Journal of Financial Economics 103 (2012) 255–279

Contents lists available at SciVerse ScienceDirect

Journal of Financial Economics

journal homepage: www.elsevier.com/locate/jfec

The high volume return premium: Cross-country evidence ☆

Ron Kaniel [a,d], Arzu Ozoguz [b], Laura Starks [c,*]

[a] University of Rochester, Rochester, NY, United States
[b] University of Texas at Dallas, United States
[c] Department of Finance, University of Texas, Austin, TX 78712-1179, United States
[d] CEPR, London, UK

ARTICLE INFO

Article history:
Received 5 September 2007
Received in revised form
17 November 2009
Accepted 29 January 2010
Available online 3 September 2011

JEL classification:
G14

Keywords:
Return premium
Volume
International stock markets

ABSTRACT

We examine the high volume return premium across 41 different countries and find it to be a 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.

1. Introduction

The high volume return premium, that is, the excess market-adjusted return that occurs after a stock receives a substantial positive volume shock, has been found to be an intriguing component of financial markets in the United States (Gervais, Kaniel, and Mingelgrin, 2001). 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. We investigate the hypothesis as to whether the high volume return premium is associated with changes in investor visibility for a stock, as would be predicted by Merton's (1987) investor recognition hypothesis and as suggested by evidence presented by Gervais, Kaniel, and Mingelgrin.

Examining data from 41 countries that vary in their market structure, investor composition, and constituent 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 return premiums. In addition, we characterize their time-series properties.

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

☆ 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.

* Corresponding author. Tel.: +1 512 471 5899; fax: +1 512 471 5073.
E-mail address: LStarks@mail.utexas.edu (L. Starks).

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doi:10.1016/j.jfineco.2011.08.012

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 the size of its investor base.

The main idea in Merton's (1987) 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 might affect the costs of being informed, the level of a stock's visibility, and an investor's decision on whether to purchase the stock.

In our empirical tests we identify potential 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 (1987) 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. We find this result with several measures of visibility. That is, we find greater high volume premiums in countries that are more developed, countries with more listed companies per urban population, and countries with more dominant stocks (either through large size or industry domination) in their stock markets. We also find that the high volume return premium is 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 All-World 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 Standard & Poor's (S&P) Transparency and Governance Index, but it is not affected by the magnitude of the analyst coverage or the S&P Transparency and Governance ranking for the firm. We go further by examining the effects of the firm-specific determinants of the high volume return premium within each of the G-7 countries separately and obtain results that are consistent with our cross-country findings.

We next consider the viability of economic trading strategies for retail and institutional investors in different countries, particularly given the previously documented variation in transaction costs across these two types of investors and countries (e.g., Lesmond, Ogden, and Trzcinka, 1999; Domowitz, Glen, and Madhavan, 2001; Chiyachantana, Jain, Jiang, and Wood, 2004; Lesmond, 2005; Eleswarapu and Venkataraman, 2006). We assume large institutional investors are likely to face transaction costs distinct from those of retail investors. Specifically, beyond the explicit trading costs required of both retail and institutional investors, the institutional investors also face implicit trading costs (e.g., bid-ask spread) due to the large size of their transactions. Consequently, 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 after controlling for the explicit transaction costs retail investors would face. However, once we include the implicit trading costs that large investors would face in the G-7 markets, we do not find that the premium remains significant. We also find that in developed markets other than the G-7 and in emerging markets, even the estimated explicit trading costs are too high for the retail investors to profit from 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.

Our paper proceeds as follows. In Section 2, 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 tests involving characteristics across and within countries

[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), Grullon, Kanatas, and Weston (2004), Fehle, Tsyplakov, and Zdorovtsov (2005), and King and Segal (2009).

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 modify the Gervais, Kaniel, and Mingelgrin (2001) methodology. The small modifications we employ arise from differences in institutional details and in data availability for financial markets across the countries in our sample as compared to their U.S. 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 days constitute the reference period, where we measure the typical distribution of volume for each stock individually. There is then a one-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). Using volume shocks during the one-day formation period, in the final period, the testing period, we group stocks 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. We then assess the returns on these portfolios.

