First draft: March 1, 2000. This version: June 26, 2001

Why Is Stock Market Volatility So Different Around the World?

Julan Du
Harvard University

And

Shang-Jin Wei *
Brookings Institution, Harvard University
Center for International Development and NBER

Abstract Stock markets are considerably more volatile in some countries than others. The market in Japan or Italy is typically twice as volatile as the U.S. Hong Kong's is three times as volatile as the U.S. The Chinese and the Russian markets are 600% and 800% as volatile as the U.S., respectively. Possible explanations include the volatility of economic fundamentals, uncertainty regarding government's macroeconomic policies, and the liquidity and maturity of the market. In addition, market integrity, particularly the prevalence of insider trading, and quality of information may also play a role. This paper undertakes a systematic cross-country study on the issue. As a measure of market integrity, it adopts a novel (albeit imperfect) measure of the extent of insider trading across 50 countries. The central finding is that countries with weaker market integrity, particularly in terms of more prevalent insider trading, also have more volatile stock markets, even after one controls for liquidity/maturity of the market, and the volatility of the underlying fundamentals (volatility of real output, and monetary and fiscal policies). Moreover, the effect of insider trading on market volatility is quantitatively important compared with the effect of economic fundamentals.

****

* Corresponding author: Shang-Jin Wei, New Century Chair in International Economics, The Brookings Institution, 1775 Massachusetts Avenue, Washington, DC 20036 USA. Tel: 202/797-6023, fax: 202/797-6181, swei@brook.edu.

* We thank Guy Meredith, Martin Feldstein, Andrew Sheng, Andrei Shleifer, and seminar participants at an NBER meeting in China, Hong Kong Securities and Futures Commission, Hong Kong Institute for Monetary Research, University of Hong Kong, and the Institute for International Economic Studies in Tokyo for helpful discussion, and Yi Wu for superb research assistance. The views in the paper are the authors' own and may not be shared by any organization that the authors are or have been associated with. All errors are the authors' responsibilities.

1. Introduction

Stock markets are volatile. That is not news. But the volatility varies substantially across countries. Suppose we use the standard deviation of the monthly returns of a major market index as the measure, then the volatility in Japan or Italy is typically twice as high as in the United States. The Chinese and the Russian markets, respectively, are nearly six times and eight times as volatile as the U.S market[1].

A certain degree of market volatility is unavoidable, even desirable, as we want the stock price fluctuation to indicate changing values across economic activities so that resources can be better allocated. However, precisely because stock prices are supposed to serve as signals for resource allocation, excessive volatility that is not related to economic fundamentals would diminish the signaling function of the stock market and impede resource allocation. Market volatility affects the incentive to save and to invest. In almost any model with representative agent utility maximization under uncertainty, the more volatile the asset market, holding the average return constant, the less the agent will save, and hence the less the investment will be.

The purpose of this paper is to assess the reasons for why market volatility varies so much across countries. There is a long literature on whether stock market volatility is excessive relative to the present discounted values of the future dividend streams. That literature was pioneered by Shiller (1981) and followed by many others. The literature focuses largely on time series properties of market volatility and uses data typically from one country, most often the United States. The current paper investigates a distinct (though not necessarily unrelated) topic – the difference in volatility across different national markets. As far as we know, such a cross-section study has not be undertaken. (**Campell Harvery ???)**

There are many potential reasons for the difference in market volatility. First, the volatility of the underlying fundamentals, in particular, the volatility of the real output stream whose present discount value that the asset price is supposed to reflect, should matter. In addition, the maturity of the asset market also matters. For example, it may be reasonable to expect a young market to be more volatile than a long established and

highly liquid one, even holding constant the volatility of the underlying fundamentals, just because the average experience and skill of the investors and of the market regulators may improve with market maturity.

Finally, we investigate the role of institutions of market integrity in affecting market volatility. Two such institutions are of particular interest to us: the extent of insider trading and the quality of information about corporate fundamentals. To our knowledge, their effects on volatility have not been previously examined in the empirical literature.

The implication of insider trading for stock price volatility and economic efficiency is ambiguous in theory. The first view is that, by allowing relevant information to be reflected in the stock price faster than otherwise, insider trading should increase the signal-to-noise ratio, and therefore reduce market volatility and improve economic efficiency (Manne, 1966). A more sophisticated refinement is that, by allowing a one-time jump in the price, insider trading may temporarily raise the price volatility at the time of the price adjustment, but improves the overall efficiency nonetheless (Leland, 1992). Under this view, if one measures the return volatility at an appropriately long horizon, insider trading should not raise market volatility.

On the other end of the spectrum, it has been argued that insider trading can raise price volatility in the long run and reduce economic efficiency. Access to inside information is more valuable when there is either a big rise or a big fall in prices. Therefore, there may be two channels through which insiders may choose to generate more volatility. First, other things equal, insiders may have an incentive to choose riskier projects that they otherwise would. Second, even holding the inherent risk characteristics of a production process constant, insiders have an incentive to manipulate the timing and content of the information release in a such way that will generate more price volatility than otherwise (Brudney, 1979; Easterbrook, 1981; Allen and Gale, 1992; and Benabou and Laroque, 1992).

Relative to the active theoretic modeling, empirical work on the subject is lagging behind. The small empirical literature on insider trading so far has made use of two types

---

[1] We calculated these numbers based on the standard deviation of monthly returns on major indexes during 1985:1 – 1998:12. The details are explained later in the paper.

of data. The first is based on self-reported legal trading by corporate insiders filed with government regulators, mostly in the U.S. and the U.K.(see Seyhun, 1986; Elliot, Morse, and Richardson, 1984; and Givoly and Palmon, 1985; John and Lang, 1991; Chowdhury, Howe and Lin, 1993; and Gregory, Matatko, Tonks and Purkis, 1994). Of course, reported legal trading by insiders, by its nature, is unlikely to be associated with a large price movement. The second type of data is a compilation of illegal insider trading cases as discovered by the government regulator. We are aware of only one published paper on the subject by Meulbroke (1992) who studied the impact on the stock prices of the illegal insider trading in the U.S. market. A possible concern is that the link between insider trading and market volatility may be exaggerated by this type of data: presumably only a subset of insider trading cases are discovered by the government, often as a result of observing a large price movement.

All of these papers are studies of a single country (typically either the U.S. or the U.K.). Moreover, the countries in these studies have relatively comprehensive regulations against insider trading, and the enforcement of the laws is reasonably vigorous. It may not be possible to draw strong inferences from these studies about what would happen to the stock market volatility when insider trading is rampant and unchecked by the legal system. In a well regulated market such as the U.S. and the U.K, even though there are violations of the insider trading laws from time to time, the majority of insiders or would-be "insiders" are deterred from engaging in illegal insider trading. Non-insider investors understand this and can still have confidence in the system. In a market where insider trading is either explicitly or implicitly tolerated, non-insider investors would assume that insider trading takes place routinely and take measures accordingly (including withdrawing from the domestic stock market altogether). In other words, we need to exercise caution to extrapolate lessons from well-regulated markets to emerging markets.

Paper y Randy Morck, and Bhattacharya???\

The contribution of this paper is to study the connection between market integrity and market volatility in a cross-section of 48 countries. We will also introduce a measure

of prevalence of insider trading that is new to the literature. To give the bottom line up front, we will report evidence that the cross-country difference in market integrity, particularly in the degree of insider trading, is a crucial factor in understanding the vastly different market volatility across countries. This is true even after we take into the account the effects of the volatility of economic and policy fundamentals, and of market liquidity and maturity.

The rest of the paper is organized as follows. Since insider trading plays a central role in our study, and its measurement is most problematic, Section 2 is devoted to discuss issues related to its definition and measurement. As the core of the paper, Section 3 presents the empirical findings. Section 4 concludes.

2. Market Integrity: Definition and Measurement

The central objective of the paper is to assess what accounts for the difference in volatility across different national markets. The introductory section discussed five classes of possible explanations. Among them, perhaps the most elusive one is (a lack of) market integrity. Because market integrity is difficult to quantify and its effect on market volatility is somewhat controversial, it may be useful to devote this section discussing the definition of this concept and the reasons behind a wide variation across the countries.

