to investment, may reduce savings rates. The second is that, given the ambiguous effect of uncertainty on savings, greater stock market liquidity might in fact reduce savings rates through its negative impact on uncertainty since less uncertainty may decrease the demand for precautionary savings. The third channel operates through the euphoria and myopia that may be encouraged by highly liquid stock markets. Dissatisfied participants find it easy to sell quickly which can lead to disincentives to exert corporate control, thus affecting adversely corporate governance and hurting economic growth in the process (see, however, Jensen and Murphy 1990).

The Role of Volatility

Another important characteristic of stock markets is that of price volatility, as this may undermine the ability of stock markets to promote an efficient allocation of investment. The undesirable side effects of volatility were recognized early on in the literature, notably by Keynes (1936), who was particularly sharp-tongued:

> As the organisation of investment markets improves, the risk of the predominance of speculation does . . . increase . . . Speculators may do no harm as bubbles on a steady stream of enterprise . . . a serious situation can develop . . . when enterprise becomes the bubble on a whirlpool of speculation. When the capital development of a country becomes a by-product of the activities of a casino, the job is likely to be ill-done. . . . It is usually agreed that casinos should, in the public interest, be inaccessible and expensive. And perhaps the same is true of Stock Exchanges. (pp. 158–59)

More recent literature is less conclusive on this issue. While a certain degree of price volatility in the stock market is clearly desirable, since it may reflect the effects of new information flows in an efficient stock market, some evidence suggests that the observed levels of volatility may be "excessive." This may reflect independence of stock-market-asset values from underlying fundamentals (Shiller 1981 and 1989), even though the debate on the presence of *excess* volatility in stock returns is far from settled. If present, excessive volatility is likely to result in an inefficient allocation of resources, upward pressures on interest rates in view of the higher uncertainty, hampering both the volume and the productivity of investment and, therefore, reducing growth (Federer 1993; DeLong et al. 1989). Furthermore, excessive stock trading may very well induce "noise" into the market to the detriment of efficient resource allocation (DeLong et al. 1989).

BANKS

The relationship between stock markets and growth may also be influenced by the link between stock markets and financial intermediaries, which is not unambiguous. Stock markets and banks are clearly substitute sources for corporate finance since when a firm issues new equity its borrowing needs from the banking system decline. Assuming that banks and financial intermediaries are in a better position than stock markets to address agency problems (for example, Diamond 1984; Stiglitz 1985), it is then possible that stock market development may hamper economic growth if it happens at the expense of banking system development.

Similar views are expressed by the literature on capital-market-based financial systems that predicts a very weak relationship between stock markets and growth since corporate investment is not financed through issues of equity (Mayer 1988; see, also, Fry 1997). Corbett and Jenkinson (1994) when discussing the contribution of stock market to corporate investment financing, suggest that it was negative in the United Kingdom and only small positive overall in the United States during the 1970s and 1980s. Akyuz (1993) and Singh (1997) argue that unfavorable economic shocks produce macroeconomic instability through the interactions between stock markets and foreign exchange markets, which affect economic growth adversely.

On the other hand, at the aggregate level increased stock market capitalization may be accompanied by an increase in the volume of bank business, if not an increase in new lending, as financial intermediaries may provide complementary services to issuers of new equity such as underwriting. Thus, it is likely that at the aggregate level the development of the stock market goes hand in hand with the development of the banking system.

Empirical Evidence

Existing evidence points to stock market development taking place in tandem with other aspects of financial development. Using data for forty-four industrial and developing countries for the period 1986–1993, Demirgüç-Kunt and Levine (1996) conclude that countries with well-developed stock markets also have well-developed banks and nonbank financial intermediaries, while countries with weak stock markets tend to have weak banks and financial intermediaries. Demirgüç-Kunt and Maksimovic (1996), in their investigation of the effect of stock market development on firms' financing choices in thirty industrial and developing economies from 1980 to

1991, find that initial improvements in the functioning of a developing stock market produce higher debt/equity ratios for large firms, with small firms not being significantly affected. In already developed stock markets, further development leads to substitution of equity for debt financing, especially for long-term debt. Boyd and Smith (1996) argue that as an economy develops the ratio of debt to equity tends to increase, with the two sources of finance being complementary.

Levine and Zervos (1998), utilizing cross-country regressions for a number of countries covering the period 1976–1993, demonstrate that various measures of equity market activity are positively correlated with measures of real activity and that the association is particularly strong for developing countries. Conditioning on a number of variables, including indicators of banking development, they conclude that stock markets provide different financial services from banks. They argue that stock markets may enhance growth through liquidity, which makes investment less risky, thereby enabling companies to enjoy permanent access to capital through liquid equity issues. Atje and Jovanovic (1993), using a similar approach, also find a significant correlation between economic growth and the value of stock market trading relative to GDP for forty countries over the period 1980–88. However, Harris (1997) shows that this relationship is at best weak. Reestimating the same model for forty-nine countries over the period 1980–91, but using current investment rather than lagged, and utilizing two-stage least squares, he demonstrates that in the case of the full sample (which includes both developed and developing countries), and of the subsample of developing countries, the stock market variable does not offer much incremental explanatory power. In the subsample of developed countries, although the level of stock market activity has some explanatory power, its statistical significance is weak.

The volatility characteristic of stock markets has been investigated from the point of view of its relationship to the size of stock markets and capital control liberalization. Demirgüç-Kunt and Levine (1996) find that in a sample of forty-four developed and emerging markets from 1986 to 1993, large markets tend to be less volatile. Also, that internationally integrated markets tend to be less volatile. Levine and Zervos (1995) explore the effect of liberalizing capital controls in sixteen countries which reduced substantially barriers to international capital and dividend flows in the 1980s. They conclude that stock market volatility increases significantly immediately following capital control liberalization in approximately half of the countries considered and does not decrease significantly in any of them. This result may be combined with that of Demirgüç-Kunt and Levine (1996) to suggest that, in the long run, stock return volatility is lower in countries with more open capital markets. However, more recently Levine and Zervos (1998) have examined volatility in a relationship that concentrates on stock market liquidity and economic performance. They conclude that in a cross-section approach, this link is not statistically robust (and it is unexpectedly positive in most cases). We investigate this link further in this paper and are able to improve substantially on this result and show that the link between volatility and growth is significantly strong and negative in our time series analysis as shown below.

