Which Factors Influence Trading Costs in Global Equity Markets?

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As we conclude the first decade of the 21st century, there has been a dizzying degree of growth and innovation in global equity markets during the past 10 years. For example, Davis, Pagano, and Schwartz [2006] observe that electronic trading systems have been adopted swiftly in recent years as traditional trading floors around the world closed or saw their market shares decline. Interestingly, the leaders in the move towards electronic financial markets during the past decade have frequently been outside the United States. Consequently, the importance of international, or regional, financial markets has grown substantially. For example, the recent merger of the Nasdaq exchange with Scandinavia-based OM Group was partially motivated by the latter's well-respected and widely used OMX electronic trading technology. Thus, global investors are taking notice of the growing influence and liquidity of financial markets outside the United States. However, as Davis et al. [2006] suggest, there are still major challenges facing the world's equity markets in terms of price discovery, transparency, trading costs, and liquidity provision, despite the important advances that have been made during the past decade. In addition, Miller and Pagano [2007] demonstrate that these forces are also influencing the relatively new global trend of equities exchanges going public and/or merging with other financial markets.[1]

Due to the increased wealth outside the United States and the improved depth of international equity markets, the average investor now has a wider choice of investment opportunities. Thus, one wonders whether there is greater competition for order flow on a global basis and, if so, which geographic regions are gaining market share and what role the U.S. equity market plays within this increasingly international investment arena. To answer these questions, we extend the analysis reported in Pagano [2008].[2] As a starting point, I present some empirical evidence related to two key areas of focus in the trading/market structure literature: 1) the growth in international trading activity, and 2) the trends in transaction costs around the globe. In addition, I examine whether international trading costs are closely correlated with recent developments in U.S. financial markets. To do this, I focus on global equity trading activity and, similar to Pagano [2008], use data on institutional trading behavior provided by an independent brokerage firm's analytical service. Abel/Noser Corporation's *Ancerno* database is used to examine trends in transaction costs and trading volume for six geographic regions covering 50 different equities markets (as well as for six countries that contain some of the largest equity markets in the world).

The *Ancerno* database is also used to address the question of whether transaction costs and trading volume are determined

jointly. A system of two simultaneous equations can help answer this question by capturing any "virtuous" or "vicious" cycles that might exist between trading costs and volume. For example, a virtuous cycle occurs when an equity market with low transaction costs attracts higher trading volume which, in turn, helps lower costs further and thus encourages even more orders to be sent to this market. This behavior is consistent with the old market saying, "order flow attracts order flow." In contrast to a virtuous cycle, a vicious cycle of higher transaction costs and lower volume normally exists for high-cost equity markets. Thus, the simultaneous equations approach explicitly studies this dynamic and provides a mechanism for identifying how much of a region's (or country's) trading costs and volume are determined by trends in U.S. equity markets rather than the region's "domestic" trends.

The empirical analysis presented here indicates that transaction costs have been falling around the world over the past three years, led by a sharp decline in U.S. brokerage commissions (e.g., −40% from March 2005 to December 2007). Although this finding is not that surprising given the growing linkages between markets and greater capital mobility, I also find that indirect one-way transaction costs such as those related to market impact and order execution delay may have approached a bottom at around 2 basis points (bps).[3] That is, even though there is still considerable geographic variation in trading costs, the indirect costs of trading appear to be converging around a plateau of approximately 2 bps per trade. The overall decreases in global trading costs are strongly correlated with movements in U.S. transaction costs, with most regions reporting correlations of +0.90 or more with their corresponding U.S. figures.

In addition to the above cost estimates, dramatic increases in trading volume can be seen across all parts of the globe, with some of the largest gains occurring in the emerging markets of South America (+633%), Asia (+76%), and the Middle East/Africa (+61%). Interestingly, Europe's share of global trading volume has increased 4 percentage points to 17.5%, while North America's share has slipped 5.6 points to 73.6%.

