The High Volume Return Premium: Cross Country Evidence

by

Ron Kaniel
Duke University

Arzu Ozoguz
The University of North Carolina at Chapel Hill

and

Laura Starks*
University of Texas

Abstract

We examine the high volume return premium across 41 different countries and find it to be a persistent phenomenon found in both developed and emerging markets. The premium is not caused by systematic differences in risk or liquidity. Using Merton's (1987) investor recognition hypothesis as a guide, we find the magnitude of the premium is generally associated with country and firm characteristics hypothesized to affect returns subsequent to a change in a stock's visibility. We also characterize the time series properties of the premium and consider economic trading strategies.

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* Submitting author: Laura Starks, Department of Finance, Austin, TX 78712-1179, (512) 471-5899, FAX: (512) 471-5073, LStarks@mail.utexas.edu. We would like to thank participants in seminars at the Atlanta Finance Forum, the University of Arizona, the University of Texas at Austin, the American Finance Association meetings and the Financial Management Association European meetings. We would also like to thank Yakhov Amihud, Bob Hodrick, Paul Laux, Felix Meschke, David Ng and especially the referee for their helpful comments. We also thank Art Durnev, Ken French, Karl Lins, and the Standard & Poor's Company for providing us with data for this study. We thank Dong Li for her research assistance on earlier versions of this paper.

The High Volume Return Premium: Cross-Country Evidence

1. Introduction

The high volume return premium, that is, the return premium that occurs after a stock receives a substantial volume shock, has been found to be an important component of financial markets in the United States (Gervais, Kaniel and Mingelgrin, 2001). These authors also provide evidence that the premium is most likely a result of investor visibility events. In this paper, we take the high volume return premium to cross-country data and examine two major issues. First, we examine whether the premium holds across diverse stock markets to the degree it holds in the United States. Second, we take advantage of differences in market, investor, and firm characteristics across countries to examine the determinants of the high volume return premium, including the hypothesis of whether it is a result of changes in investor visibility for a stock, as would be predicted by Merton's (1987) investor recognition hypothesis.

Examining data from 41 countries that vary in their market, investor and firm characteristics, we first confirm that the high volume return premium is pervasive, occurring in almost all developed countries and in many emerging market countries as well. We further show that differences in risk or liquidity cannot explain these results. In addition, we characterize the time series properties of the high volume return premium.

We then turn to the question of how the existence and the magnitude of the high volume return premium are affected by different characteristics of the firm, its market and its potential investors. As a guide to determining which characteristics would be expected to be related to the high volume return premium, we employ Merton's (1987) investor recognition hypothesis. This theory implies that investors' incomplete information affects their trading behavior and the resulting security values. That is, because of the incomplete nature of their information, some investors may not become aware of certain securities and, consequently, do not hold those securities in their portfolios. In such a case, Merton shows that investors will be inadequately diversified

and will demand a premium for taking on nonsystematic risk, causing a stock's required rate of return to depend on its investor base.

The main idea in Merton's theory relies on an information environment that limits the investors who are aware of a firm's securities to a subset of the potential investing population. The stock's limited visibility among investors means that if the stock achieves increased visibility and consequently, increases its investor base, there should be a reduction in the cost of capital and a concomitant increase in the firm's market value. Thus, the implications of the investor recognition hypothesis should vary across firms with different market, demographic, and firm characteristics as these characteristics of the information environment affect the costs of being informed, the degree of a stock's visibility, and the decision on whether to purchase the stock.

In our empirical tests, we identify determinants of the high volume return premium and in so doing also test predictions derived from the investor recognition hypothesis, using both country-level and individual firm analyses. In the country-level analyses, we provide evidence that is consistent with most, but not all, of the derived predictions from Merton's (1987) model. In particular, we show that the magnitude of the high volume return premium is associated with country characteristics that are expected to be related to the importance of a stock's visibility, such as investor demographics, the extent of information dissemination, the country's stock market composition and investor confidence in the country's markets. Consistent with the implications of Merton's hypothesis, we find that the return premium on a stock following a volume shock is increasing in the extent to which the stock is less visible, a priori, to investors, decreasing in the potential investor base in the country (as reflected in a proxy for demographics of country), and decreasing in the market's aggregate risk aversion (as reflected in the degree of investor confidence in the market).

In the individual firm analyses, we find mixed evidence on whether the high volume return premium is associated with the firm-specific variables that would be

predicted by Merton's (1987) hypothesis according to our interpretation. Consistent with the visibility argument, we find that the high volume return premium is decreasing in a firm's size relative to other firms in the domestic market, and it is also smaller if the firm is a member of the FTSE global index. However, not all of the expected predictions are supported by the data. For example, we find that the high volume return premium is increasing in the existence of analyst coverage and inclusion in the S&P Transparency and Governance Index, but it is not affected by the magnitude of the analyst coverage or the Index. We go further by examining the effects of the firm-specific determinants of the high volume return premium within each of the G7 countries separately and obtain results that are consistent with our cross-country findings.

We next consider the viability of economic trading strategies for different classes of investors in different countries, particularly given the previously documented variation in transaction costs across investors and countries (e.g., Lesmond, Ogden, and Trczinka, 1999; Domowitz, Glen and Madhavan, 2001; Chiyachantana, Jian, Jiang and Wood, 2004; Lesmond, 2005; and Eleswarapu and Venkataraman, 2006). We assume large investors are likely to face transaction costs distinct from those of retail investors, and we differentiate between these classes of investors by considering variations in the impact of explicit and implicit transaction costs on the viability of trading strategies.

In tests employing estimated transaction costs, we first show that the high volume return premium remains significant in the G-7 stock markets, even after controlling for the transaction costs retail investors would face. However, we do not find the premium to remain significant after controlling for the estimated total trading costs that would be faced by large investors (i.e., explicit and implicit transaction costs). We also find that in developed markets other than the G-7 and in emerging markets, the estimated explicit trading costs are too high even for retail investors to take advantage of the high volume return premium, on average.

Overall, our results are generally consistent with previous empirical studies that provide support for the implications of Merton's (1987) investor recognition hypothesis in that changes in stock visibility are an important aspect of investor decision-making.[1] A key distinction between these previous studies and ours is that their findings are confined to a single within-country sample while our results merge within-country results for multiple countries with cross-country evidence. We also contribute to the literature on the importance of transaction costs in determining whether an investor can actually take advantage of an anomaly by providing evidence from a number of different markets (e.g, Lesmond, Schill and Zhou, 2004).

Our paper proceeds as follows. In the following section, we present the data and the methodology for measuring the high volume return premium. We then provide the results from the empirical tests of the premium. We examine the determinants of the high volume return premium using test of characteristics across and within countries in Section 3. We consider the questions of time variation in Section 4 and economic trading strategies in Section 5. Finally, we provide our concluding comments in Section 6.

2. The high volume return premium across markets

2.1 Methodology and data

To measure the return premium that accompanies an extreme shock to a stock's trading volume, i.e., the high volume return premium, we follow Gervais, Kaniel and Mingelgrin (2001) with some modifications. These small modifications are necessary because of differences in institutional details and in data availability for financial markets across the countries in our sample. We begin with a 70-day trading interval divided into three periods for the analysis: the reference, formation and testing periods. The first 49

[1] See, for example, Kadlec and McConnell (1994),Kang and Stulz (1997), Foerster and Karolyi, (1999), Amihud, Mendelson, and Uno (1999), Dahlquist and Robertsson (2001), Gervais, Kaniel and Mingelgrin (2001), Chen, Noronha, and Singal (2004), Grullon, Kanatas and Weston (2004), Fehle, Tsyplakov, and Zdorovtsov (2005) Dyl and Elliot (2006) and King and Segal (2009)..Additional theoretical papers include Basak and Cuoco (1998) and Shapiro (2002).

days constitute the reference period, where we measure the typical distribution of volume for each stock individually. There is then a 1-day formation period, the purpose of which is to identify whether a stock has an extreme volume shock on that date (as compared to its own volume distribution during the preceding 49-day reference period). Stocks are then grouped into three portfolios according to whether they have extremely high, normal, or extremely low volume on the formation date relative to their own typical volume in the preceding reference period. The last 20 days of the interval provide the testing period, which is used to assess the returns on these portfolios following the volume shock.

Since many countries have a relatively short time series of volume data available, for most of our analysis, each following reference period in the sequence begins so that the subsequent testing period starts one day after the end of the previous testing period. This approach ensures non-overlapping test periods and, at the same time, provides us with overlapping reference periods. We allow the reference periods to overlap in order to make full use of the time series in our data; however, we do not allow the testing periods to overlap.

We define a stock as having extreme trading volume during the one-day formation period if the stock's trading volume on that day is in the top or bottom twentieth percentile as compared to its own distribution of volume over the preceding 49-day reference period. Each stock meeting these criteria is defined as being in an extreme trading volume portfolio (either high or low). All other stocks are classified as having normal volume in the formation period.[2]

Although Gervais, Kaniel and Mingelgrin (2001) define extreme volume stocks as those in the top or bottom tenth percentiles, for much of the analysis in our study, we rely

[2] A potential issue is whether allowing the reference periods to overlap results in some stocks being selected more often than expected. We checked for this possibility by using different measures of the chance of a stock to be picked as having extreme high or low volume and found no differences.

on the top or bottom twentieth percentiles due to the more limited number of stocks available in our sample countries. The cost of using a broader definition of extreme volume is that it could lessen any significant differences between the high-volume and low-volume portfolios. As we show later in the paper, if we limit the analysis to countries with sufficient data to use the 10% cut-off, the results are indeed stronger. However, this limitation requires omitting many countries that do not have sufficient data on stocks. Since we need a large cross-section of countries for our later tests on the determinants of the high volume return premium, we conduct most of our analyses using the 20% cutoff, even though this lowers the bar for an event to be defined as a volume shock. However, it should be noted that using this larger cutoff works against our hypothesis.

We employ returns and volume data for stocks traded in 41 countries for which we have sufficient data. For the United States, we obtain the returns and volume data from the CRSP database for all firms listed on the New York Stock Exchange and NASDAQ. For the other countries in our sample, we obtain returns and volume from Datastream International. Table 1 provides the list of countries used in our study along with characteristics of the volume data. The table shows, for each country, the starting date of the sample period, the number of 70-day intervals constructed from the available time series and the average number of stocks in each interval.[3] The time period for our analysis is limited by the availability of volume data for many countries. Although Datastream has returns from earlier periods, our analysis also requires volume data, which is not available until the 1980's, or even 1990's, for most countries (the exceptions being the U.S. and Canada). In order to make use of the greatest amount of data possible for any individual country, we allow sample periods to vary across countries, with every country's sample period ending on June 30, 2001.[4]

[3] The time periods for the 70-day intervals are the same across stocks and countries.

[4] The lack of a sufficient times series and cross-section of data for many countries also means that we cannot employ some of the additional analyses used in the Gervais, Kaniel and Mingelgrin (2001) study such as examining weekly data or using longer test periods such as 50 to 100 days even though these authors show that weekly results are stronger.

To be included in a country's sample, a stock must be a domestic stock traded on a primary exchange in the country and included in Datastream for the previous year.[5] In many of these markets, a large number of stocks are traded only occasionally. We therefore employ filters designed to ensure that nontrading of securities, outliers, or important firm capital events do not affect our analysis. Specifically, we require that the stock must trade for at least 40 of the first 49 days of each 70-day trading interval, and that its local currency price must not be in the lowest five percentile of stock prices in the country's sample for the year.[6] We omit observations with an earnings or dividend announcement during a three-day window around the formation date. Finally, we require the stock not to have had any major capital events during the year previous to the formation date.[7] Consequently, the number of stocks in each country used in the sample is smaller than what is available on Datastream.

Beyond these filters for individual stocks, we also consider whether a country had an adequate number of stocks trading in order to construct meaningful within-country portfolios. Thus, we left out from our sample any country whose major exchange did not have data, on average, for more than 20 stocks per trading interval. This criterion resulted in the omission of 9 countries with stock data available on Datastream, Colombia, Venezuela, Russia, Kenya, Peru, Cyprus, Hungary, Czech Republic, and Zimbabwe, leaving us with the 41-country sample.

Table 1 shows the large variation across the countries in the number of stocks included in the intervals. Even with our restriction of eliminating any country that

[5] For countries with more than one major exchange (defined as an exchange with at least 5% market share), we combine the exchanges. The countries with multiple exchanges include Belgium, Canada, China, Germany, India, Korea, Poland, Spain, and the U.S. For purposes of this study, we consider Hong Kong as a separate country from China as it was separate for the majority of the sample period.

[6] Because of the lack of trading for many of the stocks in our sample, we must allow for some nontrading. If we do not allow some nontrading, we would lose too many observations for a number of the countries.

[7] We define major capital events as events such as mergers, delistings, partial liquidations, and seasoned equity offerings.

averaged fewer than 20 stocks in the available intervals, some of the remaining countries still have a relatively small number of stocks with sufficient data. For example, Morocco and Argentina have, on average, less than 30 stocks that meet the data requirements. Across countries, the average number of stocks in an interval is 229.

For each of the 41 countries remaining in the sample, we plot in Figures 1 and 2 the evolution of the average cumulative returns conditional on their formation-day trading volume shocks. That is, for each country, at the end of every fiftieth trading day, we form equally-weighted portfolios of stocks classified according to their relative trading volume on that day. A stock whose trading volume on the fiftieth day falls within its top (bottom) 20 percentile of its daily trading volume over the previous 49 trading days is categorized as a "high volume" ("low volume") stock; otherwise, it is categorized as a "normal volume" stock. The average cumulative return over the following twenty-day test period is plotted in each figure for the high extreme volume, normal volume and low extreme volume portfolios. Figure 1 shows the results for the developed markets and Figure 2 presents them for the emerging markets in our sample.[8]

Figure 1 shows that for the developed markets, the results are striking in their similarity to the results for the United States and in their pervasiveness across markets. The figure demonstrates that in nearly all cases, the high extreme volume portfolios have greater cumulative returns over the test periods than do the normal or the low extreme volume portfolios. The figure also indicates that in nearly all cases, the normal volume portfolios outperform the low extreme volume portfolios.

Figure 2, which reports the results for the emerging markets, indicates that the differences in returns over the twenty-day test periods between the high, normal and low volume portfolios in emerging markets are not as well-defined as are those of the developed markets. The figure shows that in the majority of these markets, the high

[8] The figures use the same scale (-1.5, 3.5) for all countries except for several emerging market countries whose spreads are outside this scale: Brazil, China, Greece, Philippines and Turkey.

volume portfolio return appears to be greater than the returns on the other two portfolios, but the differences are not as large.

In sum, just examining the raw data, we observe that the vast majority of developed countries and some emerging market countries appear to have significant differences between their high-volume and low-volume portfolios. In the next section we examine these differences more formally.

2.2 Reference return and zero-investment portfolios

If the high volume return premium is a persistent phenomenon in each of the sample countries, we should be able to form portfolios to take advantage of it. To test this hypothesis, we follow Gervais, Kaniel and Mingelgrin (2001) and construct two types of portfolios for each country: zero-investment and reference return portfolios. To create the zero-investment portfolio in a given country, at each formation period we take a long position for a total of one dollar in all of the high-volume stocks, and a short position for a total of one dollar in all of the low-volume stocks in that country. We equally weight the stocks in each long and short position of the country's portfolio and then hold the portfolio for the subsequent twenty-day testing period without rebalancing. The resulting portfolio return for country *i* over interval *t* then consists of a net return,

$$NR_{i,t} = R_{i,t}^{h} + R_{i,t}^{l}$$

where $R_{i,t}^{h}R$ denotes the return on the high volume portfolio position and $R_{i,t}^{l}R$denotes the return on the low volume portfolio position.

We construct each country's reference return portfolio (e.g., Conrad and Kaul, 1993; Lyon, Barber, and Tsai, 1999, Gervais, Kaniel and Mingelgrin, 2001) by investing a dollar long into each stock that has high extreme volume and offsetting the long investment by shorting a dollar's worth of a size-adjusted reference portfolio so that the net investment is zero. Correspondingly, we invest a dollar short into each stock that has low extreme volume and offset it by a dollar long investment in a size-adjusted reference

portfolio. These portfolios are formed so that each high (low) volume security is offset by the other securities of the same size in the same country. That is, each long and short position is offset by a reference portfolio.

To construct the size-adjusted reference portfolios, we form, for each country, one, two or three size portfolios based on each stock's market capitalization at the end of the previous year. Ideally, we would construct three size portfolios in every country in our sample; however, some countries have a relatively small number of securities. Thus, we group the stocks in a country into one, two or three size portfolios depending on the number of stocks traded and the range of market capitalizations in a given country. Specifically, we use the following algorithm to determine the number of size portfolios in a country: We first divide the country's stocks into deciles based on their market capitalizations and we compare the median of the largest market capitalization decile to that of the second smallest market capitalization decile. If this ratio is greater than 500 and there are more than 400 securities trading in the market, then we divide the market into three size portfolios. If the ratio of the two medians is greater than 100 and there are between 100 and 400 securities trading in the market, or if the ratio is less than 100, but there are more than 250 securities trading, we then group the stocks into two size portfolios. In all other cases, the market is not divided into size portfolios and grouped as one.

As in the zero-investment portfolio, the reference return portfolio is held for a twenty-day testing period without rebalancing. The rationale for using the reference return portfolio approach, as compared to the zero investment approach, is to prevent bias in the return measures if the low-volume stocks are substantially smaller or larger than the high-volume stocks. As we show in a later section of the paper, this concern is warranted because the return on the reference return portfolio is decreasing in firm size.

Our choice of using size as the relevant characteristic for constructing reference portfolios is driven by several considerations. While Conrad and Kaul (1993), Lyon,

Barber, and Tsai (1999), and Gervais, Kaniel and Mingelgrin (2001) use firm size as the relevant characteristic for reference portfolios, it can be argued that these studies are based on U.S. data and that size adjustment may not be the most appropriate choice for markets around the world. We employ size-based reference portfolios for several reasons. First, size is the firm characteristic that is most readily available for the firms in our sample. Employing another characteristic, for example, the market-to-book ratio would reduce the sample size substantially. Second, firm size has been found to be significantly related to stock returns in many countries around the world, both in developed markets as well as emerging markets (e.g, Bauman, Conover and Miller, 1998; Chui and Wei, 1998; Rouwenhorst, 1999). Furthermore, firm size has also been found to be related to liquidity and transaction costs (e.g., Keim and Madhavan, 1997; Lesmond, Ogden, and Trzcinka, 1999), although the relation between transaction costs and firm size in emerging markets may be more questionable as Lesmond (2005) finds no relation between these two variables.

Table 2 presents the average returns of these two investment strategies along with the Newey-West (1987) t-statistics from significance tests. The averages are calculated over the sum of the available twenty-day intervals.[9] The results for the developed countries are presented in Panel A, with the G-7 countries listed first and other developed countries listed second; The results for the emerging market countries follow in Panel B. The table shows that the results for the zero-investment portfolios and the reference return portfolios are largely similar with the latter being significant somewhat more often.

Focusing on the reference return portfolios in Panel A, we note that the only developed countries that do not show significantly positive average returns over the twenty-day test period are Norway and the Netherlands. In any of the other 18

[9] The number of twenty-day intervals used for each country is shown in Table 1.

developed markets, a strategy of going long in the high volume stocks and short in the low volume stocks would result in significantly positive returns over a twenty-day holding period. These returns range from 0.16% in Austria to 0.85% in Canada. For the zero-investment portfolios, we find that 15 of the 20 developed countries have significantly positive returns, with the significant returns ranging from 0.65% in Switzerland to 1.59% in Singapore. In general, the results for the developed countries show that the high-volume return premium is an important effect, which is pervasive across markets.

Panel B of Table 2 shows that the high-volume return premium is not as persistent in the emerging market countries as it is in the developed markets. Even so, for the reference return portfolios, we find a significant positive return in 9 of the 21 emerging market countries, and in eight of these nine emerging markets, we find a significant positive return on the zero-investment portfolios as well.

One potential explanation for the lack of results in the emerging markets is that the power of the tests is simply too low due to lack of data, both in terms of an inadequate time series and in terms of the number of securities traded in these countries. For example, Poland has 157 intervals and an average of 30 stocks per interval. Moreover, the median number of stocks per interval for the emerging markets with significant returns on the zero-investment portfolios is 179, while the median for those without significant returns is 49, suggesting that the number of securities may be important. To test whether low power could explain the lack of significant results for these countries, we conduct a series of alternative tests.

In the first test, we examine whether the differences in time series matter. As we indicated previously, the data availability for the emerging markets improves significantly only in the second half of the sample. Therefore, we check whether the lack of significance can be explained by the limited nature of the time series we have for these markets. To do so, we divide the sample for the G-7 firms into two five-year subperiods and calculate the zero-investment and reference return portfolio returns for each of the

subperiods. Our results, shown in Table 3, are still statistically significant, but the t-statistics tend to be lower.

In a second test, we examine next whether the number of securities per interval can affect the outcome. Our strategy is to examine the distribution of the significance of the results in random draws of smaller samples from the G-7 countries. Specifically, for each of the G-7 countries, we randomly sample a group of 50 and a group of 100 stocks every period and form zero-investment and reference return portfolios from these groups; we then calculate the t-statistics on the returns. We repeat this procedure for hundred times and compare the distribution of the t-statistics we obtain across the portfolios with different numbers of securities. We report the 90th, 75th, 50th, 25th and 10th percentile values of the t-statistics for each portfolio for each country in Table 4. Comparing the t-statistics for similar percentiles across the 50-stock and the 100-stock portfolios shows that in every case the t-statistic for the 50-stock portfolio is lower. These results are consistent with our supposition that low power could explain the lack of significant results for the different countries.