Many countries have a relatively short time series of volume data available. Thus, we overlap our reference periods, but not our testing periods, in order to make full use of the time series. For most of our analyses, we time the start of each reference period in the sequence so that the subsequent testing period starts one day after the end of the previous testing period. This approach ensures non-overlapping testing periods and at the same time provides us with overlapping reference periods.

We define a stock to have extreme high or low trading volume during the one-day formation period if the stock's trading volume on that day is in the top or bottom 20th 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 10th percentiles, for much of the analysis in our study, we rely on the top or bottom 20th 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 would 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% cut-off, even though the cut-off lowers the bar for an event to be defined as a volume shock. However, it should be noted that using this larger cut-off works against our hypothesis.

We employ returns and volume data for stocks traded in the 41 countries for which we have sufficient data. For the United States we obtain the returns and volume data from the Center for Research in Security Prices (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 are not available until the 1980s, or even 1990s, 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] The mean (median) number of intervals is 142 (134).

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

[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.

[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 50–100 days, even though these authors show that weekly results are stronger.

[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.

[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.

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
Philippines	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
Mean		142	229
Median		134	93

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.[8]

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 omitted 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 nine 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 countries with too few stocks, 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 mean (median) number of stocks in an interval is 229 (93).

Internet Appendix Fig. 1 shows 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 50th 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 50th day falls within the top (bottom) 20th 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 20-day test period is plotted in each figure for the high extreme volume, normal volume, and low extreme volume portfolios.

The results for the developed markets, for example, as shown in Canada, Australia, and the U.K., are striking in their similarity to the results for the United States. The figure demonstrates that the extreme high volume portfolios have greater cumulative returns over the test periods than do the normal or the extreme low volume portfolios. The figure also indicates that normal volume portfolios outperform the extreme low volume portfolios. For almost all of the developed countries, their plots are consistent with those shown—the high volume portfolio return appears to be greater than the returns on the other portfolios. For the emerging markets, the figure shows more mixed results with the differences in returns over the 20-day test periods between the high, normal, and low volume portfolios not being as well-defined as shown, for example, in the graphs for Taiwan or Pakistan. We examine these differences more formally in the next section.

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

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

[8] Hou, Karolyi, and Kho (2009) also use this type of screening for Datastream in deriving their sample.

portfolio and then hold the portfolio for the subsequent 20-day testing period without rebalancing. The resulting portfolio return for country i over interval t then consists of a net return,

$$NR_{i,t} = R^h_{i,t} + R^l_{i,t},$$

where $R^h_{i,t}$ denotes the return on the high volume portfolio position and $R^l_{i,t}$ 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 extreme high 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 extreme low 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. 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 20-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. 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. See also Hou, Karolyi, and Kho (2009) for evidence on firm size in global markets.

Table 2 presents the average returns of these two investment strategies along with the Newey and West (1987) t-statistics from tests for whether the returns are significantly different from zero. The averages are calculated over the sum of the available 20-day intervals. 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. As expected and discussed in Gervais, Kaniel, and Mingelgrin (2001), the magnitudes in the zero-investment portfolios are larger than for the reference portfolios.

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 20-day test period are Norway and the Netherlands. In any of the other 18 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 20-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 nine 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

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. The zero-investment portfolio consists of a long $1 position in extreme high volume stocks and a short $1 position in extreme low volume stocks, where the stocks are equally weighted. The reference return portfolio consists of $1 long in extreme high volume stocks plus $1 short in extreme low volume stocks, where each of these positions is offset by $1 short or long in a size-adjusted reference portfolio. Each of the portfolios is held for the subsequent 20–day testing period without rebalancing. Extreme high and low volume are defined as the top and bottom 20% of volume (in the country) for the 49 days prior to the portfolio formation dates. The sample periods vary across countries depending on availability of data as shown in Table 1. The table also includes the Newey and 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.