Understanding Market Integrity

In this paper, we focus on two areas of market integration: prevalence of insider trading, and quality of information release. Insider trading refers to trading by people who possess some material non-public information – where "material" means "relevant for the price of a stock or stocks." Quality of accounting information refers to the comprehensiveness, timeliness, and reliability of information released that is relevant to the past, current and projected future profit of publicly traded corporations. The scarcer the insider trading, or the higher the quality of information release, the higher is the degree of market integrity.

Perhaps a natural benchmark to use is the United States. This is because it has perhaps among the most comprehensive anti-insider trading laws, most stringent

requirement on information disclosure, and the strictest enforcement. In addition, the U.S. insider trading laws, accounting rules, and their enforcement are frequent subjects of the economic and legal literature.

The definition of illegal insider trading in the U.S. is not an immutable concept, but evolves over time[2]. The notion that some form of insider trading is wrong was well established before the passing of the federal securities laws. For example, back in 1909, the United States Supreme Court held that a director of a corporation who knew that the value of the stock would soon change committed fraud when he bought the stock from uninformed outsiders. The U.S. Securities Exchange Act of 1934 addressed insider trading directly through Section 16(b). That part of the law prohibits profits realized in any short (less than six months) period by corporate insiders. Corporate insiders are defined as directors or officers of the corporation or major shareholders (with over 10% of the shares). What about insider trading not covered by Section 16(b)? The Securities Exchange Act also has a Section 10(b), which authorizes the Securities and Exchange Commission (SEC) to issue rules and regulations to prevent security fraud. To implement Section 10(b), the SEC Rule 10b-5 prescribes the principle of "disclose or abstain": any person should either disclose truthfully what he/she knows before trading or abstain from trading. This has been used to prohibit trading on material non-public information acquired by people other than "corporate insiders" as defined by SEA Section 10(b). These people can include outside auditors, outsider lawyers, investment bankers and so on that are temporarily retained by the corporation but have access to material non-public information. People in this category are labeled as "temporary insiders" or "constructive insiders," and are prohibited from trading on the information.

In the early 1980s, in response to some legal challenges, the SEC promulgated Rule 14e-3 under Section 14(e) of the Exchange Act. Rule 14e-3 makes it illegal for anyone to trade on the basis of material non-public information regarding a tender offer if he/she knows the information comes from an insider. The SEC has succeeded in and won the support of the court system by prosecuting people who traded on material non-public information that he/she has obtained in violation of a relationship of trust and

[2] The following discussion is based on Newkirk and Robertson (1998).

confidence. This came to be known as the "misappropriation" theory in the parlance of insider trading jargons. A celebrated example of this is the case of *United States vs. Newman*. Newman, a securities trader, traded on material non-public information about corporate takeovers that he obtained from two investment bankers, who had misappropriated the information from their employers.

Relative to the United States, the prevalence of insider trading and the quality of information release vary widely from countries to countries. The market integrity in the United Kingdom is perhaps similar to the U.S., whereas that in Russia is probably very different. We will make these cross-country comparisons more precise later.

There are three reasons why these dimensions of market integrity vary across countries. First, the set of activities that are defined as illegal under a national law or regulation can vary from country to country. For example, in terms of information release, some countries require quarterly disclosure of information by publicly traded firms while others require only annual reports. In terms of insider trading, some countries may choose not to prohibit certain activities that are prohibited in the U.S. such as trading by "tipees" or "mis-appropriators." In fact, there are countries that still do not prohibit any type of insider trading.

Second, for a given violation, the penalties allowed by laws in different countries can also vary. In the U.S., insider trading is a criminal offense. So the set of penalties can include jail terms in addition to monetary fines and revocation of business license. The Insider Trading Sanctions Act of 1984 provides penalties for up to three times the profit gained or the loss avoided by the insider trading. The Insider Trading and Securities Fraud Enforcement Act of 1988 further expanded the power of the SEC in investigating crimes related to insider trading, including greater scope for cooperation with foreign governments. In comparison, in several other economies, including Hong Kong, insider trading is a civil violation. So the maximum penalty is some fines but no jail terms.

In Europe, a prominent and wide-ranging movement in insider trading regulation occurred relatively recently in 1989 with the adoption of the European Community Directive Coordinating Regulations on Insider Trading ("EC Directive"). The EC Directive was modeled after French and English laws that prohibit insider trading as a

criminal offense. It prohibits insiders from trading on inside information, from tipping other people to take advantage of the information. It also prohibits people who receive a tip from the insiders from trading on the information. However, the EC Directive allows individual member countries to enact stricter laws at their own preference, and decide on appropriate penalties at their own preference.

Third, holding constant the set of prohibited activities and penalties on the book, the vigor with which a country chooses to enforce the laws and the punishment also differs widely. It is believed that the U.S. SEC's effort in enforcing the laws on truthful and timely information disclosure as well prohibition of insider trading is vigorous. For example, in the fiscal year of 1997 (Oct, 96-Sept. 97) alone, the SEC brought 57 insider trading cases (Newkirk and Robertson, 1998). [Among those, 90% of all the cases have been settled out of court.]

In Europe, the extent of enforcement differs across countries. For example, Italy is still perceived to be a place where insider trading is relatively common. Some observed that "[i]n spite of the passage of laws on takeovers and insider trading since 1992, the bourse has not shaken its reputation as a fiefdom of an inward-looking financial community that treats small shareholders shabbily." (Graham, 1997, as quoted in Newkirk and Robertson, 1998, p7).

In Hong Kong, insider trading is considered a civil offense (so the penalty on the book is not as grave as in the U.S. or many European countries. However, Hong Kong has a relatively tight anti-fraud regulation and relatively rigorous and predictable law enforcement. The government regulators enjoy a good reputation for being well trained, professional, and relatively uncorrupt. This makes it less prevalent for corporate insiders to release misleading information or otherwise to commit financial fraud than in some other markets such as South Africa or the mainland China.

Both South Africa and China prohibit some forms of insider trading by law. The penalty on the book can be severe. For example, in South Africa, insider trading is a criminal offense, with penalties of up to 10 years in prison and a fine up to half a million Rand (Business Times, February, 1997). However, the deterrence of the law has been less than satisfactory. In South Africa, there had never been anyone who had been convicted of insider trading at least up until May 1999 (Business Times, May 16, 1999). In China,

where the exact number is not available, an informal discussion between the authors and some market participants suggests that information release is considered not comprehensive and unreliable. Insider trading and price manipulation is also perceived to be widespread and relatively unchecked. In Russia, a recent scandal involving insider trading of Russian government bonds alleged involvement of even senior government officials.

To sum up, the quality of information release and the prevalence of insider trading vary widely across countries. This is due to a combination of a differing scope of prohibited behavior, a differing penalty for a given offense, and a differing degree of enforcement of existing laws and regulations. This suggests that the knowledge of whether a country prohibits insider trading or requires a particular disclosure is probably not sufficient to determine the prevalence of insider trading or the quality of information release in that country. We have to keep that in mind when we turn to the empirical analysis.

Measuring Market Integrity Across Countries

Insider trading, by its very nature, is difficult to measure. In the empirical part of the paper, we will explain two measures of insider trading based on the existence of insider trading laws and the time of the first prosecution of a violation (from Bhattacharya and Daouk, 2000). We also use a new measure of insider trading that has not been used in the literature. Because of its relative novelty, we provide a brief explanation of the measure here.

Our measure is derived by the Global Competitiveness Report. Respondents were asked to rate the extent of insider trading on a scale of 1 to 7. The exact question (3.13) was

"Do you agree that insider trading is not common in domestic stock market?"
(1=strongly disagree, 7=strongly agree)

For each country, the report presents the mean answer from all respondents. We define our variable, "Insider Trading Index" = 7 – country mean answer to Question 3.13.

We assume that the severity of the insider trading is (highly) correlated with the value of this index. In other words, the bigger the value of our "insider trading" index, the more pervasive insider trading is. A potential shortcoming of this measure is that perception based measure may not be accurate.[3] There are also advantages of using index. As we discussed before, laws on the book may not be a sufficient description of the prevalence of insider trading activities as potential penalties and extent of enforcement also would influence it. This index that is based on the survey question presumably reflects all three factors that would influence insider trading. In this sense, it is a more reasonable measure than the mere presence of a law.