In still a third test (not shown), we allow for overlapping test periods. The overlapping test period approach provides more intervals and consequently, greater power in the tests.[10] We start the subsequent test periods eleven days after the former period, rather than twenty-one days as in the previous approach. The results for the reference return portfolios and zero-investment portfolios are consistent with the hypothesis that lack of power explains the lack of significant results for some countries. With the increased number of testing periods, we find that 14 of the 21 emerging countries have significant high volume return premiums on the 20th day (according to the reference return portfolios). Similarly, we find that using overlapping testing periods results in a significant high volume return premium for Norway and the Netherlands, the

[10] Recall that we employ Newey-West (1987) t-statistics so that the greater power is not the result of autocorrelations in errors from using overlapping test periods.

two developed countries that previously did not have a significant premium.

In summary, the results in this section provide evidence that the high volume return premium is remarkably pervasive across countries – for almost all developed markets, and for some of the emerging markets, extreme volume shocks predict significant positive short-term returns. Further analysis suggests that the phenomena may exist in even more countries as the tests for those countries without significant positive high volume returns could be affected by low power due to the smaller numbers of securities. Moreover, it should be noted that even for the countries without significantly positive returns to these strategies, there are no significantly negative returns.

2.3 Potential alternative explanations

Before turning to the tests of the cross-country determinants of the high volume return premium, we first examine whether our results could be explained by differences in risks or liquidity between the high volume and low volume portfolios.

2.3.1 Potential risk differences between high volume and low volume portfolios

One potential explanation for the differences in return we find between the high volume and low volume stocks could be differences in risk between the two groups. We test this possibility by examining whether there are differences in risk factor exposures between the high and low volume shock stocks. To do so, we need the risk factors for *each country* that correspond to the Fama-French (1993) and Carhart (1997) four-factor model.[11] We construct separate factor models individually for each country by using the methodology of Liew and Vassalou (2000) to create country-specific factors. Specifically, for all of the stocks in each country for which we can obtain book values,

[11] Griffin (2002) shows that using country-specific factors is more appropriate in explaining time-series variation in international stock returns.

market capitalizations and 12-month past returns each year, we create country-specific factors through the following process: Each year, we sort a country's stocks by their book-to-market ratios and create three portfolios. Within each book-to-market portfolio, we then sort the stocks according to their size. For each country, we then have nine portfolios, each of which is further sorted by their momentum, that is, the average of the previous year's returns, excluding the most recent month. This results in a total of 27 portfolios for each country, which are drawn on to estimate the HML, SMB and WML factors.[12]

With these constructed country-specific factors, we then estimate the average differences in risk exposures (betas) between high and low volume stocks in each country. We do this using a methodology similar to that of Gervais, Kaniel and Mingelgrin (2000), except that they use a single factor and we use four factors. We estimate a joint four-factor model for the test period returns of both the high and low volume portfolios in each country. This joint model is estimated using a seemingly unrelated regression model (SURE), which allows the disturbance terms for the high and low volume portfolios in each trading interval to be correlated. The differences in the average risk exposures are displayed in Table 5. As the table indicates, we find no significant differences in factor exposures between high and low volume stocks for any of the G-7 countries. Moreover, out of 52 possible risk exposure differences among the 13 other developed countries, we find only one to be significantly different from zero at the five percent level and two at the ten percent level. Similarly, out of the 68 possible risk exposure differences in the 17 emerging markets for which we have sufficient data to run the four-factor model, we find only five to be significantly different from zero at the

[12] As Liew and Vassalou (2000) point out, their portfolio construction procedure differs from that of Fama and French (1993) who use independent sorts to create the Fama-French factors. The rationale for the difference is that independent sorts cannot be used in many countries because of the small number of securities. However, Liew and Vassalou found that when they reverse the sorting order and repeat their tests, their main results remain qualitatively the same.

five percent level (one of which is in the wrong direction) and one at the ten percent level.

Using the same methodology, we also employ country-specific factor-mimicking portfolios based on cash flow-to-price, dividend-to-price, book-to-market and earnings-to-price ratios, as in Fama and French (1998).[13] Specifically, in these tests we estimate a joint two-factor model for the test period returns of both the high and low volume portfolios using each factor-mimicking portfolio spread individually combined with the market portfolio return. Table 6 reports the average differences in risk exposures. When we define risk factors by these alternative variables, we find, again, very few countries with significant risk exposure differences between the high and low volume portfolios.

In a final test for whether differences in risk exposures can explain our results, we employ a global market model using the Datastream world market index and test for differences in market betas across the high and low volume portfolios in each country. The results (not shown) are consistent with those for the individual country factors shown in Tables 5 and 6; almost all of the countries show no significant difference in the risk exposures of the high versus low volume portfolios.

2.3.2 Potential liquidity differences between high and low volume portfolios

A second potential explanation for the high volume return premium is that the effects are driven by a change in the stock's liquidity. Previous studies provide evidence that stocks can carry a liquidity premium (e.g., Amihud and Mendelson (1986), Pastor and Stambaugh (2003), and Acharya and Pedersen (2005)).[14] If stocks carry such a premium, then a high volume shock event could conceivably result in a change in a stock's liquidity premium, changing its return. Gervais, Kaniel and Mingelgrin (2001) consider this possibility and provide evidence against a liquidity-based explanation for

[13] We obtained the returns on these factor-mimicking portfolios from Ken French's website.
[14] See Amihud, Mendelson and Pedersen (2005) for a review of this literature.

the high volume return premium found in the United States markets. If, despite their results, the high volume return premiums in other countries reflect changes in liquidity, then the implication is that each stock has a time-varying liquidity component and that the rates of changes in liquidity systematically vary.

To test whether differences in liquidity between the high and low volume stocks can explain the high volume return premium, we double sort the stocks with extreme volume shocks in each of the developed countries, first into quintiles by their relative volume, and then into liquidity quintiles based on their estimated liquidity betas using the Pastor and Stambaugh (2003) specification.[15] As in Pastor and Stambaugh, we estimate the liquidity betas, controlling for market, size and book-to-market factors, which we construct for each country individually following Liew and Vassalou (2000), as described in the previous section.

In Table 7, Panels A and B, we present the returns for each of the volume-liquidity stock groups pooled by region, sorted by their volume and liquidity betas.[16] The table also provides the differences in returns between the highest and lowest volume portfolios within each liquidity group. Panel A shows the results pooled by continent and Panel B shows the results grouped by G7 and other developed countries. We find that in every liquidity quintile, the difference in returns between the highest and lowest volume stocks is positive and significantly different from zero. Furthermore, the results show that within a given liquidity quintile, in most cases, the return is monotonically increasing across the volume shock quintiles.

Finally, Panel C shows the differences in returns between the highest and lowest volume stocks for each liquidity quintile portfolio for each country with sufficient data. Consistent with the pooled results shown in Panels A and B, in most countries, the

[15] Due to the need for a relatively large number of stocks and intervals to conduct the regressions and sorts, we restrict this analysis to the developed countries with sufficient data. We provide more information about our model specifications in the Appendix.

[16] Countries enter the panel data according to the beginning date whentheir data becomes available

difference between the high and low volume stocks within each liquidity quintile is significantly different from zero at least at the five percent level. Overall, the results from Table 7 suggest that differences in liquidity cannot explain the high volume return premiums we document.

3. Determinants of the high volume return premium

Having established that the high volume return premium exists across many countries and that it is robust to risk and liquidity differences, we next turn to the important question of what drives the premium. That is, we seek to identify which market, investor and firm characteristics are related to the premium. Specifically, we test whether the existence and the magnitude of the high volume return premium are related to country-level characteristics such as a country's investor base and its financial market (that is, the degree of its development, market liquidity, its legal origins, information measures, concentration) as well as to firm-specific characteristics that may affect a firm's visibility such as firm size, turnover, volatility, block ownership, index membership and the extent of its analyst coverage.

3.1 Cross-country determinants of the high volume return premium

We develop hypotheses regarding how certain characteristics of a stock and its information environment would be expected to affect the magnitude of the high volume return premium. To develop these hypotheses we use Merton's (1987) investor recognition hypothesis. In his work, Merton hypothesizes that when investors do not have information about a stock, i.e., are unaware of the stock, a shadow cost exists. He then shows that the magnitude of this shadow cost depends on the following four factors: investors' aggregate risk aversion, the firm's unique risk, the firm's proportional investor base (i.e., the proportion of investors who are aware of the firm) and the size of

the firm relative to the aggregate wealth of investors in the firm.[17] Thus, if a high volume shock changes the visibility of a firm, Merton's hypothesis implies that the degree to which the stock's expected return changes depends on these factors.

Because we can gather data on market and investor characteristics across a greater number of countries than that for which we can obtain data on firm-specific characteristics, our first set of tests employs only country-level variables. In our second set of tests, we expand our analysis by adding firm-specific variables along with the country-level data. In our final set of tests in this section, we focus only on the firm-specific variables and estimate regressions within each of the G7 countries separately. In the next two sub-sections, we discuss the choice and measurement of the country-level variables that we consider.

3.1.1 Demographics

A firm's investor base depends on the demographics of the potential investor base as well as differences across firms in the distribution of information across those investors. While the potential investor base will depend largely on country characteristics, the differences in how information is distributed across firms and across investors can depend on both country and firm characteristics. Thus, we first examine the demographics of countries' markets to derive proxies that capture the systematic differences in the potential investor base across countries. We then examine the characteristics of the information structure in each financial market as these structures affect the proportion of investors who are aware of a particular stock.

A country's demographics determine its relative investor base and consequently, should influence the magnitude of the return premiums associated with changes in the visibility of stocks in that country. We construct two variables to proxy for the size and

[17] Kadlec and McConnell (1994) and Chen, Noronha, and Singal (2004) use Merton's (1987) shadow cost to test for changes in stock value upon being listed on the NYSE or added to the S&P 500 Index, respectively.

the sophistication of a country's potential investor base, namely, the number of listed companies per urban population (in millions) and the level of education in the country (secondary school enrollment). For most countries, we collect these two demographic measures using data obtained from Global Prospectus.[18]

The number of listed companies per million of urban population provides a relative measure of the investor base for each stock in that country. In our sample of 41 countries, the median number of listed companies per million of urban population is about 22 companies. Some countries have very few listed companies relative to the size of their populations, (e.g., China (1.5), Mexico (3.0) or Indonesia (3.3)). Other countries have a substantially larger number of listed companies relative to their urban populations (e.g., Singapore (66.0), Australia (76.3) or Japan (93.7)). Although a better demographic measure would be the proportion of individual investors in each stock market, we do not have access to this data for markets outside the U.S.[19]

There are at least two possible interpretations regarding the effects of the investor base as measured by the number of listed companies per million of urban population on the magnitude of the high volume premium. First, ceteris paribus, one could expect that the more stocks traded per potential investor, the less likely a given stock would be visible to all investors and the more likely the stock would require some type of visibility event such as a volume shock to increase its investor awareness. Consequently, one would expect the high volume return premium to be increasing in this measure. A second possible interpretation, on the other hand, is that the number of listed

[18] The one exception is that Global Prospectus does not include information on Taiwan. We obtain the data on Taiwan from Standard and Poor's *Emerging Stock Markets Factbook* and from Taiwan's statistical yearbook on their website.

[19] The use of number of listed companies per million of urban population is also imperfect because it assumes a sufficient percentage of the population is invested in stocks to begin with. We use urban population rather than general population to achieve a better proxy. We assume an urban population is more likely than a rural population to invest in a country's equity markets. If the market has few stocks per urban population, but the urban population is not representative of investors, then we are less likely to find a significant association between the variable and the high volume return premium.

companies per capita reflects the development of the market. More developed markets would be expected to have a higher level of investor participation and higher investor awareness of all stocks. Thus, the implication with this interpretation is that the high volume return premium would be decreasing in this measure.

Secondary school enrollment, on the other hand, captures an alternative dimension of a country's demographics; it provides a general measure of the population's education level. This measure is defined as the ratio of total secondary school enrollment, regardless of age, to the population of the age group that officially corresponds to the level of secondary school education. That is, it is the percentage of the population that should be in secondary school that actually is in secondary school. We expect the general level of a country's education to be correlated with the sophistication of the individual investors, which is the measure we would really like to have. Ceteris paribus, the more highly educated the population is in a country, the greater we would expect the degree of accessibility to financial information and investors' awareness of stocks to be in this population; that is, there should be relatively fewer uninformed individual investors in the base.[20] Thus, the high volume return premium should be decreasing in the country's level of education.

3.1.2 Development, investor confidence and information characteristics

We next discuss how other characteristics of a financial market such as its degree of development, the level of investor confidence, the degree of market concentration and the quality of its information environment can affect the magnitude of the high-volume premium.

[20] Bekaert, Harvey and Lundbland (2001) find that countries with higher education levels (proxied by secondary school enrollment) show stronger increases in economic growth following financial liberalizations. Similar to the caveat with our other demographic variable, if the secondary school enrollment is an inadequate proxy for the level of investor sophistication, then we should find no significant association with the high volume return premium.

In Section 2, we provided evidence that there exist differences in reference portfolio returns between the developed and emerging markets. This is indicative that the magnitude of the high volume premium is related to the degree of development of a country's market. To test this relationship formally, we designate countries as being in one of three groups based on market development: the most developed markets (G-7 countries), the other developed markets, and emerging markets. We then measure the effect of the degree of market development on the high volume premium through two dummy variables representing the extreme cases of development: G-7 countries and emerging market countries.

In addition to the degree of market development, we might expect variables that reflect the level of investor confidence in a market and in its information environment to affect the high volume return premium as well. In fact, Merton's (1987) hypothesis implies that systematic differences in aggregate market risk aversion across countries should affect the size of the high volume return premium. Although we do not have direct measures of risk aversion differences across countries, we do have measures of investor confidence, which could be correlated with investors' risk aversion. The rationale is that if investors are less confident about a financial system, then they may be more likely to exhibit additional risk aversion in their investment behavior.

Our proxy for measuring the level of investor confidence in a country is the accounting standards index, obtained from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998), which is a measure of the quality of the information available to investors. It is constructed based on the examination of company reports from different countries and a higher value of the index indicates better accounting standards in a country.[21] We also consider related measures to capture countries' legal origins, specified as dummy variables indicating the origin of the country's legal system: Scandinavian law, French

[21] For the countries in our sample, the accounting standards index ranges from 24 to 83, with a mean (median) of 63 (64).

law, German law, with the omitted variable being English law. These measures, also obtained from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998), are designed to proxy for the degree of investor protection that would be expected to exist across different legal systems.[22]

Alternatively, it is possible that the level of investor confidence can reflect the need in a market for some type of investor visibility event to attract investors' attention. This would suggest, for example, that countries with lower accounting standards or weaker investor protection may have less investor participation in their markets, and consequently, exhibit a greater impact on returns – and higher return premiums -- subsequent to a volume shock.

Yet another characteristic of a financial market that may be important for how the information environment varies across firms is the composition of the market. Indeed, in Merton's (1987) description of the types of stocks expected to have less investor awareness, he points out "neglected" stocks as investigated by Arbel, Carvell and Strebel (1983). Stocks are more likely to be "neglected" if they trade in a market dominated by a few large stocks or industries. If the dominant stocks are most visible during normal times, then the visibility of the other stocks, which are less visible in general, would be considerably enhanced by a high volume shock.

To capture this idea, we employ two measures for whether a market has dominant stocks (and, consequently, potentially neglected stocks); the first is a measure of the range of firm sizes in a market, and the second is a measure of the industry concentration. We measure the range in firm sizes in a country as the ratio of the average market value of the tenth-decile firms to the average market value of the second-decile firms by market capitalization. There tends to be large variation in this variable across countries. For example, while this ratio is 243 in the United States, it is

[22] Poland and China are eliminated from this analysis because they do not fit into one of these four regimes.

932 for Australia, suggesting that, in some countries, there is a sizeable range between the large and small companies. This market value ratio, thus, reflects the degree to which large stocks could normally mask smaller stocks. The latter would then need some type of additional visibility for investors to be aware of their presence.

Similarly, if a market is dominated by a few industries, then a high volume shock to stocks in less dominant industries should increase significantly their visibility.[23] To measure the extent of industry domination in a given market, we employ the share of the country's market capitalization accounted for by the largest three industries in the market. For at least half of the countries in the sample, the share of the stock market represented by the largest three industries is greater than 50%, a substantial dominance by these industries. In fact, in Brazil, the three largest industries represent 89% of the market capitalization, compared to the United States, where the three largest industries represent less than 25%.

For both of these measures of potential market domination or concentration, the implication of Merton's (1987) investor recognition hypothesis is that a positive relation should exist between the measures and the magnitude of the high volume return premium.

Merton (1987) also argues that firm size can be a proxy for a firm's investor base. Thus, we expect the high volume return premium to be related to firm size and allocate the extreme volume stocks to size portfolios using the same size classification methodology described earlier in Section 2. We then include dummy variables for firms that are in the large and medium size categories.

Finally, we characterize the information environment in a country's market using a measure of the proportion of systematic versus firm-specific information, namely, the average R^2 of the market model. Such an interpretation of the R^2 of the market model

[23] In the vernacular of Arbel, Carvell and Strebel (1983) and Merton (1987), these could be considered "neglected" industries.

was first pointed out by Roll (1988) who suggests that the R^2 provides an indication of the relative levels of the market-wide versus firm-specific information in equity securities. Roll and, subsequently, Durnev, Morck, Yeung and Zarowin (2003) provide further evidence in support of this interpretation. The intuition is simple: If the market model explains, on average, a large amount of the variation in stock returns, then this suggests that less firm-specific information is reflected in a country's stock prices. In addition, Jin and Myers (2006) provide a different, but related interpretation of the R^2 measure. They argue that R^2 reflects the firm's opaqueness, i.e., lack of transparency. The implication from any of these interpretations is that to the extent a country's prices contain less information, we would expect them to have greater sensitivity to changes in visibility induced by increased volume.[24]

In Section 2, we tested whether the return differences between the high and low volume stocks could be a result of differences in their systematic risks or liquidity. We did not find evidence supporting either hypothesis. The possibility remains, however, that differences in the high volume return premium across countries is due to differences in average level of risk or liquidity across the countries. Thus, in addition to all of the country-level variables that are aimed at capturing the characteristics of each market, we need to control for possible differences in country-level risk and liquidity in our regressions. We add a variable for the general risk level in a country's equity markets, measured as the average return volatility of the stocks traded in the market. We also include a measure of the aggregate liquidity of a country's stock market in our regressions. Since our previous liquidity measure used in Table 7 is only available for developed markets, in this analysis we proxy for market liquidity with a coarser estimate, namely, the market turnover ratio, defined as the total value of shares traded divided by average market capitalization.

[24] The mean R^2 for our countries is 0.12 with a standard deviation of 0.10. This number is comparable to that of Morck, Yeung, and Yu (2000), who use weekly data for 37 countries for 1995 and find a mean R^2 of 0.169 and a standard deviation of 0.099.

We expect that many of our explanatory variables may be related to each other. We checked for correlations between our explanatory variables. While we found some strong correlations, we did not find any that were particularly problematic. For example, not surprisingly, we find that the emerging market indicator is negatively correlated with the two demographic variables and the accounting standards index. However, it does not exhibit meaningful correlation with any of the market characteristic variables. The two measures of concentration are somewhat correlated (38%), implying that markets that are dominated by a few industries also have some tendency to be dominated by larger companies. Finally, we find strong correlation between the accounting standards index and the number of listed companies per urban population (45%).

3.1.3 Cross-country tests of the determinants of the high volume return premium

In this section, we conduct tests of the cross-country determinants of the high volume return premium using multivariate Fama-MacBeth (1973) tests in which we estimate a series of cross-sectional regressions for each interval from 1988 through 2000. The dependent variable in these regressions is the 20th day return on the reference return portfolios where we define extreme volume using the 20% cut-off discussed earlier. The independent variables are the country characteristics hypothesized to be related to the high volume return premium, along with the controls for differences in country-level risk and liquidity. We also control for differences between high and low extreme volume shocks.

The coefficients and the Newey-West (1987) corrected t-statistics from the Fama-MacBeth (1973) regressions are presented columns 1 and 2 in Table 8. We find that the magnitude of the high volume return premium across countries is significantly affected by many of the country-level variables we consider. According to our interpretation of Merton's (1987) investor recognition hypothesis, when a country has more listed companies, the investor base for each of the companies individually would

be expected to be smaller, allowing for a larger effect from a volume shock. Indeed, consistent with this interpretation, we find that countries with more listed companies per urban population show greater high volume return premiums. On the other hand, our tests show no apparent effect of the country's education level, although its absence could be a result of the crude proxy we are using for investor education.

In terms of the effect of the degree of market development, the results indicate that the magnitude of the high volume premium is no different in emerging market countries than it is in developed countries that are not in the G-7. However, the positive coefficient on the G-7 variable suggests stocks in a G-7 country are more susceptible to the effects of an extreme volume shock, ceteris paribus. This result is consistent with the hypothesis that since these markets have more individuals per capita who are exposed to and participate in the stock market, there may be a relatively greater proportion of investors who would be susceptible to investor visibility shocks.

Next, we turn to the measures of market concentration: Both measures have a positive association with the high volume return premium. That is, countries with a larger market value ratio (i.e., greater range of firm sizes) and countries in which the market is dominated by a few large industries (largest three industries) exhibit a greater return associated with a volume shock. The fact that the high volume return premium is increasing in both measures of market concentration is consistent with the implication that in the presence of greater market concentration, investors tend to focus on the more dominant stocks (either because of size or industry). Thus, consistent with our interpretation of Merton's (1987) investor recognition hypothesis, in a market with a few dominant stocks or industries, a given change visibility through a volume shock becomes all the more important in making individual investors aware of the other stocks.