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
Panel A: Developed markets				
G-7 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***
Panel B: Emerging markets				
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
Philippines	0.28	0.09	0.07	0.06
Poland	0.21	0.89	0.27	1.73*
South 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

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 length 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 as compared to the results in Table 2.

Table 3
20th-day returns by G-7 countries 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. The zero-investment portfolio consists of a long $1 position in extreme high volume stocks and a short $1 position in extreme low volume stocks, where the stocks are equally weighted. The reference return portfolio consists of $1 long in extreme high volume stocks plus $1 short in extreme low volume stocks, where each of these positions is offset by $1 short or long in a size-adjusted reference portfolio. Each of the portfolios is held for the subsequent 20–day testing period without rebalancing. Extreme high and low volume are defined as the top and bottom 20% of volume (in the country) for the 49 days prior to the portfolio formation dates. The sample period is divided into two subsamples: 1997–2001 as shown in the left panel and 1992–1996 as shown in the right panel. Each sample period has 65 test periods. The average number of stocks per country are given in Table 1. 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					1992 – 1996				
Country	ZI (%)	*t*-Statistic	RR (%)	*t*-Statistic	Country	ZI (%)	*t*-Statistic	RR (%)	*t*-Statistic
Canada	1.52	7.49***	1.09	7.82***	Canada	1.05	6.68***	0.71	6.79***
France	1.39	4.09***	0.73	4.77***	France	1.36	5.17***	0.47	5.12***
Germany	0.64	2.47**	0.31	2.73***	Germany	1.46	3.55***	0.68	3.66***
Italy	0.87	4.76***	0.51	4.24***	Italy	0.58	1.73	0.20	2.04**
Japan	1.06	2.67***	0.33	4.55***	Japan	1.58	6.18***	0.70	6.59***
UK	1.90	6.14***	0.98	10.35***	UK	0.72	4.79***	0.41	5.62***
US	1.21	4.30***	0.57	4.70***	US	0.81	10.73***	0.41	12.06***

In a second test (reported in Internet Appendix Table 1), we examine 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 100 times and compare the distribution of the *t*-statistics we obtain across the portfolios with different numbers of securities for the 90th, 75th, 50th, 25th, and 10th percentile values of the *t*-statistics for each portfolio for each country. For example, at the 25th percentile for Canada, the *t*-statistic for the 50-stock portfolio is 1.43 but the 25th percentile *t*-statistic for the 100-stock portfolio is 2.13. Comparing *t*-statistics for similar percentiles across the 50-stock and 100-stock portfolios for each country and percentile 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. Further, since we are using Newey and West (1987) *t*-statistics, the greater power is not the result of autocorrelations in errors from using overlapping test periods. We start the subsequent test periods 11 days after the former period, rather than 21 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 (instead of nine) 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 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 shown by Gervais, Kaniel, and Mingelgrin (2001) for the United States 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 phenomenon 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 and low volume stocks could be differences in risk between the two groups. We test this possibility by examining whether there exist differences in risk factor exposures between the high and low volume shock stocks. A number of different arguments have been made regarding which factors are important for explaining the time-series and cross-sectional variation in global stock returns (e.g., Fama and French, 1998; Griffin, 2002; Hou, Karolyi, and Kho, 2009). Consequently, we employ several different models to test for differences in risk factor exposures.

First, Griffin (2002) provides evidence supporting the use of country-specific factors in explaining time-series variation in international stock returns. For this approach, we need the risk factors for *each country* that correspond to the Fama-French (1993) and Carhart (1997) four-factor model. 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, 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 book-to-market (HML), size (SMB), and momentum (WML) factors.