The simultaneous equations framework reveals that there is strong evidence of vicious and virtuous cycles between transaction costs and trading volume within a specific geographic region or nation. In addition, trends in U.S. trading costs and volume play a key role in influencing the costs and trading activity in other parts of the world. For example, international trading costs and volume are *both* positively related to U.S. trading costs. This suggests that the U.S. equity markets not only still play a leadership role in terms of pointing the way for transaction costs in international equity markets but they also have become more sensitive to global competition for order flow. That is, a positive relationship between U.S. trading costs and international trading volume implies that higher U.S. transaction costs will encourage greater trading volume outside the United States. This means that global investors might be increasingly cost-sensitive and more likely to direct orders to markets where transaction costs are lower (holding all else constant).

THE *ANCERNO* FINANCIAL DATABASE

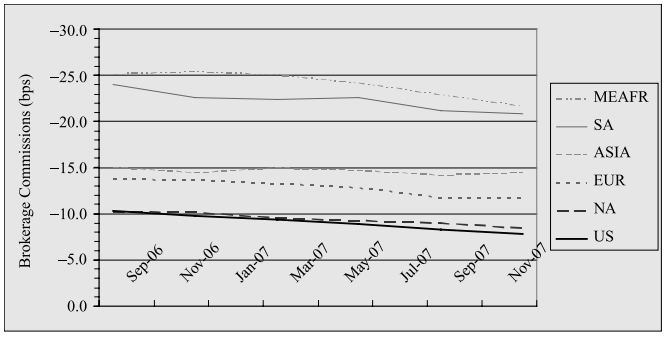
The *Ancerno* data used here are aggregated from detailed trade-level transaction data obtained from large institutional investors. The *Ancerno* database tracks orders from: a) the time they enter the institutional investor's order entry system, to b) the time the order is placed by the firm's traders, and c) up to, and including, all of the related filled trade executions associated with that order. This data set captures a significant portion of global institutional trading activity and helps quantify trends in equity trading costs beyond basic brokerage commissions. For example, the *Ancerno* database is built upon the trading activity of institutional investors with a total of $4.9 trillion invested in U.S. markets and $2.0 trillion invested in 50 equity markets outside of the United States (as of March 2007). These data are drawn from over 400 Abel/Noser clients in the United States and 125 international clients. Although the data do not capture trading by all institutional investors in every global market, the database does represent an economically significant portion of global financial assets (e.g., nearly $7 trillion) and a sizable number of the world's largest investment managers.[4]

TRENDS IN GLOBAL TRADING COSTS AND VOLUME

To identify the broad trends in one-way brokerage commissions and indirect trading costs such as market impact and order execution delay, we plot graphs for regional equity markets in Exhibits 1–3. Exhibit 1 shows a steady decline in brokerage commissions from September 2006–December 2007 for all six major geographic regions (Middle East/Africa, South America, Asia, Europe, North America, and the United States),

EXHIBIT 1

This exhibit displays the median brokerage commissions (in basis points) during September 2006–December 2007 for Middle East/Africa (MEAFR), South America (SA), Asia (ASIA), Europe (EUR), North America (NA), and the United States.



with the U.S. leading the way with the lowest brokerage costs of 7.8 bps in December 2007.[5] Although country-specific graphs are not reported here to save space, I find a similar trend in six major trading markets (Japan, Hong Kong, Australia, Germany, the U.K., and the U.S.) from March 2005–December 2007. Both the regional and country-level data show sizable declines in brokerage commissions, with the U.S. exhibiting the largest decrease in percentage terms (−40% from March 2005–December 2007). However, there still is considerable cross-sectional variation in these commissions because regions such as South America and the Middle East/Africa report median one-way brokerage costs of 21–22 bps, whereas investors in European and North American markets pay less than 12 bps.

I use *Ancerno's dEX* variable to examine the indirect costs of market impact and delay related to institutional trades. This variable measures the cost from the time a portfolio manager enters the order into the firm's trading system until the order is finally executed.[6] Exhibit 2 displays this indirect cost measure and shows a much different pattern than the one associated with brokerage commissions. Both at the regional and national levels, the trend in the indirect costs is essentially flat with most values hovering between 2 and 3 bps. In contrast to the steady decline in commissions, the indirect costs appear to have bottomed at approximately 2 bps. Due to the relatively short time period for which we have data, it is unclear whether this is a true "floor" in indirect trading costs or just a temporary hiatus from the secular downtrend in global trading costs.