For quality of information release, we do not have a satisfactory measure. We adopt a measure of the quality of accounting standard that was constructed by the Center for International Financial Analysis and Research, Inc. and used by La Porta et al (1998). This index was "created by examining and rating companies' 1990 annual reports on their inclusion or omission of 90 items. These items fall into seven categories: general information, income statements, balance sheets, funds flow statement, accounting standards, stock data, and special items. A minimum of three companies in each country were studied. The companies represent a cross-section of various industry groups; industrial companies represent 70 percent and financial companies represent the remaining 30 percent. (La Porta, 1998, p125). As the description suggests, the index mainly aims to measure the comprehensiveness of information release in a country, but not so much the timeliness and reliability. Consequently, this is an imperfect measure for our purpose.

3. Empirical Evidence

We now turn to the empirical results. As we do not have a reliable time-series measure of market integrity, we focus on the cross-section variation exclusively. Let V(k) be the volatility of stock returns for country k – measured by the standard deviation of the monthly returns over 1985-1998. Our benchmark specification is the following.

[3] Worse, systematic bias could be introduced by the survey question. In the empirical part, we will discuss the possibility of a systematic bias and an instrumental variable approach to deal with it.

$$V(k) = \alpha + F(k)\beta_1 + G(k)\beta_2 + L(k)\beta_3 + M(k)\beta_4 + I(k)\beta_5 + e(k)$$

where F(k) is a vector of variables measuring the volatility of economic fundamentals, G(k) a vector for uncertainty regarding government macroeconomic policies, L(k) a vector for liquidity of the market, M(k) a vector for maturity of the market, and finally, I(k) a vector for integrity of the market. α, β_1, β_2, β_3, β_4, and β_5 are parameters to be estimated (with appropriate dimensions). And e(k) is a random variable that is assumed to be normally distributed with zero mean and a constant variance.

We adopt a strategy of sequential estimation. Starting with of the volatility of economic fundamentals, we progressively augment the regression with other factors as additional explanations: uncertainty regarding a government's macroeconomic policies, liquidity and maturity of the market, and quality of market integrity. As we have a maximum of 55 countries in our sample (and typically less due to missing observations of some regressors), we need to conserve the degree of freedom in order to obtain meaningful estimates. Consequently, in successive regressions, we drop those regressors that have consistently been insignificantly different from zero in prior regressions. [In the final set of regressions, we add some of the dropped regressors to ensure that our procedure does not bias our inference.]

Uncertainty about Economic Fundamentals

To measure the volatility of the economic fundamentals that underline the stock prices, we use several proxies. First, we use the standard deviation of the real GDP growth rate, computed over the same sample period as the volatility of the stock market. The result is reported in Column 1 of Table 2. The coefficient is positive and statistically significant. In other words, as consistent with our intuition, countries with a more volatile GDP growth process also have a more volatile stock market. In fact, one cannot reject the hypothesis that the slope coefficient is equal to one at the ten-percent level. That means that, on average, there is a one-to-one correspondence between the volatility of the real GDP growth and the volatility of the stock returns.

Output by publicly listed companies is only part of a country's GDP[4]. An alternative way to measure the uncertainty of the corporate fundamentals is to look at the variability of operating income for publicly traded companies in a country. More precisely, we utilize the standard deviation of the change in operating income for a subset of major listed companies over 1991-96, scaled by the mean operating income in absolute value during the same period[5]. The regression result with this alternative measure of the volatility of the fundamentals is reported in the second column of Table 2. The coefficient is positive, consistent with the hypothesis that a more volatile corporate operating income stream generates a more volatile aggregate stock return. Unfortunately, this estimate comes with a relatively large standard error so that we cannot reject the null hypothesis that it is equal to zero. Of course, the same large standard error also indicates that we are equally unable to reject the null hypothesis that it is equal to one.

At this point, it is useful to note that there may be many reasons why some countries' real output or operating income is more volatile than others'. The discussion in the previous section suggests that more prevalent insider trading itself may contribute to a higher volatility of real output as the managers of the firms may have an added incentive to choose riskier projects than otherwise.

Other aspects of economic fundamentals may also be relevant. In particular, firms in some economies are more leveraged (i.e., with a higher debt-to-equity ratio) than other economies. It has been recognized at least since Black and Scholes (1973) that a higher leverage ratio may induce firm managers to undertake riskier projects than they otherwise would have. To measure this effect, we adopt an economy-wide leverage ratio measure, which is the ratio of aggregate corporate debt to the sum of corporate debt and equity. The third column of Table 2 reports the regression with this leverage ratio measure as the only regressor. The coefficient is positive, consistent with the notion that a higher economy-wide debt-to-equity ratio leads to a more volatile stock returns. Like the cash flow variability measure, this measure by itself is not statistically significant at the 10% level.

---

[4] One might assume, however, that the output of the non-listed firms and that of the listed companies within a common country are highly correlated. Indirect evidence on this is the empirical findings that business cycles are far more correlated for regions within a country than across different countries (e.g., Rose and Engel, 2000).

Concentration of wealth in an economy might also raise the market volatility if one thinks that a concentrated wealth might imply that large shareholders are more likely to expropriate small shareholders. The effect could also go the other way if one thinks that a concentrated wealth implies that companies are mostly controlled by concentrated large shareholders who can overcome the principle-agent problem more effectively vis-à-vis the managers. We do not have a good measure of the wealth concentration. As a proxy, we use the ratio of the total wealth of the billionaire in an economy relative to the size of the GDP. As reported in Column 4 of Table 2, this measure of wealth concentration turns out to be insignificant as an explanatory variable for stock return volatility.

Interestingly, when they are introduced collectively into the regression, together with the volatility of real GDP growth, cash flow risk and leverage ratio are marginally significant. Collectively, these proxies for economic fundamentals explain about 46% of the variation in the cross-country dispersion in stock market volatility.

Uncertainty about Macroeconomic Policies

Another potentially important factor is uncertainty associated with macroeconomic policies. As proxies for monetary policy uncertainty, we use the volatility of exchange rate and volatility of inflation rate. As a proxy for fiscal policy uncertainty, we use the volatility of the fiscal deficit as a share of GDP. In addition, we use to the ratio of trade (exports plus imports) to GDP as a measure of the government's willingness to adopt pro-competition policies. The results are reported in Table 3.

We first look at the regression results when these policy variables are included one by one. Either a more volatile exchange rate or a more volatile inflation rate is associated with a higher volatility of stock returns (Columns 1-2 in Table 3). So a less predictable monetary policy is indeed associated with a higher volatility. In addition, countries with more open trade regimes tend to have a less volatile stock market. However, fiscal policy uncertainty does not appear to matter: the coefficient on the ratio of fiscal deficit-to-GDP is not statistically different from zero even though the point estimate is positive.

---

[5] This comes from Claessens, Djankov and Nenova (1999).

When these measures of policy uncertainty are included simultaneously, together with uncertainty about economic fundamentals from the previous table, the only variable that is statistically significant is the volatility of exchange rate. Hence, one may say that stock market volatility is related to some measure of monetary policy uncertainty, particularly exchange rate volatility, but is unrelated to fiscal policy uncertainty. Uncertainty about economic fundamentals, particularly the real GDP growth rate and the leverage ratio, continue to play a role in explaining the dispersion in the market volatility.

Liquidity and Maturity of the Market

Less liquid or less matured markets may be more volatile. We measure liquidity of the market by the ratio of the stock market turnover to market capitalization. The notion of the maturity of a market lacks a precise definition. But one sometimes hears the assertion that a newer and less matured market may be more volatile. In this paper, we examine three possible dimensions of market maturity: the ratio of stock market capitalization to GDP, the age of the stock exchange (i.e., number of years since the inception of the main exchange), and the level of per capital GDP. All three are imperfect, but each may capture something that is useful. The results are reported in Tables 4-5.

We found that the ratio of the stock market turnover to market capitalization is not significant. That is, across countries, there is no discernible association between liquidity and the market volatility. Both the ratio of market capitalization to GDP and the age of the stock exchange are significant when entered alone in the regression, but not so when economic and policy fundamentals are taken into account. On the other hand, the average income level (log GDP per capita) is consistently negative across specifications. In other words, richer countries have consistently lower stock market volatility even after one takes into account economic and policy fundamentals. Note that income level may also be a proxy for the quality of institutions in addition to being a proxy for market maturity.