We find support for Merton's (1987) argument that firm size (as a proxy for its investor base) is a factor in the magnitude of the effect from a visibility event; the estimated coefficients on the two dummy variables for size in Table 8 confirm that small

firms have significantly higher returns for extreme volume shocks than do medium or large firms; in turn, medium size firms also have greater returns for extreme volume shocks than do the large firms.

We find that the level of investor confidence in a country, as proxied by the accounting standards index in our analysis, is negatively related to the magnitude of the high volume premium. This implies that markets in which investors have less confidence due to weaker accounting standards have larger high volume return premiums. This result suggests that controlling for other differences, investors in such markets are more susceptible to changes in a stock's visibility because they put less credence in the accounting information available regarding the stock. Furthermore, if one also interprets the country's accounting standards index as reflecting the amount of firm-specific information or the transparency incorporated into the stock prices in the country, then the coefficient on this variable is also consistent with the coefficient on the R^2 variable.[25]

On the other hand, the high volume return premium does not seem to vary across countries with different legal origins. Thus, if legal origins represent the protection of property rights as suggested by La Porta, et. al. (1998), these protections do not affect investors' response to a high volume shock.

Finally, Table 8 indicates that there exists a significant positive relation between the R^2 measure and the magnitude of the high volume return premium. This is supportive of the hypothesis that in countries in which stock prices have less transparency or less firm-specific information relative to market-wide information, the

[25] In unreported tests, as alternatives to the accounting standards index, we also used a country credit rating index obtained from Erb, Harvey and Viskanta (1996), which is based on a survey by *Institutional Investor* of global bankers' assessments of the country's credit risk; an index of country risk, which is the International Country Risk Guide (ICRG) index published by the PRS Group, Inc.; and a measure of whether shortselling is allowed in the country. The reported tests are not qualitatively affected by the use of these alternatives. The country credit rating index and the index of country risk are both significantly related to the high volume return premium. Higher country credit ratings and higher ICRG ratings are associated with smaller high volume return premiums. The shortselling measure is not significantly related with the high volume return premium.

effect of a volume shock that captures investors' awareness is significantly greater. We interpret this result as evidence that when there is less firm-specific information incorporated into stock prices, there correspondingly exists a greater likelihood that a volume shock will make a stock more visible to investors, impacting prices.

This finding combined with the insignificant coefficient estimated on the country's legal origin variable has implications for the interpretation of R^2 in our regression model. Morck, Yeung and Yu (2000) argue that a high R^2, or stock price synchronicity, can reflect poor and uncertain protection of private property rights in countries. That is, the lack of property rights protection makes informed risk arbitrage unattractive, which increases market-wide noise trader risk. They argue further that the poor property rights protection can also imply that firm-specific information is less useful to risk arbitrageurs, leading to less capitalization of that information into stock prices. Both of these interpretations of the implications of a high R^2 would also be consistent with higher volume allowing investors to become more aware of individual stocks. On the other hand, our results regarding legal origins suggest that the poor protection of property rights is not related to the high volume return premium. We therefore conclude that our findings are more supportive of Jin and Myers' (2006) interpretation of the R^2 as a measure of opaqueness.

Finally, Table 8 shows that neither of the country-level controls for the aggregate level of risk or liquidity seems to be important in our regressions. The estimated coefficients indicate no significant relation between the high volume return premium and our proxy for aggregate liquidity, the equity market turnover ratio. Thus, these results do not support the hypothesis that differences in high volume premium across countries can be explained by differences in the level of aggregate liquidity.

In the remaining columns of Table 8, we check the robustness of our results by first, changing the extreme volume definition from 20% to a 10% cut-off for the full sample, and then by estimating the regression with the 10% cut-off definition using only

the last five years of the sample period. The results from all of the models are generally consistent with the main results based on the 20% cut-off definition. The fact that the magnitude and the significance of the coefficients obtained with the 10% cut-off over the last five years are similar to those estimated over the full sample with either the 20% and 10% cut-offs period suggests that changing market structures due to financial innovations and liberalizations over the sample period have not changed the relation between the high volume return premium and its country-level determinants. We discuss this issue more in detail in Section 5 of the paper.

Finally, to test the robustness of our results to alternative model specifications, we also ran a fixed-effects pooled regression model using all of the individual observations. The results of this regression are consistent with those of the Fama-MacBeth (1973) regression approach shown in Table 8. Due to the conservatism of the Fama-MacBeth (1973) approach, we have chosen to present only those results.

3.2 Cross-country and firm-specific determinants of the high volume return premium

In this section, we add firm-specific characteristics to the analysis and examine their explanatory power along with the country-level characteristics. Our strategy is to examine the firm-specific determinants first using cross-country analysis; we then take a deeper look by investigating within individual countries.

3.2.1 Cross-country analyses

In this section, we consider the high volume return premium at the individual firm level. That is, in our regressions, we replace the dependent variable with the 20th day cumulative return on firms with extreme volume shocks, and we add individual firm characteristics as independent variables along with country-level variables. Specifically, we consider additional firm characteristics such as firm's size relative to the country's

market capitalization; whether the firm is a member of a global index (FTSE Index); whether the firm has analyst coverage and its level normalized for the country coverage; whether the firm is followed by the S&P Transparency and Governance Index, and if followed, its rank; the ratio of the firm's idiosyncratic volatility to the country's average firm idiosyncratic volatility, and a dummy for whether the firm had a high (versus low) volume shock. The country-level variables we include in this specification are, as before, the number of listed companies per urban population, the secondary school enrollment, the ratio of the average market value of the tenth-decile firms to the average market value of the second-decile firms by market capitalization, the share of the largest three industries in total market capitalization, the average R^2 from the country's market model, the market turnover ratio, the equally-weighted market return volatility, and indicators for whether the country is an emerging market or G-7 country.

We estimate a series of cross-sectional regressions at the individual firm level. Table 9 presents the coefficient estimates and the Newey-West (1987) corrected t-statistics. The table indicates that even after including the firm-specific variables and estimating the regressions at the individual firm level, we obtain results for the country-level variables that are similar to those from the previous country-level regressions without firm-specific variables. Although the share of the largest three industries is no longer significant, the listed companies per urban population, market value ratio, average R^2, and G-7 indicator remain significantly positive as in Table 8.

Turning to the estimated coefficients on firm-specific variables, we see that the coefficient on the firm-specific size variable, i.e., the ratio of a firm's capitalization to the country's total market capitalization, is consistent with coefficients on the size variables employed in Table 8. Again, we find evidence that the 20th day return is decreasing in firm size. In other words, a firm that is small relative to the other firms in the same market is more likely to be affected by an extreme volume shock presumably because it is less likely to have already had investors' awareness.

Also related to firm size in terms of a firm's visibility would be the effect of membership in a broad-market index. That is, companies that are included in a global index would be expected to be more visible to investors in general, and an extreme volume shock would not be accompanied by as high a return as firms that are not included in the index. To capture this idea, we include a dummy variable indicating whether the company is in the FTSE all-global index. As the results in Table 9 show, consistent with our expectation, the association between the FTSE dummy and the high volume return premium is significantly negative.

We next examine the effect of analyst coverage on the magnitude of the high volume premium. We expect that the availability of analyst coverage should increase the visibility of the firm, a priori, and therefore should dampen the impact of a volume shock. In our test, we distinguish between the availability of any coverage and its intensity by employing two different variables to proxy for analyst coverage. The first is a dummy variable that takes the value of 1 if there exists at least one analyst providing coverage for the firm in a given year. To measure the intensity of the coverage a firm receives, we consider the number of analysts covering the firm relative to the general level of analyst coverage available in the country; specifically, we construct the ratio of the number of analysts covering a given firm to the average number of analysts across all firms that have analyst coverage in the country.[26] The coefficient estimates in Table 9 show that although the intensity of the analyst coverage does not appear to have an effect on the high volume return premium, the existence of analyst coverage has a strong and significant positive relation with the high volume return premium.

A measure that may also reflect the visibility of a firm is the S&P Transparency and Governance Index measure, which captures how much a firm discloses about 91 items that investors may want information on. To construct a transparency measure, we

[26] We obtain analyst coverage from International IBES.

rely on a S&P a survey conducted in 2001 of the financial statements of more than 1500 firms worldwide on 91 selected items in the following three categories: ownership structure and investor relations (22 items), financial policy and accounting disclosure (34 items) and board structure and policies (35 items). From this survey, we obtain the count of disclosure items in each category and add these items together to get an aggregate measure of the firm's transparency. As pointed out by Durnev and Kim (2005, 2007), who also employ a similarly constructed index, this measure does not reflect the content of the disclosure, just whether the firm discloses the item or not. Durnev and Kim assume the measure provides an indication of the quality of a firm's disclosure. Using this measure as a proxy for the quality of the firm-specific information environment in our regressions, we find the magnitude of the high volume premium has a significantly positive association with the existence of a transparency measure for a firm, but it bears no significant relation to the magnitude of the firm's transparency measure.

While this positive relation between transparency and high-volume premium is consistent with our finding on how analyst coverage affects the high-volume premium, they are both puzzling in terms of the investor recognition hypothesis. The results suggest that firms that are more closely followed by analysts or S&P are more likely to experience a high return after a high volume shock. Since one would think that such firms would have more visibility, a priori, than the other firms, it is not clear how these results could be consistent with the investor recognition hypothesis. One possibility is that a visibility event such as a volume shock perhaps requires that a stock be brought to investors' attention *and* that the investor decide to purchase the stock. That is, it could be that when a firm that is more closely followed by analysts or S&P experiences a volume shock, it is easier for an investor to gather information about the firm and more likely for the shock to result in a purchase. Merton (1987) hypothesis, however, does not discuss the quality of the information which could be represented by these proxies. On the other hand, the fact that the high volume return premium only increases in the

existence of analyst coverage or S&P coverage but not in the level of analyst coverage or transparency may simply indicate a failure of the model.

Equally puzzling is the negative relation we obtain in Table 9 between the high volume return premium and the stock's idiosyncratic volatility, when Merton's (1987) investor recognition hypothesis would suggest a positive relation. One explanation for this result may be, again, that it is due to a simple failure of the model; if one is willing to consider differences in the quality of information across firms, however, it is possible to entertain an alternative hypothesis where the idiosyncratic volatility may be capturing differences in the quality of the information. Roll (1988), Durnev, Morck, Yeung and Zarowin (2003), Durnev, Morck and Yeung (2004), and Jin and Myers (2006) provide evidence and argue that firms' R^2's from a country market model reflect differences in the amount of information incorporated into prices across the firms, whether due to differences in private information or due to the opaqueness of the information. That is, their evidence would suggest that the quality of information may not be the same across firms. If this is the case, then it is possible that the relative magnitude of the high volume return premium decreases with greater idiosyncratic volatility due to the latter's relationship with the quality of information about the firm. That is, firms with lower quality of information, more opaqueness in the Jin and Myers' sense, may not have as great a return premium from a high volume shock because investors who are interested in buying the stock, given their new awareness, cannot get sufficiently clear information about the stock to choose to make the purchase. Since Table 9 shows that the high volume return premium is decreasing in idiosyncratic volatility, one could interpret the result to imply that although the high volume shock can increase the firm's visibility, how many investors choose to invest in the firm and how much the investor base increases depends also on how opaque information about the firm is.

Finally, in Table 9, we re-examine the relationship between investor base and high-volume return premium, this time, at the firm-level. As indicated before, Merton's

(1987) discussion and analysis suggests that a firm with a broader ownership base would have greater visibility and lower shadow costs. Consequently, a high volume shock would result in a lower return premium. We test this conjecture by obtaining block ownership information on firms for which this data is available, which constitutes a smaller sample of firms from 27 countries (Argentina, Austria, Belgium, Brazil, Chile, Czech Republic, Finland, France, Germany, Hong Kong, Indonesia, Ireland, Italy, South Korea, Malaysia, Norway, Philippines, Portugal, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom).[27] The second set of columns in Table 9 show the results when we include additional variables that capture the ownership base: the percentage ownership by blocks held by family and management and the percentage ownership of blocks held by outsiders (i.e., not family or management). We also include an indicator variable for whether the firm is included in the Worldscope database.[28] As can be seen from the table, these additional variables do not have significant coefficients and, moreover, the other coefficients on the other variables are little changed when these new variables are included. Thus, our results regarding the effect of the ownership base do not support, at least in the way in which we have implemented them, the implications of the investor recognition hypothesis. These results may be a consequence of the failure of our hypothesis. Alternatively they may be a consequence of an inadequate proxy for the ownership base.

Similar to the analyses presented in Table 8, Table 9 provides the results for the last five years of the sample with both a 20% cut-off and a 10% cut-off. Again the coefficients for the firm-specific variables are similar in magnitude and significance across the different specifications. This suggests that the high volume return premium does not have significant time variation – we test this hypothesis explicitly in a later section of the paper.

[27] The data was generously provided by Karl Lins and was used in Lang, Lins, and Miller (2004).
[28] The block ownership is defined as at least five percent ownership by an individual, group, or firm.

3.2.2 Within-country analyses

Next, we examine the firm-specific variables within individual countries. Due to the lack of sufficient data for many of the countries in our sample, we restrict this analysis to the subset of G-7 countries only. In the regressions, we include only the firm-specific variables employed in the previous subsection (Table 9) and we estimate them within each of the G-7 countries individually.[29] Because these regressions are estimated within each country individually, we cannot include the country-level characteristic variables since there is obviously no variation within a country.

The estimation results for the individual within-country regressions for the G-7 countries are shown in Table 10. We consider two alternative specifications. In regressions reported in Panel A, we include both firm total volatility and idiosyncratic volatility as independent variables; in Panel B, on the other hand, we leave out firm total volatility and include, this time, firm's R^2 as independent variables. Because of the mechanical relationship between the R^2, idiosyncratic volatility and total volatility, we cannot include all three at the same in the regression. The results from the within-country analyses are generally consistent with the cross-country analyses shown in Table 9, although we do not see significance uniformly across the countries for all of the variables. Firm size is, undoubtedly, the strongest determinant. At the five percent significance level, the high volume return premium is significantly decreasing in relative firm size in all of the seven countries. Similarly, the high volume return premium is significantly increasing in total volatility in six of the seven countries. The relation of the high volume return premium to the other firm-specific variables, inclusion in the FTSE index, idiosyncratic volatility, and analyst coverage, is more mixed, showing statistically significant coefficients in some countries but not others.

[29] We do not include the transparency variables in these regressions because they are only available for one time period and would limit the sample.

In Panel B where we have substituted the firm-specific R^2 for total volatility, the results are somewhat consistent with our earlier results on country-level average R^2's in Tables 8 and 9. The coefficient on R^2 in Table 10 Panel B is significantly positive at the five percent level for three of the seven countries. This is reminiscent of the positive relation we reported in Tables 8 and 9 between the high-volume return premium and R^2. A comparison between the results in Panels A and B of Table 10 provides some additional insight into the relation between the high volume return premium and these variables. A high R^2 occurs when the ratio between the idiosyncratic volatility and total volatility is low, which can develop from two sources: either the idiosyncratic volatility is low, or the total volatility is high. Our results indicate that the positive relation between the high volume return premium and R^2 is driven from both sources. Panel B includes the idiosyncratic volatility and R^2 in the regression but not total volatility, showing that the R^2 does not crowd out the idiosyncratic volatility effect.

In summary, our empirical tests show that a number of country-level and firm-specific variables can help explain the magnitude of the high volume return premium. Further, we find some support for our argument that, consistent with Merton's (1987) investor recognition hypothesis, the high volume return premium is a result of increased investor awareness of a stock. However, not all of the implications from our interpretation of Merton's hypothesis hold in the data, in particular, the high volume return premium, although related to the existence of analyst coverage and coverage by the S&P Transparency & Governance Index, does not change with the level of the coverage or the firm's transparency and governance rank. Nor do we find any relation between the high volume return premium and the level of block ownership in a firm.

4. Potential time variation in the high volume return premium

One concern may be that the variation over time in the high volume return premium and its constituents could affect our results and conclusions. In the previous

sections, we conducted some preliminary tests to address this concern. In Table 3, we split the G-7 countries' sample into two subperiods; while the power of the tests in each subperiod was lower due to fewer observations, the differences in the magnitude of the premium across time were not substantial. In Tables 8 and 9, where we presented our cross-country analyses of determinants of the high volume premium, we also conducted our tests with a sub-sample limited to the last five years. The results show that other than reducing the power of our tests due to the smaller number of observations in the sub-samples, we do not find substantial differences across time, suggesting that time variation does not change our central results. In this section, we take a more formal approach and employ several methods to characterize the time series properties of the high volume return premium. First, we test whether any trends or autocorrelations exist in the time series of the premium in each country. Next, we check whether the magnitude of the high volume return premium is systematically related to macroeconomic factors over time. Finally, we examine whether the increased presence of foreign investors over our sample period leads to changes in the composition of the investor base in a way that affects the high volume premium.

4.1 Time series analyses

First, we characterize the time series properties of the high volume return premium by analyzing the return on the zero-investment portfolios over time for each country using several different methodologies.[30] We begin by considering with three alternative specifications to analyze the presence of trends in the premium. The first specification considers a simple time trend regression. The second is a piecewise linear specification that allows for one breakpoint at the middle of the sample period for that country. Finally, in the third specification, we consider a piecewise linear specification

[30] In this section of the paper, because we are in some sense testing the robustness of our results, we use the zero-investment portfolios as they had the weaker results in Section 2.

where we allow the position of the breakpoint to be optimally chosen using the AIC information criteria. The trend coefficients presented in Table 11 are annualized to make it easier to gauge the average changes in the premium from one year to another. If, for example, changes in market conditions such as improvements in market efficiency or globalization affect the high volume return premium, one would expect the premium to be getting smaller through time; that is, the trend coefficients would be negative and significant. The three panels in Table 11 report the estimated trend coefficients for the G7, the non-G7 developed and the emerging countries, respectively. We find, however, that almost none of the coefficients in any of the specifications are significant, and the few that are significantly different from zero are positive rather than negative.

In a second group of tests, we look for systematic changes in the high volume return premium over time by testing the time series of the zero-investment portfolio returns by each country to determine any systematic patterns across time. We first use a general test of the time series, the Ljung-Box test, and test the autocorrelations for the first six and twelve lags. The results, shown in the four left hand columns of Table 12, suggest that very little autocorrelation exists in the data. In a second test, we take a different approach and compare the normalized cumulative periodogram with the cumulative distribution function of a uniform (0,1) random variable. The statistics from these tests, Bartlett's Kolmogorov-Smirnov statistics are shown in the next two columns of Table 12. They provide consistent results in that only a few countries have significant trends. Finally, we test for stationary of the time series, using the Dickey-Fuller test for unit roots. The results, provided in the last three columns of the table, indicate that the high volume return premium has a stationary time series.

4.2 Macroeconomic conditions

Alternatively, the high volume return premium could be related to macroeconomic factors and show systematic variation through time with these factors. To test the

relation between the high volume return premium and macroeconomic conditions, we obtain business cycle and growth rate peak and trough dates for 20 countries from the Economic Cycle Research Institute (ECRI).[31] Using these dates, we conduct separate analyses for high-growth and recessionary periods in which we regress the 20th day returns on the zero-investment portfolios on dummy variables indicating high-growth or recessionary periods. The coefficients from these regressions for each country are presented in Table 13. As the table indicates, there is no relation between the high volume return premium and macroeconomic conditions such as recessions or low growth periods.

4.3 Increasing presence of foreign investors

An additional source of time variation for many of the stock markets in our sample, including most of the emerging markets, may arise from the increasing presence of foreign investors. This growth in foreign investors over our sample period could potentially affect our analyses, causing inappropriate inferences. In particular, the presence of foreign investors could have an effect, or a changing effect, on the high volume return premium. In this section, we discuss these possible effects and their implications for our analyses.

During our sample period, some of the markets in our sample went through financial liberalization, which further opened the markets to foreign investors. Besides increasing the presence of foreign investors in the markets, Bekaert, Harvey and Lumsdaine (2002a) argue that financial liberalizations create a nonstationarity in portfolio flow data. This nonstationarity in portfolio flows could potentially lead to differences in the high volume return premium over time. However, at least two factors could mitigate this potential problem. First, most of our emerging market data begin after the major

[31] ECRI employs the NBER methodology to classify recessionary periods.

financial liberalizations and market integration described in Henry (2000), Bekaert and Harvey (2000) and Bekaert, Harvey and Lumsdaine (2002b). Second, given the short nature of the trading intervals we employ (seventy day periods), the structure of our tests should not be affected by changes in portfolio flows. That is, we are testing over such short periods that changes caused by increased foreign investor flows (or decreased flows in the case of a financial crisis) should not affect our results.

The presence of foreign investors in a market can potentially affect the visibility of stocks in a market as well as the importance of that visibility. Because of the information asymmetry between foreign and domestic investors, a stock's visibility may become more important in markets with a strong foreign investor presence. Consistent with this hypothesis are empirical studies by Kang and Stulz (1997) and by Dahlquist and Robertsson (2001).[32] Kang and Stulz find that foreign investors in Japan tend to hold more stocks that have characteristics of higher visibility – they tend to hold shares of larger firms and of firms with significant export sales. Similarly, Dahlquist and Robertsson find that foreign investors in Sweden tend to hold firms with a greater presence in international markets, even after controlling for firm size. Given this empirical evidence regarding the preferences of foreign investors for more visible stocks and the increasing presence of foreign investors in financial markets over our sample period, the question arises as to whether the high volume return premium increases in foreign investor presence.