To get a sense as to how both direct and indirect trading costs have fluctuated in the aggregate, brokerage commissions are added to the *dEX* indirect cost estimates and reported as "total" trading cost estimates in Exhibit 3.[7] As can be seen in this graph, the overall trend in the sum of direct brokerage commissions and indirect trading costs is downward for all regions. However, the decrease in Asia's total trading costs is slight due to only modest declines in both commissions and indirect costs (i.e., both fall less than 1 bps).

Exhibit 4 quantifies the trends illustrated in Exhibits 1–3 by reporting the percentage changes in commissions, total trading costs, and trading volume (measured in U.S. dollars) over the relevant time periods. This exhibit also reports each region's/country's respective share of trading volume, the change in this market share, and the correlations of total trading costs with those estimated for the United States. For example, the first two columns of Exhibit 4 show the declines in trading costs across the various countries/markets (in Panel A) and regions (in Panel B). As noted earlier, the United States has exhibited the strongest decreases in trading costs, while Asian countries experienced much

EXHIBIT 2

This exhibit displays the median estimates of one-way indirect trading costs related to order execution delay and market impact (in basis points) during September 2006–December 2007 for Middle East/Africa (MEAFR), South America (SA), Asia (ASIA), Europe (EUR), North America (NA), and the United States.

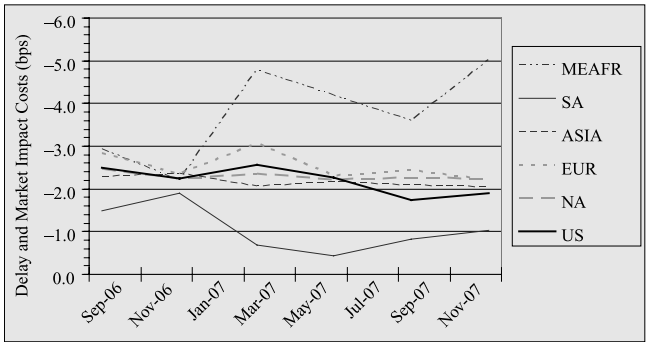
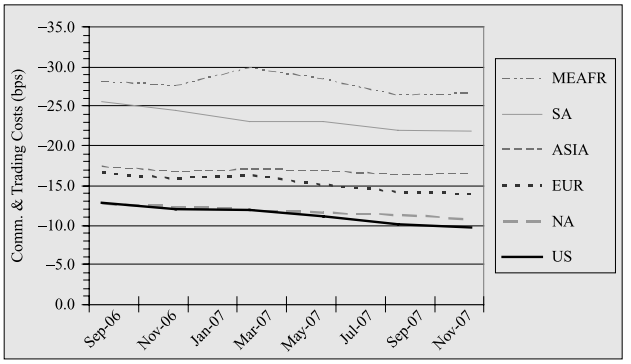


EXHIBIT 3

This exhibit displays the sum of the estimates for brokerage commissions and indirect trading costs (in basis points) during September 2006–December 2007 for Middle East/Africa (MEAFR), South America (SA), Asia (ASIA), Europe (EUR), North America (NA), and the United States.



smaller reductions (most notably, Japan's total trading costs actually increased 3.1% during the period).

The third, fourth, and fifth columns in Exhibit 4 report trading volume activity. As the third column shows, there are substantial gains across all parts of the globe, with some of the largest percentage gains in trading volume occurring in the emerging markets of South America (+633%), Asia (+76%), and the Middle East/Africa (+61%). In addition, columns 4 and 5 of Exhibit 4 indicate that Europe's share of global trading volume has risen 4 percentage points to 17.5%, while North America's share has fallen 5.6 points to 73.6%. Thus, the United States is still the dominant force in global equities, but its overall share of trading activity is declining, albeit gradually.

