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Part III Education and Growth

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Stock Market Liquidity and Economic Growth: Theory and Evidence

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Introduction

Consider the following three statements. Liquid stock markets were a pre-condition for the Industrial Revolution and a critical factor underlying long-run growth in many countries. Enhanced stock market liquidity reduces saving rates and weakens corporate control, which retard economic growth. Stock markets are basically a sideshow, a casino where players come to place bets, but where there is little feedback to the real economy. Rigorous theoretical models support each of these statements.[1]

The theoretical ambiguity can be exemplified by considering a very stylized and simplified example, the construction of a railway. While potentially very profitable, building a railway requires a long gestation period. Capital must be invested with no returns for many years. If savers are reluctant to relinquish control of their savings for long periods, this reluctance will impede railway construction. Under these conditions, an equity market where it is inexpensive to trade securities at posted prices – a liquid market – reduces this reluctance and thereby facilitates railway construction. Specifically, savers can invest in the railway, and they seek access to their wealth prior to the completion of the railway and the distribution of profits, they can sell their claim in the stock market. The greater the liquidity of the equity market, the lower will be the impediments to investing in long-run projects. By making more investment projects feasible, greater stock market liquidity boosts returns to saving.

Enhanced stock market liquidity may also impede railway construction, however. First, by increasing returns to saving, more liquid markets can lower saving rates if the income effect of higher returns dominates the substitution effect. If savings fall sufficiently, this will make it more

difficult to mobilize capital for the railway. Second, more liquid securities markets may encourage ownership of the railway to become more diffuse, and for each owner to spend less time and resources overseeing the construction and operation of the railway. Put simply, if I only have a little invested in the railway and I can cheaply and confidently sell my stock in a liquid market, then I have fewer incentives to monitor the railway energetically than if I have a large portion of my wealth invested in the project and I cannot easily liquidate my holdings. If greater stock market liquidity reduces corporate control importantly, then it will have a negative influence on resource allocation and growth. Thus, the net effect of greater stock market liquidity on the ability of an economy to construct a railway efficiently is theoretically unclear.

After reviewing the theoretical literature on the relationship between stock market liquidity and growth, this chapter presents cross-country evidence using data on forty-nine countries over the period 1976–93. Conceptually, a more liquid stock market is a market where the costs of trading equities and the uncertainty concerning the price, timing and settlement of stock transactions are lower than in a less liquid market. To measure stock market liquidity for each economy, I use the total value of domestic equities traded on each country's major stock exchanges divided by gross domestic product (GDP). This indicator measures stock transactions relative to the size of the economy, and is motivated by theoretical models of stock market liquidity and growth (Levine, 1991; Bencivenga *et al.,* 1995). After controlling for many other factors associated with long-run growth, including measures of banking development and measures of stock market size, and after testing for the importance of 'outliers', I find a statistically and economically strong, positive association between growth and stock market liquidity. While much more empirical work needs to be done to dissect the causal relationship between stock market development and growth, and to identify appropriate policies towards capital markets, this chapter's analyses push one towards theories that predict a positive relationship between growth and liquidity, and away from theories that forecast a negative association between stock market liquidity and national growth rates.[2]

This contribution builds on Atje and Jovanovic's (1993) study of stock market trading and economic growth. Besides increasing importantly the sample of countries and the number of years covered, this chapter controls for initial conditions and other factors that may affect economic growth in the light of evidence that many cross-country regression results are sensitive to changes in the conditioning information set (Levine and Renelt, 1992).

A few cautionary remarks are worthwhile, to alert readers to the limitations of cross-country comparisons. Cross-country growth regressions suffer from measurement, statistical and conceptual problems. In terms of measurement problems, country officials sometimes define, collect and measure variables inconsistently across countries. Further, people with detailed country knowledge frequently find discrepancies between published data and what they know happened in fact. As I discuss below, these measurement difficulties also apply to financial transactions data. In terms of statistical problems, regression analysis assumes that the observations are drawn from the same population. Yet vastly different countries appear in cross-country regressions. Many countries may be sufficiently different that they warrant separate analyses. Conceptually, cross-country regressions do not resolve issues of causality, and they do not examine 'one piece of machinery' over time. Consequently, we should not interpret the estimated coefficients as elasticities that predict by how much growth will change following a particular policy change. Rather, the coefficient estimates and the associated t-statistics evaluate the strength of the partial correlation between stock market development and economic growth.[3]

These measurement, statistical and conceptual problems, however, should not blur the benefits that can accrue from cross-country comparisons. Elucidating cross-country empirical regularities between stock market development and economic growth will influence beliefs about this relationship, and shape future theoretical and empirical research. Put differently, beliefs about stock markets and growth that cross-country comparisons do not confirm will be viewed more sceptically than those views that are confirmed by cross-country regressions.