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 (2001), 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 (SUR), 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 4. As the

Table 4
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% (in the country) for the 49 days prior to the portfolio formation dates. The sample periods vary across countries depending on availability of data as shown in Table 1. The betas are the estimated coefficients from the four-factor Fama-French (1993) and Carhart (1997) models using country-specific factors constructed based on the Liew and Vassalou (2000) approach. The table also includes the *t*-statistics. *, **, and *** represent 10%, 5%, And 1% significance levels, respectively.

Country	Market		SMB		HML		WML	
	High-Low	*t*-Statistic	High-Low	*t*-Statistic	High-Low	*t*-Statistic	High-Low	*t*-Statistic
G-7 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
Hong Kong	0.124	1.85*	0.085	1.35	0.0222	1.18	−0.0856	−1.40
Netherland	0.055	1.16	0.095	1.10	−0.0078	−1.10	−0.0151	−1.09
New Zealand	−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
South 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 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 5% level and two at the 10% level. Similarly, out of the 64 possible risk exposure differences in the 16 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 1% level (one of which is in the wrong direction) and one at the 10% level.

As suggested by the results of Fama and French (1998) and Hou, Karolyi, and Kho (2009), 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.[9] Specifically, in these tests (reported in Internet Appendix Table 2) we use the same methodology as in the previous test and 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. 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 Table 4; 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).[10] 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 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.[11] 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 5, Panels A and B, we present the returns for each of the volume-liquidity stock groups pooled by region and market development, sorted by their volume and liquidity betas.[12] 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 G-7 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 difference between the high and low volume stocks within each liquidity quintile is significantly different from zero at least at the 5% level. Overall, the results from Table 5 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, and concentration of industries and market capitalizations of firms) 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.

[9] We obtained the returns on these factor-mimicking portfolios from Ken French's Web site.

[10] See Amihud, Mendelson, and Pedersen (2005) for a review of this literature.

[11] 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.

[12] Countries enter the panel data according to the beginning date when their data become available.

Table 5

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 sample periods vary across countries depending on availability of data as shown in Table 1. 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-G-7 countries. Panel C provides the differences between the fifth and first quintiles for stocks pooled by country.

Panel A: Results pooled across continents

Region			Liquidity											
			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 G-7 and non-G-7 countries

Region			Liquidity											
			1-Low	*t*-Stat	2	*t*-Stat	3	*t*-Stat	4	*t*-Stat	5-High	*t*-Stat	5–1	*t*-Stat
G-7	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-G-7	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

Country			Liquidity									
			1-Low	*t*-Stat	2	*t*-Stat	3	*t*-Stat	4	*t*-Stat	5-High	*t*-Stat
Australia	Volume	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
Hong Kong		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
New Zealand		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

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 would be aware of the firm), and the size of the firm relative to the aggregate wealth of investors in the firm.[13] 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 G-7 countries separately. In the next two subsections, 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 awareness of a country's potential investor base, namely, the number of listed companies per million of urban population and the level of education in the country measured by secondary school enrollment. For most countries, we collect these two demographic measures using data obtained from the World Bank annual data.[14]

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 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 these data for markets outside the U.S.[15]

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 is that the number of listed 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, measured as the percentage of the population that should be in secondary school that actually is in secondary school, captures an alternative dimension of a country's demographics—the population's education level. 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 perfer 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

[13] 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.

[14] The one exception is that data on Taiwan are not included so we obtain the data on Taiwan from Standard & Poor's *Emerging Stock Markets Factbook* (2000) and from Taiwan's statistical yearbook on their Web site.

[15] The use of the 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.

uninformed individual investors in the base.[16] 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.

In Section 2, we provide evidence that there exist differences in reference portfolio returns between 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 again 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 LaPorta, 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 examinations of company reports from different countries and a higher value of the index indicates better accounting standards in a country.[17] 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 law, German law, with the omitted variable being English law. These measures, also obtained from LaPorta, 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.[18]

Alternatively, it is possible that the level of investor confidence can reflect the need 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—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 of 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 932 for Australia, suggesting that, in some countries, a sizeable range exists 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 would increase their visibility.[19] 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

[16] Bekaert, Harvey, and Lundblad (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.