To explore this idea further, we focus on the seven countries that had financial liberalizations during the sample period (Chile, Korea, Malaysia, Mexico, Philippines and Turkey). We test for differences in the high volume return premium across pre-liberalization and post-liberalization periods in these countries. We find significant high volume return premiums in both pre- and post-liberalization periods and no significant

[32] The results of Foerster and Karolyi (1999) for foreign firms which start trading ADR's are also consistent with these studies.

differences between the two periods.[33,34] In summary, these additional tests indicate that the increase in the presence of foreign institutional investors over our sample period did not significantly alter our results.

5. Economic trading strategies

An important question regarding the high volume return premium is whether there are trading strategies that are economically implementable across countries as Gervais, Kaniel and Mingelgrin (2001) have found for the United States. In this section, we examine five issues relevant to this question. We first assess whether the turnover of stocks in the extreme volume portfolios and the probability of a stock appearing within such a portfolio are different from what one would expect unconditionally. After this analysis, we consider the remaining four issues in combination. The second issue we examine is whether the returns found from a trading strategy that invests long in the high volume portfolios and shorts the low volume portfolios would still hold after considering transaction costs. Since the transaction costs that individual investors face are different

[33] The official liberalization dates used for splitting the sample were January 1990 for Chile, January 1992 for Korea, December 1988 for Malaysia, May 1989 for Mexico, June 1991 for the Philippines, September 1987 for Thailand, and August 1989 for Turkey (See Bekaert, Harvey and Lumsdaine, 2002). The corresponding t-statistics for the difference in premia between the pre and post liberalization periods (testing whether pre is higher), using the zero-investment portfolio returns, are respectively: -1.06, 1.43, -0.33, 0.41, -0.06, and -0.14.

[34] We also analyzed whether the presence of institutional investors in the United States affects the high volume return premium for stocks listed on the New York Stock Exchange. For each stock, we obtain the percentage of institutional holdings (from the Thomson CDA Spectrum 13F filings database). Because of the strong correlation between institutional holdings and market capitalization (Sias and Starks, 1997), we sort the sample firms into three size groups based on market capitalization. Within each size group, we then sort by institutional holdings. We construct the reference return portfolios in the same manner as in Section 2, except that we divide the portfolios by firm size and institutional holdings. The results for the 20th day average returns indicate that, in general, there is a significant difference in the high volume return premium across levels of institutional holdings. That is, firms with low institutional holdings have a greater high volume return premium than do firms with large institutional holdings, suggesting that volume shocks are more important when there are fewer institutional investors interested in a firm. This result is consistent with the investor recognition hypothesis in that visibility is most important for the individual investors rather than the institutional investors. The result on institutional holdings also suggests that the increase in foreign institutional investors should not heighten the high volume return premium in a country.

from those of institutional investors, we examine this issue from the perspective of both types of investors. Third, we check whether the high volume return premium is being driven by extreme returns. Fourth, we examine whether a coarse cut-off at the 20th percentile, rather than the 10th percentile, can really represent true volume shocks. Finally, we consider whether lengthening the holding period to measure the return premium that occurs after a high volume shock results in higher profits.

The first issue is whether there are differences over time in the probability of a stock being selected for our extreme volume portfolios. To check this possibility, we used different measures of the chance of a stock to be picked as an extremely high-volume or an extremely low-volume stock in two adjacent intervals where we vary the amount of time between the intervals. For stocks selected in a given interval, we calculated the probability of being chosen again in the following interval. Alternatively, for stocks selected in a subsequent interval, we calculated the probability of being chosen in the preceding interval. With any of these measures, we find that a sampling procedure with eleven days between testing periods has almost the same probability as does the a procedure with more days between testing periods. Both procedures result in a probability of a stock being in an extreme volume portfolio of close to 20%, independent of whether the stock was chosen in an adjacent interval or not.

We also checked for the average rate of turnover in the composition of the low and high volume portfolios in each country. With a 20% definition for the cutoff between low or high volume versus normal volume, one would expect unconditionally the average turnover to be 80%. Consequently, at each portfolio formation period we calculated the percentage of low and high volume stocks in the country's portfolios that left the portfolios. The averages from these calculations, reported in Table 14, show that. the actual rates of turnover of the composition of the portfolios are not very different from what one would expect, ranging from a low of 79.9% for Brazil's low volume portfolio to

91.4% for Bangladesh's low volume portfolio, with most countries having the average turnover of the composition of their low and high volume portfolios within 80-85%..

We next turn to analyze the remaining issues in combination. The most important of these is the effect of transaction costs on the viability of a trading strategy that invests long in the high volume portfolios and shorts the low volume portfolios. Transaction costs have been found to be important in determining whether investors can actually take advantage of documented anomalies (e.g., Lesmond, Schill and Zhou, 2004). In this section, we estimate the transaction costs for the zero-investment portfolios and examine whether the magnitude of the high volume return premium is sufficiently large to cover these costs. Although we do not have exact transaction costs for each country, we can estimate the impact of these costs using estimates provided by Table 5 of Chiyachantana, Jain, Jiang and Wood (CJJW) (2004) for the United States, 19 other developed markets, and 14 emerging markets in our sample. Domowitz, Glen and Madhavan (2001), Lesmond (2005), and Lesmond, Ogden, and Trczinka (1999) also provide transaction cost estimates. We use the CJJW estimates because they provide estimates for more countries and for different size firms and their time period corresponds more closely to our sample period. The CJJW estimates also allow us to examine the effects of transaction costs from the diverse perspectives of retail and institutional investors, since retail investors are affected primarily by the explicit trading costs (e.g., commissions), while the institutional investors often also have to contend with implicit trading costs (e.g., price impact of the trade).

We account for the time variation in trading costs by making use of the different estimates for the pre-1999 and post-1999 periods, provided in Table 5 of CJJW (2004). Our pre-1999 estimates for the average implicit and explicit trading costs are based on CJJW's Table 5, columns four and seven, respectively.[35] For the post-1999 period, we

[35] Columns four and seven of CJJW Table 5 incorporate trading cost estimates from Domowitz, Glen and Madhavan (DGM) (2001).

use the estimates of explicit and implicit trading costs that are reported in columns five and eight of the same table. While CJJW Table 5 reports the average explicit and implicit trading costs across all stocks in each country, we try to account for the variation in trading costs across size groups by using the information provided by CJJW in their Table 3A. That is, for each size group in a given country, we use the corresponding imputed implicit trading costs obtained for that country.

To develop the size groups for each country, we divide stocks into deciles and define the small-size group as the bottom three deciles; the medium-size group as deciles four through seven, and the large-size group as the top three deciles in each country. [36]

Our computation of the imputed implicit trading costs for each size group is based on the following intuition: After making the size portfolio designations for each country, we assume that the ratios of institutional trading costs across different market capitalization groups reported in CJJW's Table 3A (columns one and four) applies to each country in our sample. That is, we first make the assumption that the medium-size group corresponds to the average in each country, and then we estimate the trading costs for the small-size and the large-size groups, respectively, by multiplying the small-to-medium and the large-to-medium ratios from CJJW's Table 3A with the average trading costs obtained from CJJW's Table 5 for each country. This approach provides us with estimates of the implicit trading costs for each size group in each country. In contrast, we assume that the explicit trading costs are constant across all size groups in our sample. Having obtained the trading costs for each size group in each country in this manner, we then compute the average zero-investment portfolio returns after taking into

[36] We also employed an alternate size classification methodology that allows the number of size groups to depend on the total number of stocks in each country sample as previously described in Section 2. The results were consistent with the results we report. In this section, we employ the simpler division in order to be consistent with the size divisions used in the transaction cost estimations by CJJW (2004).

account (i) explicit trading costs and (ii) all trading costs in each size group (i.e., explicit and implicit trading costs).

Table 15 provides insights into the issues related to whether there are trading strategies that are economically implementable across countries which we highlight above. Because some of the restrictions required by our analyses eliminate a large number of stocks, the country-by-country analysis is not feasible due to the lack of sufficient data for many countries. Consequently, we pool countries into regions according to continent or development of the economy. The table shows the average 20th day return on the zero-investment portfolios under a number of different assumptions. All four panels in the table show the returns under three different cost assumptions for three size groups of stocks for each region. Panel A provides the results using a 20% cutoff definition of extreme volume for a 20-day holding period for all stocks and stocks with "normal" returns only. Panel B provides the corresponding results this time using a 10% cutoff, Panel C provides these results with longer holding periods, and Panel D has the longer holding periods as in Panel C except that we employ a different approach to defining extreme volume, which is explained below.

Our analysis of the effects of trading costs on the profits from the high volume return premiums consider the after-trading-costs profits from the perspective of retail as well as institutional investors. While retail investors would be exposed primarily to the explicit trading costs, institutional investors are likely to face both explicit and implicit trading costs. Thus, we consider both of these perspectives in our analysis. Examining the effects of transaction costs shows that before considering transaction costs, all of the countries in the G-7, other developed markets and emerging markets show significantly positive high volume return premiums. After considering explicit costs (i.e., from the perspective of the retail investor), the G-7 country portfolios continue to show positive returns, but the other developed and emerging markets no longer show significantly positive returns. Finally, our analysis indicates that the high volume return premium

basically does not hold after considering implicit trading costs; thus, it is not a phenomenon that institutional investors could exploit.

To test for the possibility that the high volume return premium is being driven by extreme returns, we restrict the analysis to only those stocks that had “normal returns” over the formation period, where we define “normal returns” as those returns within the 60% midrange of returns. In other words, we use only stocks that do not show up in our extreme 20% portfolios in the formation period. Such an analysis allows us to determine whether stocks with normal returns also show a high-volume return premium. The right three columns in Panel A of Table 15 show the average 20th day returns on the three size portfolios when we include only stocks with normal returns in our extreme portfolios. That is, the extreme high and low volume portfolios used to form the zero-investment portfolios are calculated from using 20% cutoffs of the midrange 60% of the stocks. The right three columns of Panel B of Table 15 show the same analysis using a 10% rather than 20% cutoff to define high and low volume extremes. Comparing the right three columns in Panels A or B of Table 15 to the left three columns of the same panels, we observe that the different sets of results lead to quite similar conclusions. This suggests that our results are not being driven by extreme returns.

In Panel A of Table 15, as throughout our previous tables, we employ a 20% definition for the extreme volume shocks rather than the 10% employed by Gervais, Kaniel and Mingelgrin (2001). As explained earlier, we employ the 20% cutoff because of the limited number of stocks in many of the sample countries. The question is whether such a coarse cut-off can really represent true volume shocks given that 40% of the shocks would be in one of the two “extreme” portfolios. To examine this issue, we employ a 10% cut-off and re-compute the average returns for the zero-investment portfolios. Comparing results obtained using the 10% cutoff definition shown in Panel B of Table 15 to those with the 20% cutoff shown in Panel A, shows that the conclusions remain the same under either definition of a high volume shock.

We also examine whether the length of the holding period alters the return premium that occurs after a high volume shock. Gervais, Kaniel and Mingelgrin (2001) provide evidence that the premium becomes larger as the holding period increases. Throughout our analysis, we have maintained the 20-day holding period in order to increase the number of observations for each country. Panel C shows the results when we consider longer time horizons than the 20-day holding period. In the left three columns, we hold the portfolios for 30 days and in the right three columns we hold the portfolios for 40 days. We calculate the results for the more restrictive of our assumptions, i.e., high and low volume portfolios with a 10% cut-off definition and from stocks with only normal returns. In terms of qualitative results, the results from a longer holding period basically replicate those from the right three columns of Panel B for the 20-day holding period. Examining the results in the two strongest cases across the three holding periods, shows that the profits are monotonically increasing the longer the holding period is both for before costs and after costs for retail investors for the G-7 countries.

In Panel D we define extreme volume using Z-scores rather than percentiles. The Z score is calculated as (current volume less average volume in the 50 day formation period)/(standard deviation of volume in the 50 day formation period). If the Z score is in the extreme 10%, then we define that stock as having extreme volume.

In summary, in this section we have shown that after considering transaction costs, our results hold up for retail investors in G-7 countries. Neither extreme returns, nor using a more restrictive volume shock definition seems to have any effect on our findings. Further, lengthening the holding period appears to enhance the potential profits from a trading strategy based on the high volume return premium in G-7 countries, consistent with the Gervais, Kaniel and Mingelgrin (2001) results for the United States.

6. Conclusions

In this paper, we examine the high volume return premium, as defined by Gervais, Kaniel, Mingelgrin (2001), across 41 countries to investigate its existence and determinants. We find that the high volume return premium is a strikingly pervasive global phenomenon as it has a significant presence in almost all developed markets and in a number of emerging markets as well. We further find that the high volume return premium is not related to differences in liquidity or risk exposures. We also characterize the time series properties of the high volume return premium and find that the ffect is pervasive in a wide variety of economic conditions. Further, we find that economic trading strategies would be successful in G-7 countries for the retail investor, but not for the large investor due to implicit transaction costs. The size of the transaction costs precludes profitable trading strategies for either retail or large investors in countries besides the G-7 countries.

The high volume return premium varies systematically across markets in relation to investor, market and firm characteristics in many ways predicted by Merton's (1987) investor recognition hypothesis. We find that characteristics of the market affect the high volume return premium, generally consistent with the hypothesis. The most significant determinants are proxies for the investor base, including investor demographics and a market's information dissemination, the investor confidence in the country's markets, and the size of the company.

Examining individual firm characteristics across countries, we find that the relation between high volume return premium and firm-specific characteristics is complex, generally, but not totally in keeping with a simple interpretation of Merton's (1987) hypothesis. As would be expected, the premium is decreasing in some proxies for the visibility of the firm, such as firm size and inclusion in a major market index, like the FTSE index. We also examine the determinants of the high volume return premium

in each of the G7 countries and find results generally consistent with those across countries.

Our results are consistent with previous studies that show that investor stock visibility events such as a high volume shock can have significant return effects. Our results, however, are unique in that we examine an event both across countries and within multiple countries, while the previous studies have focused within a particular country. By examining the effects of the high volume shock across countries, we are also able to provide insights into what factors affect the magnitude of the return effects.

Our study underscores the importance of volume in asset pricing and provides an impetus for further research into the effects of volume and changes in volume. A better understanding of the role of volume can be obtained from further examinations of volume in other markets, not only stock markets with differences in characteristics and fundamentals, but also other types of asset markets such as derivative markets. Our results suggest that volume is important to investors' decision making processes. Most importantly, there is need for additional self-consistent theory of the role of volume.

Appendix

Application of Pastor Stambaugh methodology

We use the Pastor and Stambaugh (2003) methodology for estimating liquidity betas with a few modifications suggested by Li (2005). These modifications are primarily due to the smaller number of stocks in some countries as compared to the United States data which Pastor and Stambaugh employ. We begin by using daily data to construct a monthly measure of market liquidity for each country.[37] This measure is the equally weighted average of the liquidity measures of individual stocks in that country. Specifically, for each country for which we have sufficient data, we first estimate for each stock *i* in month *t* an OLS regression of the excess return on the stock against its return on the previous day, its excess return on the previous day as compared to the value-weighted index for that country, and the dollar volume for the stock on the previous day. The Pastor and Stambaugh measure of liquidity is the coefficient, $\gamma_{i,t}$ on the excess return variable. That is, from equation (1) in Pastor and Stambaugh we run the regression on a monthly basis for each month for which we have sufficient data for the country:

$$r^e_{i,d+1,t} = \theta_{i,t} + \varphi_{i,t} r_{i,d,t} + \gamma_{i,t}\,\mathrm{sign}\left(r^e_{i,d,t}\right) \cdot \upsilon_{i,d,t} + \epsilon_{i,d+1,t} \quad d = 1, \dots, D, \quad (1)$$

where

$r_{i,d,t}$ = the return on stock *i* on day *d* in month *t*,

$r^e_{i,d+1,t} = r_{i,d,t} - r_{m,d,t}$, where $r_{m,d,t}$ is the return on the country value-weighted market return on day *d* in month *t*, and

$\upsilon_{I,d,t}$ = the dollar volume for stock *i* on day *d* in month *t* (in this case dollar volume is defined as the product of the stock's price in its local currency times the trading volume).

As in Pastor and Stambaugh (2003), we examine the changes in the measure of liquidity over time and also scale these changes for differences in the sizes of the different stock markets according to their equation (6):

$$\Delta\gamma_t = \frac{m_t}{m_1}\frac{1}{N_t}\sum_{i=1}^{N_t}(\gamma_{i,t} - \gamma_{i,t-1})$$

where m_t/m_1, the scaling factor in our case is each country's current month's market capitalization divided by the beginning market capitalization in the country and N_t is the number of stocks in month t.

We then regress $\Delta\gamma_{i,t}$ on its lag as well as the lagged value of the scaled series as in Pastor and Stambaugh's equation (7):

[37] Pastor and Stambaugh (2003) require that a stock trade on at least 15 days during the month in order to include the stock in the analysis. In order to include a larger number of stocks, we modify that slightly by requiring at least 14 days of trading.

$$\Delta\gamma_t = a + b\Delta\gamma_{t-1} + c\left(\frac{m_{t-1}}{m_1}\right)\gamma_{i,t-1} + u_t$$

The residual from this equation, scaled by 100, is then the Pastor and Stambaugh liquidity measure denoted $\mathcal{L}_t$.

To measure the individual stocks' liquidity betas, we employ Pastor and Stambaugh's equation (9)

$$r_{i,t} = \beta_i^0 + \beta_i^{\mathcal{L}}\mathcal{L}_t + \beta_i^M MKT_t + \beta_i^S SMB_t + \beta_i^H HML_t + \epsilon_{i,t}$$

where $r_{i,t}$, denotes stock *i* 's excess return, $\mathcal{L}_t$ is each country's market liquidity measure as defined above, *MKT* is the excess return on the value-weighted market index of each country, and *SMB* and HML are payoffs on long-short spreads constructed by sorting stocks according to market capitalization and book-to-market, respectively, where we construct these factors for each country individually using the Liew and Vassalou (2000) methodology. This regression is run for each stock as it enters the high or low volume portfolio. The horizon for the regression is the preceding 60-month period, as long as at least 36 months of data are available.

References

Amihud, Yakhov, and Haim Mendelson, 1986, Asset pricing and the bid-ask spread, *Journal of Financial Economics* 17, 223-249.

Amihud, Yakhov, Haim Mendelson, and Lasse Heje Pedersen, 2005, Liquidity and asset prices, *Foundations and Trends in Finance* 1, 269-364.

Amihud, Yakhov, Haim Mendelson, and Jun Uno, 1999, Number of shareholders and stock prices: Evidence from Japan, *Journal of Finance* 54, 1169-1184.

Arbel, Avner, Steven Carvell and Paul Strebel, 1983, Giraffes, institutions and neglected firms, *Financial Analysts Journal* 39, pp. 57-63.

Archya, Viral, and Lasse Pedersen, Asset pricing with liquidity risk, *Journal of Financial Economics* 77, 375-410.

Baker, Kent, John Nofsinger and Daniel Weaver, 2002, International cross-listing and visibility, *Journal of Financial and Quantitative Analysis* 37, 495-521.

Basak, Suleyman and Dominico Cuoco, 1998, An equilibrium model with restricted stock market participation, *Review of Financial Studies* 11, 309-341.

Bauman, W. Scott, C.Mitchell Conover and Robert E. Miller, 1998, Growth versus value and large-cap versus small-cap stocks in international markets, *Financial Analysts Journal,* 75-89.

Bekeart, Geert, and Campbell Harvey, 2000, Foreign speculators and emerging equity markets, *Journal of Finance* 55, 565-613.

Bekeart, Geert, Campbell Harvey, and Robin Lumsdaine, 2002a, The dynamics of emerging market equity flows, *Journal of International Money and Finance* 21, 295-350.

Bekeart, Geert, Campbell Harvey, and Robin Lumsdaine, 2002b, Dating the integration of world equity markets, *Journal of Financial Economics*

Bekeart, Geert, Campbell Harvey, and Christian Lundblad, 2001, Emerging equity markets and economic development, *Journal of Development Economics* 66, 465-504.

Blume, Lawrence, David Easley, and Maureen O'Hara, 1994, Market statistics and technical analysis: The role of volume, *Journal of Finance* 49, 153-181.

Carhart, Mark, 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57-82.

Charoenrook, Anchada, and Hazem Daouk, 2009, A study of market-wide short-selling restrictions, Vanderbilt University and Cornell University working paper.

Chen, Honghui, Gregory Noronha, and Vijay Singal, 2004, The price response to S&P additions and deletions: Evidence of asymmetry and a new explanation, *Journal of Finance* 59, 1901-1929.

Chiyachantana, Chiraphol N., Pankaj K. Jain, Christine X. Jiang and Robert A. Wood, 2004, International evidence on institutional trading behavior and price impact**,** *Journal of Finance* 59, 869-898.

Chui, Andy, and Wei, K.C. John, 1998, Book-to-market, firm size, and the turn-of-the-year effect: Evidence from Pacific-Basin emerging markets, *Pacific-Basin Finance Journal* 6 (1), 275-293.

Chung, Richard, and Lawrence Kryzanowski, 2001, Tests of investor cognizance using earnings forecasts of North American analysts, *International Review of Economics and Statistics* 10, 187-204.

Conrad, Jennifer, and Gautam Kaul, 1993, Long-term market overreaction or biases in computed returns, *Journal of Finance* 48, 39-63.

Dahlquist, Magnus, and Goran Robertsson, 2001, Direct foreign ownership, institutional investors, and firm characteristics, *Journal of Financial Economics* 59, 413-440.