I organize the remainder of the chapter as follows: the second section reviews the theoretical literature on the functioning of stock markets and economic growth; the third section turns to the data and evaluates the strength of the empirical link between stock market liquidity development and long-run economic growth; while the fourth section concludes.

Theoretical overview

The theoretical literature provides ambiguous predictions regarding the influence of stock market liquidity on national economic growth rates. Liquid stock markets are markets where it is relatively inexpensive to trade equities, and where there is relatively little uncertainty concerning the price, timing and settlement of those trades. This section explains

that the theoretically ambiguous relationship between growth and stock market liquidity derives from three core sources. First, stock market liquidity lowers the risk of investing in longer-run, high-return projects, and in consequence fosters a growth-accelerating reallocation of capital. The lower risk, however, affects saving and capital accumulation rates ambiguously, so that aggregate growth will slow if saving rates fall enough. Second, stock market liquidity lowers the cost of investing in longer-run, higher-return projects, and thereby induces a growth-enhancing reallocation of capital. The higher rate of return on savings, however, affects saving and capital accumulation rates ambiguously, so that growth will fall if capital accumulation rates fall enough. Finally, stock market liquidity affects incentives for investors to undertake the costly processes of researching and monitoring firms and managers ambiguously. If stock market liquidity induces agents to evaluate firms and exert corporate control more rigorously, then liquidity will affect growth positively. Alternatively, if greater stock market liquidity reduces incentives to assess firms and managers, it will influence long-run growth rates negatively.

Consider first the relationship between stock market liquidity and risk. Many high-return projects require a longer-run commitment of capital than lower-return projects. Savers, however, are generally averse to relinquishing control of their savings for long periods. In financial autarky with risk averse agents, this liquidity risk will reduce investment in longer-run, higher-return projects, Bencivenga and Smith (1991) and Levine (1991) model this liquidity risk as an agent-specific, privately observed shock to preferences.[4] They use an overlapping generations model in which agents live for three periods and have a utility function of the following form:

$$U(c_2, c_3) = -[c_2 + \varphi c_3]^{-\gamma}/\gamma,$$

where $\gamma > 0$, and where age i consumption is c_i, and where:

$$\varphi = \begin{cases} 0 & \text{with probability } 1 - \pi \\ 1 & \text{with probability } \pi \end{cases}$$

Agents make saving allocation decisions at age 1. They can invest in a high-return project that pays off in period 3, or a low-return project that pays-off in period 2. Agents care about liquidity – the ability to

consume wealth at age 2 – because they may receive $\varphi = 0$ and therefore not value the payoff from the long-run project. The uncertainty associated with being a type 0 agent is 'liquidity risk'. This liquidity risk affects the period 1 allocation decision. Namely, if agents are sufficiently risk averse, liquidity risk reduces investment in high-return projects.

Liquid equity markets can reduce the negative implications of liquidity risk. If transaction costs are not too high, an equity market will arise. Agents who receive $\varphi = 0$ sell their equity claims to period 3 output from the long-term project to agents who receive $\varphi = 1$. The type 1 agents buy these equity claims with the savings they invested in the short-run liquid investment. Thus, if transaction costs are sufficiently low, equity markets reduce liquidity risk – the risk associated with being type 0. More generally, liquid equity markets make long-run investment less risky – and more attractive – because they allow savers to acquire an asset (equity) and to sell it quickly and cheaply if they need access to their savings or want to alter their portfolios. Simultaneously, projects enjoy permanent access to capital raised through equity issues. By facilitating longer-term, more profitable, investments, liquid markets improve the allocation of capital and enhance prospects for long-term growth.

Theory is unclear about the effects of lower liquidity risk on saving rates, however. As shown by Levhari and Srinivasan's (1969) classic article, lower risk may increase or decrease saving rates. Thus, an increase in stock market liquidity that lowers liquidity risk may increase or decrease saving rates in more general versions of the model sketched above, that allow for a non-trivial consumption-saving decision at age 1 (Bencivenga and Smith (1991).[5] If saving rates rise, then the reduction in liquidity risk will tend to increase growth, as both the saving rate and the efficiency of capital allocation rise. If saving rates fall, however, then growth will slow if the fall in savings dominates the improvement in capital allocation.

So far I have focused on how greater stock market liquidity can affect economic growth by altering the riskiness of longer-run, higher-return investments. Greater stock market liquidity, however, can also affect investment returns in a risk-free world (Bencivenga *et al.*, 1995, 1996). To see how, assume that (i) agents live for two periods, working and investing in period 1 and consuming their wealth at age 2; (ii) projects can extend for many periods, and longer-run projects enjoy higher technological rates of return than short-run projects ($R_j > R_{j-1}$, for all j); and (iii) there are deadweight costs associated with each stock market

transactions (α), so that the net of transactions cost rate of return on a project of duration j periods is $R_j\ (1 - \alpha)^{j-1}$ because ownership must be transferred in each period throughout the gestation of the project (agents must sell their claim to projects that will produce in the future to enable them to consume their wealth before they die). Thus there will be more transactions the longer the gestation period of the project. It follows that higher transaction costs will reduce the attractiveness of longer-run projects. Thus, greater stock-market liquidity – lower transaction costs – will induce a reallocation of savings into longer-term, higher-return projects. The reallocation has a positive impact on economic growth.