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

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

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

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 propose that the information environment in a country's market can be characterized with 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 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. 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. The implication 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.[20]

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 levels 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 5 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.

We expect that many of our explanatory variables may be related to each other and thus, we check for correlations. While we find some strong correlations, we do not find any that are 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 (0.38), 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 (0.45).

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 and MacBeth (1973) tests in which we estimate a series of cross-sectional regressions for each interval from 1988 through 2000 for a total of 155 cross-sectional regressions. 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 independent variables are static and time-varying. Specifically, the legal standards and accounting standards indices are static. The short selling variable is relatively static with perhaps one change per country when short selling laws changed. The other variables are time-varying, most with annual measurements: the demographic variables (listed company per urban population and secondary school enrollment), market value ratio, share of the largest three industries, and market turnover ratio. The average R^2 from the country market model is measured as a three-year moving average, which is then updated once a year. Similarly, the equal-weighted market volatility is measured as a three-year moving average updated annually.

The coefficients and the Newey and West (1987) corrected *t*-statistics from the Fama and MacBeth (1973) regressions are presented in columns 1 and 2 in Table 6. We find that the magnitude of the high volume return premium across countries is significantly related to 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.

For 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

[20] 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. Later studies (e.g., Morck, Yeung, and Yu, 2000; Jin and Myers, 2006; Bartram, Brown, and Stulz, 2009; Karolyi, Lee, and van Dijk, 2009) differ on the interpretation of the country R^2 measure. We discuss these issues later in the paper.

Table 6
Country-level regression analysis of extreme volume returns on market characteristics.

This table shows the results from Fama and MacBeth (1973) 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 Newey and West (1987) *t*-statistics] in which we use alternatively, the 20% and 10% extreme volume definitions and extreme high and low volume are defined as the top and bottom 20% (10%) of volume (in the country) for the 49 days prior to the portfolio formation dates. The sample period is 1988–June 2001. We also restrict the sample to the last five years of the sample period for the 10% extreme volume 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 the 5-year-only sample. Also included are the average R^2*s* from the regressions. *, **, And *** represent 10%, 5%, and 1% significance levels, respectively.

Variable	20% cut-off		10% cut-off		10% cut-off Last 5 years of sample	
	Mean coefficient	*t*-Stat	Mean coefficient	*t*-Stat	Mean coefficient	*t*-Stat
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
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 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***
Accounting standards	−0.01	−2.01**	−0.011	−2.25**	−0.01	−2.25**
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
Average R^2 from country mkt model	1.36	1.96**	1.18	1.88*	1.29	1.88*
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	

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., more dominant large firms compared to smaller firms) and countries in which the market is more concentrated in 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 in 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 6 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.

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 LaPorta, Lopez-de-Silanes, Shleifer, and Vishny (1998), these protections do not affect investors' response to a high volume shock.

Table 6 indicates a significant positive relation between the R^2 measure and the magnitude of the high volume return premium, which 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 effect of a volume shock that captures investors' awareness is significantly greater. Such a result is consistent with the hypothesis that when less firm-specific information gets incorporated into stock prices, there correspondingly exists a greater likelihood that a volume shock will make a stock more visible to investors, impacting prices.

The R^2 coefficient 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. More recent studies have also considered the interpretations of the R^2 measure. For example, Jin and Myers (2006) provide evidence that R^2 reflects the firm's opaqueness, i.e., lack of transparency. In contrast, Bartram, Brown, and Stulz (2009) and Karolyi, Lee, and van Dijk (2009) provide evidence consistent with the interpretation of Morck, Yeung, and Yu that R^2 is related to the effects of legal origin and investor protection on investors' incentives to gather information about a firm rather than the Jin and Myers' interpretation that it is related to corporate disclosure policy. All 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 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.[21]

Finally, Table 6 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 market 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 6, 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 second 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% or 10% cut-offs 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 in more 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 and MacBeth (1973) regression approach shown in Table 6.