2. DATA AND ECONOMETRIC METHODOLOGY

We are motivated by two primary objectives: First, to explore the long-run relationship between stock market volatility, stock market development, banking system development and the level of output. In so doing, the magnitude of the estimated long-run output elasticities with respect to the measures of banking system development and the stock market development is likely to shed light on the relative importance of the two components of the financial system for output growth. Second, to investigate the causal flows in this relationship, that is, between output and banking system development on one hand and output and stock market development on the other.

Data and Measurement

We employ quarterly data on output and indicators of banking system development, stock market development and stock market volatility for Germany during 1973:1–1997:4, the United States for 1972:2–1998:1, Japan for 1974:2–1998:1, the United Kingdom for 1968:2–1997:4, and France for 1974:1–1998:1.[4] Our variables are measured as follows. Output is measured by the logarithm of real GDP (LY); stock market development by the logarithm of the stock market capitalization ratio (LMC), defined as the ratio of stock market value to GDP; banking system development by the logarithm of the ratio of domestic bank credit to nominal GDP (LBY); stock market volatility (SMV) is measured by an eight-quarter moving standard deviation of the end-of-quarter change of stock market prices.[5]

There are, of course, other possible indicators of financial development. As far as banking sector development is concerned a deposit-based measure could also be used. Earlier work by Arestis and Demetriades (1996), however, suggests that in the case of developed economies credit-based indicators are more likely to exhibit a stable long-run relationship with output than deposit-based ones. As far as stock market development is concerned, cross-section studies have found liquidity-based measures, such as the ratio of the value of traded shares to GDP, to be more closely linked with economic growth than market capitalization indicators. Nevertheless, in a time series context the capitalization indicator has a number of advantages over transaction-based measures. Firstly, it is a stock variable rather than a flow variable that makes comparison with the bank development-based indicator, which is also a stock, more meaningful. Secondly, primarily for the same reason it is more likely to have time series properties that make it suitable for cointegration analysis. Furthermore, the discussion of section 1 suggests that there are also conceptual reasons as to why stock market capitalization may be more closely linked to economic growth than transactions-based measures. Despite this we test the sensitivity of our results

4. All data series were extracted from the online information service *Datastream International*. Stock market variables are end-of-quarter price indices and market values.

5. We first calculated the logarithmic first differences of the end-of-quarter stock market price index. We then computed a moving eight-quarter standard deviation as a measure of stock market volatility.

using alternative measures of stock market development; however, this is only possible for the United Kingdom and the United States since data on these variables are not available for the other countries in our sample for a sufficiently long period.

Methods

We carry out our empirical investigation in a vector autoregression (VAR) framework. Recent literature (for example, Gonzalo 1994; Hargreaves 1994; Haug 1996) suggests that for sample sizes of around one hundred data points, the maximum likelihood approach of Johansen (1988) performs in general better than a range of other estimators of long-run relationships (cointegrating vectors). Further, Toda and Phillips (1993), Hall and Wickens (1993), and Hall and Milne (1994) show it to be an efficient method of testing causality. We therefore follow this method to identify the number of cointegrating vectors amongst the variables specified in the VAR and then examine the direction of causality.

The Johansen (1988) method is based on a vector error correction (VECM) representation of a VAR(p) model which can be written as

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \ldots\ldots + \Gamma_{p-1} \Delta x_{t-p+1} + \Pi x_{t-p} + \Psi D_t + u_t \qquad (1)$$

where x is an nx1 vector of the first order integrated [that is, I(1)] variables, $\Gamma_1, \Gamma_2, \ldots, \Gamma_p$ are nxn matrices of unknown parameters, D is a set of I(0) determimistic variables such as constant, trend, and dummies, and u is a vector of normally and independently distributed errors with zero mean and constant variance. The steady-state (equilibrium) properties of equation (1) are characterized by the rank of Π, a square matrix of size n. In our case $n = 4$. The existence of a cointegrating vector implies that Π is rank deficient. Johansen (1988) derives the maximal eigenvalue and trace statistic for testing the rank of Π. Appropriate critical values are tabulated in Osterwald-Lenum (1992). If Π is of rank r ($0<r<n$) then it can be decomposed into two matrices α (nxr) and β (nxr) such that

$$\Pi = \alpha\beta' . \qquad (2)$$

The rows of β are interpreted as the distinct cointegrating vectors whereby $\beta' x$ form stationary processes. The αs are the error correction coefficients that indicate the speeds of adjustment toward equilibrium. Substituting (2) into (1) we get

$$\Delta x_t = \Gamma_1 \Delta x_{t-1} + \Gamma_2 \Delta x_{t-2} + \ldots\ldots + \Gamma_{p-1} \Delta x_{t-p+1} + \alpha(\beta' x_{t-p}) + \Psi D_t + u_t . \quad (3)$$

This is a basic specification for the test of long-run causality. A test of zero restrictions on the αs is a test of weak exogeneity when the parameters of interest are long run (Johansen and Juselius 1992). Hall and Wickens (1993) and Hall and Milne (1994) interpret weak exogeneity in a cointegrated system as a notion of long-run causality. We employ weak exogeneity tests to examine the issue of long-run causality between the variables in the system. The null of $\alpha=0$ can be tested by the standard likelihood ratio test.