Theory is unclear about the effects of higher returns on saving rates, however. Well-known income and substitution effects suggest that higher returns can increase or decrease saving rates. Thus, greater stock market liquidity will boost returns to saving, but the higher returns may increase or decrease saving rates. If saving rates fall sufficiently, then enhanced stock market liquidity reduces overall growth rates. Indeed, with capital externalities and a large fall in saving rates, enhanced stock market liquidity causes welfare to fall even as returns to investment rise.

Stock markets may also affect incentives for acquiring information about firms and managers (Grossman and Stiglitz, 1980; Kyle, 1984; Holmstrom and Tirole, 1993). Specifically, more-liquid markets may make it easier for an investor who has gained information to trade at posted prices. This will enable the investor to earn a return for expending the resources to find the information before it becomes widely available and prices change. The ability to profit from investing in information-acquisition will stimulate investors to research and monitor firms. Thus, by spurring more information-acquisition, liquid markets improve resource allocation and accelerate economic growth.

Theories differ, however, Stiglitz (1985, 1993), for example, argues that well-functioning stock markets reveal information quickly through price changes. This quick public revelation will reduce – not enhance – incentives for expending private resources to obtain information. Thus, theoretical debate still exists on the importance of stock market liquidity in enhancing incentives to acquire information.

Stock market development may also influence corporate control. More liquid stock markets ease corporate takeovers. Laffont and Tirole (1988), and Scharfstein (1988) argue that the threat of takeover induces managers to maximize the firm's equity price. Thus, by easing corporate takeovers, greater stock market liquidity can mitigate the princi-

pal–agent problem and promote efficient resource allocation and growth.

Opinion differs on this issue too. Stiglitz (1985) argues that outsiders will be reluctant to take over firms because outsiders generally have worse information about firms than do existing owners, and both insiders and outsiders recognize this information asymmetry. Thus, the threat of takeover will not be a useful mechanism for exerting corporate control; stock market liquidity, therefore, will not importantly improve corporate control. Moreover, Shleifer and Summers (1988) note that, by simplifying takeovers, stock market development can stimulate welfare-reducing changes in ownership and management. Specifically, a takeover may allow new owners and managers to transfer wealth to themselves by breaking pre-existing implicit contracts between former owners and firm workers, suppliers and other stakeholders. While new owners and managers may profit, there may be a deterioration in the efficiency of resource allocation. Finally, Shleifer and Vishny (1986) and Bhide (1993) argue that greater stock market liquidity encourages more diffuse ownership, and this impedes effective corporate governance.

Thus some theories provide a conceptual basis for believing that enhanced stock market liquidity will boost economic growth importantly. Other theoretical models, however, have a more pessimistic opinion about the importance of stock markets. Given these dissenting views, this chapter examines the empirical relationship between one measure of stock market liquidity and long-run national growth rates.

Stock market liquidity and long-run growth: cross-country evidence

This section provides cross-country evidence regarding the empirical association relationship between stock market liquidity and economic growth. This broad cross-country evidence complements important microeconomic studies of stock market liquidity. Specifically, an influential literature studies whether a security's liquidity affects its price. These studies generally find that an increase in liquidity – as measured by lower bid–ask spreads – tends to increase the security's price (for example, Amihud and Mendelson (1986, 1989)). Thus, liquidity is a positive characteristic that investors are willing to pay for. Also, Demirguc-Kunt and Maksimovic (1996b) present firm-level evidence from thirty countries consistent with the hypothesis that firms with access to liquid stock markets grow at rates faster than they could

have grown without this access. This chapter supplements these micro-economic studies by addressing the question: Do countries with more liquid stock exchanges tend to grow faster, holding other factors constant?

A measure of stock market liquidity

I measure stock market liquidity as the ratio of the total value of domestic equities traded on each country's major stock exchanges to GDP. This ratio measures the value of domestic equity transactions relative to the size of the economy. This indicator of stock market liquidity does not measure directly the costs and uncertainties associated with buying and selling securities at posted prices.[6] None the less, the total value traded:GDP indicator (TVT_GDP) measures the degree of trading compared to the level of economic activity. Furthermore, theoretical models of stock market liquidity and economic growth (Levine, 1991; and Bencivenga *et al.,* 1995, 1996) motivate the TVT_GDP proxy for stock market liquidity.