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 country-level dependent variable with the 20th-day cumulative return on individual 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 size relative to country market capitalization; whether the firm is a member of a global index (FTSE All-World Index); whether the firm has analyst coverage and if so, its level of coverage normalized for the average coverage in that country; whether the firm is included in the S&P Transparency and Governance Index, and if so, 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 of the 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.

[21] 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 2001 *International Country Risk Guide* (ICRG) index published by the PRS Group, Inc. (Political Risk Services Group, 2001); and a measure of whether short-selling 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 short-selling measure is not significantly related with the high volume return premium.

Again we employ the Fama and MacBeth (1973) approach and estimate a series of 155 cross-sectional regressions at the individual firm level. Table 7 presents the coefficient estimates and the Newey and 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 6.

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 the portfolio approach of Table 6. 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 included in the FTSE All-World index. As the results in Table 7 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

Table 7
Firm-specific regression analysis of extreme volume returns on market characteristics.

This table shows the results of Fama and MacBeth (1973) 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 where extreme high and low volume are defined as the top and bottom 20% (or 10%) of volume (in the country) for the 49 days prior to the portfolio formation dates. The table shows the mean coefficients from the series of regressions [along with Newey and West (1987) *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 both 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 normalized by the average level of analyst coverage for that country, a dummy variable for whether the firm is included in the S&P Transparency and Governance Index, the firm's rank in that index, the firm's idiosyncratic risk relative to the average idiosyncratic risk for firms in the country, the firm's annual total volatility, the R^2 from the firm's market model using the return on the country index as the market, the percentage ownership of 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 (1988–June 2001) and 47 in the 5-year-only models. Also included are the average R^2s from the regressions. *, **, And *** represent 10%, 5%, and 1% significance levels, respectively.

	20% Full sample		20% Full sample		10% Last 5 years		20% Last 5 years	
	Mean coef	*t*-Stat	Mean coef	*t*-Stat	Mean coef	*t*-Stat	Mean coef	*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^2	0.035		0.034		0.042		0.039	

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 one if at least one analyst provides 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, measured annually; 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.[22] The coefficient estimates in Table 7 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 is designed to capture firm disclosure policy. The measure relies on a survey conducted in 2001 of the financial statements of more than 1,500 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), 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 the relation between analyst coverage and 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 investors 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's (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 in our regression specification.

Equally puzzling is the negative relation we obtain in Table 7 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 in our regression specification. If one is willing to consider differences in the quality of information across firms, however, it is possible to entertain an alternative hypothesis in which the idiosyncratic volatility may be capturing differences in the quality of the information. Roll (1988), Durnev, Morck, and Yeung (2004), Jin and Myers (2006), Bartram, Brown, and Stulz (2009), and Karolyi, Lee, and van Dijk (2009) hypothesize and provide evidence that firms' R^2s 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. Thus, their evidence suggests that the quality of information varies 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 7 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 depend also on the informational opacity of the firm.

Finally, in Table 7, 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 these data are 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,

[22] We obtain each firm's analyst coverage from the International Institutional Brokers Estimates System (IBES) database.

South Africa, Spain, Sri Lanka, Sweden, Switzerland, Taiwan, Thailand, Turkey, United Kingdom).[23] The second set of columns in Table 7 shows 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.[24] 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 6, Table 7 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.

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 7) and we estimate them within each of the G-7 countries individually.[25] 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 8. We consider two alternative specifications. In the regression models reported in Panel A, we include both firm total volatility and idiosyncratic volatility as independent variables; in Panel B, we replace firm total volatility with the firm's R^2 from the country market model. Because of the mechanical relationship between the R^2, idiosyncratic volatility, and total volatility of a firm, we cannot include all three at the same time in the regression. The results from the within-country analyses are generally consistent with the cross-country analyses shown in Table 8, although we do not see significance uniformly across the countries for all of the variables. Firm size is, undoubtedly, the strongest determinant. At the 5% significance level or better, the high volume return premium is significantly decreasing in relative firm size in all 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 All-World index, idiosyncratic volatility, and analyst coverage, is more mixed, showing statistically significant coefficients in some countries but not others.