A number of issues are important in the estimation and interpretation of cointegrating vectors. First, in view of the various (financial) policy changes that have taken place during the sample period, it is plausible to allow for the possibility of structural break in the cointegrating relationships. We address this issue directly by testing the null of parameter and rank constancy in the cointegrating relationships following Quintos (1995) and Hansen and Johansen (1993, 1998). The hypothesis of interest here is that Π and the rank of Π, $\rho(\Pi)$, or the number of cointegrating relationships remains stable overtime. The null of parameter and rank constancy can be stated as

$$H_o\!: \rho(\Pi_t) = r, \text{ or } \rho(\Pi_t) = \rho(\Pi) \text{ for all } t\,. \tag{4}$$

The alternative hypothesis that allows for both the parameters and number of cointegrating ranks to change is

$$H_a\!: \rho(\Pi_t) \neq \rho(\Pi), \text{ for all or some of the } t\,. \tag{5}$$

Quintos (1995, p. 412) provides a likelihood ratio (LR) statistic which tests the null of no structural break under a single break date. Implementation of Quintos's test requires splitting the sample at the break date; estimating separate models for the pre- and postbreak dates; and testing whether subsample eigenvalues are significantly different from those of the full sample. In view of the fairly small sample we have we do not follow this approach. Instead, we implement the rank stability tests in a recursive framework as suggested by Hansen and Johansen (1993, 1998).[6] The relevant LR test can be shown as

$$LR = T\sum_{i=1}^{q} \ln(1-\lambda_i) - T_j\sum_{i=1}^{q_1} (1-\lambda_{1i})$$

where λ and λ_1 are the full and resursive sample estimates of the eigenvalues of matrix Π; subscript j indicates the starting date of recursion such that $T_j = T_1 + 1, T_1 + 2,\ldots,T$. Thus, our approach essentially involves estimating the cointegrating vector(s) using full sample and then testing whether the full sample results (that is, cointegrating parameters and ranks) remain stable when the model is estimated over the recursive subsample. The recursive LR test is $\chi^2(2)$ distributed.

Second, it is shown that cointegrating relationships are sensitive to the treatment of deterministic terms in the cointegrating space (Baillie and Bollerslev 1994; Diebold, Gardeazabal, and Yilmaz 1994). To resolve this, Johansen (1992) suggests

6. It should be noted that Quintos's test is based on Hansen and Johansen (1993). One of the advantages of recursive tests of structural break is that we do not require to identify break date endogenously which is important in view of our sample size.

identifying appropriate deterministic terms in the cointegrating space through rank tests following the so-called Pantula principle. Crowder and Hoffman (1996) and Luintel and Paudyal (1998), among others, implement cointegration tests along these lines and we follow this approach. Third, it is well known that the results are sensitive to lag length selection in the VAR. Generally lag lengths are specified following some information criteria (for example, Akaike 1973; Schwarz 1978). However, Hall (1989) and Johansen (1992) suggest that the lag length should be specified such that the VAR residuals are empirically Gaussian. Cheung and Lai (1993) show that the lag length selection based on information criteria may not be adequate when errors contain moving average terms. We specify lag lengths as the minimum length for which there is no significant autocorrelation in the estimated VAR residuals.

Finally, the identification and interpretation of the cointegrating vectors, β, as long-run economic relationships is another pertinent issue. Given r cointegrating vectors, Johansen (1991) suggests identification through the test of r^2 *just-identifying* restrictions. Pesaran and Shin (1994), however, show that Johansen's identification scheme is deficient in that the maximized log-likelihood values associated with any set of *just-identifying* restrictions would be identical, which makes it impossible to distinguish between the competing set of restrictions. Instead, they suggest identification of long-run economic relationship through the tests of over-identifying restrictions. This requires testing for r^2+k (where $k \geq 1$) restrictions in a cointegrating space spanned by r stationary relationships which gives k over-identifying restrictions. It should be noted that when a unique cointegrating vector is found then the problem of interpretation does not arise, and one may simply test for just identifying restrictions in the form of a normalization restriction.

3. EMPIRICAL RESULTS AND ANALYSIS

We begin by carrying out unit root tests which suggest that the all variables are I(1).[7] We then perform cointegration analysis for each of the five countries, the results of which are reported in Tables 1–5. In order to allow for any deterministic seasonality, centered quarterly dummies are included in unrestricted form throughout the estimation. Part (a) of each table contains the results from recursive estimation. In view of the sample size, the starting year for the recursive estimation is chosen as 1990(4) for all countries except for the United Kingdom, in which case because of the longer sample we begin recursive estimation at 1987(4). The last column of each table reports the LR tests under the null that the full sample cointegrating rank is stable over the recursive subsample. The rejection of the null indicates structural breaks in the cointegrating rank that forms the basis for the introduction of appropriate shift dummies.

Once the structural break is identified, we then reestimate the cointegration rank

7. Unit root tests for all variables (which are not reported here) can be obtained from the authors upon request.

for the full sample by allowing for structural shifts through shift dummies.[8] Since trace statistics and maximal eigenvalue statistics provide qualitatively similar results, only the former are reported for the sake of brevity. In the event of multiple cointegrating vectors, identification of each vector to an economically interpretable relationship is achieved through tests of over-identifying restrictions (see Pesaran and Shin 1994). Each vector is normalized on the variable for which we could find evidence of error correction (that is, negative and significant loading factors, α). These results are reported in part (b) of each table. Finally in part (c) we report the results of weak exogeneity tests, which are expected to shed light on the patterns of long-run causality in each system.

The results on Germany, reported in Table 1, show evidence of a break in the cointegrating rank during 1991–92, which coincides with the period of the German reunification. Once this structural break is taken into account through the introduction of an intercept dummy for the period of 1991(1)–1992(4) in the cointegrating space, we continue to find evidence of a single cointegrating vector. Tests of normality and serial correlation suggest that the VAR residuals are empirically Gaussian.[9]

The cointegrating vector is normalized on output, given the correctly signed and strongly significant error correction term (α). The cointegrating vector for this country shows a positive relationship between the level of real GDP and banking system development, as well as a positive stock market capitalization effect. It also shows that stock market volatility, a variable treated weakly exogenous to the system, has a positive but insignificant effect.[10] Banking system development is endogeneous to the output vector whereas stock market capitalization is not. Hence, in Germany, there is bidirectional causality between banking system development and the level of output while stock market capitalization is weakly exogeneous to the output vector in the long run. Stock market capitalization, however, affects GDP through the positive and significant cointegrating parameter. The coefficients on LBY and LMC are significant at the 1 percent level, with the former being more than three times larger than the latter. These results are clearly not surprising given the close relationship of the banking system with industry in Germany and the relatively minor role played by the stock market there (see, for example, Arestis and Demetriades 1996).