Market Integrity

A central question in this paper is whether market volatility is related to the degree of market integrity. As the first measure of market integrity, we look at the prevalence of insider trading. Later, we will examine the quality of accounting and information disclosure.

Inside information is material non-public information about corporate fundamentals. This may include data on a company's profit or loss before it is announced, or information about a pending merger or acquisition involving the company before it becomes public knowledge, or information about approval or rejection of a product by a government regulator before it is announced to the public. Insider trading refers to trading of securities by people who possess the inside information and take advantage of it. Notice an insider who trades on inside information can make a profit (or avoid a loss that otherwise would materialize) either from a subsequent drop in price as well as a rise in price. For example, the insider could short-sell the stock or buy put options if she knows some bad news about the company ahead of the rest of the market. Therefore, any movement in price that the insider knows in advance potentially provides a profit opportunity.

At the beginning of the paper, we suggested that the effect of market integration on market volatility is ambiguous in theory. On the one hand, insider trading allows payoff-relevant information to be incorporated into the prices faster, reducing the relative importance of noise, and hence may reduce volatility. On the other hand, there are two possible channels through which prevalence of insider trading may lead to a greater volatility in the stock returns. The first is the possibility that the managers of the firm may choose unnecessarily riskier projects just to raise the volatility of the stock price (and hence the scope of insider trading). This suggests that corporate fundamentals may be more volatile in countries where insider trading is more tolerated. The second channel is the possibility that the content and the timing of informational release are manipulated to generate more volatility even after holding constant the inherent degree of risk of the projects. Which of these effects dominates is a matter to be resolved in the empirical studies.

To measure the degree of insider trading in different countries, we first make use of the information on laws and enforcement collected by Bhattacharya and Daouk (2000). Based on the year a law that prohibits insider trading is enacted, we construct a measure of the fraction of the time during 1985-1998 in which a country has an anti-insider-trading law for all countries in our sample. Of course, laws on the book and laws enforced in reality may not the same. Based on the year that a first prosecution of a violation of the law occurs, we construct a measure of the fraction of the time during 1985-1998 since the first prosecution.

The regression results are reported in Table 6. From the first three columns, we see that the fraction of time an insider-trading law is in place is not different from zero statistically. This could simply reflect the fact that some countries that have such laws on the books do not seriously enforce them. In the last three columns of Table 6, the fraction of time since the first prosecution is used as a regressor. The coefficients are all negative, consistent with the notion that law enforcement on insider trading is associated with a reduction in stock market volatility. However, only the coefficient in the last regression is statistically significant at the 15% level (where uncertainty about macro policies and economic fundamentals are included). Therefore, the supportive evidence is not very strong.

It is possible that even the year of first prosecution does not adequately capture the cross-country difference in the strength of enforcement against insider trading. For example, some countries may pursue insider-trading cases more aggressively and intensely than others. So they may have less insider-trading than others even if they start the first prosecution relatively late. In addition, what is defined as insider trading may vary from one country's law to another. For example, country A may have its first prosecution a year later than country B; but country A may choose to prohibit a wider range of behaviors as illegal insider trading. As a result, country A may have less insider trading than country B even if its first prosecution comes later. Finally, even if two countries have identical years for first prosecution, the effective punishment for insider trading may be different. For example, France treats insider trading as criminal violation and the punishment includes a jail sentence for the offenders. Hong Kong treats insider trading as civil violation, so the maximum punishment includes a fine and a loss of

license. The difference in punishment could induce a different level of insider trading even if the year of first prosecution is the same.

An alternative measure is a survey-based perception score on the prevalence of insider trading. The Global Competitiveness Report (World Economic Forum and Harvard University, 1997) includes a question that asked the respondents in 53 countries to rate the extent of insider trading on a scale of 1 to 7. This is described in the previous section. For each country, the GCR presents the mean answer from all respondents. We define our variable, insider trading index = 7 – country mean of the answers to Question 3.13. The transformation makes a higher value to be associated with more prevalent insider trading. In the regressions, we further scale the insider-trading index by dividing it by its standard deviation. This way, the coefficient on the variable can be interpreted as the effect on market volatility from a one standard deviation increase in the extent of insider trading.

The advantage of this measure (relative to the previous ones) is its comprehensiveness. Any cross-country difference in the punishment for illegal insider trading, in enforcement, and in the relative demarcation of legal vs. illegal insider trading would all be captured in a single measure of the (perceived) prevalence of insider trading. In other words, if country A has a more widespread practice of insider trading than country B, then this measure would reflect that whether the prevalence of the practice is caused by lax law enforcement or a lighter punishment does not matter.

The disadvantage of this measure is that it is based on the perception of the survey respondents. As such, it can be different from reality. An instrumental variable method to deal with some of the associated problems will be discussed later.

In the first three columns of Table 7, this new measure of insider trading is included in the regressions with progressively more control variables. We observe that the insider-trading index has a coefficient that is positive and statistically significant. This is consistent with the hypothesis that a more prevalent practice of insider trading (less market integrity) is associated with a higher volatility of the stock market.

To get an idea on the economic significance of the insider trading, consider a thought experiment of a rise in the extent of insider trading from what prevails in the U.S (with the index of insider trading=0.87) to what prevails in China (with the index value =

2.69). This increase in insider trading would increase the volatility of stock returns by 216 basis points {=[(2.69-0.87)/0.86}*1.02}. As a comparison, the increment in the volatility of the GDP growth rate from the U.S. level of 1.7 percent to the Chinese level of 3 percent generates only an extra volatility in the stock market by 130 basis points. So the effect on stock market volatility from China's lack of market integrity – prevalent insider trading – is more important than its more volatile economic fundamentals.

Instrumental Variable Regressions

One potential concern with the previous regressions is the possible endogeneity of insider trading. In particular, it is possible that insider trading is more prevalent in some countries because the stock markets in these countries are more volatile for reasons unrelated to insider trading. The higher volatility in the stock market offers more opportunity for insiders to profit from insider trading. So the direction of causality could run from market volatility to insider trading. Secondly, the perception of the survey respondents about the insider trading in their country can be influenced by the actual extent of market volatility (this is another form of reverse causality). Either of the two reasons could generate a spurious correlation between the insider trading index and market volatility even if the actual insider trading activities do not contribute to greater volatility.

To deal with this possibility, we adopt an instrumental variable approach. In fact, we consider two potential sets of possible instruments. The first is the extent of corruption in a country's judicial system ("legal corruption" for short). On an *ex ante* basis, it seems reasonable to expect that legal corruption and insider trading are positively correlated: if the judges can be influenced by bribery, then it is highly probable that the laws regarding insider trading prohibition are not vigorously and/or fairly enforced. Furthermore, it seems unlikely that the extent of legal corruption is caused/influenced by the volatility of the stock market.

The legal corruption measure comes from a different question in the GCR survey. Question 8.09 of the survey asked the respondents to rate the level of corruption in the country's legal system on a one to seven scale. The exact question is the following:

"Do you agree that irregular payments to judges or other officials involved in the enforcement and execution of judgement are not common and do not influence the outcome of court proceedings?" (1= strongly disagree, 7= strongly agree)

We define legal corruption for a particular country = 7 - the average of the answers for that country. A bigger number implies a higher degree of legal corruption.

The second set of instruments is the dummies indicating the origin of a country's legal system ("legal origin" for short) plus legal corruption. Legal origin dummies, proposed by La Porta, Lopez-de-Silanez, Shleifer and Vishny (1998), separate the legal systems into five categories: British common law, French civil law, German tradition, Scandinavian tradition, and the socialist legal system. Because legal systems are by and large determined by colonial expansion or revolution in history, they are unlikely to be influenced by stock market volatility in the last fifteen years. On the other hand, as legal origins have been discovered to influence a country's preference to offer protection for minority shareholder rights and creditor rights, they may also influence a country's proclivity to disallow insider trading, which may be a form of exploitation of minority shareholders.