It is important to recognize and avoid one potential pitfall of using TVT_GDP.[7] If investors anticipate large corporate profits, stock prices will rise. This price rise will increase the value of stock trades and therefore boost the value traded:GDP ratio. Thus, the TVT_GDP liquidity indicator would rise without a change in the number of transactions or a fall in transaction costs. It is easy to control for this price effect, however, by using the market capitalization:GDP ratio (MCAP_GDP), which equals the total value of domestic stocks divided by GDP. Note, a rise in stock prices increases MCAP_GDP in the same way that it increases TVT_GDP. Thus, one way to gauge whether the price effect is dominating the relationship between TVT_GDP and growth is to include the market capitalization ratio in the regression simultaneously. The price effect influences both indicators, but only the value traded ratio is related directly to trading. Therefore, if TVT_GDP is correlated significantly with economic growth when controlling for MCAP_GDP, then the price effect is not dominating the relationship between TVT_GDP and growth.

Cross-country regression framework

To evaluate whether stock market liquidity is strongly linked to long-run economic growth, I use cross-country growth regressions. There are data on forty-nine countries during the period 1976–93. The dependent variable, GROWTH, is the growth rate of real per capita GDP averaged over the 1976–93 period.

The structure of our regression equation is the following:

$$\text{GROWTH} = \alpha\mathbf{X} + \beta\,(\text{TVT\_GDP}) + u \tag{1.1}$$

where **X** is a set of control variables, α is a vector of coefficients on **X**, β is the estimated coefficient on the stock market liquidity indicator, TVT_GDP, and u is an error term.[8]

The goal of the empirical analysis is to assess the strength of the independent partial correlation between stock market liquidity and economic growth. Consequently, I select a large set of potential control variables and alter the variables included as **X** variables in regression (1.1). These variables include the logarithm of initial real per capita GDP (LRGDP), the logarithm of the initial secondary school enrolment rate (LSEC), the number of revolutions and coups (REV), the ratio of government consumption expenditures to GDP (GOVY), the inflation rate (PI), the black market exchange rate premium (BMP), the ratio of exports plus imports to GDP (TRDY), a measure of judicial efficiency (LEGAL), the market capitalization ratio (MCAP_GDP), and the ratio of bank assets to enterprises divided by GDP (BANK).[9]

Before describing the results, I first define and discuss each of the variables used as **X** variables in regression (1.1). The logarithm of initial real per capita GDP and the logarithm of the initial secondary school enrolment rate are included because recent theoretical work suggests an important link between long-run growth and the initial per capita levels of physical and human capital (see Lucas, 1988; Mankiw *et al.*, 1992). We follow Barro (1991) Barro and Sala-i-Martin (1992) and others in using LSEC and LRGDP to proxy for the initial levels of per capita human and physical capital. I include the number of revolutions and coups, since many authors find that political instability is associated negatively with economic growth (see Barro and Sala-i-Martin, 1995 for evidence and citations).

I also include a variety of macroeconomic indicators to evaluate the strength of the partial correlation between stock market liquidity and economic growth (for example, Levine and Renelt, 1992; Levine and Zervos, 1993). GOVY and PI are included because some evidence suggests a positive connection between macroeconomic stability and economic activity, as shown by Fischer (1993), Easterly and Rebelo (1993), and Bruno and Easterly (1995). Similarly, I include BMP, since international price distortions may impede economic growth, as suggested by Dollar (1992). Also, the black market premium is a general indicator of policy distortions and therefore makes a good control variable in

assessing the independent relationship between growth and liquidity (Levine and Zervos, 1993). The last general macroeconomic indicator I use is the ratio of exports plus imports divided by GDP, since openness to international trade may also affect long-run growth. Thus, I include GOVY, PI, BMP and TRDY primarily to gauge the strength of the partial correlation between stock market liquidity and long-run growth.

Besides these standard initial value indicators and macroeconomic indicators, I also include a measure of judicial efficiency taken from Mauro (1995). This measure is an index ranging from 1 (lowest judicial efficiency) to 10 (highest judicial efficiency) based on subjective assessments of judicial efficiency in a broad cross-section of countries. It is important to control for judicial efficiency, since cross-country differences in stock market liquidity could primarily reflect cross-country differences in legal systems, and differences in judicial efficiency may affect growth through channels other than stock market activity. Thus, to assess whether there is an independent empirical connection between stock market liquidity and growth, I control for the level of judicial efficiency (LEGAL).

Furthermore, as discussed above, I control for the size of the stock market (MCAP_GDP). Since expectations of future corporate profits will boost TVT_GDP without implying a corresponding fall in transaction costs, I include MCAP_GDP, which is also liable to this price effect. If TVT_GDP remains correlated significantly with growth while controlling for MCAP_GDP, then readers can feel more comfortable that this relationship does not simply reflect expectations of future corporate profits.