The U.S. market's influence can also be seen in the correlations reported in the last column of Exhibit 4. These correlations compare movements in U.S. total trading costs with those of each respective region/country and indicate that nearly all of these regions/countries are strongly and positively correlated with U.S. trading costs. For example, the five geographic regions in Panel B all report correlations with U.S. costs between 64% and 98%. The one exception to these strong positive correlations is Japan, which exhibits a negative correlation with U.S. trading costs because Japan's transaction costs have bucked the downward global trend.

Overall, the results reported in Exhibits 1–4 present relatively good news for global investors as brokerage commissions continue to decrease while trading volume climbs at a rapid rate. Both of these empirical findings suggest that global equity markets are enjoying a virtuous cycle by creating lower trading "frictions" and greater depth/liquidity than ever before. These trends are due, in part, to the changes in market structure that have occurred over the past 10–15 years (e.g., new trading systems, greater transparency, more effective regulation, better enforcement of trading rules, etc.). However, as Exhibit 2 illustrates, indirect trading costs related to market impact and order execution delays are not declining as rapidly as brokerage commission costs. This suggests there is still room for improvement in terms of how global capital markets can be structured to increase the trading efficiency of both institutional and retail investors.

A SIMULTANEOUS EQUATIONS APPROACH TO IDENTIFY FACTORS IN GLOBAL EQUITY MARKETS

As noted, a system of simultaneous equations is an effective way to control for potential virtuous and vicious cycles between transaction costs and trading volume. In order to investigate the importance of these joint interactions, as well as the influence of U.S. forces on international equities markets, one must first identify valid proxies for U.S. trading costs and volume. To do this, I use quarterly estimates of U.S. total trading costs and the dollar value of U.S. trading volume described in the previous section. However, there is a statistical problem associated with these two variables because they can be highly correlated with each other, which, in turn, can lead to biased parameter estimates and incorrect inferences. To mitigate this potential problem, I first regress the U.S. trading volume data on the U.S. transaction cost data and then use the residuals from this regression, v_t, as an alternative proxy for U.S. trading volume's effect on international equity markets. In this way, the U.S. trading volume data are "orthogonalized" and thus purged of any multicollinearity with the U.S. total transaction cost estimates. This ordinary least squares regression can be described by the following stylized model:

$$USVolume_t = f_1(USTTC_t) + v_t \qquad (1)$$

where,

$USVolume_t$ = the total dollar volume of trading in U.S. equity markets during the t-th quarter,
$USTTC_t$ = the total one-way transaction costs of trading in U.S. equity markets during the t-th quarter (as proxied by the sum of brokerage commissions and indirect trading costs),
$ResidUSVol_t$ = a stochastic disturbance term which measures the unexplained variation in U.S. trading volume = v_t.

After estimating Equation (1), the system of simultaneous equations for regional and country-specific trading activity can be estimated via a panel data set as follows:[8]

$$TTC_{i,t} = f_2(USTTC_t,\ ResidUSVol_t,\ Volume_{i,t}) + e_{i.t} \quad (2)$$

$$Volume_{i,t} = f_3(USTTC_t,\ ResidUSVol_t,\ TTC_{i,t}) + u_{i.t} \quad (3)$$

where,

$USTTC_t$ and $ResidUSVol_t$ are quarterly percentage changes of the variables defined in Equation (1),

$TTC_{i,t}$ = the quarterly percentage change in the total one-way transaction costs of trading in the i-th regional/national equity market during the t-th quarter (as proxied by the sum of brokerage commissions and indirect trading costs),
$Volume_{i,t}$ = the quarterly percentage change in the total dollar volume of trading in the i-th regional/national equity market during the t-th quarter, and
$e_{i,t}$ and $u_{i,t}$ = two stochastic disturbance terms which measure the unexplained variation in regional/national total trading costs and volume, respectively.

Note that the above variables are expressed in percentage format to ensure the data are stationary and to facilitate comparability across regions/countries which differ widely in the overall magnitudes of trading costs and volume.