To have an idea of whether the instruments are actually correlated with the insider-trading index, we report in Table 7a two regressions of the insider-trading index on the instrumental variables. We observe that legal corruption is positively and significantly associated with insider trading: countries with a higher degree of legal corruption are also likely to have more prevalent insider trading. Legal origins are not successful: none of the legal origin dummies is shown to be statistically significant in explaining insider trading once legal corruption is taken into account. In light of this, we will use legal origin as the instrumental variable for insider trading.

The result of the 2SLS estimation is reported in Column 4 in Table 7. The coefficient is positive, consistent with the hypothesis that insider trading and market volatility are positively associated. In fact, the point estimate from the IV regression (1.84) is bigger than the OLS regression in Column 3 (with the point estimate of 1.02). However, because the standard error of the IV estimate is three times as large as that of the OLS estimate, the coefficient is not statistically different from zero. We perform a

formal Hausman test for the null hypothesis that the differences in the coefficients between the IV regressions and the corresponding OLS regressions are not systematic. This null hypothesis cannot be rejected for both columns even at the 50% level. In other words, from the statistics point of view (as indicated by the Hausman test), we cannot say that the IV regression is necessary.

It is useful to note that two of the other regressors, log per capita GDP and cash flow risk, are not statistically significant in either the IV or the OLS estimation. In Column 5, we omit log per capita GDP from the IV regression. In that case, the coefficient on insider trading becomes statistically significant again (at the 5% level). In Column 6, we omit cash flow risk from the IV regression, but retain log per capita GDP, the coefficient on insider trading is positive (2.17) and statistically significant at the fifteen percent level. In Column 7, we drop another regressor that is not significant in any of IV regressions, namely the leverage ratio, but retain log per capita GDP. The resulting coefficient on insider trading is once again positive (with a value of 3.92) and statistically different from zero at the 5 percent level. Note that in this case, the null hypothesis that the IV and OLS coefficients are the same (a Hausman test) can be rejected at the 5% level, indicating the need for an IV estimation. Note also that when legal corruption is used as the instrument for insider trading, the system is exactly identified. As a result, we cannot perform a formal over-identifying restriction test on the validity of the instrument. We can add the dummies for legal origins to the list of the possible instruments (and ignore the fact that the legal origins are not statistically significant according to Table 7a). This allows us to formally test the null hypothesis that the instruments and the error term are not correlated. We find that the null hypothesis cannot be rejected with a p-value equal to 0.24 (the regression results not reported to save space). This bolsters the validity of the instruments.

To summarize, the coefficients on insider trading in all OLS regressions are always positive and significant. In the IV regressions, if we drop any of the insignificant regressors, the coefficient on insider trading –instrumented by legal corruption—is also positive and statistically significant. Therefore, the instrumental variable approach supports the notion that insider trading raises market volatility. In fact, the quantitative effect as revealed by the IV approach is bigger than the OLS estimation.

Quality of Accounting Standard

Another aspect of market integrity is the timeliness, reliability, and comprehensiveness of the information about corporate fundamentals that are released to the market. We are not aware of any measure on all these aspects of the quality of accounting standard. An index on accounting standard was constructed by the Center for International Financial Analysis and Research based on the inclusion or omission of 90 items in the 1990 annual reports of the public companies in a number of countries and was used in La Porta, et al (1998).

As said before, this index is not ideal, as it does not address timeliness and reliability aspects of a country's accounting system. Nonetheless, we adopt this imperfect measure as another measure of market integrity and report the regression results in Table 8. We should note that the inclusion of this variable reduces the sample size to 40 or below. So the power of the t-tests is reduced. When this accounting standard variable is included as the only regressor (other than a constant), its coefficient is negative and statistically significant: countries with a better accounting standard according to this measure tend to have lower stock market volatility. When we include other control variables plus the insider trading index, this measure of accounting standard is no longer statistically significant. The index on insider trading has a positive and statistically significant (if non-significant regressors are excluded from the regressions).

4. Conclusion

The volatility of the stock market varies widely across countries. This paper studies a variety of factors that may affect the volatility. These include uncertainty about economic fundamentals, unpredictability of government macroeconomic policies, liquidity and maturity of the market. In addition, we investigate whether a lack of market integrity, particularly the prevalence of insider trading and poor quality of information release, is associated with market volatility.

The evidence suggests that (lack of) market integrity is an important part of the explanation for the difference in volatility across national markets. More insider trading

is found to be associated a higher market volatility even after one controls for the volatility of the real output growth, volatility of monetary and fiscal policies, and maturity of the stock market. Moreover, the quantitative effect of insider trading on market volatility is also big when compared with the effect of the volatility of other fundamentals. For example, a rise in the extent of insider trading from what prevails in the U.S to what prevails in China would increase the annual stock market volatility by 182 basis points. This effect is equivalent to increasing the volatility of the Chinese GDP growth rate from its current level by 60%.

In future research, it would be useful to ascertain the precise mechanisms through which insider trading raises market volatility, and to investigate if the rise in volatility translates into reduced economic efficiency.

References:

Allen, Franklin and Douglas Gale (1992), "Stock Price Manipulation," *Review of Financial Studies*, 5(3): 503-29.

Ausubel, Lawrence M. (1990), "Insider Trading in a Rational Expectations Economy," *The American Economic Review*, 80(5) December: 1022-41.

Benabou, Roland and Guy Laroque (1992), "Using Privileged Information to Manipulate Markets: Insiders, Gurus, and Credibility," *The Quarterly Journal of Economics*, 107(3): 921-58.

Bhattacharya, Utpal and Hazem Daouk (2000), "The World Price of Insider Trading," mimeo, Kelley School of Business, Indiana University.

Black, Fischer and Myron Scholes (1973), "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy*, 81(3): 637-54.

Brudney, Victor (1979), "Insiders, Outsiders, and Informational Advantages Under the Federal Securities Laws," *Harvard Law Review*, 93: 322-76.

Business Times (1997), "Legislation to Curb Insider Trading Looms," February 2, South Africa. (http://www.btimes.co.za/97/0202/news/news5.htm)

Business Times (1999), "Time Ripe to Stop the Insider Trading Rot," May 16, South Africa. (http://www.btimes.co.za/99/0516/comp/comp17.htm)

Chowdhury, Mustafa, John S. Howe, and Ji-Chai Lin (1993), "The Relation between Aggregate Insider Transactions and Stock Market Returns," *Journal of Financial and Quantitative Analysis*, 28(3) September: 431-37.

Claessnes, Stijn, Simeon Djankov and Tatiana Nenova (1999), "Corporate Risk around the World," mimeo, The World Bank Group.

Easterbrook, Frank H. (1981), "Insider Trading, Secret Agents, Evidentiary Privileges, and the Production of Information," *Supreme Court Review*, 11: 309-65.

Givoly, d., and D. Palmon (1985), "Insider Trading and the Exploitation of Inside Information: Some Empirical Evidence," *Journal of Business*, 58: 69-87.

Graham, Robert (1997), "New Broom for Bourse: the Head of Italy's Stock Market Watchdog Outlines His Plans," *Financial Times* (London Edition), March 24, page 22.

Gregory, Alan, John Matatko, Ian Tonks and Richard Purkis (1994), "UK Directors' Trading: The Impact of Dealings in Smaller Firms," *The Economic Journal*, 104: 37-53.

John, K. and L.H. Lang (1991), "Insider Trading around Dividend Announcements: Theory and Evidence," *Journal of Finance*, 46: 1361-89.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny (1998), "Law and Finance," *Journal of Political Economy*, 6: 1113-55.

Leland, Hayne E. (1992), "Insider Trading: Should It Be Prohibited?" *The Journal of Political Economy*, 100(4), 859-87.

Manne, Henry (1966), Insider Trading and the Stock Market, New York: The Free Press, Collier Macmillan.

Manove, Michael (1989), "The Harm from Insider Trading and Informed Speculation," *The Quarterly Journal of Economics*, 104(4) November: 823-45.

Morck, Randall, Bernard Yeung, and Wayne Yu (2000), "The Information Content of Stock Markets: Why Do Emerging Markets Have Synchronous Stock Price Movements?" *Journal of Financial Economics*, 58(1) October: 215-60.

Morck, Randall, David Stangeland and Bernard Yeung (1998), "Inherited Wealth, Corporate Control and Economic Growth: The Canadian Disease," NBER Working Paper 6814.