Finally, I control for the level of banking development. A prominent line of research stresses the role of financial intermediaries in economic growth. Schumpeter (1932), Bagehot (1962), Cameron *et al*. (1967), Goldsmith (1969) and McKinnon (1973) provide conceptual descriptions of how, and empirical examples of when, financial systems affect economic growth. Building on these seminal contributions, King and Levine 1993a, 1993b show that measures of banking development are correlated strongly with economic growth in a broad cross-section of countries. Since stock market development is correlated positively with the development of banks (Demirguc-Kunt and Levine, 1996a, 1996b), I control for the level of banking development in assessing the empirical association between stock market liquidity and economic growth, using the ratio of bank loans to enterprises divided by GDP (BANK) as an indicator of banking development.[10]

Data

There are data for a maximum of forty-nine countries over the period 1976–93. The countries are Argentina, Australia, Austria, Bangladesh, Belgium, Brazil, Canada, Chile, Colombia, Costa Rica, Côte d'Ivoire, Denmark, Egypt, Finland, France, Germany, Greece, Hong Kong, India, Indonesia, Israel, Italy, Jamaica, Japan, Jordan, Korea, Luxembourg, Malaysia, Mauritius, Mexico, Nigeria, New Zealand, Norway, Pakistan, Peru, the Philippines, Portugal, Singapore, Spain, Sri Lanka, Sweden, Taiwan, Thailand, the Netherlands, Turkey, the United Kingdom, the United States of America, Venezuela and Zimbabwe. The stock market data are from the International Finance Corporation's Emerging Stock Markets act book and the International Monetary Fund's International Financial Statistics. Data on banking development are from the International Financial Statistics. Data on real per capita GDP growth, secondary school enrolment rates, government consumption spending, exports and imports are from the World Bank. The number of revolutions and coups is from Barro (1991) and initial real per capita GDP is computed from Summer and Heston 1988. Data on the black market exchange rate premium are from Picks Currency Yearbook (various issues) and International Currency Analysis (various issues).

Table 1.1 provides summary statistics on the variables. As shown, the data exhibit wide cross-country variation. Real per capita GDP growth averaged almost 10 per cent in Korea and a *negative* 2.5 per cent in Cote d'Ivoire over the eighteen-year sample period. The ratio of total value traded to GDP averaged 1.2 in Taiwan, but was very close to zero in Bangladesh, Costa Rica and Nigeria.

Table 1.2 provides correlations and P-values. Note that the TVT_GDP is correlated significantly with government spending, international trade, the efficiency of the legal system, the ratio of market capitalization to GDP, and the size of the banking system. Thus it is important to control for these variables in evaluating the strength of the partial correlation between growth and stock market liquidity. Also note that stock market size (MCAP_GDP) is very highly correlated with banking development (BANK) and the efficiency of the legal system (LEGAL).

Results

Table 1.3 presents cross-country regression results with different conditioning information sets; that is, with different sets of **X** variables. Regression (1) is a base regression that only includes a constant, the logarithm of initial income, the logarithm of secondary school enrolment, and the number of revolutions and coups, along with TVT_GDP.

Table 1.1 Summary statistics, 1976–94

	GROWTH	RGDP	SEC	REV	GOVY	PI	BMP	TRDY	LEGAL	MCAP_GDP	TVT_GDP	BANK
Mean	0.021	5959	57	0.139	0.155	0.39	16.6	0.55	7.65	0.34	0.11	0.81
Median	0.018	2762	57	0.059	0.159	0.08	2.9	0.46	7.25	0.17	0.04	0.72
Maximum	0.097	21693	92	1.588	0.347	10.93	132.6	3.04	10.00	2.45	1.16	2.68
Minimum	−0.025	0	9	0.000	0.070	0.03	−1.1	0.12	2.50	0.01	0.00	0.12
Std. Dev.	0.022	5994	26	0.254	0.056	1.53	31.8	0.47	2.04	0.44	0.19	0.56
Observations	51	51	49	51	51	51	51	51	49	50	51	51

Notes: GROWTH = real per capital GDP growth; RGDP = initial real GDP per capita, 1976; SEC = initial secondary school enrolment rate, 1976; REV = number of revolutions and coups; GOVY = government consumption spending / GDP; PI = average annual inflation rate; BMP = average black market exchange rate premium; TRDY = exports + imports divided by GDP; LEGAL = index of judicial efficiency in the 1980s (Mauro, 1995); MCAP_GDP = domestic stock market capitalization/GDP; TVT_GDP = total value of domestic equities traded/GDP