Equations (2) and (3) capture the joint, or endogenous, influences of regional/national transaction costs, $TTC_{i,t}$, and trading volume, $Volume_{i,t}$, because each of the two models contain both of these variables (as depen-

EXHIBIT 4
Summary of Global Trading Costs and Volume

This exhibit presents changes in equity-related brokerage commissions, total trading costs (commissions plus market impact and order delay costs), and trading volume, as well as each region's/market's share of trading volume (measured in U.S. dollars) and their respective changes in this market share. The correlations between U.S. total trading costs and each region/market are also reported in the final column. Panel A reports results for specific countries/markets for March 2005–December 2007 and Panel B reports similar statistics for all major geographic regions within the world's equity markets during September 2006–December 2007.

Panel A (3/05–12/07)

Country	Chg. In Commissions	Chg. In Comm. & Trading Costs	Chg. In Dollar Volume	Share of Dollar Volume	Chg. in 6-market Share of Volume	Correl. With U.S. Trading Costs
U.S.	–39.5%	–38.2%	66.8%	78.7%	–0.2%	–
U.K.	–19.2%	–12.6%	88.4%	9.3%	1.1%	79.8%
Germany	–30.0%	–28.7%	23.5%	3.2%	–1.1%	97.5%
Japan	–6.4%	3.1%	53.5%	6.1%	–0.5%	–31.3%
Hong Kong	–15.1%	–7.0%	195.8%	1.5%	0.6%	72.6%
Australia	–26.4%	–23.4%	91.8%	1.2%	0.1%	91.0%
Averages	**–22.8%**	**–17.8%**	**86.6%**			**61.9%**

Panel B (9/06–12/07)

Region	Chg. In Commissions	Chg. In Comm. & Trading Costs	Chg. In Dollar Volume	Share of Dollar Volume	Chg. In Global Share of Volume	Correl. With U.S. Trading Costs
North America	–17.7%	–16.1%	49.8%	73.6%	–5.6%	97.3%
Europe	–14.6%	–15.8%	109.7%	17.5%	4.0%	98.0%
Asia	–4.0%	–4.9%	76.1%	7.3%	0.6%	90.5%
South America	–13.6%	–14.6%	633.0%	1.2%	1.0%	93.3%
MidEast/Africa	–13.7%	–4.9%	60.8%	0.4%	0.0%	64.5%
U.S.	–24.0%	–24.1%	11.3%			–
Averages	**–14.6%**	**–13.4%**	**156.8%**			**88.7%**

dent *and* independent variables). Thus, the virtuous/vicious cycles between trading costs and volume can be examined by estimating the statistical significance of the parameters for $Volume_{i,t}$ and $TTC_{i,t}$ in Equations (2) and (3), respectively. In addition to these variables, both equations include U.S. trading costs ($USTTC_t$) and U.S. trading volume ($ResidUSVol_t$) in order to test whether U.S. market forces have a direct effect on non-U.S. equity markets.

EMPIRICAL RESULTS OF THE SIMULTANEOUS EQUATIONS APPROACH TO TRADING ACTIVITY

Exhibit 5 presents the parameter estimates for Equations (2) and (3) based on regional data in the first two columns of results, while the remaining two columns display the results for the national data. As can be seen in this exhibit, there are similarities in the results at both the regional and national levels. For example, both sets of results show that U.S. trading costs ($USTTC_t$) are positively and significantly related to non-U.S. transaction costs and non-U.S. trading volume, while U.S. trading volume ($ResidUSVol_t$) is only weakly related to non-U.S. markets. In addition, the two endogenous variables ($TTC_{i,t}$ and $Volume_{i,t}$) are significantly negatively related to each other, as shown by the negative parameter estimates in all four columns of Exhibit 5 for these variables. The explanatory power of these relatively simple models is quite good, with each model describing between 67% and 75% of the variation in trading costs and volume.

The above results indicate that there is a strong inverse relationship between a region's or country's transaction costs and trading volume, which in turn supports the notion that virtuous and vicious cycles are present in global equity markets. Given that lower transaction costs typically allow for a greater number of profitable trading opportunities (and thus stimulate even more trading activity), it is not surprising that the data sets document this negative relationship between $TTC_{i,t}$ and $Volume_{i,t}$. However, the positive relationships between $USTTC_t$ and the two endogenous variables ($TTC_{i,t}$ and $Volume_{i,t}$) yield three intriguing insights.