In the case of the United States (see Table 2) the picture is rather different in view of the endogeneity of stock market capitalization and the weak exogeneity of real GDP, once the structural shift in 1990:1–1994:4 is accounted for. This period coincides with a downturn in the U.S. economy, a substantial fall in bond market yields and a serious number of defaults of "junk" bonds. There is only one cointegrating vector for this country, which is normalized on LMC. According to this vector, LMC

8. We tested for both slope and intercept dummies but the former were insignificant in all cases.

9. In all cases recursive estimation is conducted without the introduction of any dummy variable. However, few dummies were introduced in the other estimations to capture blips in the data. Exclusion of these dummies does not change the results qualitatively, except for failure of the normality test. These are not reported but can be obtained from the authors.

10. The likelihood ratio tests could not reject the weak exogeneity of SMV. The test statistic is distributed as chi-square(1) which gives a p-value of 0.136. In Tables 1–7, the coefficients for SMV, unlike the other coefficients, are not elasticities.

TABLE 1

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN GERMANY

1A: RECURSIVE ESTIMATION OF COINTEGRATING VECTORS (LAG=5)

Sample:	Trace Statistic H_0: rank=p			Eigenvalues			
1973(1)–	$p=0$	$p\leq1$	$p\leq2$	λ_1	λ_2	λ_3	Rank stability test
1990(4)	48.18***	17.31	2.71	0.369	0.196	0.039	0.54
1991(4)	52.89***	16.10	3.05	0.404	0.168	0.042	6.54**
1992(4)	49.16***	15.06	2.24	0.365	0.157	0.029	5.98**
1993(4)	45.19***	14.68	1.92	0.320	0.149	0.024	0.81
1994(4)	46.46***	15.79	2.07	0.309	0.152	0.025	0.34
1995(4)	46.80***	16.22	1.92	0.296	0.152	0.022	0.26
1996(4)	46.03***	17.12	1.64	0.272	0.156	0.018	1.42
1997(4)	47.90***	17.58	1.71	0.273	0.154	0.018	Full sample

1B: ESTIMATED COINTEGRATING VECTOR AFTER ALLOWING FOR STRUCTURAL BREAK (LAG=5)

		Trace Statistic H_0: rank=p			
	$p=0$	$p\leq1$	$p\leq2$		
	53.67***	18.03	2.59		
Normalized on LY	Constant	Dummy: 1991(1)–1992(4)	LMC	LBY	SMV[1]
Coefficient	5.893	0.0633	0.1316	0.4405	1.239
p-value	0.0002	0.0623	0.0079	0.0000	0.1243

NOTES: 1. Treated as weakly exogenous.
p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Vector autocorrelation tests: F(45,158) = 1.1959 [0.2110]
Vector normality test: chi-square (6): 4.082 [0.6652]

1C: WEAK EXOGENEITY TESTS

	LY	LMC	LBY
Loading (α)	−0.1450	0.2550	0.2148
p-value	0.000	0.3678	0.000

NOTES: p-values are that of the likelihood ratio tests under the null that the loading factor is zero.
***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

TABLE 2

Financial Development and Economic Growth in the United States

2A: Recursive Estimation of Cointegrating Vectors (Lag=4)

Sample: 1972(2)–	Trace Statistic H_0: rank=p			Eigenvalues			
	p=0	p≤1	p≤2	λ_1	λ_2	λ_3	Rank stability test
1990(4)	78.0***	43.23***	19.14	0.400	0.298	0.176	6.9**
1991(4)	71.29***	43.28***	20.08**	0.317	0.282	0.162	12.01***
1992(4)	67.04***	42.28***	19.70	0.278	0.257	0.137	4.61
1993(4)	67.14***	41.21***	19.00	0.277	0.242	0.135	3.82
1994(4)	69.00***	42.89***	19.42	0.267	0.249	0.132	2.39
1995(4)	69.23***	42.73***	19.41	0.260	0.233	0.131	2.31
1996(4)	70.39***	43.76***	19.91	0.251	0.228	0.130	1.48
1998(1)	71.58***	42.24***	19.62	0.261	0.208	0.131	Full-sample

2B: Estimated Cointegrating Vector after Allowing for Structural Break (Lag=4)

	Trace Statistic H_0: rank=p		
	p=0	p≤1	p≤2
	35.07***	10.32	2.51

Normalized on LMC	Constant	Dummy: 1990(1)–1991(4)	LY	LBY	SMV[1]
Coefficient	N/a	−0.1939	3.208	0.447	−6.331
p-value		0.465	0.000	0.779	0.181

Notes: 1. Treated as weakly exogenous.
p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Vector autocorrelation tests: F(45,170) = 1.219 [0.184]
Vector normality test: chi-square (6): 8.092 [0.231]

2C: Weak Exogeneity Tests

	LY	LMC	LBY
Loading (α)	−0.0013	−0.109	0.003
p-value	0.617	0.0001	0.269

Notes: p-values are that of the likelihood ratio tests under the null that the loading factor is zero.
***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

is positively related to real GDP and to banking sector development (LBY) and negatively related to stock market volatility. However, only the GDP coefficient is significant in this vector. The weak exogeneity of real GDP and banking system development suggests that capital market development, which in the long run is influenced by these two weakly exogenous variables, has no long-run causal influence on either of these variables. This result shows that there is clear evidence to suggest that in the U.S. financial development does not cause real GDP in the long run. Consequently, these results are in sharp contrast to the ones obtained for Germany and may, to some extent, reflect the international character and the nature of the banking system in the United States which is a capital market-based system (as opposed to the bank-based system in Germany).