Domowitz, Ian, Jack Glenn, and Ananth Madhavan, 2001, Liquidity, volatility, and equity trading costs across countries and over time, *International Finance* 4, p. 221-256.

Durnev, Artyom, and E. Han Kim, 2005, To steal or not to steal: Firm attributes, legal environment and valuation, *Journal of Finance* 60, 1461-1493.

Durnev, Artyom, and E. Han Kim, 2007, Explaining differences in the quality of governance among companies: Evidence from emerging markets, *Journal of Applied Corporate Finance* 19, 16-24.

Durnev, Artyom, Randall Morck, and Bernard Yeung, 2004, Value-enhancing capital budgeting and firm-specific stock return variation, *Journal of Finance* 59, 65-105.

Durnev, Artyom, Randall Morck, Bernard Yeung, and Paul Zarowin, 2003, Does greater firm specific variation mean more or less informed stock pricing? *Journal of Accounting Research* 41, 797-836.

Dyl, Edward and William Elliot, 2006, The share price puzzle, *Journal of Business* 79, 2045-2066.

Erb,C.B., Harvey, C.R., Viskanta,T.E.,1996, Expected returns and volatility in 135 countries, *Journal of Portfolio Management* 22,Spring,46-58.

Eleswarapu, Venkat R., and Kumar Venkataraman, 2006, The impact of legal and political institutions on equity trading costs: A cross-country analysis, *Review of Financial Studies* 19, 1081-1111.

Fama, Eugene and Kenneth French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 33, 3-56.

Fama, Eugene and Kenneth French, 1998, Value versus growth: International evidence, *Journal of Finance* 53, 1975-1999.

Fama, Eugene F., and James MacBeth, 1973, Risk, return, and equilibrium: Empirical tests, *Journal of Political Economy* 71, 607-636.

Fehle, Frank, Sergey Tsyplakov, and Vladimir Zdorovtsov, 2005, Can companies influence investor behavior through advertising? Super bowl commercials and stock returns, *European Financial Management* 11, 625-647.

Foerster, Stephen and Andrew Karolyi, 1999, The effect of market segmentation and investor recognition on asset prices: Evidence from foreign stock listing in the U.S., *Journal of Finance* 54, 981-1013.

Gervais, Simon, Ron Kaniel, and Daniel Mingelgrin, 2001, The high-volume return premium, *Journal of Finance* 56, 877-919.

Griffin, John, 2002, Are the Fama and French factors global or country-specific? *Review of Financial Studies* 15, 783-803.

Grullon, Gustavo, George Kanatas, and James Weston, 2004, Advertising, breadth of ownership and liquidity, *Review of Financial Studies* 17, 439-461.

Henry, Peter Blair, 2000, Stock market liberalization, economic reform, and emerging market equity prices, *Journal of Financ*e 55, 529–564.

Jin, Li, and Stewart Myers, 2006, R^2 around the world: New theory and new tests, *Journal of Financial Economics* 79, 257-292.

Kadlec, Gregory and John McConnell, 1994, The effect of market segmentation and illiquidity on asset prices: Evidence from exchange listings, *Journal of Finance* 49, 611-636.

Kang, Jun-Koo, and Rene M. Stulz, 1997, Why is there a home bias? An analysis of foreign portfolio equity ownership in Japan, *Journal of Financial Economics* 46, 3-28.

Keim, Donald and Ananth Madhavan, 1997. Transactions costs and investment style: an inter-exchange analysis of institutional equity trades. *Journal of Financial Economics* 46, 265–292.

King, Michael, and Dan Segal, 2009, The long-term effects of cross-listing, investor recognition, and ownership structure on valuation, *Review of Financial Studies* 22, 2393-2421.

Lang, Mark, Karl Lins, and Darius Miller, 2004, Concentrated Control, Analyst Following and Valuation: Do Analysts Matter Most When Investors are Protected Least? *Journal of Accounting Research* 42, 2004, 581-623.

LaPorta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny, 1998, Law and finance, *Journal of Political Economy* 106, 1113-1155.

Lesmond, David, 2005, Liquidity of emerging markets, *Journal of Financial Economics* 77, 411-452.

Lesmond, David, Michael Schill, and Chunseng Zhou, 2004, The illusory nature of momentum profits, *Journal of Financial Economics* 71, 349-380.

Lesmond, David, Joseph Ogden, and Charles Trczinka, 1999, A new estimate of transaction costs, *Review of Financial Studies* 12, 1113-1141.

Li, Dong, 2005, *Essays on International Financial Markets*, University of Texas at Austin.

Liew, Jimmy, and Maria Vassalou, 2000, Can book-to-market, size and momentum be risk factors that predict economic growth? *Journal of Financial Economics* 57, 221-245.

Lyon, John, Brad Barber, and Chih-Ling Tsai, 1999, Improved methods for tests of long-run abnormal stock returns, *Journal of Finance* 54, 165-201.

Merton, Robert C., 1987, A simple model of capital market equilibrium with incomplete information, *Journal of Finance* 42, 483-510.

Miller, Darius, 1999, The market reaction to international cross-listings: evidence from Depositary Receipts, *Journal of Financial Economics* 51, 103-123.

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, 215-260.

Newey, Whitney, and Kenneth West, 1987. A simple, positive semidefinite heteroskedasticity and autocorrelation consistent covariance matrix. *Econometrica* 55: 703-708.

Pastor, Lubos and Robert Stambaugh, 2003, Liquidity risk and expected stock returns, *Journal of Political Economy* 111, 642-685.

Roll, Richard, 1988, R^2, *Journal of Finance* 43, 541-566.

Rouwenhorst, K. Geert, 1999, Local return factors and turnover in emerging markets, *Journal of Finance* 54, 1439-1464.

Shapiro, Alexander, 2002, The investor recognition hypothesis in a dynamic general equilibrium: Theory and evidence, *Review of Financial Studies* 15, 97-141.

Sias, Richard W., and Laura T. Starks, 1997, Institutions and individuals at the turn-of-the-year, *Journal of Finance* 52, 1543-1562.

Table 1

Descriptive statistics on country intervals for high volume return premium measurement

This table presents descriptive statistics for the 41 countries with sufficient data. The table shows for each country, the start date of the volume data, the number of testing period intervals over the available sample period, and the average number of stocks in each interval.

Country	Start Date	Number of Intervals	Average Number of Stocks
ARGENTINA	Jul-93	91	28
AUSTRALIA	Jan-84	208	193
AUSTRIA	Jul-90	120	50
BANGLADESH	Jan-92	99	67
BELGIUM	Jan-94	74	62
BRAZIL	Jan-99	27	136
CANADA	Jan-73	330	626
CHILE	Jul-89	129	67
CHINA	Aug-91	110	186
DENMARK	Jul-90	119	71
EGYPT	Jan-97	55	34
FRANCE	Jun-88	149	205
GERMANY	Jun-88	150	186
GREECE	Jan-88	147	100
HONG KONG	Jun-88	151	189
INDIA	Jan-95	72	266
INDONESIA	Jan-95	71	71
ITALY	Jul-86	175	93
JAPAN	Jan-90	134	1181
KOREA	Sep-87	158	557
MALAYSIA	Jan-86	179	235
MEXICO	Jan-88	148	36
MOROCCO	Jul-93	87	24
NETHERLANDS	Feb-86	182	107
NEW ZEALAND	Jan-90	134	56
NORWAY	Jan-86	172	59
PAKISTAN	Jul-92	107	43
PHILLIPPINES	Jan-90	133	49
POLAND	Jan-94	82	86
PORTUGAL	Jan-90	132	34
SINGAPORE	Jan-83	217	88
S. AFRICA	Jan-96	63	221
SPAIN	Jan-91	123	95
SRI LANKA	Jan-88	163	36
SWEDEN	Jul-87	159	131
SWITZERLAND	Jan-89	140	65
TAIWAN	Apr-91	114	119
THAILAND	Jan-87	157	102
TURKEY	Jan-88	147	62
UK	Oct-86	174	517
US	Aug-63	445	2839
Average		**142**	**229**

Table 2

20th day returns by country on zero-investment and reference return portfolios

This table shows the average cumulative returns for zero-investment and reference return portfolios held for 20 days after the portfolio formation. The portfolios are constructed on a country by country basis and consist of long positions in extreme high volume stocks along with short positions in extreme low volume stocks, where extreme high and low volume are defined as the top and bottom 20% as of the portfolio formation dates. The table also includes the Newey-West (1987) t-statistics from tests for whether the average returns are statistically different from zero. Panel A presents the average portfolio returns for the developed markets and Panel B, for the emerging markets. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.

Panel A. Developed Markets

Country	Average return for zero-investment portfolios held for 20 days	t-statistic	Average return for reference return portfolios held for 20 days	t-statistic
G7 Countries				
CANADA	1.26	5.87***	0.85	12.58***
FRANCE	1.38	4.04***	0.55	5.82***
GERMANY	0.98	5.68***	0.45	6.20***
ITALY	0.67	1.64	0.25	1.93*
JAPAN	1.30	3.64***	0.56	14.73***
UK	1.16	6.66***	0.66	10.27***
US	1.12	33.31***	0.52	47.55***
Other Developed Countries				
AUSTRALIA	0.75	2.53***	0.32	2.80***
AUSTRIA	0.65	1.48	0.16	2.34**
BELGIUM	1.46	3.55***	0.45	2.88***
DENMARK	1.02	1.63	0.26	4.10***
HONG KONG	0.97	2.21***	0.52	3.53***
NETHERLANDS	0.30	0.95	0.12	1.15
NEW ZEALAND	1.57	3.67***	0.31	4.04***
NORWAY	0.12	0.25	-0.02	-0.19
PORTUGAL	1.52	2.01**	0.25	2.37**
SINGAPORE	1.59	4.02***	0.50	4.45***
SPAIN	1.23	3.73***	0.27	4.68***
SWEDEN	0.68	1.69*	0.49	3.61***
SWITZERLAND	0.65	2.11***	0.43	3.08***

Table 2 continued

Panel B. Emerging Markets

Country	Average return for zero-investment portfolios held for 20 days	t-statistic	Average return for reference return portfolios held for 20 days	t-statistic
ARGENTINA	0.11	0.12	0.07	0.54
BANGLADESH	1.68	1.25	0.16	1.43
BRAZIL	1.62	1.89*	0.38	2.28**
CHILE	0.69	1.72*	0.12	1.61
CHINA	0.43	0.43	-1.49	-0.08
EGYPT	-0.57	-0.56	0.03	0.19
GREECE	1.24	2.20**	0.21	1.88*
INDIA	1.63	1.73*	0.44	1.96**
INDONESIA	2.70	2.54**	0.31	1.61
KOREA	0.45	1.56	0.14	1.65*
MALAYSIA	1.10	2.02**	0.23	2.42**
MEXICO	0.68	0.73	0.27	2.80**
MOROCCO	0.97	1.41	0.12	0.76
PAKISTAN	0.97	1.36	0.13	1.12
PHILLIPPINES	0.28	0.09	0.07	0.06
POLAND	0.21	0.89	0.27	1.73*
S. AFRICA	1.11	2.32**	0.17	1.80*
SRI LANKA	3.91	1.01	7.26	1.25
TAIWAN	0.36	0.59	0.00	-0.05
THAILAND	2.08	3.20***	0.91	5.01***
TURKEY	1.44	0.99	0.14	0.87

Table 3

20th day returns by G-7 country on zero-investment and reference return portfolios for subperiods

This table shows the average returns for zero-investment (ZI) and reference return (RR) portfolios held for 20 days after the portfolio formation. The portfolios are constructed on a country-by-country basis and consist of long positions in extreme high volume stocks and short positions in extreme low volume stocks, where extreme high and low volume are defined, respectively, as the top and bottom 20% as of the portfolio formation dates. The table also includes the t-statistics from tests for whether the average portfolio returns are statistically different from zero. *, ** and *** represent significance at the 10%, 5% and 1% levels, respectively.

1997-2001				
Country	**ZI**	**t-stat**	**RR**	**t-stat**
CANADA	1.52%	7.49***	1.09%	7.82***
FRANCE	1.39%	4.09***	0.73%	4.77***
GERMANY	0.64%	2.47**	0.31%	2.73***
ITALY	0.87%	4.76***	0.51%	4.24***
JAPAN	1.06%	2.67***	0.33%	4.55***
UK	1.90%	6.14***	0.98%	10.35***
US	1.21%	4.30***	0.57%	4.70***

1992-1996				
Country	**ZI**	**t-stat**	**RR**	**t-stat**
CANADA	1.05%	6.68***	0.71%	6.79***
FRANCE	1.36%	5.17***	0.47%	5.12***
GERMANY	1.46%	3.55***	0.68%	3.66***
ITALY	0.58%	1.73	0.20%	2.04**
JAPAN	1.58%	6.18***	0.70%	6.59***
UK	0.72%	4.79***	0.41%	5.62***
US	0.81%	10.73***	0.41%	12.06***

Table 4
Simulations of zero-investment portfolios for G-7 countries

This table shows the t-statistics by percentile for 100 simulations of zero-investment portfolios with 100 stocks or 50 stocks held for 20 days after the portfolio formation. The portfolios are constructed on a country-by-country basis and consist of long positions in extreme high volume stocks and short positions in extreme low volume stocks, where extreme high and low volume are defined, respectively, as the top and bottom 20% as of the portfolio formation dates. The table shows the 90th, 75th, 50th, 25th, and 10th percentile values for the distribution of the t-statistics.

	100 simulations of 100 stocks				
Country	**90th**	**75th**	**50th**	**25th**	**10th**
CANADA	4.18	3.49	2.78	2.13	1.02
FRANCE	3.39	2.97	2.23	1.62	1.10
GERMANY	3.48	2.80	2.07	1.24	0.65
ITALY	2.90	2.50	1.82	1.27	0.83
JAPAN	4.60	3.97	3.50	2.76	2.13
UK	3.70	3.26	2.63	1.94	1.34
US	4.16	3.43	2.55	1.85	1.36

	100 simulations of 50 stocks				
Country	**90th**	**75th**	**50th**	**25th**	**10th**
CANADA	3.75	2.91	2.16	1.43	0.65
FRANCE	2.89	2.36	1.92	1.28	0.74
GERMANY	2.94	2.17	1.61	0.99	0.35
ITALY	2.86	2.14	1.59	1.09	0.45
JAPAN	4.05	3.57	2.66	2.12	1.38
UK	3.27	2.84	1.94	1.37	0.86
US	3.06	2.46	1.78	1.25	0.76

Table 5

Differences in risk exposures between high and low volume stocks using constructed four-factor model

This table provides the average differences in risk exposures (betas) between high and low volume stocks in each country where high and low volume are defined, respectively, as the top and bottom 20% as of the portfolio formation dates. The betas are the estimated coefficients from the four-factor Fama-French (1993) and Carhart (1997) model using country-specific factors constructed based on the Liew and Vassalou (2001) approach. The table also includes the t-statistics. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

	Market		SMB		HML		WML	
Country	High-Low	t-statistic	High-Low	t-statistic	High-Low	t-statistic	High-Low	t-statistic
G7 Countries								
CANADA	0.028	1.29	0.104	1.15	-0.0098	-1.11	0.1015	0.42
FRANCE	0.031	0.55	0.039	0.92	0.0125	1.04	0.1004	1.07
GERMANY	0.000	0.00	0.015	0.87	0.0322	0.51	-0.0115	-0.87
ITALY	-0.068	-0.84	0.085	1.00	-0.0347	-0.86	0.0328	0.55
JAPAN	0.013	0.75	0.033	0.97	0.0101	0.68	0.0936	0.41
UK	-0.071	-1.05	0.054	0.69	0.0058	1.08	0.0776	1.09
US	0.007	1.07	0.025	1.08	0.0129	1.09	0.0771	0.42
Other Developed Countries								
AUSTRALIA	0.011	1.23	0.033	1.41	0.0026	0.57	0.0158	1.80*
AUSTRIA	-0.269	-1.73	0.005	0.69	-0.0005	-1.13	0.0750	1.52
BELGIUM	-0.187	-1.45	-0.059	-1.20	-0.0005	-0.58	0.0215	0.42
DENMARK	-0.035	-0.65	-0.001	-1.78	0.0063	1.05	0.0009	1.08
HONGKONG	0.124	1.85*	0.085	1.35	0.0222	1.18	-0.0856	-1.40
NETHERLA	0.055	1.16	0.095	1.10	-0.0078	-1.10	-0.0151	-1.09
NEWZEAL	-0.064	-1.14	-0.017	-1.78	0.0022	1.09	0.0460	0.89
NORWAY	-0.054	-0.28	0.076	0.86	-0.0102	-1.02	0.0467	1.07
PORTUGAL	0.141	1.06	-0.039	-1.07	-0.0045	-0.71	0.0268	0.88
SINGAPORE	0.064	0.89	-0.101	-1.72	-0.0288	-1.07	-0.0672	-1.08
SPAIN	0.050	1.16	0.055	1.11	0.0049	0.89	0.0792	0.42
SWEDEN	0.047	2.00**	-0.095	-1.42	0.0121	0.79	0.0375	0.74
SWITZERLAND	-0.061	-1.58	-0.016	-1.25	-0.0038	-1.14	-0.0080	-1.11
Emerging Markets								
ARGENTINA	0.089	0.14	-0.125	-0.82	-0.0040	-1.01	0.1079	1.06
BRAZIL	-0.031	-0.05	-0.122	-1.29	0.0039	0.46	0.0842	0.90
CHILE	0.064	0.48	-0.002	-0.90	0.0001	0.52	-0.0371	-0.40
CHINA	0.018	1.92*	-0.127	-1.39	-0.0120	0.43	0.0740	0.73
GREECE	0.117	2.29***	0.015	1.54	0.0024	1.25	-0.0266	-0.45
INDIA	0.149	1.49	0.038	1.23	-0.0044	-1.14	-0.0316	-1.38
INDONESIA	0.188	2.12***	-0.017	-1.48	0.0220	1.23	-0.0425	-0.59
KOREA	0.082	2.52***	0.027	0.84	0.0021	0.39	-0.0234	-1.16
MALAYSIA	-0.000	-2.26***	0.081	1.54	0.0381	0.24	-0.0201	-0.59
MEXICO	-0.148	-1.16	0.009	1.10	-0.0142	-1.09	-0.0526	-1.09
PHILIPPINES	0.415	1.60	0.039	1.25	0.0000	-1.15	-0.0275	-1.11
POLAND	-0.014	-0.30	-0.053	-0.86	0.0007	0.51	0.0855	0.70
S.AFRICA	-0.067	-1.50	0.020	1.22	0.0324	1.14	-0.0401	-1.11
TAIWAN	0.067	0.66	-0.094	-0.94	-0.0022	-1.04	-0.0645	-1.08
THAILAND	0.141	2.40***	-0.044	-1.01	0.0021	1.27	-0.0588	-0.76
TURKEY	-0.005	-0.82	0.003	1.00	0.0082	1.06	-0.0698	-1.08

Table 6

Differences in risk exposures between high and low volume stocks using Fama/French (1998) factors

This table provides the average differences in risk exposures (betas) between high and low volume stocks in each country where high and low volume are defined, respectively, as the top and bottom 20% as of the portfolio formation dates. The betas are the estimated coefficients from four different two-factor models each with the market factor and the spread on a factor-mimicking portfolio based on cash flow-to-price (C/P) and dividend-to-price (D/P) ratios in Panel A and earnings-to-price (E/P) and book-to-market (B/M) ratios in Panel B. The factor-,mimicking portfolio returns for each country are obtained from Ken French's website. The table also includes the t-statistics. *, **, and *** represent 10%, 5% and 1% significance levels, respectively. The average R^2 for the high volume (low volume) stock models are .026 (.040), for the C/P model, 035 (.025) for the D/P model, 042 (.038) for the E/P model and .039 (.034) for the B/M model.