First, the statistical significance of the $USTTC_t$ parameters in both Equations (2) and (3) reveal the continuing importance of U.S. transaction costs in terms of acting as a "floor" for global equity trading costs. Thus, the U.S. equity markets still serve as the world leader in exerting downward pressure on the costs of trading. In particular, this leadership role can be seen by the positive parameter estimates for $USTTC_t$ in Equation (2) for both the regional and national data sets. These results show that a market's total trading costs will typically move in the same direction as movements in U.S. transaction costs.

Second, the positive parameter estimates for $USTTC_t$ in Equation (3)'s results for both the regional and national data sets suggest that global investors are sensitive to regional/national differences in trading costs. That is, these positive parameters indicate that investors "shop around" for lower-cost trading venues (holding all else constant) because a positive relationship between $USTTC_t$ and a region's/nation's $Volume_{i,t}$ indicates that an increase in U.S. trading costs leads to *higher* non-U.S. trading volume. So, if U.S. trading costs rise, then global investors are likely to shift orders to equity markets outside the United States. This finding clearly has important implications for the competitiveness of U.S. equity markets because regulations that increase the cost of trading in the United States can, in turn, cause investors to shift more capital overseas, which ultimately reduces the depth and liquidity of U.S. equity markets vis-à-vis other equity markets.

Third, the statistically significant effects for U.S. transaction costs are present even after controlling for regional/national endogenous fluctuations in trading costs and volume, as well as changes in U.S. trading volume. Thus, the impact of U.S. transaction costs is separate and distinct from movements in "local" trading costs and volume that are specific to a particular geographic region or country.

Overall, the above results, along with the relatively high explanatory power of Equations (2) and (3), suggest that both domestic and international factors jointly influence recent trends in global equity trading costs and volume. Further, these findings suggest that the U.S. equity markets still lead the way forward in terms of global transaction costs, while international investors have also become more sensitive to global competition for order flow.

CONCLUDING THOUGHTS

This article has presented some evidence related to two key areas of interest in international market structure studies: 1) the growth in international trading activity, and 2) the trends in global transaction costs. In

particular, international trading costs and volume are not only determined jointly but also appear to be closely correlated with recent developments in U.S. financial markets.

I find that transaction costs have been falling around the world over the past three years, led by a steep decline in U.S. brokerage commissions. Interestingly, indirect transaction costs such as those related to market impact and order execution delay may have approached a plateau at around 2 basis points per trade. In addition to these cost estimates, Europe's share of global trading volume has increased 4 percentage points to 17.5%, while North America's share has slipped 5.6 points to 73.6%. The overall decreases in global trading costs are strongly correlated with movements in U.S. transaction costs, with most regions reporting correlations of +0.90 or more with the U.S. data.

The multivariate analysis based on a simultaneous equations framework provides strong evidence of virtuous and vicious cycles between transaction costs and trading volume within a specific geographic region or nation. Trends in U.S. trading costs and volume also play a key role in influencing the costs and trading activity in other parts of the world. These patterns suggest that the U.S. equity markets continue to play a leadership role related to global transaction costs and that investors around the world have become more sensitive to the costs associated with trading equities. This increasing cost-sensitivity also makes it more likely that global investors will direct orders to markets where transaction costs are lower.