Table 1.2 Correlations

	LRGDP	LSEC	REV	GOVY	PI	BMP	TRDY	LEGAL	MCAP_GDP	BPY	TVT_GDP
LRGDP	1.00	0.59	−0.41	0.47	−0.70	−0.39	0.15	0.55	0.27	0.57	0.19
		0.00	0.00	0.00	0.53	0.01	0.00	0.00	0.00	0.00	0.00
LSEC		1.00	−0.17	0.36	−0.02	−0.62	0.09	0.57	0.32	0.58	0.22
			0.00	0.00	0.08	0.01	0.00	0.00	0.00	0.00	0.00
REV			1.00	−0.28	0.23	0.15	−0.14	−0.38	−0.18	−0.29	−0.15
				0.01	0.02	0.01	0.05	0.01	0.22	0.07	0.38
GOVY				1.00	−0.20	−0.28	−0.05	0.51	0.03	0.27	−0.01
					0.22	0.01	0.00	0.00	0.00	0.00	0.00
PI					1.00	0.08	−0.11	−0.09	−0.11	−0.26	−0.11
						0.18	0.42	0.12	0.62	0.56	0.82
BMP						1.00	−0.16	−0.26	−0.29	−0.50	−0.25
							0.07	0.01	0.58	0.29	0.86
TRDY							1.00	0.29	0.74	0.39	0.39
								0.00	0.00	0.00	0.00
LEGAL								1.00	0.54	0.51	0.23
									0.00	0.00	0.00
MCAP_GDP									1.00	0.52	0.56
										0.00	0.00
BANK										1.00	0.52
											0.00
TVT_GDP											1.00

Note: See variable definitions in Table 1.1.

Table 1.3 Economic growth and stock market liquidity

	(1)	(2)	(3)	(4)	(5)	(6)
C	0.017318152	0.054279133	0.058003928	0.052315574	0.05460077	0.052462462
	0.28343891	0.021661121	0.019982318	0.022980915	0.02766479	0.036462981
LRGDP	−0.004631255	−0.011668086	−0.012360287	−0.011509134	−0.011956503	−0.010561877
	0.025330425	0.001037283	3.93E-04	1.01E-03	0.000485461	0.001022738
LSEC	0.00919213	0.016878558	0.01620813	0.017380785	0.016753897	0.017928484
	0.117930314	0.102190485	0.127328762	0.088540133	0.12123138	0.143936243
REV	−0.012831279	−0.017763815	−0.017218416	−0.016688781	−0.016341019	−0.018840142
	0.056720694	0.086992557	0.094004164	0.147919227	0.152503445	0.103025077
GOVY		−0.053158096	−0.053994095	−0.060684361	−0.061656868	−0.030510346
		0.150835923	1.53E-01	1.17E-01	0.119208869	0.456511548
PI		−0.007950852	−0.008168934	−0.007845344	−0.007920352	−0.006610086
		0.008216261	0.006274905	0.008086469	0.007836957	0.017206639
BMP		−0.000211545	−0.000190233	−0.000185767	−0.000172885	−0.000125312
		0.024045825	0.030031674	0.043224161	0.047850811	0.247762995
TRDY		0.01023926	0.008161665	0.008373562	0.008250673	0.006589018
		3.54E−05	0.003468413	0.008910318	0.01089331	0.161138251
LEGAL						−0.002855203
						0.066902862
MCAP_GDP				0.002663578	−0.000337847	0.012028657
				0.47602357	0.950244284	0.309657112
BANK			0.007156021		0.006137066	0.007323565
			0.083471546		0.273428186	0.239794753
TVT_GDP	0.059711547	0.04018321	0.036279595	0.039522254	3.66E−02	0.032292983
	0.000806629	0.000375014	0.000579648	0.000205945	0.00049	0.009066961
Obs.	49	49	49	48	48	46
Adj. R^2	0.307540291	0.515438895	0.516631387	0.494457474	0.489309156	0.490075055

Notes: Variable definitions are given in the note to Table 1.1.
P-values are given in parentheses. Dependent variable: Real per capita GDP growth.

As shown, stock market liquidity is correlated strongly with economic growth. TVT_GDP enters with a coefficient of 0.06 and P-value of 0.001, which signifies a statistically significant relationship at any conventional significance level. The coefficient value of 0.06 suggests that the association is economically large. For illustrative purposes, assume that TVT_GDP is exogenous. Then the estimated coefficient implies that one standard deviation increase in stock market liquidity (0.2) will increase annual real per capita growth by 1.2 percent (0.2*0.06*100). This is huge, since it suggests that a one standard deviation in TVT_GDP increases growth by more than 50 per cent of the average value of GROWTH in the sample.[11]

The remainder of the regressions in Table 1.3 show that the relationship between stock market liquidity and growth remains significant statistically and economically large while altering the conditioning information set. Specifically, after controlling for government spending, inflation, the black market premium, international trade, the efficiency of the legal system, the size (as opposed to the liquidity) of the stock market, and the degree of banking development, the total value traded to GDP ratio remains associated strongly with economic growth at the 1 per cent significance level. Although the coefficient falls by almost half to 0.032, this still represents a large value in economic terms. By including so many control variables, the significance of many of these variables vanishes; it is difficult to establish an independent empirical relationship between many economic indicators and growth. For example, while the black market premium, the international trade ratio, and BANK enter the growth regression significantly and with the 'correct' signs in the more parsimonious regression (3), they all enter insignificantly in regression (6), which also includes LEGAL and MCAP_GDP. This sensitivity to changes in the conditioning information set does not affect stock market liquidity. Stock market liquidity enters all of the growth regressions significantly.