Panel A. Cash flow to price and dividend to price factors

Country	MKT High-Low	t-stat	C/P High-Low	t-stat	MKT High-Low	t-stat	D/P High-Low	t-stat
G7 Countries								
CANADA	-0.345	-0.99	-0.003	-0.96	-0.051	-0.26	0.251	1.53
FRANCE	0.616	0.94	0.002	0.78	1.326	1.07	0.144	0.72
GERMANY	0.143	0.45	-0.002	-0.54	-0.062	-0.2	-0.126	-0.31
ITALY	-0.123	-0.55	-0.003	-1.13	-0.068	-0.42	-0.111	-0.75
JAPAN	-0.321	-3.47***	-0.003	-3.08***	-0.069	-1.21	0.036	0.86
UK	-0.313	-1.29	0.000	0.16	-0.213	-0.94	0.094	0.51
Other Developed Countries								
AUSTRALIA	-0.212	-0.65	-0.003	-1.08	-0.140	-0.49	0.139	0.66
AUSTRIA	0.148	0.59	0.003	1.34	0.174	0.59	0.235	1.23
BELGIUM	-1.134	-1.16	-0.007	-0.83	0.258	0.78	-0.321	-1.06
DENMARK	-0.209	-0.96	-0.001	-0.65	0.033	0.18	0.277	1.88
HONG KONG	-0.171	-0.87	-0.006	-2.69***	0.380	3.41***	0.399	2.47**
NETHERLANDS	-0.420	-2.15**	0.000	-0.11	-0.198	-1.29	0.068	0.38
NEW ZEALAND	-1.020	-1.41	-0.002	-0.28	-0.046	-0.13	0.418	1.22
NORWAY	0.544	1.51	0.006	1.02	-0.273	-0.30	-0.554	-0.95
SINGAPORE	-0.369	-0.96	-0.004	-1.14	0.185	1.80	0.200	1.76
SPAIN	0.111	0.41	-0.009	-1.10	-0.075	-0.57	-0.261	-0.51
SWEDEN	0.474	2.25**	0.003	1.47	0.217	1.07	-0.201	-1.47
SWITZERLAND	-0.495	-1.20	-0.006	-1.91	-0.182	-0.75	-0.036	-0.23
Emerging Markets								
MALAYSIA	-1.696	-8.81	-0.011	-5.79	-0.465	-6.62	0.706	5.86

Panel B. Earnings to price and book to market factors

Country	MKT High-Low	t-stat	E/P High-Low	t-stat	MKT High-Low	t-stat	B/M High-Low	t-stat
G7 Countries								
CANADA	-0.216	-1.07	0.236	1.15	-0.077	-0.35	0.007	0.04
FRANCE	1.048	1.13	0.047	0.27	0.126	0.30	-0.435	-1.56
GERMANY	0.225	0.79	0.174	0.42	-0.516	-0.97	-0.446	-1.62
ITALY	-0.079	-0.41	-0.107	-0.46	0.048	0.26	-0.110	-0.59
JAPAN	0.005	0.10	0.243	5.38***	-0.085	-1.69	0.064	1.5
UK	-0.706	-1.60	-0.028	-0.17	-0.428	-2.22**	-0.230	-0.84
Other Developed Countries								
AUSTRALIA	-0.321	-1.19	0.404	1.48	0.006	0.02	-0.086	-0.33
AUSTRIA	-0.295	-1.33	-0.222	-1.03	-0.190	-1.16	-0.140	-0.76
BELGIUM	0.183	0.68	0.464	0.65	-0.133	-0.38	-0.576	-1.41
DENMARK	0.099	0.45	0.437	1.78	-0.182	-0.62	0.227	1.06
HONG KONG	0.162	1.24	1.030	5.42***	0.068	0.51	0.482	3.02***
NETHERLANDS	-0.115	-0.89	-0.253	-1.68	-0.111	-0.82	0.123	0.82
NEW ZEALAND	0.100	0.3	-0.408	-1.46	-0.600	-1.45	-0.103	-0.55
NORWAY	-0.591	-0.65	-0.706	-1.48	1.853	1.31	-1.665	-1.16
SINGAPORE	0.086	0.49	0.231	1.48	0.174	1.45	-0.069	-0.22
SPAIN	0.959	0.88	0.671	0.77	0.017	0.17	-0.228	-0.66
SWEDEN	0.437	2.04**	0.070	0.46	0.204	0.55	-0.199	-0.9
SWITZERLAND	-0.312	-1.19	-0.212	-0.52	-0.321	-0.84	0.088	0.27
Emerging Markets								
MALAYSIA	-0.657	-9.82***	0.488	3.76***	-0.707	-9.23***	0.283	2.71***

Table 7

Differences in 20th day returns on extreme volume stocks sorted by relative volume and liquidity betas

This table shows the average returns for stocks that are first sorted into quintiles by their ranked volume on the formation day and then sorted by their liquidity betas (the latter are measured using the Pastor-Stambaugh (2003) model). The table shows t-statistics from differences in returns between the highest and lowest volume stocks for each liquidity quintile and between the highest and lowest liquidity stocks for each volume quintile. In Panel A, stocks are pooled by region, in Panel B stocks are pooled by G-7 versus non-G7 countries. Panel C provides the differences between the fifth and first quintiles for stocks pooled by country.

Panel A. Results pooled across continents

			Liquidity											
Region			**1-Low**	**t-stat**	**2**	**t-stat**	**3**	**t-stat**	**4**	**t-stat**	**5-High**	**t-stat**	**5-1**	**t-stat**
Asia Pacific	**Volume**	**1-Low**	-0.79		0.18		-0.17		0.72		0.12		0.91	5.08
		2	-0.29		0.49		0.57		1.00		0.71		1.00	4.49
		3	0.45		1.13		0.68		1.67		1.46		1.01	3.13
		4	0.57		1.83		0.96		2.04		1.95		1.38	2.93
		5-High	1.92		2.80		1.58		2.44		2.61		0.69	2.91
		5-1	2.71	9.79	2.62	9.55	1.75	6.76	1.73	6.35	2.49	5.74		
Europe	**Volume**	**1-Low**	-0.57		0.41		1.15		0.67		0.53		1.10	3.01
		2	-0.46		0.62		1.21		1.33		0.87		1.32	3.75
		3	-0.15		1.13		1.22		1.53		1.25		1.40	3.77
		4	0.17		1.60		1.29		1.83		1.64		1.47	3.96
		5-High	0.90		2.37		1.87		2.11		2.15		1.25	3.25
		5-1	1.47	4.43	1.96	5.40	0.73	2.67	1.44	4.62	1.62	5.57		
North America	**Volume**	**1-Low**	-0.53		-0.08		1.07		1.07		0.50		1.03	12.38
		2	0.06		0.17		1.48		1.14		1.08		1.02	13.74
		3	0.26		0.19		2.00		1.48		1.54		1.28	16.34
		4	0.74		0.63		2.28		1.81		1.86		1.12	15.32
		5-High	1.46		0.94		2.58		2.01		2.53		1.07	24.05
		5-1	1.99	8.11	1.03	10.65	1.51	16.23	0.95	18.53	2.03	22.29		

Panel B. Results pooled across G7 and non-G7 countries

			Liquidity											
Region			**1-Low**	**t-stat**	**2**	**t-stat**	**3**	**t-stat**	**4**	**t-stat**	**5-High**	**t-stat**	**5-1**	**t-stat**
G7	**Volume**	**1-Low**	-0.57		-0.33		0.27		0.36		0.75		1.31	6.55
		2	0.07		0.19		0.82		0.88		1.10		1.03	5.37
		3	0.39		0.81		1.15		1.14		1.68		1.29	7.89
		4	0.92		1.10		1.20		1.66		1.86		0.94	6.64
		5-High	1.54		1.72		1.83		1.77		2.53		0.99	7.71
		5-1	2.10	8.49	2.05	8.96	1.55	7.33	1.41	5.14	1.78	7.17		
Developed-Non G7	**Volume**	**1-Low**	-0.68		0.67		1.11		0.94		0.23		0.92	3.51
		2	-0.61		0.75		1.20		1.44		0.71		1.32	4.01
		3	-0.15		1.16		1.18		1.79		1.13		1.28	3.55
		4	-0.02		1.84		1.38		2.05		1.66		1.68	4.59
		5-High	1.04		2.65		1.93		2.48		2.18		1.14	3.88
		5-1	1.73	4.21	1.98	4.49	0.82	2.84	1.54	3.74	1.95	5.44		

Panel C. Result by country

							Liquidity					
Country	**Volume**		**1-Low**	**t-stat**	**2**	**t-stat**	**3**	**t-stat**	**4**	**t-stat**	**5-High**	**t-stat**
AUSTRALIA		**5-1**	2.37	3.88	0.81	2.98	2.21	9.08	1.92	4.72	2.26	4.17
AUSTRIA		**5-1**	1.27	1.53	1.67	2.85	1.66	2.31	2.37	2.78	1.89	2.68
BELGIUM		**5-1**	1.14	0.90	-0.42	4.83	-0.28	4.13	1.49	1.59	0.66	0.61
CANADA		**5-1**	2.45	7.60	0.88	2.26	1.84	8.12	1.00	11.97	3.23	10.72
DENMARK		**5-1**	1.13	1.57	1.85	4.09	0.87	7.52	0.77	5.00	1.06	3.01
FRANCE		**5-1**	2.90	6.84	1.60	3.58	2.13	9.77	0.85	6.00	1.38	7.94
GERMANY		**5-1**	1.78	4.28	1.41	4.03	1.89	3.90	1.29	3.68	1.01	3.75
HONGKONG		**5-1**	3.66	6.12	2.65	4.59	2.90	4.68	2.48	7.94	6.85	8.76
ITALY		**5-1**	2.09	4.48	3.56	7.01	0.61	1.39	1.89	6.55	2.86	5.13
JAPAN		**5-1**	2.20	9.44	3.43	14.07	1.77	7.90	1.63	10.78	-1.60	-13.15
NETHERLANDS		**5-1**	1.98	3.38	1.19	5.66	0.46	10.15	1.15	6.10	0.84	5.45
NEWZEALAND		**5-1**	1.38	3.72	1.21	2.21	2.14	2.36	1.47	6.01	0.50	1.27
NORWAY		**5-1**	-1.88	-4.19	2.26	4.42	-1.33	-1.57	0.79	4.89	1.39	3.25
SINGAPORE		**5-1**	4.08	5.55	4.86	6.56	-0.24	-1.14	1.25	8.04	4.51	6.71
SPAIN		**5-1**	-0.91	-4.63	3.53	5.67	0.18	5.03	0.60	5.74	1.99	5.98
SWEDEN		**5-1**	4.48	6.15	0.80	7.22	1.11	10.85	1.70	5.86	1.28	2.15
SWITZERLAND		**5-1**	2.04	3.25	3.34	4.50	0.05	3.46	2.34	7.73	0.37	10.90
UK		**5-1**	1.78	8.65	2.35	7.35	1.39	6.58	2.29	5.10	4.73	8.76
US		**5-1**	1.55	10.55	1.17	7.68	1.15	25.53	0.89	11.46	0.93	22.31

Table 8

Country-level regression analysis of extreme volume returns on market characteristics

This table shows the results from Fama-MacBeth regression tests of the market characteristic variables each period. The dependent variable is the 20th day return on the country reference return portfolios. The table shows the mean coefficients from the series of regressions (along with a Newey-West t-statistics) in which we use alternatively, the 20% and 10% extreme volume definitions. We also restrict the sample to the last five years of the sample period for one model. The country characteristics included are the number of listed companies per urban population, the secondary school enrollment, the ratio of the average market value of tenth-decile firms to the average market value of second-decile firms, the three largest industries' market capitalization share, the average R^2 for firms from the country's market model, an accounting standards index, the market turnover ratio, the equally-weighted market return volatility, and indicators for market development, size of firms in portfolio, the country's legal system and for whether the portfolio has a high volume (rather than low volume) shock. The number of cross-sectional regressions is 155 in the full sample models and 47 in 5-year only sample. Also included are the average R^2*'s* from the regressions. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

	20% cut-off		10% cut-off		10% cut-off Last 5 years of sample	
Variable	**Mean coefficient**	**t-statistic**	**Mean coefficient**	**t-statistic**	**Mean coefficient**	**t-statistic**
Intercept	1.25	0.57	0.85	0.68	0.79	0.72
Listed co. per urban pop.	0.11	1.97**	0.13	1.94*	0.12	1.84*
Sec. school enrollment	-0.003	-0.47	-0.004	-1.24	-0.004	-1.01
Market value ratio	0.003	1.82*	0.0025	1.92*	0.002	1.92*
Share of lgst 3 industries	0.48	2.11**	0.59	2.04**	0.52	2.04**
Medium size firms	-0.22	-3.41***	-0.24	-3.86***	-0.21	-3.54***
Large size firms	-0.33	-6.90***	-0.31	-5.87***	-0.27	-3.98***
Average R^2 from country mkt model	1.36	1.96**	1.18	1.88*	1.29	1.88*
Accounting standards	-0.01	-2.01**	-0.011	-2.25**	-0.01	-2.25**
Emerging market indicator	-0.06	-0.15	-0.12	-0.56	-0.11	-0.26
G-7 indicator	0.77	1.93*	0.93	1.89*	0.85	1.56
Market turnover ratio	0.001	0.59	0.001	0.44	0.001	0.32
Scandinavian law	-0.03	-0.08	0.05	0.28	0.07	0.56
French law	-0.16	-0.45	-0.27	-0.84	-0.43	-0.04
German law	-0.15	-0.35	-0.09	-0.82	0.18	0.54
Equally-weighted market volatility	-32.73	-0.12	-25.75	-0.08	-21.73	-0.18
High volume dummy	-0.16	-0.64	0.18	0.78	0.21	0.44
Average Adj. R^2	0.038		0.033		0.016	

Table 9

Firm-specific regression analysis of extreme volume returns on market characteristics

This table shows the results of Fama-MacBeth regression tests of firm-specific and country characteristic variables each period. The dependent variable is the 20th day return on the firm after an extreme volume shock. The table shows the mean coefficients from the series of regressions (along with a Newey-West t-statistic) in which we use alternatively, the 20% and 10% extreme volume definitions. We also restrict the sample to the last five years of the sample period for two models. The firm-specific characteristics included are the firm size relative to the country's market capitalization, indicator variables for whether the firm is included in the FTSE index or has analyst coverage, the number of analysts covering the firm, a dummy variable for whether the firm is covered by the S&P Transparency & Governance Index, the firm's rank from the index, the firm's idiosyncratic risk relative to the average idiosyncratic risk for firms in the country, the firm's total volatility, the R^2 from the firm's market model using the return on the country index as the market, the percentage ownership by blocks held by family and management, the percentage ownership of blocks held by outsiders (i.e., not family or management), an indicator variable for whether the firm is included in the Worldscope database, and a dummy variable for whether it is a high volume (rather than low volume) shock. The country characteristics included are the number of listed companies per urban population, the secondary school enrollment, the ratio of the average market value of tenth-decile firms to the average market value of second-decile firms, the market capitalization share of the largest three industries, the average R^2 for firms from the country's market model, an accounting standards index, the market turnover ratio, the equally-weighted market return volatility, and indicators for emerging markets and G-7 countries. The number of cross-sectional regressions is 155 in the full sample models and 47 in the 5-year only models. Also included are the average R^2*'s* from the regressions. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

Table 9 continued

		20% Full Sample		20% Full Sample		10% Last 5 years		20% Last 5 years	
		Mean coeff	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**
	Intercept	0.863	0.78	0.832	0.79	0.468	1.00	0.682	0.96
Firm-specific variables	Firm size to country market cap	-0.120	-4.04***	-0.120	-4.04***	-0.143	-3.55***	-0.126	-2.79***
	Dummy if firm is in the FTSE index	-0.374	-1.89*	-0.380	-1.91*	-0.365	-2.64***	-0.404	-2.13
	Dummy for any analyst coverage	0.490	3.91***	0.490	3.90***	0.417	2.80***	0.462	2.29***
	Average analyst coverage ratio	0.031	0.31	0.036	0.31	0.028	1.03	0.030	0.41
	Dummy if transparency coverage	0.010	3.10***	0.011	3.10***	0.008	2.60***	0.009	2.79***
	Rank for transparency	0.004	1.19	0.004	1.19	0.003	0.58	0.004	0.96
	Relative idiosyncratic volatility	-0.308	-2.87***	-0.303	-2.86**	-0.225	-1.91*	-0.247	-2.43***
	Block %owned by mgmt & family			0.034	1.12				
	Block % owned by outsiders			0.053	1.08				
	Firm is in Worldscope database			0.015	0.85				
	High volume dummy	-0.130	-0.37	-0.130	-0.37	-0.175	-0.54	-0.224	-0.79
Country-specific variables	Listed co. per urban pop.	0.170	2.03**	0.170	2.03**	0.169	2.49***	0.166	2.16**
	Sec. school enrollment	-0.005	-0.76	-0.005	-0.76	-0.006	-0.98	-0.004	-0.89
	Market value ratio	0.002	2.16**	0.002	2.16**	0.002	2.33***	0.003	1.96**
	Share of largest 3 industries	0.502	1.24	0.502	1.24	0.546	1.75	0.522	1.44
	Average R^2 – mkt model	1.003	1.79*	1.004	1.79	0.931	2.46***	0.992	2.29***
	Emerging Market	-0.059	-0.23	-0.062	-0.28	-0.070	-0.37	-0.056	-0.94
	G-7	0.806	3.49***	0.812	3.51***	0.791	2.61***	0.762	2.29***
	Turnover ratio	0.001	0.95	0.001	0.94	0.002	0.96	0.001	0.80
	Equally-weighted volatility	-36.942	-0.18	-35.467	-0.18	-32.636	-0.20	-34.594	-0.17
	Adj. R-sqr	0.035		0.034		0.042		0.039	

Table 10

Firm-specific regression analysis of extreme volume returns on firm-specific characteristics for G-7 countries

This table shows the results of Fama-MacBeth regression tests for the firm characteristic variables each period within each of the G-7 countries. The dependent variable is the 20th day return on the firm after an extreme volume shock. The table shows the mean coefficients from the regressions (along with a Newey-West t-statistics for the significance of the mean coefficients) for the firm-specific variables. The characteristics included are the firm size relative to the country's market capitalization, a dummy variable for whether the firm is included in the FTSE index, a dummy variable for whether the firm has any analyst coverage, the number of analysts covering the firm, the firm's idiosyncratic risk relative to the average idiosyncratic risk for firms in the country, the firm's total volatility, the R^2 from the firm's market model using the return on the country index as the market and a dummy variable whether it is a high volume (rather than low volume) shock. Panel A includes firm idiosyncratic and total volatility as independent variables and Panel B includes the firm's idiosyncratic volatility and R^2 from a country market model. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

Panel A

	U.S.		Japan		Germany		UK		Canada		France		Italy	
Variable	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**	**Mean coef**	**t-stat**
Intercept	0.240	0.84	0.172	0.95	0.584	0.56	0.231	0.67	0.162	0.71	0.351	0.90	0.410	0.88
Relative firm size	-0.171	-2.42***	-0.160	-3.27***	-0.157	-2.45***	-0.198	-2.54***	-0.232	-2.24***	-0.427	-2.09**	-0.370	-2.81***
FTSE dummy	-0.384	-1.61	-0.421	-1.70	-0.304	-2.75***	-0.418	-2.65***	-0.760	-1.99**	-0.400	-2.50***	-0.355	-2.17**
Analyst coverage	0.432	3.15***	0.352	1.77	0.481	1.90	0.441	2.68***	0.696	2.18**	0.452	1.66	0.519	2.37***
# of analysts	0.006	0.72	0.013	1.16	0.011	0.18	-0.005	-0.27	-0.008	-0.52	-0.016	-0.73	0.011	0.35
Rel. idiosy. risk	-0.262	-4.65***	-0.413	-3.85***	-0.415	-1.73	-0.400	-1.89	-0.208	-1.78	-0.182	-1.24	-0.199	-1.88
Volatility	0.723	4.50***	0.495	3.58***	0.519	2.85***	0.506	2.35***	0.489	2.81***	0.456	2.52***	0.628	1.29
High volume	0.287	0.84	0.414	1.05	0.471	0.89	0.176	0.53	0.417	1.25	0.430	1.07	0.216	0.92
Adj R-sqr	0.022		0.030		0.042		0.038		0.051		0.044		0.033	

Panel B

	U.S.		Japan		Germany		UK		Canada		France		Italy	
Variable	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**	**Mean coeff**	**t-stat**
Intercept	0.229	0.91	0.162	0.73	0.574	0.67	0.221	0.82	0.156	0.12	0.357	0.99	0.425	0.85
Relative firm size	-0.159	-2.25***	-0.153	-3.01***	-0.159	-2.99***	-0.205	-2.17**	-0.215	-2.16**	-0.402	-1.98**	-0.381	-2.88***
FTSE dummy	-0.405	-2.02**	-0.393	-1.72*	-0.316	-2.21**	-0.436	-2.12**	-0.766	-1.59	-0.398	-1.97**	-0.350	-2.03**
Analyst coverage	0.431	2.73***	0.358	2.00**	0.462	2.36***	0.408	2.54***	0.671	1.89*	0.426	1.47	0.514	1.96**
# of analysts	0.006	0.54	0.012	1.03	0.016	0.17	-0.005	-0.35	-0.008	-0.55	-0.016	-0.75	0.011	0.48
Rel. idiosy. risk	-0.245	-5.08***	-0.417	-4.02***	-0.409	-2.12**	-0.375	-1.75	-0.200	-1.40	-0.175	-0.97	-0.195	-1.57
Firm's R^2	0.241	2.05**	0.183	3.07***	0.416	1.19	0.194	1.45	0.184	2.60***	0.139	1.92*	0.225	1.30
High volume	0.289	0.76	0.399	1.17	0.465	0.78	0.169	0.45	0.404	1.63	0.402	1.11	0.208	0.76
Adj R-sqr	0.020		0.029		0.042		0.035				0.041		0.032	

Table 11
Trends in the high volume return premium

This table examines time trends by country in the high volume return premium as measured by the 20-day returns on the zero-investment portfolios as formed in Table 2. The table shows the annualized coefficients from three regression specifications with the 20-day return as the dependent variable. The first specification is a simple time trend regression shown in model (1). The second specification is a piecewise linear specification with one breakpoint at the middle of the sample period for that country. The trend coefficients from this specification are shown in models (2) and (3). The third specification is a piecewise linear specification that allows for the position of a single breakpoint to be optimally chosen using the AIC information criteria for each country. The trend coefficients from this specification are shown in models (4) and (5). The table also shows the Newey-West (1987) t-statistics on the coefficients. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

Panel A: G-7 countries

	Single trend coefficient		**Trend coefficients Break equally spaced**				**Trend coefficients Break optimally chosen**			
	(1)	t-stat	(2)	t-stat	(3)	t-stat	(4)	t-stat	(5)	t-stat
Canada	0.0000	1.20	0.0012	1.56	0.0012	1.56	0.0005	0.83	0.0005	0.84
France	0.0020	2.05**	0.0021	0.89	0.0021	0.89	0.0022	1.08	0.0022	1.08
Germany	-0.0020	-0.49	0.0073	0.79	0.0072	0.79	-0.0016	-0.18	-0.0016	-0.18
Italy	-0.0010	-0.44	-0.0004	-0.15	-0.0004	-0.15	-0.0004	-0.15	-0.0004	-0.15
Japan	0.0000	0.58	-0.0015	-0.95	-0.0015	-0.95	0.0004	0.30	0.0004	0.31
UK	0.0010	2.04**	0.0010	0.88	0.0010	0.89	0.0012	1.65*	0.0012	1.65*
US	0.0000	3.16***	0.0002	1.54	0.0002	1.56	0.0002	1.68*	0.0002	1.70*