The results for Japan are reported in Table 3. The recursive estimates show two cointegrating vectors throughout 1990–1995 and one cointegrating vector after 1996. Such a shift in the number of significant eigenvalues is indicative of a structural break in the long-run relationship. We therefore treat the data points up to 1995:4 as the full sample and compute LR tests of rank stability for the other years reported in the table. Tests reveal that in Japan structural breaks in the cointegrating ranks appear during 1991–1992 and 1996–1998. The former period coincides with a steep decline in bank profits, reflecting worsening in the scale of nonperforming loans, due to a sharp fall in asset values, especially in the property market, and a tight monetary policy. The structural break during the period 1996:1–1998:1 is clearly not surprising given that this period coincides with one of the worst economic crises in Japan's postwar history. Importantly, the Japanese financial system has been at the center of these problems, with many financial institutions becoming insolvent. Once this break is taken into account through the introduction of intercept dummies for 1996:1–1998:1 two cointegrating vectors emerge. These vectors are respectively normalized on real GDP and banking system development, which show clear evidence of error correction. The over-identifying restrictions that are accepted by the data include two normalization restrictions, linear homogeneity of LBY and a positive coefficient on LMC in the first vector and exclusion of LY from the second vector. The first vector shows that both the stock market and the banking system development indicators influence output positively; however, the influence of the former is about one-sixth of the latter. Stock market volatility, on the other hand, exerts a negative and significant influence on the development of the real economy. The second vector is essentially a positive and significant relationship between the banking system development and stock market capitalization. Once again, stock market volatility enters with a negative and significant coefficient, suggesting that increased stock market volatility—a weakly exogenous variable to the system[11]—impacts negatively on the development of the banking system. The estimated banking development vector displays a downward shift during 1996:1–1998:4, reflecting a significant autonomous shift of 1.13 percent. This effect is not significant in the output vector.

11. Weak exogeneity test of SMV from the system assumes a p-value of 0.972 which is chi-square(2) distributed.

TABLE 3

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN JAPAN

3A: RECURSIVE ESTIMATION OF COINTEGRATING VECTORS (LAG=5)

Sample: 1973(1)–	Trace Statistic H_0: rank=p			Eigenvalues			
	$p=0$	$p\leq1$	$p\leq2$	λ_1	λ_2	λ_3	Rank stability test
1990(4)	68.46***	41.27***	18.91	0.333	0.284	0.167	3.11
1991(4)	69.46***	41.54***	16.56	0.325	0.297	0.135	6.47**
1992(4)	68.56***	35.53**	15.35	0.356	0.236	0.160	6.77**
1993(4)	65.73***	35.12**	14.58	0.321	0.229	0.132	4.72
1994(4)	61.42***	33.97*	12.38	0.282	0.229	0.112	2.61
1995(4)	59.83**	36.09**	13.39	0.239	0.230	0.119	#
1996(4)	51.80*	27.99	13.71	0.230	0.145	0.114	22.63***
1998(1)	53.40**	28.32	14.71	0.230	0.132	0.118	21.37***

1973(1)–1995(4) treated as full sample (see text for details).

3B: ESTIMATED COINTEGRATING VECTORS AFTER ALLOWING FOR STRUCTURAL BREAK (LAG=5)

	Trace Statistic H_0: rank=p		
	$p=0$	$p\leq1$	$p\leq2$
	80.91***	23.01***	7.78

Vector 1

Normalized on LY	Constant	Dummy: 1996(1)–1998(4)	LBY	LMC	SMV
Coefficient	12.92	−0.0111	1.000	0.130	−1.336
p-value	0.000	0.3866	0.000	0.008	0.000

Vector 2

Normalized on LBY	Constant	Dummy: 1996(1)–1998(4)	LMC	SMV[1]
Coefficient	0.5939	−0.1130	0.304	−1.755
p-value	0.0002	0.0381	0.000	0.000

NOTES: 1. Treated as weakly exogenous.
p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Test of over-identifying restrictions: chi-square(1) = 1.8842 [0.1699]
Vector autocorrelation tests: F(45,161) = 1.1371 [0.2782]
Vector normality test: chi-square (6): 8.7299 [0.1890]

3C: WEAK EXOGENEITY TESTS

	LY	LMC	LBY
Loading (α) of vector 1	−0.1471	0.1661	−0.9011
p-value	0.0000	0.0119	0.0000
Loading (α) of vector 2	0.0763	−0.1410	0.9005
p-value	0.0000	0.0111	0.0002

NOTES: p-values are that of the likelihood ratio tests under the null that the loading factor is zero.
***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

Finally, the weak exogeneity tests suggest a feedback relationship between real GDP and both parts of the financial system since all three variables are endogenous to the system. With perhaps the exception of the negative and significant influence of stock market volatility, these results should not be surprising in view of the relative importance of the banking sector in Japan (Corbett and Jenkinson 1994; Arestis and Demetriades 1996).[12]

The results pertaining to the United Kingdom, presented in Table 4, display significant differences with those of the other countries, reflecting perhaps the uniqueness of its financial system. To start with, we find evidence of a structural shift in the estimated relationships during 1987:1–1991:4. As 1987 was the year of one of the most important deregulations of the U.K. financial system in recent history—the Big Bang—this is once again not a surprising result. There were also statistical redefinitions in the mid-1980s, pertaining to the inclusion of Building Societies in the banking system statistics. Once these structural shifts are taken into account, we find evidence of two cointegrating vectors. They are normalized on stock market capitalization and banking development. The data-identifying restrictions are the following five: exclusion of real GDP from the first cointegrating vector, exclusion of LMC and linear homogeneity between LBY and LY in the second vector, and two normalization restrictions. The first vector is a simple and straightforward positive relationship between stock market capitalization and banking sector development: the two parts of the financial system exhibit a stable long-run positive association—subject to a shift in the 1987–91 period. It also shows that stock market volatility impacts negatively on stock market capitalization. The second vector suggests that banking sector development is explained by real GDP growth, while stock market volatility exerts a significant negative influence. The weak exogeneity tests show that real GDP is weakly exogeneous with respect to the LBY vector, and marginally so in the case of the LMC. Thus, the LMC vector appears to cause LY, although marginally, in the long run. The long-run banking development vector has no relationship with the level of output and stock market development. In the long run, causality runs from LBY to LMC and from LMC to GDP. There is no direct long-run causal relationship between banking system development and real GDP for this country.

In conclusion, the evidence on the United Kingdom suggests that in the long run causality flows from banking system development to stock market development. It is also evident, however, that the flow of causality from financial system development to real GDP is, at best, weak. On the other hand, banking system development and stock market development are both negatively affected by stock market volatility. This evidence could also be interpreted as suggesting that the U.K. financial system is not a strong promoter of domestic economic growth, which to some extent reflects its weak links with industry, in that it is a typical capital market-based system, and its international character.

