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## Growth strategies and value creation: what works best for stock exchanges?

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Iftekhar Hasan – Heiko Schmiedel – Liang Song

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## Growth strategies and value creation: what works best for stock exchanges?

The views expressed in this paper are those of the authors and do not necessarily reflect the views of the Bank of Finland.

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# Growth strategies and value creation: what works best for stock exchanges?

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## Abstract

In recent years, demutualized stock exchanges have increasingly engaged in M&A and alliance activities. To shed light on this topic, we investigate short-run share price responses to the formation of 110 stock exchange M&As and alliances in the period 2000–2008. Our findings show that the average stock-price responses to a stock-exchange M&A or alliance is positive. Stock exchange M&As create more value than alliances. For alliances, joint ventures generate more value than non-equity alliances. More value is created when the integration is horizontal and cross-border than when it is vertical and domestic. Evidence is also found for learning-by-doing effects in stock exchange integration activities. Finally, we find that the better the shareholder protection, accounting standards and degree of capital market development in the partnering exchange's country, the higher the merger and alliance premium. These patterns also obtain when we examine long-run performance measures such as the three-year buy-and-hold abnormal return, change in ROA (ROE), change in liquidity, and change in market capitalization of IPO between years  $t-2$  and  $t+2$ .

Keywords: exchanges, mergers and acquisitions, strategic alliances, joint ventures, network organization

JEL classification numbers: L22; G32; D23

# Kannattaako pörssien yhdistyä vai liittoutua?

## Suomen Pankin keskustelualoitteita 2/2010

Iftekhar Hasan – Heiko Schmiedel – Liang Song  
Rahapolitiikka- ja tutkimusosasto

### Tiivistelmä

Yksittäiset pörssit ovat viime vuosien aikana yhä useammin joko fuusioituneet tai liittoutuneet. Taustasyiden selvittämiseksi tässä tutkimuksessa estimoidaan, millaisia hintareaktioita 110 pörssin yhdistyminen ja liittoutuminen ovat osakemarkkinoilla aiheuttaneet vuosina 2000–2008.

Tulosten mukaan osakemarkkinat reagoivat keskimäärin myönteisesti pörssien yhdistymiseen tai liittoutumiseen: osakemarkkinoiden hinnat yleensä nousevat, kun tieto pörssien yhdistämisestä tai pörssien muodostamasta liittoutumasta julkaistaan. Pörssien fuusioitumisen seurauksena osakemarkkinoiden arvostus kohenee tulosten mukaan enemmän kuin liittoutumisen yhteydessä. Pörssiliittoutumien tapauksessa pörssien yhteishankkeet tai yhteisyritykset kasvattavat arvostuksia enemmän kuin sopimussuhteisiin perustuvat liittoutumat. Arvostukset kohenevat lisäksi enemmän horisontaalisten ja eri maiden pörssien yhdistymisten tapauksessa kuin vertikaalisten ja yksittäisessä maassa toteutettujen yhdistymisten tapauksessa.

Tutkimustulokset tukevat myös käsitystä tekemiseen liittyvästä oppimisesta (learning by doing) pörssien yhdistymisessä. Lisäksi omistajansuoja, kirjanpito-normit ja pörssin osakasmaan pääomamarkkinoiden kehittyneisyys kasvattavat näytön mukaan osakemarkkinatuottoja. Pitkän aikavälin suoriutumismittareiden muutosten analyysi tukee johdonmukaisesti työssä raportoituja tilastollisia säännönmukaisuuksia. Työssä käytettyjä suoriutumismittareita ovat mm. kolmen vuoden passiivisten positioiden poikkeukselliset tuotot, oman pääoman tuottojen muutos, likviditeetin ja IPO:n markkina-arvon muutos.