Panel B: Other developed countries

	Single trend coefficient		Trend coefficients Break equally spaced				Trend coefficients Break optimally chosen			
	(1)	t-stat	(2)	t-stat	(3)	t-stat	(4)	t-stat	(5)	t-stat
Australia	0.0010	0.68	-0.0015	-0.76	-0.0015	-0.75	0.0006	0.61	0.0006	0.61
Austria	0.0020	1.02	-0.0001	-0.03	-0.0001	-0.03	0.0020	0.86	0.0020	0.87
Belgium	0.0070	1.75*	-0.0035	-0.48	-0.0035	-0.48	0.0075	1.03	0.0075	1.03
Denmark	0.0030	1.47	0.0019	0.50	0.0019	0.50	0.0029	0.72	0.0029	0.72
Hong Kong	0.0020	0.89	0.0033	0.97	0.0033	0.98	0.0016	0.65	0.0016	0.65
Netherlands	0.0010	0.88	0.0015	1.01	0.0015	1.01	0.0004	0.26	0.0004	0.27
New Zealand	0.0050	0.97	0.0068	0.62	0.0068	0.62	0.0064	0.56	0.0064	0.56
Norway	0.0000	-0.12	0.0041	1.05	0.0041	1.04	-0.0003	-0.12	-0.0003	-0.12
Portugal	-0.0050	-1.28	-0.0055	-0.82	-0.0055	-0.82	-0.0055	-0.82	-0.0055	-0.82
Singapore	0.0000	-0.51	-0.0010	-0.63	-0.0010	-0.63	-0.0004	-0.36	-0.0004	-0.36
Spain	0.0040	1.85*	0.0049	1.09	0.0049	1.10	0.0042	1.33	0.0042	1.33
Sweden	0.0040	2.79***	0.0047	1.77*	0.0047	1.78*	0.0039	1.77*	0.0039	1.77*
Switzerland	-0.0010	-0.66	0.0011	0.36	0.0011	0.36	0.0004	0.12	0.0004	0.12

Panel C: Emerging markets

	Single trend coefficient		Trend coefficients Break equally spaced				Trend coefficients Break optimally chosen			
	(1)	t-stat	(2)	t-stat	(3)	t-stat	(4)	t-stat	(5)	t-stat
Argentina	0.0040	1.02	0.0058	0.80	0.0058	0.80	0.0045	0.58	0.0045	0.58
Bangladesh	-0.0140	-1.62	0.0076	0.54	0.0075	0.53	-0.0131	-0.78	-0.0131	-0.78
Brazil	0.0220	0.86	0.0000	0.00	0.0225	0.86	0.0000	0.00	0.0000	0.00
Chile	0.0020	0.91	0.0030	0.86	0.0030	0.86	0.0022	0.60	0.0022	0.60
China	0.0010	0.19	0.0040	0.58	0.0040	0.58	-0.0001	-0.03	-0.0001	-0.03
Egypt	-0.0140	-0.38	-0.0311	-0.63	-0.0311	-0.63	-0.0030	-0.04	-0.0030	-0.04
Greece	0.0010	0.31	-0.0033	-0.84	-0.0033	-0.84	0.0003	0.07	0.0003	0.07
India	-0.0020	-0.65	-0.0022	-0.34	-0.0022	-0.34	-0.0027	-0.35	-0.0027	-0.35
Indonesia	0.0010	0.05	-0.0052	-0.25	-0.0052	-0.25	0.0039	0.20	0.0038	0.19
Korea	-0.0030	-2.21**	-0.0065	-2.29**	-0.0064	-2.29**	-0.0032	-1.19	-0.0032	-1.19
Malaysia	0.0020	1.67*	0.0006	0.24	0.0006	0.24	0.0020	1.54	0.0020	1.55
Mexico	0.0000	0.05	0.0035	0.84	0.0035	0.84	0.0001	0.03	0.0001	0.03
Morocco	-0.0050	-0.96	-0.0011	-0.15	-0.0011	-0.16	-0.0044	-0.64	-0.0044	-0.64
Pakistan	0.0000	-0.09	0.0024	0.30	0.0024	0.30	-0.0008	-0.14	-0.0008	-0.14
Philippines	-0.0240	-0.38	0.1679	1.38	0.1672	1.38	-0.0233	-0.34	-0.0233	-0.34
Poland	-0.0010	-0.09	0.0159	1.14	0.0159	1.14	-0.0013	-0.07	-0.0013	-0.08
S. Africa	-0.0120	-1.44	0.0295	2.00**	0.0294	2.00**	-0.0231	-1.52	-0.0231	-1.52
Sri Lanka	0.0010	0.30	-0.0042	-0.68	-0.0042	-0.68	0.0009	0.25	0.0009	0.25
Taiwan	0.0000	-0.26	0.0035	1.16	0.0035	1.16	-0.0027	-0.91	-0.0027	-0.91
Thailand	-0.0010	-0.46	0.0005	0.15	0.0005	0.15	-0.0006	-0.19	-0.0006	-0.19
Turkey	0.0010	0.18	0.0054	0.93	0.0054	0.93	0.0003	0.06	0.0003	0.06

Table 12

Time series analysis of high volume return premium

This table examines the autocorrelations by country in the high volume return premium as measured by the 20-day returns on the zero-investment portfolios as formed in Table 2. The table shows the test statistics and probability levels from three statistical tests, the Ljung-Box test (with lags of 6 and 12), the Bartlett's Kolmogorov-Smirnov statistic, and Dickey-Fuller tests for stationarity.

Panel A. G7 and other developed countries

	Liung-Box (lag = 6)		Liung-Box (lag = 12)		Bartlett's Kolmogorov Smirnov		Dickey-Fuller Tests		
	statistic	p-value	statistic	p-value	statistic	p-value	Trend	Zero-mean	Single-mean
G-7									
Canada	14.420	0.025	18.130	0.112	0.125	0.018	0.000	0.000	0.000
France	5.240	0.513	11.670	0.473	0.090	0.761	0.000	0.000	0.000
Germany	14.450	0.025	18.260	0.108	0.183	0.324	0.000	0.000	0.000
Italy	2.300	0.890	5.150	0.953	0.059	0.984	0.000	0.000	0.000
Japan	7.080	0.314	9.720	0.640	0.162	0.094	0.000	0.000	0.000
UK	15.360	0.018	20.380	0.060	0.116	0.232	0.000	0.000	0.000
US	5.090	0.532	7.080	0.853	0.069	0.244	0.000	0.000	0.000
Other developed countries									
Australia	6.160	0.405	11.580	0.480	0.086	0.683	0.000	0.000	0.000
Austria	1.620	0.951	8.380	0.755	0.099	0.694	0.000	0.000	0.000
Belgium	9.720	0.137	13.460	0.336	0.283	0.009	0.008	0.002	0.000
Denmark	2.440	0.875	11.760	0.465	0.062	0.987	0.000	0.000	0.000
Hong Kong	8.460	0.207	13.630	0.325	0.161	0.064	0.000	0.000	0.000
Netherlands	5.790	0.447	15.280	0.227	0.106	0.316	0.000	0.000	0.000
New Zealand	4.000	0.677	6.250	0.903	0.055	0.998	0.000	0.000	0.000
Norway	4.340	0.631	20.080	0.066	0.116	0.355	0.000	0.000	0.000
Portugal	2.890	0.823	6.310	0.900	0.104	0.806	0.000	0.000	0.000
Singapore	1.380	0.967	11.040	0.525	0.074	0.659	0.000	0.000	0.000
Spain	2.930	0.818	7.550	0.820	0.101	0.663	0.000	0.000	0.000
Sweden	10.730	0.097	20.000	0.067	0.156	0.062	0.000	0.000	0.000
Switzerland	4.370	0.626	8.310	0.761	0.083	0.839	0.000	0.000	0.000

Panel B. Emerging markets

	Liung-Box (lag = 6)		Liung-Box (lag = 12)		Bartlett's Kolmogorov Smirnov		Dickey-Fuller Tests		
	statistic	p-value	statistic	p-value	statistic	p-value	Trend	Zero-mean	Single-mean
Argentina	10.970	0.089	22.520	0.032	0.236	0.045	0.000	0.000	0.000
Bangladesh	14.360	0.026	16.470	0.171	0.165	0.709	0.000	0.000	0.000
Brazil	2.970	0.813	6.740	0.875	0.389	0.324	0.724	0.307	0.081
Chile	5.360	0.499	10.910	0.537	0.087	0.774	0.000	0.000	0.000
China	3.240	0.778	5.550	0.937	0.117	0.724	0.000	0.000	0.000
Egypt	5.790	0.447	8.500	0.745	0.131	0.979	0.037	0.007	0.001
Greece	8.650	0.194	12.560	0.402	0.204	0.010	0.000	0.000	0.000
India	4.820	0.567	8.870	0.714	0.134	0.652	0.000	0.000	0.000
Indonesia	14.080	0.029	18.760	0.095	0.167	0.391	0.000	0.000	0.000
Korea	9.880	0.130	23.020	0.028	0.175	0.025	0.000	0.000	0.000
Malaysia	1.810	0.936	10.850	0.542	0.066	0.875	0.000	0.000	0.000
Mexico	4.860	0.561	19.080	0.087	0.119	0.425	0.000	0.000	0.000
Morocco	2.960	0.814	4.950	0.960	0.077	0.999	0.001	0.000	0.000
Pakistan	2.470	0.871	16.170	0.184	0.077	0.983	0.000	0.000	0.000
Philippines	0.040	1.000	0.100	1.000	0.028	1.000	0.000	0.000	0.000
Poland	6.070	0.416	15.170	0.232	0.179	0.401	0.000	0.000	0.000
S. Africa	17.330	0.008	31.310	0.002	0.375	0.003	0.004	0.001	0.000
Sri Lanka	6.540	0.366	9.650	0.647	0.110	0.622	0.000	0.000	0.000
Taiwan	4.760	0.575	10.030	0.613	0.173	0.107	0.000	0.000	0.000
Thailand	5.170	0.522	11.010	0.528	0.092	0.597	0.000	0.000	0.000
Turkey	7.290	0.295	13.140	0.359	0.101	0.499	0.000	0.000	0.000

Table 13

High volume return premium across growth and recessionary periods

This table provides the coefficients and t-statistics from separate regressions of the high volume return premiums on indicator variables for high-growth and recessionary periods in each country as defined by the Economic Cycle Research Institute. The high volume return premium is measured by the 20-day returns on the zero-investment portfolios as formed in Table 2. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

	Coefficient on high_growth_dummy	t-stat	Coefficient on recession_dummy	t-stat
G7 countries				
Canada	-0.0044	-0.73	0.0039	0.44
France	0.0062	0.89	-0.0089	-0.92
Germany	-0.0314	-1.14	0.0270	0.88
Italy	0.0087	0.69	0.0078	0.36
Japan	-0.0021	-0.43	0.0045	0.96
UK	0.0040	0.87	-0.0075	-1.11
US	0.0014	0.81	0.0001	0.05
Other developed countries				
Australia	-0.0024	-0.34	0.0293	2.81***
Austria	-0.0033	-0.31	-0.0059	-0.48
New Zealand	0.0005	0.07	-0.0070	-0.46
Spain	0.0019	0.15	-0.0267	-1.60
Sweden	0.0079	0.76	-0.0299	-2.50***
Switzerland	0.0031	0.31	0.0127	1.27
Emerging markets				
India	0.0011	0.09	0.0098	0.50
Korea	-0.0080	-0.71	-0.0185	-0.89
Mexico	0.0112	0.70	-0.0194	-1.07
S. Africa	-0.0166	-0.73	0.0492	2.39
Taiwan	0.0012	0.12	0.0098	0.73

Table 14
Average turnover in composition of stocks in extreme portfolios

This table shows the average turnover of the compositions of the stocks in the low and high volume portfolios for each country.

	Low-volume portfolio composition turnover	High-volume portfolio composition turnover
G7 countries		
Canada	82.18%	84.93%
France	84.02%	85.22%
Germany	84.64%	90.29%
Italy	83.53%	84.50%
Japan	83.06%	82.16%
UK	82.10%	81.99%
Other developed countries		
Australia	83.42%	83.63%
Austria	83.67%	84.76%
Belgium	85.74%	83.10%
Denmark	87.57%	83.14%
Hong Kong	82.33%	82.91%
Netherlands	82.86%	82.17%
New Zealand	84.63%	85.37%
Norway	85.20%	85.09%
Portugal	88.49%	87.63%
Singapore	84.84%	84.43%
Spain	83.10%	83.79%
Sweden	85.08%	80.91%
Switzerland	86.59%	85.14%

Table 14 (continued)

Emerging markets	Low-volume portfolio composition turnover	High-volume portfolio composition turnover
Argentina	85.40%	84.80%
Bangladesh	91.38%	90.23%
Brazil	79.87%	80.23%
Chile	87.48%	84.84%
China	81.81%	90.34%
Egypt	83.53%	86.17%
Greece	84.92%	84.91%
India	82.09%	80.87%
Indonesia	82.52%	83.03%
Korea	83.16%	82.57%
Malaysia	83.96%	85.23%
Mexico	83.04%	89.00%
Morocco	87.61%	83.31%
Pakistan	85.11%	86.36%
Philippines	80.82%	86.30%
Poland	83.54%	85.80%
S. Africa	84.96%	82.80%
Sri Lanka	86.48%	88.19%
Taiwan	81.35%	83.89%
Thailand	82.98%	85.62%
Turkey	82.06%	81.62%

Table 15
Impact of normal returns, definition of extreme volume, longer holding periods and transaction costs for returns on zero-investment portfolios

This table shows the results from estimating the average return for zero-investment portfolios held for 20 days after the portfolio formation, considering transaction costs and a 10% (rather than 20%) cutoff for the extreme volume definition. The portfolios are constructed on a country by country basis and consist of long positions in extreme high volume stocks and short positions in extreme low volume stocks, where extreme high and low volume are defined as of the portfolio formation dates. The results are grouped by small, medium and large firms within each region. The normal return columns define the extreme volumes within only the normal return set (the 60% midrange returns). The table employs the average transactions costs by country from Chiyachantana, Jain, Jiang and Wood (2004) where the transaction costs are calculated for each size group. The costs for retail investors are the explicit costs and the costs for institutional investors are both explicit and implicit costs. The table only includes countries that had significant average returns and that had transaction cost information available. Extreme volume is defined as extreme 10% or 20% percentile except for Panel D where it is defined using the stocks' Z scores on volume. *, **, and *** represent 10%, 5% and 1% significance levels, respectively.

Panel A: 20% Cutoff and 20-day holding period

	20% Cutoff (20-day holding period)			20% Cutoff Normal Returns (20-day holding period)		
	before costs	after costs for retail investors	after costs for institutional investors	before costs	after costs for retail investors	After costs for institutional investors
G7 Countries						
Small	2.00%***	1.71%***	0.40%	1.57%***	1.26%***	-0.12%
Medium	1.48%***	1.19%***	0.16%*	1.56%***	1.25%***	0.15%**
Large	0.97%***	0.67%***	-0.03%	0.93%***	0.61%***	-0.15%
Other Developed Markets						
Small	1.05%	-0.16%	-0.75%	1.60%**	0.30%	-0.32%
Medium	1.54%***	0.24%	-0.24%	1.70%***	0.34%	-0.18%
Large	1.27%***	-0.02%	-0.40%	1.33%***	-0.05%	-0.45%
Emerging Markets						
Small	5.03%**	3.14%	1.89%	5.82%	3.79%	2.45%
Medium	2.40%***	0.53%	-0.70%	2.97%***	0.94%	-0.40%
Large	1.83%***	-0.04%	-1.17%**	2.14%***	0.13%	-1.07%

Panel B: 10% Cutoff and 20-day holding period

	10% Cutoff (20-day holding period)			10% Cutoff Normal Returns (20-day holding period)		
	before costs	after costs for retail investors	after costs for institutional investors	before costs	after costs for retail investors	after costs for institutional investors
G7 Countries						
Small	1.43%***	1.11%**	-0.32%	1.25%*	0.92%	-0.53%
Medium	1.73%***	1.41%***	0.23%*	1.85%***	1.52%***	0.34%**
Large	1.18%***	0.85%***	0.08%	1.06%***	0.72%***	-0.08%
Other Developed Markets						
Small	1.74%*	0.46%	-0.19%	2.06%**	0.74%	0.07%
Medium	1.95%***	0.56%	0.00%	1.77%***	0.33%	-0.21%
Large	1.14%***	-0.24%	-0.64%	1.13%**	-0.27%	-0.68%
Emerging Markets						
Small	6.65%*	4.59%	3.21%	10.28%	8.15%	6.73%
Medium	1.78%**	-0.28%	-1.62%*	2.92%***	0.76%	-0.65%
Large	2.26%***	0.20%	-1.06%	2.81%***	0.66%	-0.63%

Panel C: 10% Cutoff and longer horizons conditional on normal returns

	10% Cutoff Normal Returns (30-day holding period)			10% Cutoff Normal Returns (40-day holding period)		
	before costs	after costs for retail investors	after costs for institutional investors	before costs	after costs for retail investors	after costs for institutional investors
G7 Countries						
Small	1.65%**	1.32%*	-0.14%	1.99%**	1.67%*	0.21%
Medium	2.05%***	1.72%***	0.54%**	2.17%***	1.84%***	0.62%**
Large	1.14%***	0.79%***	-0.01%	1.17%***	0.82%***	0.02%
Other Developed Markets						
Small	3.02%***	1.70%	1.03%	1.96%	0.63%	-0.04%
Medium	1.81%***	0.37%	-0.17%	2.26%***	0.82%	0.27%
Large	1.04%*	0.63%	-0.77%	1.39%*	-0.01%	-0.42%
Emerging Markets						
Small	6.65%*	4.59%	3.21%	12.24%	10.10%	8.67%
Medium	1.78%**	-0.28%	-1.62%*	4.36%***	2.20%	0.79%
Large	2.26%***	0.20%	-1.06%	2.02%*	-0.14%	-1.43%

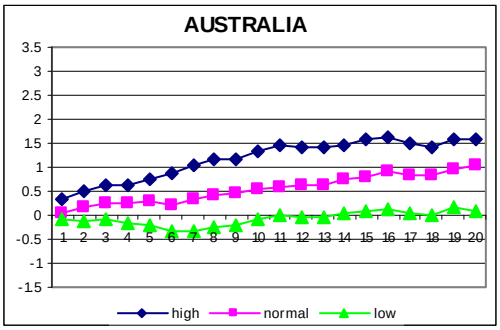
Panel D: 10% Cutoff and longer horizons conditional on normal returns with extreme volume defined by extreme Z score

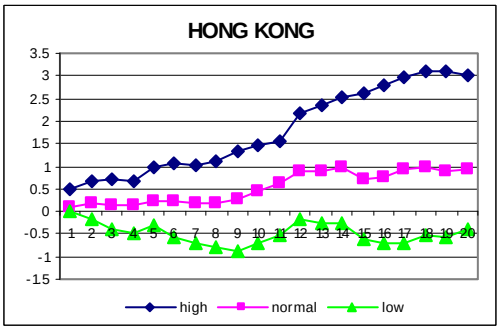
	10% Cutoff Normal Returns (20-day holding period)			10% Cutoff Normal Returns (40-day holding period)		
	before costs	after costs for retail investors	after costs for institutional investors	before costs	after costs for retail investors	after costs for institutional investors
G7 Countries						
Small	1.33%*	1.00%	-0.46%	2.06%**	1.73%*	0.27%
Medium	2.08%***	1.74%***	0.56%**	2.24%***	1.90%***	0.72%**
Large	1.13%***	0.79%***	-0.01%	1.19%***	0.84%***	0.04%
Other Developed Markets						
Small	2.95%**	1.60%	0.93%	2.69%	1.34%	0.66%
Medium	2.13%***	0.68%	0.14%	2.47%***	1.02%	0.48%
Large	1.37%**	-0.03%	-0.44%	1.72%**	0.32%	-0.09%
Emerging Markets						
Small	11.30%	9.19%	7.78%	13.29%	11.16%	9.75%
Medium	2.94%***	0.77%	-0.64%*	4.56%***	2.38%	0.97%
Large	2.36%***	0.20%	-1.09%	1.50%	-0.66%	-1.96%*

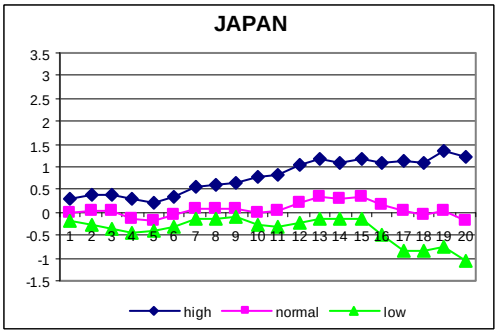
Figure 1. Evolution of the average cumulative return of stocks conditional on their one-day trading volume shocks: developed markets divided by geographical regions

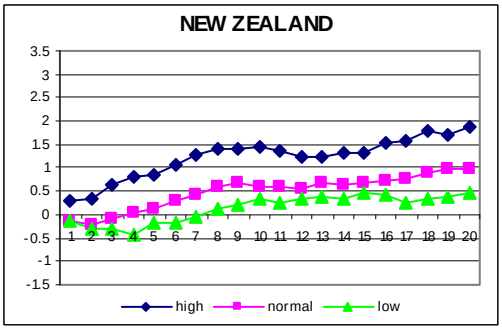
For each country, at the end of every fiftieth trading day, equally-weighted portfolios are formed according to the trading volume (as measured by the number of shares traded) experienced by each stock during that day. A stock whose trading volume that day is amongst its top (bottom) 20 percent of daily trading volumes over the previous 49 trading days is categorized as a "high volume" ("low volume") stock; otherwise, it is categorized as a "normal volume" stock. The average cumulative return of the three portfolios is plotted in each figure.