Meulbroek, Lisa K. (1992), "An Empirical Analysis of Illegal Insider Trading," *Journal of Finance*, 47(5): 1661-99.

Newkirk, Thomas C., and Melissa A. Robertson (1998), "Insider Trading – A U.S. Perspective," Speech at the 16th International Symposium on Economic Crime, Jesus College, Cambridge, England, September 19, 1998. The authors were (at the time of the speech), respectively, the Associate Director and the Senior Counsel of the Division of Enforcement, U.S. Securities and Exchange Commission. Available on the SEC web (http://www.sec.gov/news/speech/speecharchive/1998/spch221.htm).

Rose, Andrew K., and Charles Engel (2000), "Currency Unions and International Integration," National Bureau of Economic Research Working Paper 7872.

Seyhun, H.N (1986), "Insiders' Profits, Costs of Trading, and Market Efficiency," *Journal of Financial Economics* 16: 189-212.

Shiller, Robert (1981), “Do Stock Prices Move Too Much to Be Justified by Changes in Subsequent Dividends?” *American Economic Review*, 71(3) June: 421-36.

World Economic Forum and Harvard University (1997), Global Competitiveness Report, Geneva: World Economic Forum.

Table 1: Summary Statistics

Name of variables	# of Obs.	Mean	Std. Deviation	Minimum	Maximum
Stock market volatility	54	0.098	0.047	0.043	0.29
Fundamentals					
Real GDP growth volatility	55	0.030	0.017	0.010	0.075
Cash flow risk	45	0.57	0.28	0.20	1.39
Leverage ratio	46	0.42	0.38	0.079	2.49
Billionaire Wealth/GDP	39	31.57	57.20	0	350.96
Policy Unpredictability					
Exchange rate volatility	54	0.086	0.23	0	1.18
Volatility of inflation rate	55	1.22	4.99	0.000057	25.51
Volatility of real interest Rate	54	49020	351260	0.0066	2581634
Volatility of fiscal deficit/GDP	52	2.64	1.54	0.25	6.04
(export + import) /GDP (%)	54	36.02	29.49	8.15	180.87
Market Liquidity and Maturity					
Market capitalization/GDP (%)	53	39.32	82.45	0.045	572.23
Turnover / Market cap (%)	49	45.54	37.72	1.25	205.67
Age of stock exchange	55	114.22	76.66	4	413
Log of GDP per capita	54	8.67	1.45	5.40	10.73
Number of listed Companies (average over 1995-96)	53	703.70	1518.95	47	8665
Market Integrity					
% time insider trading law in place	55	0.78	0.30	0	1
% time since first prosecution	55	0.34	0.37	0	1
Insider trading prevalence (GCR)	50	3.68	0.84	2.2	5.14
Quality of accounting standards	40	61.68	12.67	24	83

Table 1b: Pair-wise Correlation

	Stock Market volatility	GDP Growth volatility	Cash flow risk	Leverage ratio	Billionaire wealth /GDP	Exchange Rate Volatility	Inflation Rate Volatility	Volatility of Fiscal Deficit /GDP
GDP Volatility	0.62							
Cash flow risk	0.26	0.083						
Leverage ratio	0.16	-0.12	0.088					
Billionaire wealth /GDP	0.15	0.034	-0.31	-0.0015				
Exchange Rate Volatility	0.57	0.21	0.49	0.22	0.0025			
Inflation Volatility	0.51	0.72	0.29	-0.048	-0.099	0.45		
Volatility of Fiscal Deficit	0.20	0.29	0.029	-0.11	-0.070	0.24	0.029	
Total trade /GDP	-0.18	-0.0064	-0.15	-0.085	0.26	-0.19	-0.23	0.31

Table 1c: Pair-wise Correlation

	Stock Market volatility	Stock mkt cap /GDP	Mkt turnover /mkt cap	Age of stock exchange	Log GDP /capita	# of listed companies	%time insider trading law is in place	%time since the first prosecu tion	Insider Trading
Stock mkt cap/GDP	-0.37								
Stock market turnover /mkt cap	-0.077	-0.14							
Age of stock exchange	-0.22	-0.031	0.56						
Log of GDP/ capita	-0.45	0.41	0.32	0.40					
# of listed companies	-0.24	0.10	0.15	0.14	-0.13				
%time insider trading law in place	-0.040	0.15	-0.17	-0.41	-0.12	0.0028			
%time since the first prosecution	-0.19	0.26	0.17	-0.034	0.38	0.24	0.42		
Insider trading index	0.55	-0.39	-0.27	-0.39	-0.76	-0.052	0.0048	-0.34	
Accounting standard index	-0.42	0.58	0.14	0.025	0.51	0.16	0.19	0.40	-0.49

Table 2: Stock Market Volatility and Economic Fundamentals

Dependent Variable: Standard deviation of monthly stock market returns (1985-98)						
Volatility of Real GDP Growth Rate	1.15 ***				1.70 ***	1.86 ***
	(0.51)				(0.63)	(0.55)
Cash Flow Risk		2.25			2.67 *	1.72
		(2.55)			(1.77)	(1.60)
Leverage Ratio			0.909		1.94 ***	1.84 ***
			(1.02)		(0.76)	(0.73)
Billionaire Wealth /GDP				0.0046	0.0046	
				(0.0055)	(0.0073)	
Constant	6.3 ***	8.41 ***	9.30 ***	9.23 ***	2.41	3.00 *
	(1.2)	(1.36)	(0.80)	(0.71)	(1.86)	(1.83)
# of observations	54	45	46	39	39	45
Adj. R-squared	0.15	0.023	-0.015	-0.022	0.39	0.43

Robust standard errors are in the parentheses. ***, **, and * denote statistically significant at the 5%, 10%, and 15% level, respectively.

Table 3: Macroeconomic Policy Uncertainty and Economic Openness

Dependent Variable: Volatility of monthly stock market returns (1985-98)

Volatility of Exchange Rate	0.15 ***				0.066 ***
	(2.89)				(0.030)
Volatility of Inflation Rate		0.31***			-0.028
		(0.15)			(0.19)
Volatility of Fiscal Deficit/GDP			0.31		0.089
			(0.48)		(0.33)
Economic Openness: (exports+imports)/GDP				-0.029**	-0.019
				(0.018)	(0.013)
Volatility of Real GDP Growth Rate					1.61 ***
					(0.55)
Leverage Ratio					1.76 ***
					(0.64)
Cash Flow Risk					1.27
					(1.46)
Constant Term	8.55 ***	9.42 ***	9.15 ***	10.8***	3.80 ***
	(0.47)	(0.62)	(1.28)	(1.06)	(1.70)
#Observations	54	54	51	53	44
Adjusted R-squared	0.48	0.092	-0.01	0.012	0.66

Robust standard errors are in the parentheses. ***, **, and * denote statistically significant at the 5%, 10%, and 15% level, respectively.

Table 4: Liquidity of the Market

Dependent Variable: Volatility of monthly stock market returns (1985-98)

Stock Market Capitalization /GDP	-0.050 ***		-0.017	-0.017
	(0.018)		(0.012)	(0.013)
Stock Market Turnover/ Market Capitalization		0.0099	0.0033	0.0026
		(0.017)	(0.012)	(0.012)
Volatility of Real GDP Growth Rate			1.40 ***	1.53 ***
			(0.55)	(0.62)
Leverage Ratio			3.10 *	2.71
			(1.89)	(2.03)
Cash Flow Risk				0.86
				(1.52)
Volatility of Exchange Rate			0.063 ***	0.058
			(0.030)	(0.032)
Economic Openness: (Exports+Imports)/GDP			-0.0066	-0.0042
			(0.013)	(0.011)
Constant	11.17 ***	9.54 ***	4.94 ***	4.30***
	(0.93)	(1.13)	(1.51)	(1.90)
Number of observations	52	49	40	39
Adjusted R-squared	0.12	-0.015	0.53	0.63

(1) Robust standard errors are in the parentheses. ***, **, and * denote statistically significant at the 5%, 10%, and 15% level, respectively.
(2) Stock market volatility is re-scaled by multiplying by 100

Table 5: Market Maturity

Dependent Variable: Volatility of monthly stock market returns (1985-98)

Stock Exchange Age	-0.015 **		0.0012	-0.0013
	(0.0082)		(0.0038)	(0.0035)
Log GDP/Capita		-1.32 ***	-0.95 ***	-1.00 ***
		(0.31)	(0.29)	(0.29)
Volatility of Real GDP Growth rate			1.16 ***	1.21 ***
			(0.53)	(0.60)
Leverage Ratio			1.55 ***	1.10 **
			(0.63)	(0.60)
Cash Flow Risk				2.62 ***
				(1.02)
Volatility of Exchange Rate			7.27 ***	6.51 ***
			(3.10)	(2.54)
Constant Term	11.59 ***	21.09 ***	0.14 ***	0.13 ***
	(1.33)	(3.01)	(0.032)	(0.034)
# observations	54	53	45	44
Adjusted R-squared	0.046	0.14	0.64	0.69

Robust standard errors are in the parentheses. ***, **, and * indicate statistically significant at the 5%, 10%, and 15% level, respectively.