Turning finally to France, we find evidence of instability in the cointegrating rank

12. Results including shift dummies for the period 1991(1)–1992(4) are qualitatively similar. Hence they are not reported for the sake of brevity but are available on request.

TABLE 4

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN THE UNITED KINGDOM

4A: RECURSIVE ESTIMATION OF COINTEGRATING VECTORS (LAG=5)

Sample: 1976(1)–	Trace Statistic H_0: rank=p			Eigenvalues			
	p=0	$p \le 1$	$p \le 2$	λ_1	λ_2	λ_3	Rank stability test
1987(4)	67.40***	35.85***	14.78	0.329	0.234	0.148	20.171***
1988(4)	59.47***	36.67***	15.94	0.240	0.221	0.153	11.099***
1989(4)	49.66*	25.44	10.44	0.243	0.158	0.090	8.532**
1990(4)	51.45*	26.11	10.62	0.243	0.156	0.086	7.062**
1991(4)	51.85*	25.62	9.68	0.241	0.154	0.071	6.174**
1992(4)	53.32**	25.93	9.52	0.242	0.153	0.065	4.017
1993(4)	54.65**	26.39	10.54	0.240	0.143	0.067	4.429
1994(4)	53.89***	24.79	10.96	0.238	0.121	0.069	2.610
1995(4)	55.52**	25.13	11.46	0.240	0.116	0.069	2.019
1996(4)	56.60**	25.16	12.01	0.240	0.108	0.068	0.969
1997(4)	56.75**	24.34	12.59	0.240	0.094	0.067	Full-sample

4B: ESTIMATED COINTEGRATING VECTORS AFTER ALLOWING FOR STRUCTURAL BREAK (LAG=5)

	Trace Statistic H_0: rank=p		
	p=0	$p \le 1$	$p \le 2$
	105.50**	47.72**	15.63

Vector 1

Normalized on LMC	Constant	Dummy: 1986(1)–1991(4)	LBY	SMV
Coefficient	0.791	0.490	0.499	−33.57
p-value	0.0004	0.026	0.0527	0.000

Vector 2

Normalized on LBY	Constant	Dummy: 1986(1)–1991(4)	LY	SMV
Coefficient	−5.355	0.8173	1.000	−31.080
p-value	0.0011	0.0000	0.000	0.000

NOTES: p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Test of over-identifying restrictions: chi-square(1) = 1.0176 [0.3131]
Vector autocorrelation tests: F(80,262) = 1.001 [0.485]
Vector normality test: chi-square (8): 11.933 [0.1542]

4C: WEAK EXOGENEITY TESTS

	LMC	LBY	LY	SMV
Loading (α) of vector 1	−0.0210	0.081	0.0130	−0.014
p-value	0.0303	0.000	0.0531	0.000
Loading (α) of vector 2	−0.0012	−0.082	−0.006	0.003
p-value	0.6011	0.0001	0.3247	0.000

NOTES: p-values are that of the likelihood ratio tests under the null that the loading factor is zero.
***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

during 1990:1–1993:4. This period follows the completion of financial reforms, which commenced in 1984 with the comprehensive reform of French banking legislation, the official policy of deregulation and the harmonization of institutional arrangements within the European Union. By 1992 capital account liberalization had been completed. Also, 1992–93 saw the ERM turmoil with the French franc coming under strong speculative attack. Furthermore, given the important deregulation of the French financial system that took place during the mid-1980s, we allowed for additional structural shifts by incorporating an intercept dummy for the period of 1985:1–1985:4 in our estimation.[13] Thus, for France, we allow for two sets of shift dummies, for 1985:1–1985:4 and 1990:1–1993:4.

Cointegration results for France, which take into account the above structural shifts, are reported in Table 5b. The trace statistic shows evidence of two cointegrating vectors. On the basis of the sign and significance of the associated loading factors we normalize them on real GDP and stock market capitalization respectively. The identifying restrictions that are data acceptable comprise exclusions of LMC and the 1985 dummy from the first vector, exclusion of LY from the second vector, and the two normalization restrictions. The first vector shows a positive impact of banking system development and capital market on real GDP and a negative and significant effect of stock market volatility. The second vector, portrays a positive relationship between the banking system and stock market capitalization while stock market volatility is found to have a negative influence on LMC. This vector appears to have been affected by the financial reforms of the mid-1980s, which seem to have boosted stock market capitalization. In this sense this provides support to the argument put forward by Arestis and Demetriades (1996) that the French financial system shifted toward becoming a capital-market-based one, following those reforms (see, also, Bertero 1994). Although both the stock market capitalization and banking system development appear with positive and significant cointegrating parameters in the output vector, it is important to note that the magnitude of the latter's coefficient is almost seven times that of the former. Thus, the effect of banking development on real GDP appears to be much stronger than that of the stock market. The weak exogeneity tests reveal that no variable is weakly exogenous with respect to any of the vectors, suggesting an abundance of feedback relationships between the variables in the system. In the long run there is feedback between LY and LMC as all loadings are significant. Both real output and stock market development vectors enter into the banking system development suggesting that in the long run both LY and LMC cause LBY.

In conclusion, the results on France suggest that while the French financial system has directly contributed to long-term output growth, the role of the banking system has been much more substantial than that of the stock market; this was in spite of the growing importance of the latter as a result of the financial reforms of the 1980s. Furthermore, even though the long-run development of the stock market has gone

13. In view of the sample size we did not compute recursive tests of stability for 1985:1–1985:4 period.

TABLE 5

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN FRANCE

5A: RECURSIVE ESTIMATION OF COINTEGRATING VECTORS (LAG=4)

Sample: 1973(1)–	Trace Statistic H_0: rank=p			Eigenvalues			
	p=0	p≤1	p≤2	λ_1	λ_2	λ_3	Rank stability test
1990(4)	52.22**	24.72	9.23	0.333	0.204	0.127	5.40*
1991(4)	53.40**	25.40	10.20	0.322	0.190	0.131	4.90*
1992(4)	55.11***	26.25	11.18	0.316	0.180	0.133	4.97*
1993(4)	55.19***	27.26	11.58	0.295	0.178	0.132	4.98*
1994(4)	56.22***	25.41	10.26	0.307	0.165	0.115	2.08
1995(4)	58.42***	27.31	11.28	0.298	0.167	0.118	1.79
1996(4)	60.21***	26.89	11.53	0.304	0.154	0.117	0.42
1998(1)	60.43***	27.53	11.89	0.288	0.149	0.115	Full-sample