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^2s in Tables 6 and 7. The coefficient on R^2 in Table 8 Panel B is significantly positive at the 5% level or better for three of the seven countries. This is reminiscent of the positive relation we reported in Tables 6 and 7 between the high volume return premium and R^2. A comparison between the results in Panels A and B of Table 8 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 inclusion in the S&P Transparency and Governance Index, does not change with the level of the coverage or the firm's transparency and governance index 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 variations over time in the high volume return premium and its constituents could affect our results and conclusions. In the previous sections, we conduct 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 6 and 7, where we presented our cross-country analyses of determinants of

[23] The data were generously provided by Karl Lins and were used in Lang, Lins, and Miller (2004).

[24] The block ownership is defined as at least 5% ownership by an individual, group, or firm.

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

Table 8

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

This table shows the results of Fama and MacBeth (1973) 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 where extreme high and low volume are defined as the top and bottom 20% of volume (in the country) for the 49 days prior to the 20 day test period minus one day. The sample period is 1988 through June 2001. The average number of stocks per interval per country is provided in Table 1. The table shows the mean coefficients from the regressions [along with Newey and West (1987) *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 for whether it is a high volume (rather than for 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.

Variable	U.S.		Japan		Germany		UK		Canada		France		Italy	
	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
Panel A														
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***
No. 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^2	0.022		0.030		0.042		0.038		0.051		0.044		0.033	
Panel B														
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**
No. 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^2	0.020		0.029		0.042		0.035				0.041		0.032	

the high volume premium, we also conducted our tests with a subsample 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 subsamples, 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.

We first test whether there exist differences over time in the probability of a stock being selected for our extreme volume portfolios. The results of these tests (shown in Internet Appendix Table 3) indicate that there are no differences. Second, we test whether any trends or autocorrelations exist in time series of the country premium. Third, 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

We use several different methodologies to characterize the time-series properties of the high volume return premium as reflected in the return on the zero-investment portfolios. We begin by considering 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 where we allow the position of the breakpoint to be optimally chosen using the Akaike's Information Criterion (AIC). These tests (reported in Internet Appendix Table 4) are conducted on each country separately. 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. 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 examine whether there exist systematic patterns across time in the zero-investment portfolio returns. These tests are conducted for each country separately. We first use a general test of the time series, the Ljung-Box test, and test the autocorrelations for the first six and 12 lags. The results (reported in Internet Appendix Table 5) suggest that very little autocorrelation exists in the data. In a second test, we compare the normalized cumulative periodogram with the cumulative distribution function of a uniform (0,1) random variable. Again we find consistent results in that only a few countries have significant trends. Finally, we test for stationarity of the time series, using the Dickey-Fuller test for unit roots. These results 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).[26] 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 results, shown in Internet Appendix Table 6, indicate 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, particularly many of the emerging markets, may arise from the increasing presence of foreign investors. Thus, growth in foreign investors could potentially affect 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 series begin after the major 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 (70-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

[26] ECRI employs the National Bureau of Economic Research (NBER) methodology to classify recessionary periods.

Kang and Stulz (1997) and by Dahlquist and Robertsson (2001).[27] 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 six countries that had financial liberalizations during the sample period (Chile, Korea, Malaysia, Mexico, Philippines, Thailand, 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 differences between the two periods.[28]

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 more important for individual investors than 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.

In summary, these additional tests suggest that the increase in the presence of foreign institutional investors over our sample period did not significantly alter our results and conclusions.