Sensitivity to outliers

In Table 1.3, I chose regression (3) because I wanted to include as many countries as possible (49), and for no better reason, regression (3) had the highest adjusted R^2. The partial scatter is computed as follows. I regress growth on all the regressors in Equation (3) except for

TVT_GDP, and collect the residuals u_g. Then I regress TVT_GDP on the same regressors and collect those residuals, u_l.

Taiwan, Korea, Jamaica, Côte d'Ivoire, Thailand and Luxembourg stand out as potential 'outliers' – as data points that may influence strongly the slope of the regression line, and the statistical strength of the relationship between growth and liquidity. More formal procedures for identifying influential observations as described by Belsley *et al.* (1980) also highlight these countries. To examine the importance of these data points I removed them from the sample systematically and re-ran regression (3). Table 1.4 presents these results. While removing different countries alters the size of the coefficient on stock market liquidity, stock market liquidity enters all of the regressions significantly at the 0.01 significance level and the coefficient remains larger than 0.03. Thus the strength of the partial correlation between growth and stock market liquidity is largely insensitive to changes in the conditioning information set, and to the removal of particularly influential observations.

Note that the strength of the empirical relationship between stock market liquidity and long-run economic growth should not be overemphasized, however. Although this chapter attempts to control for many other factors associated with growth, I may be omitting an important variable that is driving both stock market liquidity and economic growth. Similarly, while I control for outliers and heteroskedasticity, other diagnostic tests may show that the liquidity–growth relationship deteriorates under particular conditions. Also, this chapter simply looks at the broad cross-country relationship between growth and liquidity after aggregating the data over time to abstract from higher frequency interactions between liquidity and growth. Time-series procedures like those used by Neusser and Kugler (1996) to examine the relationship between financial intermediary development and manufacturing growth would provide significant value-added to this chapter's pure cross-country comparisons. Similarly, the chapter examines simple linear relationships, while there may exist non-linear relationships that distort my findings. Finally, if one selectively omits enough countries and adds enough regressors, the relationship between growth and liquidity weakens.[12] Thus much work remains in documenting the relationship between stock market liquidity and economic growth.

Table 1.4 Growth and liquidity: checking for the importance of outliers

	(1)	(2)	(3)	(4)	(5)
Excludes		TWN	KOR	JAM CIV	THA LUX
C	0.058003928	0.061368505	0.057605318	0.078610004	0.068736424
	0.019982318	0.012190745	0.023904667	3.36E-06	7.78E−08
LRGDP	−0.012360287	−0.012820956	−0.011021417	−0.010106786	−0.009702896
	0.000393235	0.000316465	0.000261072	3.17E−07	1.88E−07
LSEC	0.01620813	0.015726004	0.011973639	0.00519075	0.006585569
	0.127328762	0.121767498	0.229627929	0.209022143	0.055213249
REV	−0.017218416	−0.017983793	−0.017428258	−0.020743448	−0.022513236
	0.094004164	0.050125516	0.011545066	3.58E−06	8.48E−10
GOVY	−0.053994095	−0.042244978	−0.026447325	−0.016641318	−0.017638957
	0.153391604	0.198111991	0.250599434	0.412253423	0.372437729
PI	−0.008168934	−0.008363003	−0.006667386	−0.005921891	−0.005466838
	0.006274905	0.004798222	0.005390371	3.29E−05	2.86E−05
BMP	−0.000190233	−0.000179547	−0.000176059	−0.000243045	−0.000212139
	0.030031674	0.033794613	0.051183203	0.000158076	7.15E−05
TRDY	0.008161665	0.005895728	0.006885501	0.008600072	0.009940138
	0.003468413	0.119027129	0.018853324	1.34E−05	3.15E−07
BANK	0.007156021	0.006116379	0.006499786	0.006199264	0.006950357
	0.083471546	0.186330214	0.101697171	0.05077349	0.080148807
TVT_GDP	0.036279595	0.067138747	0.054865365	0.042963024	0.033151941
	0.000579648	0.002525116	0.00040794	5.87E−05	0.004043136
Obs.	49	48	47	45	43
Adj. R^2	0.516631387	0.493969031	0.559255843	0.750475251	0.789216747

Notes: Variable definitions are given in Table 1.1. Dependent variable is growth in real per capita GDP.
Country codes: Taiwan (TWN), Korea (KOR), Jamaica (JAM), Côte d'Ivoire (CIV), Thailand (THA), Luxembourg (LUX).