5B: ESTIMATED COINTEGRATING VECTORS AFTER ALLOWING FOR STRUCTURAL BREAK (LAG=4)

	Trace Statistic H_0: rank=p		
	p=0	p≤1	p≤2
	116.4***	41.48***	10.69

Vector 1

Normalized on LY	LMC	Dummy: 1990(1)–1993(4)	LBY	SMV
Coefficient	0.0561	−0.0383	0.3730	−3.358
p-value	0.0017	0.0003	0.0023	0.0023

Vector 2

Normalized on LMC	Dummy: 1985(1)–1986(4)	LBY	SMV
Coefficient	0.738	5.164	−56.060
p-value	0.0076	0.000	0.0036

NOTES: p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Test of over-identifying restrictions: chi-square(1) = 0.0068 [0.9342]
Vector autocorrelation tests: F(80,187) = 1.1606 [0.206]
Vector normality test: chi-square (8): 12.454 [0.1321]

5C: WEAK EXOGENEITY TESTS

	LY	LMC	LBY	SMV
Loading (α) of vector 1	−0.0160	1.0730	0.0790	−0.1040
p-value	0.0059	0.0031	0.0003	0.0000
Loading (α) of vector 2	−0.002	−0.057	0.0060	−0.0006
p-value	0.005	0.0025	0.0039	0.0068

NOTES: p-values are that of the likelihood ratio tests under the null that the loading factor is zero.
***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

hand in hand with the development of the banking system, the former appears to have been much more of a follower in the process of economic development, responding positively to both output growth and banking system development. On the other hand, stock market volatility seems to have been detrimental to both long-term output growth and stock market development.

Alternative Measures of Stock Market Development: Sensitivity Checks

In order to check the sensitivity of our results vis-á-vis the alternative measures of stock market development, we repeated the empirical analysis using two further measures, namely, the logarithms of the ratio of total stock market transactions to GDP (TRY) and the ratio of total stock market transactions to market valuation (TRMV) for the United States and the United Kingdom. The stock market transaction data for the United Kingdom are available for a period of 1976:1–1998:1 and for the US 1973:1–1998:1. In view of the shorter samples for the United Kingdom, this sensitivity analysis should be taken as indicative only. For other sample countries lack of data on stock market transactions, or the insufficient length of this time series, prevented us from carrying out sensitivity analysis.

The results obtained from alternative measures of financial development are reported in Tables 6 and 7. They are, in qualitative terms, broadly similar to those obtained using the stock market capitalization variable. Therefore, in the interests of brevity we report only a summary of these findings. Specifically, for the United States we continue to find one cointegrating vector, whichever of the above measures is used. In either case the cointegrating vector is normalized on the stock market variable in view of the correct sign and significance of the corresponding loading factor. The normalized vector depicts a positive association between stock market development, banking system development, and real GDP. Real GDP and banking system development appear weakly exogenous when using the first variable but become endogenous when using the second. Stock market volatility has negative effects in both vectors, albeit significant only in the TRMV vector. Further, weak exogeneity tests reveal qualitatively similar causal patterns to those reported in Table 2c with respect to TRY vector whereas LY and LBY become endogenous with respect to TRMV vector.

In the case of the United Kingdom, the results reported in Table 7 still show two cointegrating vectors with the first alternative measure of stock market development, TRY. The first cointegrating vector, normalized on TRY, is very similar to the one normalized on LMC (see Table 4b) and shows a positive association between stock market development and banking sector development; stock market volatility exerts a significant negative effect on TRY. The second vector, normalized on LBY, now shows an insignificant real output effect but the volatility effect is negative and much stronger. Weak exogeneity tests suggest that there exists a feedback effect between stock market development and banking system development; however, the causal flows from financial variables to output are more significant now. With the second alternative measure (TRMV), we find only one cointegrating vector, which is normalized on LBY and shows a positive and significant relationship between LBY and

TABLE 6

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN THE UNITED STATES
TRANSACTIONS-BASED MEASURES OF STOCK MARKET DEVELOPMENT SAMPLE: 1973:1–1998:1

A. RATIO OF STOCK MARKET TRANSACTIONS TO GDP RATIO (TRY)
ESTIMATED COINTEGRATING VECTOR AFTER ALLOWING FOR STRUCTURAL BREAK

	Trace Statistic H_0: rank=p				
	p=0	$p\leq1$	$p\leq2$		
Cointegrating Vector	31.32***	12.52	2.99		
Normalized on TRY	Constant	Dummy: 1987(1)–1991(4)	LBY	LY	SMV[1]
Coefficient	N/a	−0.128	1.464	5.299	−1.775
p-value		0.532	0.235	0.003	0.641

NOTES: 1. Treated as weakly exogenous.
Vector autocorrelation tests: F(80,116) = 1.281 [0.135]
Vector normality test: chi-square (8): 9.323 [0.156]

WEAK EXOGENEITY TESTS

	LY	TRY	LBY
Loading (α)	0.0024	−0.2528	−0.005
p-value	0.5881	0.0181	0.3026

B. RATIO OF STOCK MARKET TRANSACTIONS TO STOCK MARKET VALUATION (TRMV)
ESTIMATED COINTEGRATING VECTOR AFTER ALLOWING FOR STRUCTURAL BREAK; SAMPLE: 1973:1–1998:1

	Trace Statistic H_0: rank=p				
	p=0	$p\leq1$	$p\leq2$		
Cointegrating Vector	36.80***	12.28	2.477		
Normalized on TRMV	Constant	Dummy: 1987(1)–1991(4)	LBY	LY	SMV
Coefficient	N/a	0.181	3.372	2.527	−7.144
p-value		0.426	0.044	0.009	0.054

Vector autocorrelation tests: F(80,116) = 1.225 [0.178]
Vector normality test: chi-square (8): 8.24 [0.201]

