

## Technical Appendix to DOES INSIDER TRADING RAISE MARKET VOLATILITY?\*

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### Appendix A: Data Definition and Source

#### *Volatility of stock returns*

The stock return volatility is defined as the standard deviation of monthly returns over December 1984 to December 1998, multiplied by 100. The monthly return in US dollars is defined as the change in the log of the 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  $t$  is  $r_t = \log(P_t) - \log(P_{t-1})$ .

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 insider trading. 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 the 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, Spain, Sweden, Switzerland, UK and US. In addition, stock price indexes for Ireland, Singapore and South Africa are derived from the 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*

This variable is computed as the standard deviation of the annual real GDP growth rate over 1985–98, multiplied by 100. Real GDP growth rate is the first difference in the log of GDP in 1995 constant US dollars. The data are obtained from the World Bank's World Development Indicators.

##### *Cash flow risk*

Cash flow risk 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. Data are taken from Claessnes *et al.* (1999).

*Leverage ratio*

The leverage ratio is the ratio of total debt to the sum of total debt and the market value of the equity, from Claessnes *et al.* (1999).

*Billionaire wealth/GDP:*

This variable is defined as the ratio of the wealth of the billionaires (acquired through entrepreneurship or inheritance) relative to GDP, in 1993. The data are originally from *Forbes* magazine, cited by Morck *et al.* (1998).

*Policy Fundamentals**Volatility of inflation*

The volatility of the inflation rate is the standard deviation of the monthly inflation rate over January 1985 to December 1998. Inflation is defined as the change in the 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 the National Government Statistics dataset in DataStream. Inflation for Australia is computed from the manufacturing producer price index from the National Government Statistics dataset in DataStream.

*Volatility of real interest rate*

The volatility of the real interest rate is the standard deviation of the 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 inter-bank 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*

This is 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*

The exchange rate volatility is measured as the standard deviation of the change in monthly log nominal exchange rate with respect to US\$, multiplied by 100. The nominal exchange rate is the monthly average exchange rate from the IMF's *International Financial Statistics*. The period covered is 1985–98.

*Trade openness*

The average value of (imports + exports)/GDP over the period of 1985–98.

*Market Liquidity and Maturity**GDP per capita*

GDP per capita is measured in 1995 constant US dollars, averaged over 1985–1998, taken from the World Bank's World Development Indicator.

*Ratio of stock market capitalisation to GDP*

The source of this data is the World Bank's *World Development Report*, various issues.

*Age of stock exchange*

The age of the main stock exchange in each country is calculated as 1998 minus the founding year of the exchange. The data on the founding year of the exchange are obtained from Bhattacharya and Daouk (2002).

*Number of listed companies*

This variable is computed as the average number of listed companies during 1990–6. Source: the World Bank's *World Development Report 2000* (Table 3).

*Insider Trading**Fraction of the time an insider trading law is in place*

This is calculated as the fraction of the sample time that an insider trading law already exists for each country. Data on the year when an insider trading law is introduced are obtained from Bhattacharya and Daouk (2002).

*Fraction of the time since the first insider trading prosecution*

The data on the year of the first prosecution are extracted from Bhattacharya and Daouk (2002).

*Insider trading index and legal corruption index:*

The source for both variables is *The Global Competitiveness Report* (1997 and 1998).

The insider trading index is created from the question: 'insider trading is not common in domestic stock markets', 1=strongly disagree, 7=strongly agree.

The legal corruption index is created from the question: 'Irregular payments to judges or other officials involved in the enforcement and execution of judgments are not common and do not influence the outcome of court proceedings', 1=strongly disagree, 7=strongly agree.

We scale these two variables by the following formula: new value = 8-original value. We use the average of the values in 1997 and 1998. 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.

**Appendix B: Market volatility and insider trading index by country**

Country Name	Stock Market Volatility	GCR Insider Trading Index	Country Name	Stock Market Volatility	GCR Insider Trading Index
Argentina	0.212	4.04	Mexico	0.140	4.49
Australia	0.077	2.57	Morocco	0.046	–
Austria	0.078	3.19	Netherlands	0.046	3.09
Belgium	0.054	2.80	New Zealand	0.083	2.54
Brazil	0.182	4.24	Nigeria	0.157	–
Canada	0.050	2.71	Norway	0.077	3.55
Chile	0.081	3.64	Pakistan	0.089	–
China	0.146	4.62	Peru	0.098	4.11
Colombia	0.084	4.31	Philippines	0.110	4.60
Czech	0.094	5.12	Poland	0.176	3.82
Denmark	0.054	2.11	Portugal	0.105	3.56
Egypt	0.075	4.21	Russia	0.285	4.63
Finland	0.077	2.61	Saudi Arabia	0.043	–
France	0.063	3.07	Singapore	0.091	2.44
Germany	0.064	2.48	Slovakia	0.082	4.64
Greece	0.110	4.50	South Africa	0.090	4.20
Hong Kong	0.093	3.87	Spain	0.074	3.45
Hungary	0.119	4.08	Sri Lanka	0.090	–
India	0.093	4.53	Sweden	0.068	2.47
Indonesia	0.144	4.56	Switzerland	0.056	3.02
Ireland	0.070	2.62	Taiwan	0.132	4.70
Israel	0.068	3.77	Thailand	0.118	4.73
Italy	0.076	3.87	Turkey	0.183	4.08
Japan	0.075	2.85	United Kingdom	0.056	2.26
Jordan	0.046	4.32	United States	0.043	2.62
Korea	0.112	4.09	Venezuela	0.147	4.83
Malaysia	0.103	4.47	Zimbabwe	0.109	4.14

*Notes:*

Market volatility is the standard deviation of the monthly returns in US dollars over 1984.12–1998.12. Insider trading index is derived from the *Global Competitiveness Report* in 1997 and 1998. Insider trading index = 8 – the average of the original index in 97 and 98. A higher number implies a higher degree of insider trading.