Avainsanat: pörssi, fuusiot ja yritysostot, strateginen liittoutuma, yhteisyritys, verkosto-organisaatio

JEL-luokittelu: L22; G32; D23

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# 1 Introduction

Stock exchanges are fundamental components of the financial market by providing an efficient trading place for all investors and a necessary governance mechanism for all listed firms.<sup>1</sup> Recently, stock exchange mergers and acquisitions (M&As) and alliances to expand the exchanges' businesses globally have been a trend all over the world since the 1990s. This trend can be attributed to that the capital markets are becoming increasingly global, innovations in technology have removed many physical barriers to market access and more exchanges have demutualized to gain access to new sources of capital. The consolidations among stock exchanges have helped the listed firms lower their cost of equity financing by improving their stock liquidity, informational environment and governance in the secondary market.<sup>2</sup> Such global exchange activities may well promote competition, increased governance and the effectiveness of cross-border capital flows, and thus have the potential to benefit the markets and investors all over the world (US Securities and Exchange Commission, 2007).

A key issue that has emerged is whether certain global integration activities create value for the shareholders of the partnering stock exchanges. Because integration initiatives involving large, publicly traded stock exchanges were a relatively new phenomenon, there was little reliable information available to the market, or even to the merging exchanges themselves, regarding which types of mergers would create the most value or which exchanges would be good at planning and executing mergers. The growing number of demutualized stock exchanges has also made this question more important and interesting because shareholders of stock exchanges request management to maximize their share value.<sup>3</sup>

Theoretically, it is still an open question whether stock exchange integration and co-operation create value for the stock exchange shareholders. On the one hand, consolidations of stock exchanges can create new economies of scale to reduce trading costs. Moreover, M&As and alliances between two exchanges enable them to acquire knowledge, skills and governance mechanisms from partner exchanges. This increases exchange revenue from increased trading volume and IPOs by attracting more investors and listing companies. On the other

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<sup>1</sup> Stock exchange disclosure (rules, monitoring, and enforcement) is an important element of investor protection and is positively associated with financial market development (Frost et al, 2006). Moreover, stock exchanges often dictate corporate governance standards for listed companies (Mendiola and O'Hara, 2003).

<sup>2</sup> Amihud and Mendelson (1986), Brennan and Subrahmanyam (1996) and Datar et al (1998) find that liquid stocks gain more in value than illiquid stocks.

<sup>3</sup> In 1998, only 38% of exchanges were for profit. In 2006, the number had increased to 75% (World Federation of Exchanges, 2007).

hand, difficult global regulatory issues that emerge in such global integration activities may offset the beneficial gain mentioned above. The barriers to capital flows such as market frictions and differences in the price of risk across markets will continue to delay any integration (O'Brien, 1992; Korajczyk, 1997).

In this paper, we try to empirically answer this question by examining whether and to what extent M&As and alliances create value for the shareholders of the partnering stock exchanges. In addition, we investigate the importance of differences in the characteristics of stock exchanges and integration activities in determining the valuation consequences across stock exchanges. Specifically, this paper evaluates short-run share price responses to the formation of 110 stock exchange M&As and strategic alliances involving 102 stock exchanges all over the world during the 2000–2008 period. We employ a standard event study methodology using a market model and extend it by adding another US market return term to adapt to our multi-country event testing environment. The overall results of this study reveal that the average stock price responses for stock exchange M&As and alliances are positive. Stock exchange M&As create more value than alliances. For alliances, joint ventures generate more value than non-equity alliances. More value accrues when the integration is horizontal (cross-border) than when it is vertical (domestic).<sup>4</sup>

In the cross-sectional analysis, we use the three-day cumulative abnormal return as the dependent variable and control for deal characteristics, learning-by-doing variables, exchange characteristics, macroeconomic variables, technological integration levels, difference in legal system and language as well as country and year fixed effects. We obtain similar results to those shown in the event study. Additionally, there is evidence of learning-by-doing in stock exchange integration activities. Finally, we find that the better the shareholder protection, accounting standards, and capital market development in the partnering exchange's country, the higher the merger and alliance premium. These patterns are consistent when we examine the long-run performance measures such as the three-year buy-and-hold abnormal return, the change in ROA (ROE), the change in liquidity and the change in market capitalization of IPO between the year +2 and the year -2.