Asia Pacific









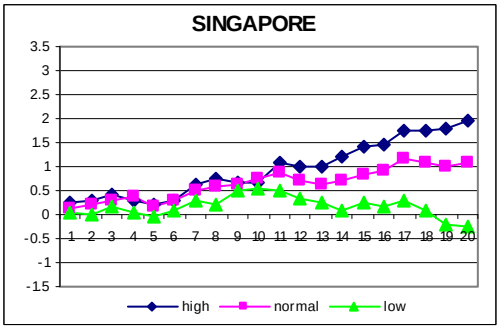
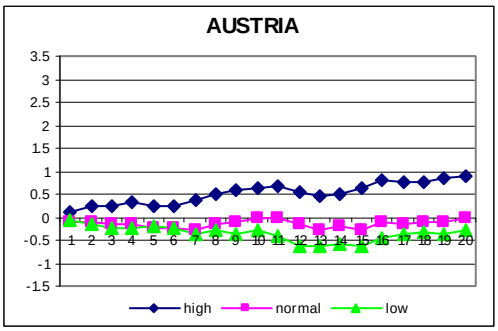
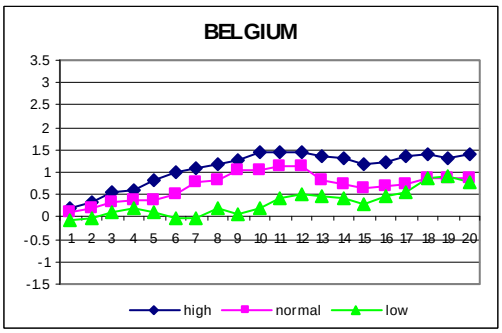
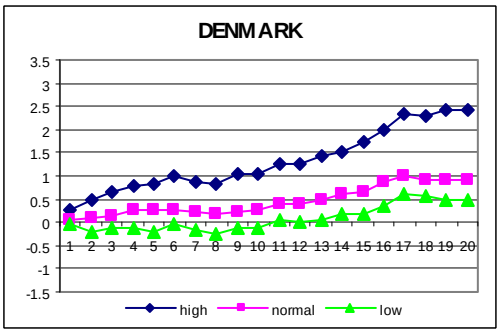


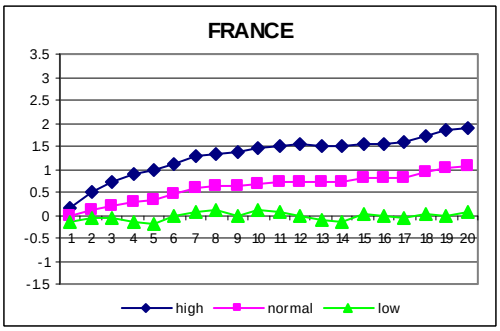
Figure 1 continued

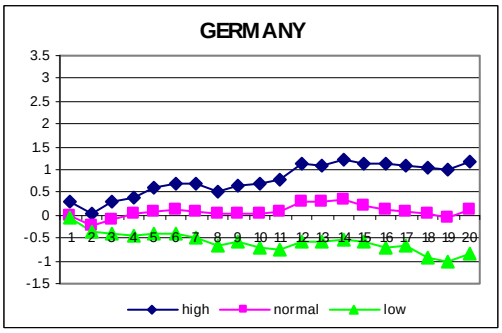
Europe

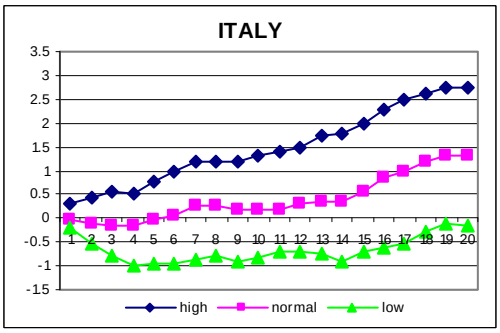


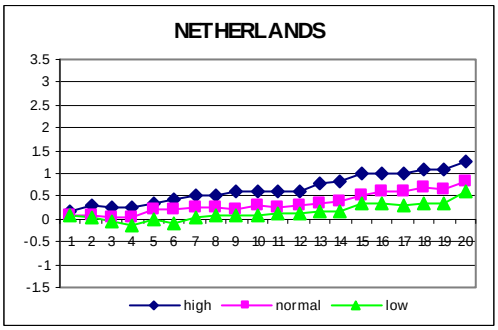












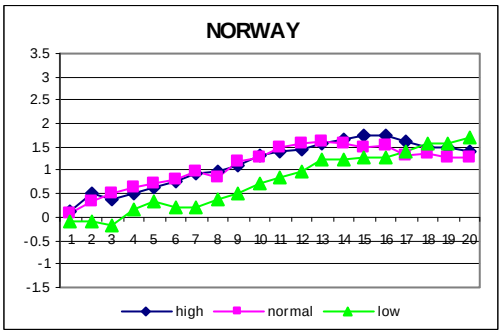
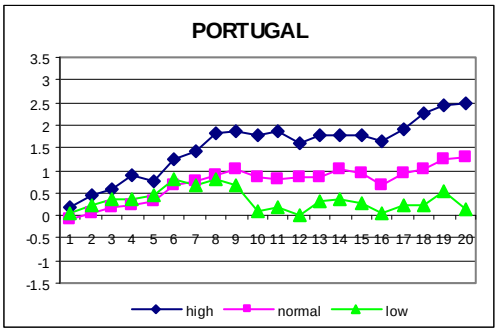
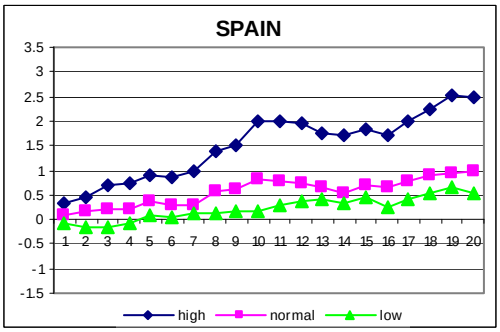
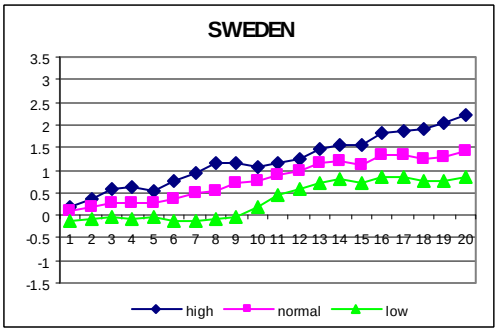
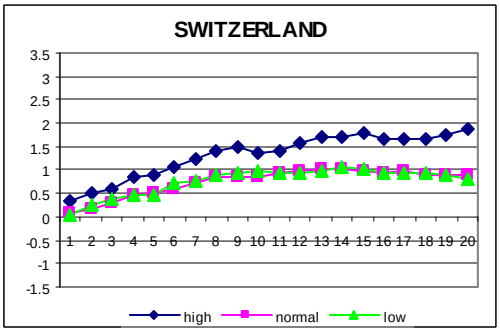


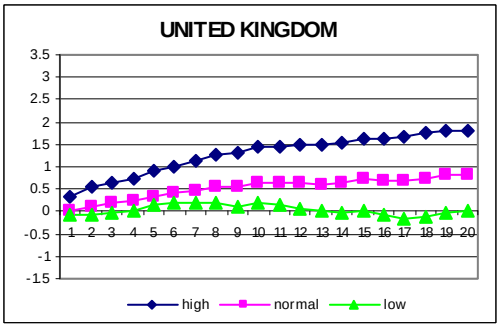
Figure 1 continued



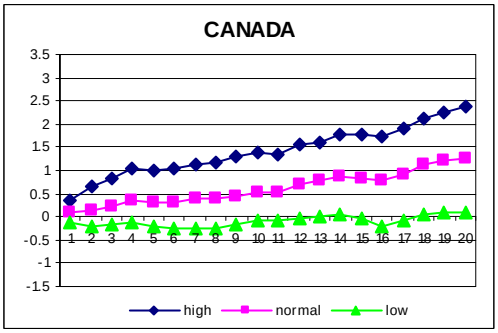








North America



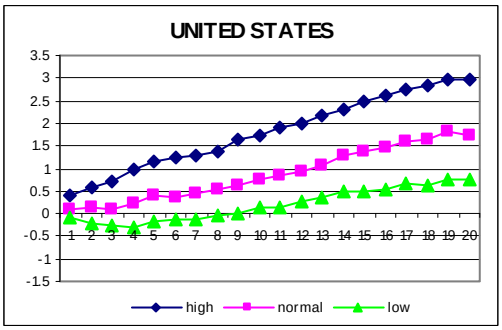
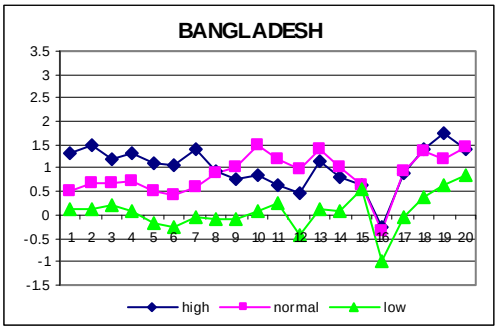
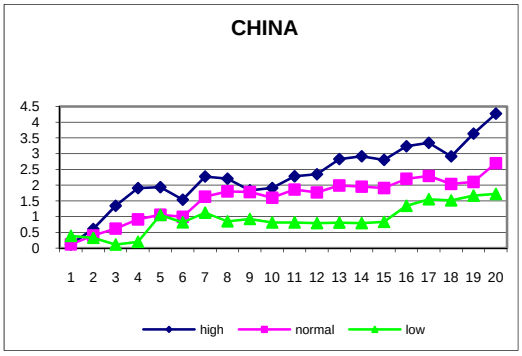


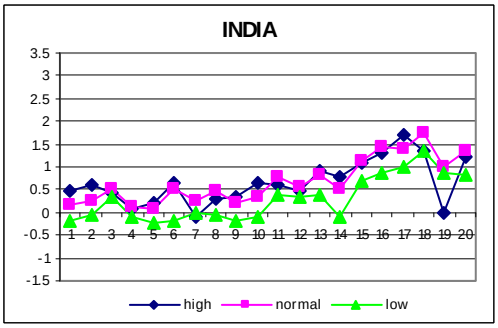
Figure 2. Evolution of the average cumulative return of stocks conditional on their one-day trading volume shocks: emerging markets divided by geographical regions

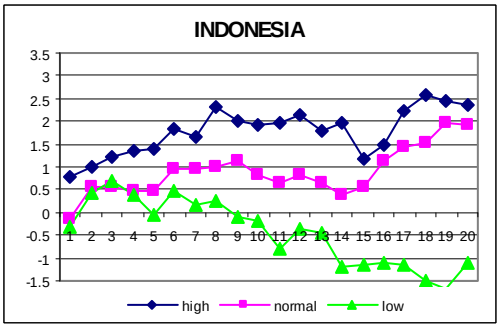
For each country, at the end of every fiftieth trading day, equally-weighted portfolios are formed according to the trading volume (as measured by the number of shares traded) experienced by each stock during that day. A stock whose trading volume that day is amongst its top (bottom) 20 percent of daily trading volumes over the previous 49 trading days is categorized as a "high volume" ("low volume") stock; otherwise, it is categorized as a "normal volume" stock. The average cumulative return of the three portfolios is plotted in each figure.

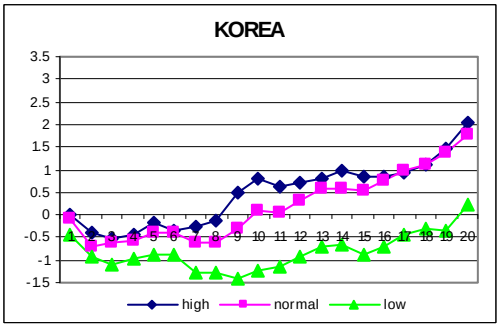
Asia Pacific











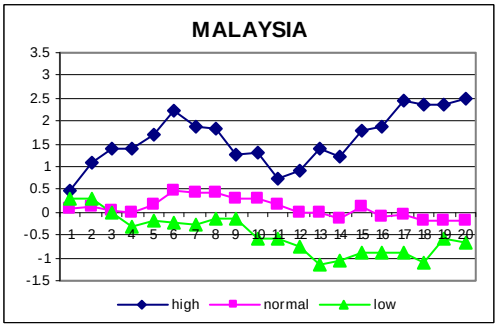
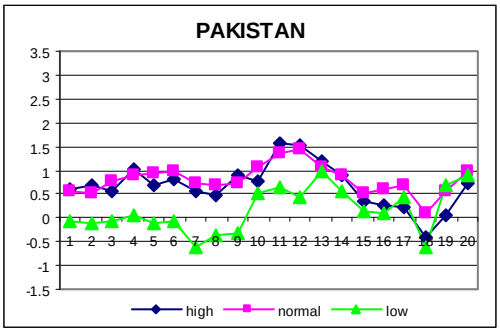
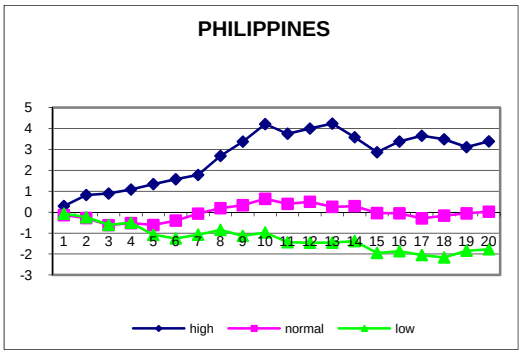
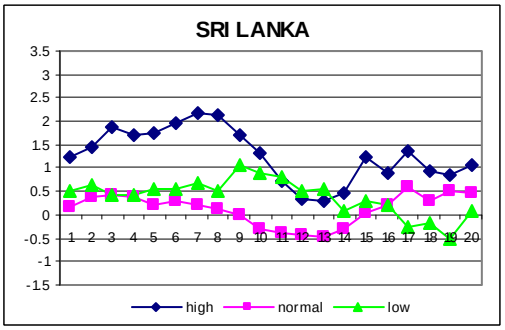
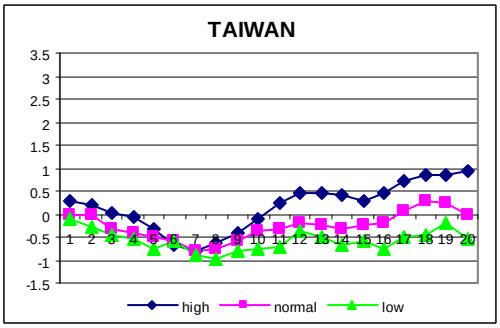


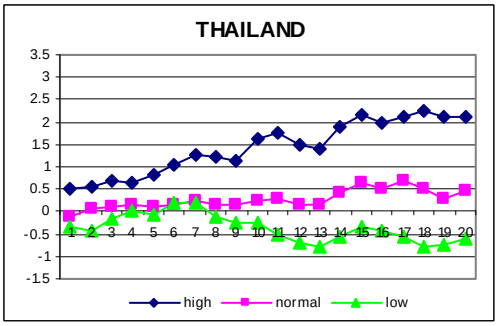
Figure 2 continued



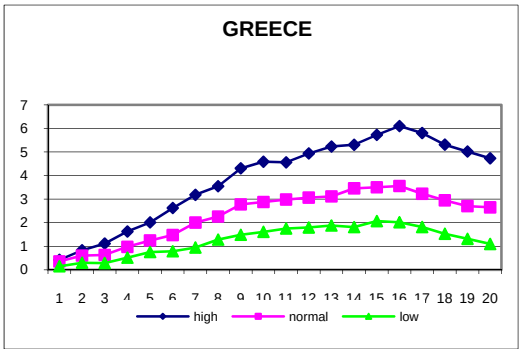








Europe



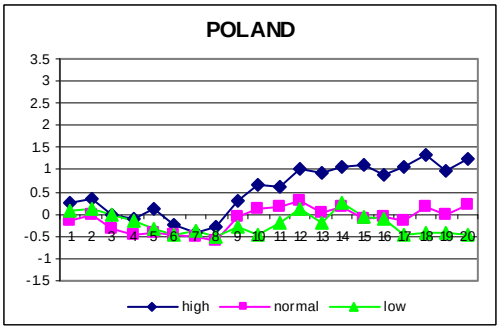
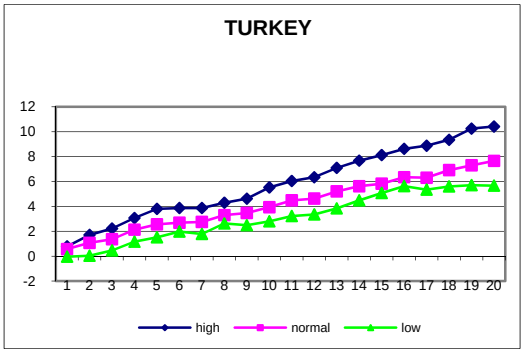
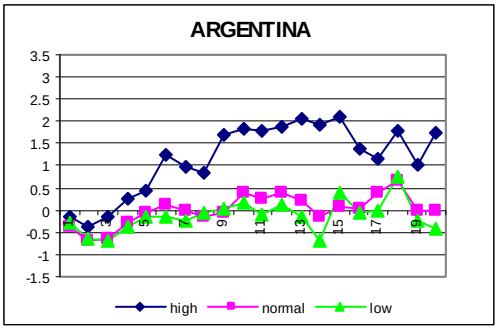
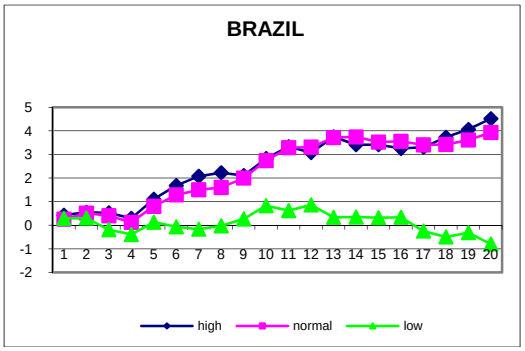


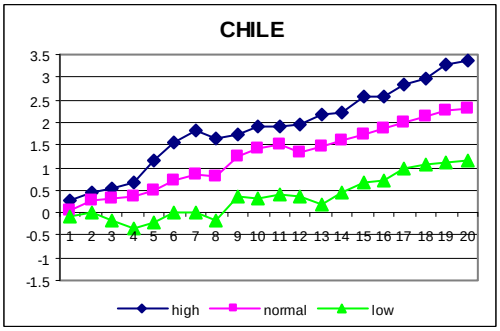
Figure 2 continued

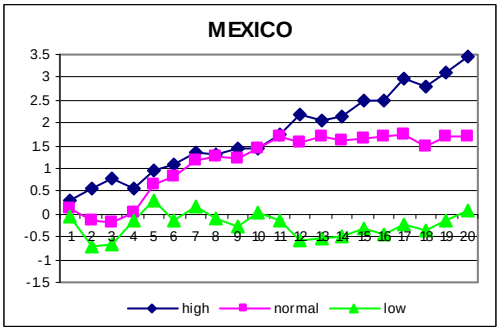


Latin America (All Are Emerging Markets)

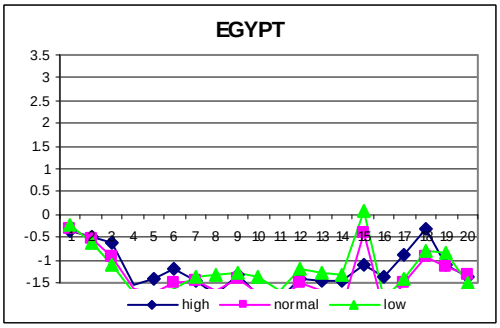


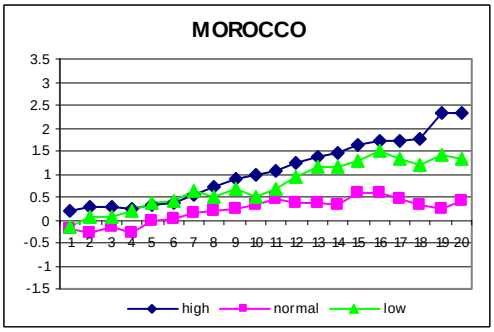


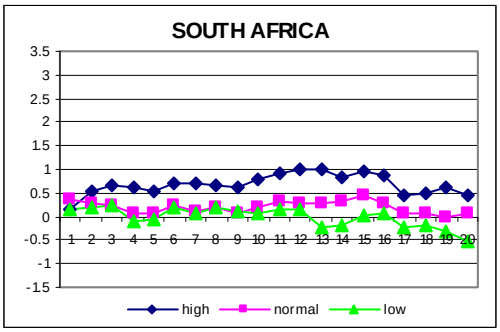




Middle East and Africa (All Are Emerging Markets)



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