Conclusions and discussion

Theory provides ambiguous predictions about the relationship between stock market liquidity and economic growth. To shed some empirical light on this issue, this paper presents cross-country evidence on the association between one measure of stock market liquidity – the total value of stock transactions divided by GDP – and average economic growth rates over the period 1976–93 using data for forty-nine countries. Subject to various qualifications detailed above, the data suggest that there is a strong, positive relationship between long-run economic growth rates and stock market liquidity. This positive relationship is robust to various changes in the conditioning information set. Furthermore, removing outliers – particularly influential observations – does not alter the strength of partial correlation between growth and stock market liquidity. Although this chapter does not address empirically the issue of causality, Levine and Zervos (1993) show that the initial level of stock market liquidity in 1976 was a good predictor of economic growth over the next eighteen years. Thus it is not simply contemporaneous shocks to stock market activity and growth that are causing the strong positive association, and it is not simply that growth causes future increases in stock market liquidity. In sum, the data are consistent with theoretical models that predict a positive relationship between stock market liquidity and economic growth. In contrast, theories that predict a negative association between stock market liquidity and growth must reconcile this prediction with existing evidence.

Notes

1 On the potentially growth-enhancing role of stock market liquidity, see Hicks (1969), Levine (1991), Holmstrom and Tirole (1993), and Bencivenga *et al.* (1995, 1996). On the potentially growth-reducing role of stock market liquidity, see Stiglitz (1985, 1993), Shleifer and Vishny (1986), Bhide (1993), and Bencivenga *et al.* (1995, 1996). And, for arguments that the stock market is basically a sideshow, see Morck *et al.* (1990a, 1990b), and Blanchard *et al.* (1993). For a review, see Levine (1997).

2 Levine and Zervos (1996a) show that international capital control liberalizations tend to increase stock market liquidity.

3 There are also problems of aggregation. When averaging over long periods, many changes are occurring simultaneously: countries change policies; economies experience business cycles; and governments rise and fall. Thus, aggregation may blur important events and differences across countries.

4 If agent types were observable publicly, then type-contingent insurance contracts would eliminate this risk.

5 The relationship between the ease with which households can borrow and aggregate saving rates, growth rates and welfare have been studied; for example,

by Miles (1992), and Jappelli and Pagano (1994). Also, on the relationship between risk diversification through stock markets and economic growth, see Saint-Paul (1992), Devereux and Smith (1994), and Obstfeld (1994).

6 I was not able to obtain bid–ask spreads for a broad cross-section of countries.

7 While financial data are often viewed as suffering from less measurement error than other data, there are inconsistencies in the measurement of total value traded across countries. As noted by Wells (1994), some exchanges measure only those transactions that take place through the exchange (for example, Austria, Belgium, Finland, France, Greece, Luxembourg, Portugal, Spain). Other markets attempt to measure all transactions, whether they occur through the exchange or not, by having regulated traders report their trades to the regulatory agency (for example, Denmark, Germany, Ireland, Norway, Sweden, Switzerland, the Netherlands, the United Kingdom). While recognizing this problem, it is not clear how to make the data perfectly consistent. Also, for many of the countries in the sample, I have not been able to identify which type of procedure has been employed in computing the total value of transactions.

8 Throughout the analysis I use heteroskedasticity consistent standard errors as developed by White (1980).

9 I also experimented with other variables, such as the standard deviation of inflation (Levine and Renelt, 1992) and lagged GROWTH (Atje and Jovanovic, 1993). These additional conditioning variables did not alter the conclusions. See also Easterly and Levine (1997).

10 There are problems with this indicator of banking development. Bank loans to GDP is not necessarily positively correlated with how well banks research firms, exert corporate control, provide risk pooling vehicles, and mobilize resources. Also, the International Monetary Fund's *International Financial Statistics* notes that while it seeks to measure bank loans to private firms, there are inconsistencies across countries in the treatment of public enterprises. None the less, the bank loans to enterprises divided by GDP measure seems to be a better proxy for the functioning of the banking system than alternative indicators that only measure the size of bank liabilities, such as M2 divided by GDP.

11 Note that this conceptual experiment is meant to illustrate the size of the 'economic' size of the estimated coefficient on stock market liquidity. As argued above, these coefficients should not be interpreted as elasticities. Moreover, the experiment does not consider *how* to enhance liquidity.

12 For example, excluding all six 'outlier' countries and including all the regressors (which drives the sample down to 41) causes TVT_GDP to enter the growth regression insignificantly.

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