Table 6: Market Integrity - Laws on Insider Trading

Dependent Variable: Volatility of monthly stock market returns (1985-98)

Fraction of Time in Which Insider Trading Law is in Place	2.31 (2.13)	0.86 (1.82)	0.91 (1.44)			
Fraction of Time Since The First Prosecution Of Insider Trading				-1.14 (1.79)	-1.20 (1.17)	-1.73 * (1.31)
Log GDP/capita		-0.90 *** (0.24)	-0.011 (0.0027)		-0.74 *** (0.31)	-0.83 *** (0.37)
Volatility of Real GDP Growth Rate		0.29 (0.39)	1.12 ** (0.62)		0.34 (0.41)	1.26 *** (0.54)
Volatility of Exchange Rate		0.13 *** (0.032)	0.062 *** (0.027)		0.13 *** (0.027)	0.077 *** (0.031)
Log (# of Listed Companies)		-0.25 (0.33)	-0.0041 * (0.0027)		-0.0022 (0.38)	-0.0011 (0.0034)
Leverage Ratio			1.30 *** (0.54)			1.51 *** (0.64)
Cash Flow Risk			2.50 *** (1.36)			1.94 * (1.25)
Constant term	7.96 *** (1.67)	0.16 *** (0.33)	0.16 *** (0.045)	10.20 *** (0.94)	14.38 *** (0.44)	13.00 *** (5.20)
Number of Observations	54	53	44	54	53	44
Adjusted R-squared	0.00055	0.57	0.70	-0.011	0.57	0.71

Robust standard errors are in the parentheses. ***, **, and * denote statistically significant at the 5%, 10%, and 15% level, respectively.

Table 7: Market Integrity – Perceived Prevalence of Insider Trading

Dependent Variable: Volatility of monthly stock market returns (1985-98)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Estimation Method	OLS	OLS	OLS	TSLS	TSLS	TSLS	TSLS
Insider Trading Index	2.40 ***	1.35 ***	1.02 ***	1.84	2.15***	2.17 *	3.92 ***
	(0.52)	(0.51)	(0.50)	(1.43)	(0.46)	(1.41)	(1.57)
Log GDP Per Capita		-0.33	-0.68	-0.20		-0.63	0.97
		(0.41)	(0.47)	(0.89)		(0.92)	(0.95)
Volatility of Real GDP		0.26	1.00 *	0.96 ***	0.95***	0.66	-0.017
Growth Rate		(0.44)	(0.63)	(0.32)	(0.59)	(0.48)	(0.50)
Volatility of the Change		0.12 ***	.067 ***	0.071***	0.072***	0.081***	0.12 ***
In Exchange Rate		(0.027)	(0.026)	(0.022)	(0.024)	(0.026)	(0.019)
Log # of Listed		-0.57***	-0.0038	-0.0034	-0.31	-0.60***	-0.67***
Companies		(0.21)	(.0027)	(.0038)	(0.25)	(0.26)	(0.33)
Leverage Ratio			0.98 ***	0.55	0.40	0.53	
			(0.45)	(1.24)	(0.54)	(0.65)	
Cash Flow Risk			1.62	1.34	1.22		
			(1.27)	(1.47)	(1.30)		
Constant Term	-0.57	8.34	9.10	15.40	1.57	1.86	-12.96
	(1.96)	(6.07)	(7.00)	(14.00)	(2.93)	(14.56)	(14.83)
No. of Observations	49	48	42	42	42	43	48
Adjusted R-squared	0.24	0.65	0.74	0.67	0.71	0.66	0.52
p-value for Hausman test				0.51	0.14	0.24	0.01

Robust standard errors are in the parentheses. ***, **, and * denote statistically significant at the 5%, 10%, and 15% level, respectively.

Insider trading index has been re-scaled by its standard deviation in the sample. Hence, the associated coefficient can be interpreted as the effect of a one standard-deviation increase in insider trading on market volatility.

Table 7a: Explaining Insider Trading

Dependent Variable: Insider Trading Index

Legal Corruption Index	0.57 ***	0.53 ***
	(0.054)	(0.069)
French Legal Origin		-0.13
		(0.25)
German Legal Origin		-0.22
		(0.30)
Scandinavian Legal Origin		-0.46
		(0.35)
Socialist Legal Origin		0.20
		(0.34)
Constant term	7.41***	7.29***
	(0.30)	(0.47)
Number of Observations	50	49
Adjusted R-squared	0.65	0.64

Table 8: Accounting Standard

Dependent Variable: Volatility of monthly stock market returns (1985-98)

Accounting Standard	-1.58***	-0.20	-0.17	-0.48	-0.36	-0.57
	(0.71)	(0.46)	(0.47)	(0.57)	(0.56)	(0.53)
Insider Trading Index			0.94 **	0.68	0.71	1.00***
			(0.50)	(0.53)	(0.54)	(0.38)
Log of GDP Per Capita		-0.81***	-0.26	-0.39	-0.41	
		(0.28)	(0.44)	(0.48)	(0.46)	
Volatility of Real GDP		1.15 **	1.13 **	1.07 **	1.10**	1.12 **
Growth Rate		(0.60)	(0.61)	(0.63)	(0.61)	(0.61)
Volatility of the Change		0.16 ***	0.15 ***	0.16 ***	0.14***	0.16 ***
In Exchange Rate		(0.040)	(0.037)	(0.045)	(0.039)	(0.044)
Log of Number of		-0.61***	-0.49 **	-0.54 **	-0.47	-0.45*
Listed Companies		(0.26)	(0.27)	(0.30)	(0.28)	(0.30)
Leverage Ratio				0.59	0.60	0.45
				(0.56)	(0.60)	(0.55)
Cash Flow Risk				-0.92		-1.07
				(1.28)		(1.20)
Constant Term	17.10***	17.48***	7.73	12.27**	10.83*	7.32 ***
	(3.81)	(3.39)	(6.23)	(6.56)	(6.77)	(3.51)
# of Observations	40	39	38	38	37	37
Adjusted R-squared	0.14	0.70	0.69	0.69	0.75	0.74

Accounting standard and insider trading indexes have been re-scaled by their respective standard deviations. The coefficients on these two variables can be interpreted as the effect of an increase in accounting quality or insider standing by one standard deviation on market volatility.

Appendix A: Data Definition and Source

Volatility of stock returns

The stock return volatility is defined as the standard deviations of monthly returns over December 1984 to December 1998, multiplied by 100. The monthly return in U.S. dollars is defined as the change in the log of stock market index (in dollar terms). Suppose P_{t-1} and P_t denote the values of the stock market index in months t-1 and t, respectively. The return in period t, $r_t = \log(P_t)-\log(P_{t-1})$.

The US$ denominated stock market price index data for emerging stock markets come mainly from the International Finance Corporation's Emerging Markets Database (EMDB). We include all countries for which we also have data on market integrity measures (i.e., index of insider trading prevalence). The countries covered are: Argentina, Brazil, Chile, China, Colombia, Czech, Egypt, Greece, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Portugal, Russia, Saudi Arabia, Slovakia, South Africa, Sri Lanka, Taiwan, Thailand, Turkey, Venezuela and Zimbabwe.