5. Economic trading strategies

An important question regarding the high volume return premium is whether there exist trading strategies that are actually economically implementable across countries as Gervais, Kaniel, and Mingelgrin (2001) have found for the United States. In this section, we examine several interrelated issues relevant to this question. The first question we address 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 that would be faced by retail or institutional investors. The second question is whether the high volume return premium is being driven by extreme returns. The third question is 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 most important of these questions 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. The CJJW estimates 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 4 and 7, respectively. For the post-1999 period, we use the estimates of explicit and implicit trading costs that are reported in columns 5 and 8 of the same table.

We next develop size groups for each country by dividing stocks into deciles and defining the small-size group as the bottom three deciles; the medium-size group

[27] Foerster and Karolyi (1999) study the returns on shares in foreign firms which start trading American Depositary Receipts (ADRs) in the U.S. market. They also find evidence consistent with Merton's (1987) investor recognition hypothesis.

[28] 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, and August 1989 for Turkey (see Bekaert, Harvey, and Lumsdaine, 2002b). The corresponding t-statistics for the difference in premiums between the pre- and post-liberalization periods (testing whether pre- is higher), using the zero-investment portfolio returns, are not significantly different from zero at conventional levels.

as deciles four through seven, and the large-size group as the top three deciles in each country.[29] For each size group in each country, we then use information provided by CJJW in their Table 3A to impute implicit trading costs. We begin by assuming that the ratios of institutional trading costs across different market capitalization groups reported in CJJW's Table 3A (columns 1 and 4) apply to each country in our sample where the medium-size group corresponds to the average in each country. We then 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.

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

Table 9 provides insights into the issues related to whether economically implementable trading strategies exist. 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.

The first three columns of Panel A of Table 9 show the results from our analysis of the effects of trading costs on the profits from the high volume return premiums considering the after-trading-costs profits from the perspective of retail as well as institutional investors. The first column reports 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) in the second column of the panel, 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 along with the explicit costs; thus, it is not a phenomenon that institutional investors could profitability 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% mid-range of returns. Thus, we eliminate stocks with returns in the top or bottom 20% of returns in each interval. In other words, we use only stocks that do not show up in our extreme 20% portfolios in that particular formation period. Such an analysis allows us to determine whether stocks with normal returns also show a relative return premium depending on volume shocks. The right three columns in Panel A of Table 9 show the average 20th-day returns on the three size portfolios when the "extreme" portfolios only include stocks with normal returns. That is, the extreme high and low volume portfolios used to form the zero-investment portfolios are calculated from using 20% cut-offs of the mid-range 60% of the stocks. The right three columns of Panel B of Table 9 show the same analysis using a 10% rather than 20% cut-off to define high and low volume extremes. Comparing the right three columns in Panels A or B of Table 9 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 9, 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% cut-off 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 recompute the average returns for the zero-investment portfolios. Comparing results obtained using the 10% cut-off definition shown in Panel B of Table 9 to those with the 20% cut-off 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.

[29] We also employed an alternative 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).

Table 9

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%) cut-off 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 the top and bottom 20% (or 10%) of volume (in the country) for the 49 days prior to the portfolio formation dates. The sample period is 1988–June 2001. The results are grouped by small, medium, and large firms within each region. The normal return columns define the extreme volumes within only the 60% mid-range returns by eliminating stocks with returns that fall in the top or bottom 20% of returns in that interval. The table employs the average transaction 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 the 10th or 20th 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% Cut-off and 20-day holding period

	20% Cut-off (20-day holding period)			20% Cut-off 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 (%)
G-7 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% Cut-off and 20-day holding period

	10% Cut-off (20-day holding period)			10% Cut-off 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 (%)
G-7 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% Cut-off and longer horizons conditional on normal returns

	10% Cut-off normal returns (30-day holding period)			10% Cut-off 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 (%)
G-7 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

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 seem 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, and 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 effect 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 other than the G-7 countries.

The high volume return premium varies systematically across markets in relation to investor, market, and firm characteristics in many ways as 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 the high volume return premium and firm-specific characteristics is complex and generally (although 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 G-7 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.

Appendix A. Supplementary materials

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jfineco.2011.08.012.

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