WEAK EXOGENEITY TESTS

	LY	TRMV	LBY
Loading (α)	0.0068	−0.0815	−0.0063
p-value	0.0440	0.078	0.0642

***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

TABLE 7

FINANCIAL DEVELOPMENT AND ECONOMIC GROWTH IN THE UNITED KINGDOM
TRANSACTIONS-BASED MEASURES OF STOCK MARKET DEVELOPMENT

A. RATIO OF STOCK MARKET TRANSACTIONS TO GDP RATIO (TRY); SAMPLE: 1976:1–1997:2
ESTIMATED COINTEGRATING VECTOR AFTER ALLOWING FOR STRUCTURAL BREAK

	Trace Statistic H_0: rank=p		
	p=0	p≤1	p≤2
Vector 1	84.51***	35.24***	18.75

Normalized on TRY	Constant	Dummy: 1987(1)–1991(4)	LBY	SMV
Coefficient	−0.932	0.553	0.630	−34.74
p-value	0.762	0.020	0.000	0.006

Vector 2

Normalized on LBY	Constant	Dummy: 1987(1)–1991(4)	LY	SMV
Coefficient	−0.697	2.122	−8.506	−131.40
p-value	0.006	0.003	0.120	0.0054

NOTES: p-values are that of the likelihood ratio tests under the null that the parameter is zero.
Vector autocorrelation tests: F(80,116) = 1.023 [0.452]
Vector normality test: chi-square (8): 11.839 [0.156]

WEAK EXOGENEITY TESTS

	LY	TRY	LBY	SMV
Loading (α) of vector 1	0.0069	−0.154	0.1096	0.1340
p-value	0.0045	0.0004	0.000	0.0004
Loading (α) of vector 2	−0.002	0.030	−0.0363	−0.0065
p-value	0.005	0.0002	0.000	0.0006

B. RATIO OF STOCK MARKET TRANSACTIONS TO STOCK MARKET VALUATION (TRMV)
ESTIMATED COINTEGRATING VECTOR AFTER ALLOWING FOR STRUCTURAL BREAK; SAMPLE: 1976:1–1992:2

	Trace Statistic H_0: rank=p		
	p=0	p≤1	p≤2
Cointegrating Vector	76.57***	33.720	15.19

Normalized on LBY	Constant	Dummy: 1987(1)–1991(4)	TRMV	LY	SMV
Coefficient	−8.607	0.452	0.612	1.598	−15.85
p-value	0.001	0.003	0.0004	0.258	0.000

Vector autocorrelation tests: F(80,116) = 1.072 [0.365]
Vector normality test: chi-square (8): 9.920 [0.271]

WEAK EXOGENEITY TESTS

	LY	TRMV	LBY	SMV
Loading (α)	0.009	−0.006	−0.072	−0.012
p-value	0.038	0.939	0.001	0.0004

***, ** and * indicate statistical significance at 1 percent, 5 percent, and 10 percent, respectively.

TRMV. The real GDP effect is insignificant and stock market volatility is significantly negative. Weak exogeneity tests indicate causality from LBY to LY and no association between LBY and TRMV.

Implications for the Debate on Financial Systems

Even though our results vary across countries, they accord reasonably well with widely accepted views regarding the comparative ability of various types of financial system to stimulate investment and growth. Specifically, our findings are broadly consistent with the view that bank-based financial systems are more capable of promoting long-run growth than Anglo-Saxon type systems because they are better able to address agency problems and short-termism (for example, Stiglitz 1985; see also Singh 1997). Specifically, both (i) the positive influence of the banking system on real GDP in Germany, Japan, and France and (ii) the absence or weakness of a positive causal link from financial development to real GDP in the United Kingdom and the United States, accord well with this view. What is also interesting in the cases of Germany and Japan is that both banking system and stock market development seem to have played a positive role in promoting long-run growth, even though in quantitative terms the contribution of the stock market was substantially smaller.

4. SUMMARY AND CONCLUSIONS

Our empirical analysis shows that while stock markets may be able to contribute to long-term output growth, their influence is, at best, a small fraction of that of the banking system. Specifically, both stock markets and banks seem to have made important contributions to output growth in France, Germany and Japan, even though the latter's contribution has ranged from about one-seventh to around one-third of the latter. Finally, the link between financial development and growth in the United Kingdom and the United States was found to be statistically weak and, if anything, to run from growth to financial development. Thus, our findings are consistent with the view that bank-based financial systems may be more able to promote long-term growth than capital-market-based ones.

Our findings also suggest that stock market volatility had negative real effects in Japan and France. In the case of the United Kingdom stock market volatility seems to have exerted negative effects both on financial development and output. Finally, the effects of stock market volatility in Germany were found to be insignificant. While in principle the presence of volatility in stock prices may reflect efficient functioning of stock markets, our findings do not support this hypothesis. Furthermore, they are consistent with the findings of Aizenman and Marion (1996), who found that other measures of volatility—fiscal, monetary and external—also have negative real effects. This, of course, may suggest that volatility of any kind reflects general economic uncertainty and is, therefore, negatively correlated to real economic activity. Clearly further research is needed before more definitive conclusions can be drawn on this issue, especially on the channels through which stock market volatility may affect economic activity.

The rich diversity in our results complements the findings obtained from cross-country growth regressions concerning the relationship between stock markets and growth. It also confirms the view that cross-country growth regressions at best only provide a broad- brush picture of the relationship between financial development and growth, which misses out many important details. There are good theoretical reasons why the relationship between the financial system and growth may vary substantially across countries. This paper's findings suggest that these reasons are empirically sound. Thus, the broad-brush conclusion that stock market development helps promote economic growth must now be viewed with some caution.[14]

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14. One of the referees suggests that the comparison of our results with those of cross-sectional studies is somewhat unfair, in that our study is not really about the long-run effects of financial intermediation on economic growth in the spirit of cross-section studies that include both developed and developing countries. Whilst we accept the premise of the referee's argument, we would make two comments. The first is that mixing developed and developing countries may not be so fruitful in view of the institutional differences between them. The second comment is that a comparison between time series results and those from cross-section studies is still useful per se, although the qualification by the anonymous referee should be borne in mind when attempting such comparisons.

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