The data for most of the developed markets are derived from Morgan Stanley Capital International database, which covers a wide range of countries including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Hong Kong, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Peru, Spain, Sweden, Switzerland, UK and US. In addition, stock price indexes for Ireland, Singapore and South Africa are derived from Financial Times database.

A few countries have data only after December 1984. The exact starting dates for these countries are as follows: China (01/93), Czech (01/94), Egypt (01/96), Hungary (01/93), Indonesia (01/90), Morocco (01/96), Peru (01/93), Poland (01/93), Portugal (01/86), Russia (01/96), Saudi Arabia (01/98), Slovakia (01/96), South Africa (01/93), Sri Lanka (01/93), and Turkey (01/87).

Economic Fundamentals

Volatility of real GDP growth rate

Computed as the standard deviation of the annual real GDP growth rate over 1985-1998, multiplied by 100. Real GDP growth rate is the first difference in the log of GDP in 1995 constant U.s. dollars. Source: the World Bank's World Development Indicators.

Cash Flow Risk

It measures the variability of operating income, defined as the standard deviation of the change in operating income relative to mean operating income in absolute value over the period of 1991-96. Source: Claessens, Djankov and Nenova (1999).

Leverage ratio:

The ratio of total debt to the sum of total debt and the market value of the equity. Source: Classens, Djankov, and Nerova (1999).

Entrepreneurial Billionaire Wealth/GDP:

The ratio of the wealth of the billionaires (acquired through entrepreneurship or inheritance) relative to GDP, in 1993. Source: originally from Forbes magazine, cited by Morck, Stangeland, and Yeung (1998).

Policy Fundamentals

Volatility of inflation

The volatility of inflation rate is the standard deviation of monthly inflation rate over January 1985 to December 1998. Inflation data is defined as the change in log consumer price index, which is from the IMF's IFS data base (line 64). For Ireland, CPI data is not available, and the wholesale price index is used instead (IFS, line 63). The CPI indexes for Hong Kong, New Zealand and Taiwan are from National Government Statistics dataset in Datastream. The inflation for Australia is computed from the manufacturing producer price index from National Government Statistics dataset in Datastream.

Volatility of real interest rate

The volatility of real interest rate is the standard deviation of monthly real interest rate from January 1985 to December 1998. The real interest rate is defined as the nominal interest rate minus the monthly inflation rate. The nominal interest rate is the monthly central bank discount rate from IFS (line 60). For Hong Kong, it is the one-month interbank offered rate. For Taiwan, it is the 91-day Treasury Bill rate in primary market. Both are from Datastream's International/National Government Dataset.

Volatility of fiscal deficit/GDP

Computed as the standard deviation of the annual ratio of the government budget deficit to GDP over 1985 to 1998. The data on the overall budget deficit/GDP are obtained from the World Bank's World Development Indicators CD Rom.

Exchange rate volatility:
Standard deviation of the change in monthly log nominal exchange rate with respect to US$, multiplied by 100. The nominal exchange rate is the average monthly exchange rate from International Financial Statistics. The period covered is 1985-1998.

Trade Openness:
The average value of (imports value + exports value)/GDP over the period of 1985-98.

Market Liquidity and Maturity

Initial stock market capitalization/GDP ratio

Source: the World Bank's World Development Indicator, 1998, or if 1998 not available, the next year available.

GDP per capita

In 1995 constant U.S. dollar, averaged over 1985-1998. Source: the World Bank's World Development Indicator.

Ratio of stock market capitalization to GNP
World Bank's World Development Report, various issues.

Age of stock exchange: The age of main stock exchange in each country is calculated as 1998-founding year of the exchange. The data on founding year of the exchange is obtained from Bhattacharya and Daouk (2000).

Number of listed companies per capita Computed as the ratio of the number of listed companies to total population, averaged between 1990 and 1996. Both are from the World Bank's World Development Report 2000 (Table 3, pp194-195, and Table 16, p220-221)

Market Integrity

Fraction of time insider trading law is in place: Calculated as the fraction of sample time that insider trading law already exists for each country. Data on the year that insider trading law is introduced are obtained from Bhattacharya and Daouk (2000).

Fraction of time since the first insider trading prosecution: Calculated as the fraction of sample time that the insider trading prosecution has been conducted. Data on the year of the first insider trading prosecution is extracted from Bhattacharya and Daouk (2000).

Insider trading index and legal corruption index:

Source: The Global Competitiveness Report (1997), Geneva: World Economic Forum.

Insider trading index: the question is "insider trading is not common in domestic stock markets", 1=strongly disagree, 7=strongly agree.

Legal corruption index: the question is "Irregular payments to judges or other officials involved in the enforcement and execution of judgements are not common and do not influence the outcome of court proceedings, 1=stronly disagree, 7=strongly agree.

We scale these two variables by the following formula: new value = 7-original value. As a result, a higher number implies more insider trading or legal corruption.

In the regressions, we re-scale the insider-trading index further by dividing it by its standard deviation in the sample. The regression coefficients can be interpreted as the effect of an increase in insider trading by one standard deviation on market volatility.

Accounting Standard Index: Index created by examining and rating companies' 1990 annual reports on their inclusion or exclusion of 90 items. Constructed by the Centre for International Financial Analysis and Research, Inc., and cited by La Porta et al (1998).

In the regressions, we re-scale the accounting quality index by dividing it by its standard deviation in the sample. The regression coefficients can be interpreted as the effect of an increase in the quality of accounting standard by one standard deviation on market volatility.

Figure 1

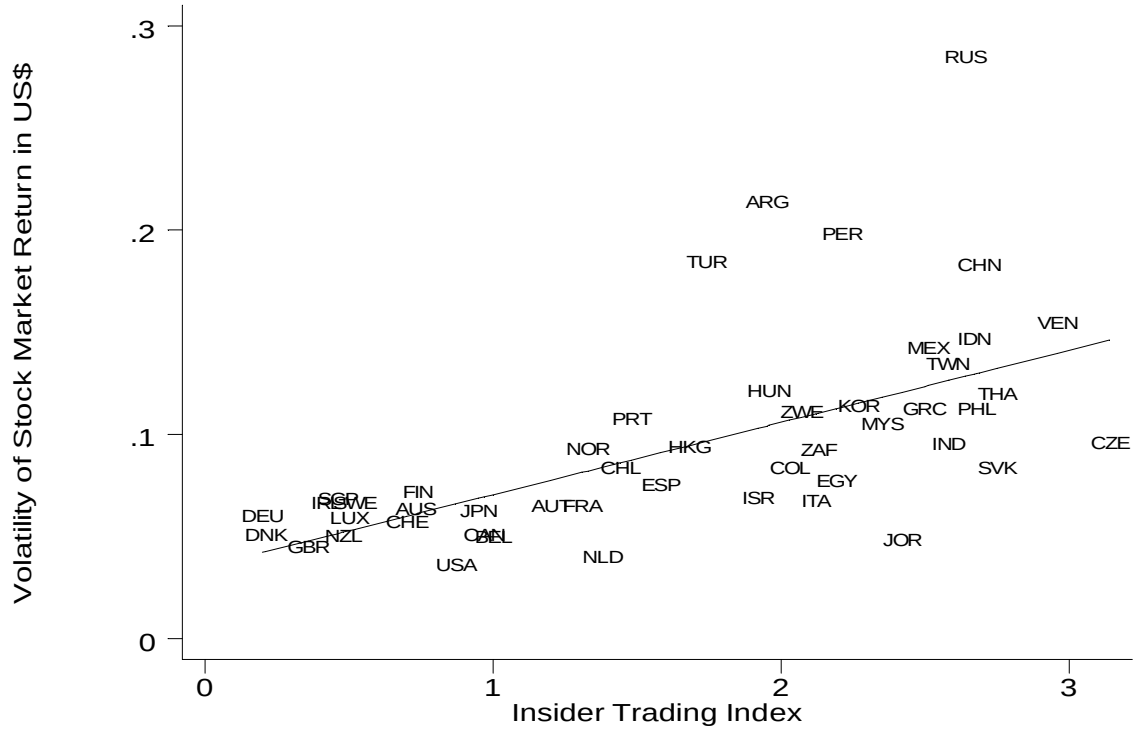

Figure 2