The results presented here also have implications for the investment community, securities exchange operators, and financial market regulators. Most importantly, it appears that the continuing decline in U.S. trading costs is creating a global virtuous cycle that is spurring more equities trading worldwide. This, in turn, increases the depth and liquidity of global capital markets and encourages even greater capital mobility, thus benefiting all investors that participate in these mar-

EXHIBIT 5

Multivariate Analysis of Global Trading Costs and Volume

This exhibit presents the results for a system of two simultaneous equations, as described by Equations (2) and (3). The first two columns of results report the parameter estimates and *t*-statistics for this system using regional quarterly data during September 2006–December 2007 for the regions displayed in Exhibits 1–3. The last two columns of results report the parameter estimates and *t*-statistics for Equations (2) and (3) using national quarterly data during March 2005–December 2007. The dependent variables, $TTC_{i,t}$ and $Volume_{i,t}$, represent the relevant regional or national estimates for total trading costs and trading volume, respectively. The independent variables are also comprised of these two variables, as well as U.S.-specific versions of these variables ($USTTC_t$ and $USResidVol_t$). The *t*-statistics are displayed in parentheses. Parameters in bold face indicate that they are significantly different from zero at the 1% level.

	Regional Data September 2006–December 2007		National Data March 2005–December 2007	
	$TTC_{i,t}$	$Volume_{i,t}$	$TTC_{i,t}$	$Volume_{i,t}$
Constant	0.097407	9.573675	0.013445	0.051472
	(2.09)	(2.11)	(1.53)	(1.58)
$USTTC_t$	**3.123773**	**306.069**	**0.233088**	**0.862311**
	(7.78)	(7.84)	(5.72)	(5.44)
$USResidVol_t$	–0.01956	–1.92575	0.000261	0.001046
	(–1.71)	(–1.73)	(0.24)	(0.25)
$Volume_{i,t}$	**–0.00999**		**–0.26491**	
	(–9.63)		(–18.57)	
$TTC_{i,t}$		**–95.8224**		**–3.69577**
		(–9.62)		(–18.56)
Durbin-Watson	2.21	2.20	1.91	1.87
Adjusted R^2	0.6753	0.6804	0.7525	0.7172

kets. For traditional liquidity providers such as broker/dealers as well as securities exchange operators, this virtuous cycle is a mixed blessing because it entails reduced per-share trading revenue and creates keener competition for global order flow while also creating the hope that gains in trading volume can outweigh the persistent decline in commissions and trading fees. Lastly, the evidence presented here can provide some guidance to market regulators in terms of how inter-market differences in trading costs can affect capital inflows and outflows within the regulators' home markets.

ENDNOTES

The author wishes to thank Abel/Noser Corporation and Judy Maiorca for generously providing the financial data from its *Ancerno* data service. Financial support for this research was provided by a Villanova School of Business summer research grant.

[1]Some other recent inter-market comparisons of domestic and international financial markets can be found in Lucarelli, Mazzoli, and Palomba [2008], Jiang and Kim [2005], and Huang [2004].

[2]The current paper draws upon Pagano [2008] but also extends this analysis in several ways (e.g., by performing multivariate analyses based upon a system of two simultaneous equations).

[3]One-way transaction costs represent the per-trade costs of either initiating or liquidating an investment whereas round-trip transaction costs include both the costs of initiating and liquidating a position.

[4]For more details on this database, see www.ancerno.com.

[5]To conserve space, we present graphs for only the five geographic regions as well as the U.S. and display the trading costs as negative values (i.e., cash outflows) on an inverted scale. Graphs of the 6 countries used in our statistical analysis are not reported here but are available upon request from the author. It should also be noted that the regional market figures are based on 6-quarter moving averages while the country-specific markets are based on 4-quarter moving averages. Due to changes in the way *Ancerno* has collected and computed some of its data, we are limited in terms of how far back we can extend our analysis (e.g., March 2005 is the earliest period for which we can obtain data). In addition, all figures reported here are the median values for their respective metrics.

[6]This cost is computed as the difference between each trade's execution price and the volume-weighted average price of all trades during the period from the order's initiation until the final trade is completed over the course of a given day.

[7]Although the brokerage and *dEX* costs are both median values and, technically, cannot be added together directly, this is done here in order to obtain a rough approximation of these combined costs. Since the data are available only in aggregate form rather than at the specific-trade level, this is the best approximation one can make. It should also be noted that other costs such as transaction taxes and other fees are not included in our "total" trading cost estimates.

[8]To conserve space, the empirical results for Equation (1) are not reported here but it should be noted that this simple model does a good job of explaining over 91% of the variation in U.S. trading volume.

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