This research contributes to the literature in several important ways. First, previous studies have examined the impact of M&As and strategic alliances on the equity values of the participating firms.<sup>5</sup> While the existing studies provide important insights into the broad use of these strategies, in each case, they do so by examining heterogeneous samples composed of many different industries. To

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<sup>4</sup> We define a deal as a horizontal integration if the stock exchange integrates with another exchange with the similar business model.

<sup>5</sup> For example, Chang (1998) finds that in M&As involving a private target firm and stock payment, bidders experience a positive abnormal return. For the joint ventures, McConnell and Nantell (1985) portray significant wealth gains from joint ventures. For the non-equity alliance, Chan et al (1997) reveal that the average stock price response to the formation of non-equity alliances is positive.

date, there was no evidence regarding which types of integrations would create the most value in the stock exchange industry or which exchanges would be good at planning and executing integrations. Given the importance of the stock exchange industry as a key component of the financial market, our study would help understand the wealth effect of integration activities in a highly regulated industry. Moreover, integration activities are mainly driven by industry shocks (Andrade et al, 2001). Thus, focusing on one industry may better remove the impact of industry heterogeneity on shareholders' response to firms' integration activities, which has not been easily controlled in previous empirical analysis.<sup>6</sup>

Second, although there are many types and levels of integration, the existing literature mostly concentrates on only one type at a time. Although M&As, joint ventures and non-equity alliances vary in their dependence levels and impact on firms (Root, 1987; Delong, 2000), no researchers have yet included all of them in a single study and compared them. This leads to our second research objective: to investigate and compare the impact of different types of integration activities on value creation. This test is better done in the stock exchange industry because stock exchanges offer almost identical services and display less heterogeneity around the world compared with other industries.

Third, while a great deal of attention has been given to theoretical analyses, liquidity and the estimation of cost functions of stock exchanges, not much attention has been paid to the value creation for the shareholders of partnering stock exchanges.<sup>7</sup> The lack of available data on stock exchanges' own stock prices is likely to be the key factor behind this. Recently, the increasing number of demutualized stock exchanges has made this research question more interesting and has also made it possible to answer this question. This paper tries to fill the gap in the literature with a comprehensive attempt to evaluate share price responses to the formation of 110 stock exchange M&As and strategic alliances over the 2000–2008 period.

The paper is organized as follows: Section 2 introduces the business model of stock exchanges and describes recent consolidation waves in this industry. Section 3 describes the related literature and develops hypotheses. Section 4 describes the data collection procedures and the resulting sample. Empirical results are presented in Section 5. The final section presents our conclusions.

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<sup>6</sup> Business models in stock exchanges are highly homogenous because they offer almost the same service around the world, eg stock listing and trading. This is very useful in comparing different entities across countries and insulates our test from the influence of within-industry heterogeneity.

<sup>7</sup> Pirrong (1999) presents theory and evidence regarding the economics of exchanges themselves. Santos and Scheinkman (2001) construct a theoretical model and show that competition among exchanges leads to an efficient, but constrained outcome. Nielsson (2008) shows that Euronext stock exchange mergers have increased liquidity of the firms listed on them. Hasan and Malkamäki (2001) confirm the existence of economies of scale and scope among the stock exchanges. Serifsoy (2007) reveals that diversified stock exchanges are mostly less efficient than exchanges that remain focused on the cash market.

## 2 Stock exchanges and the consolidation waves

Stock exchange is a market where buyers and sellers of securities come together. Thus, they are primarily in the business of providing security listing, trading, clearing and settlement services. They also provide a necessary governance mechanism and a price discovery function for all listed firms. To compete with each other, exchanges attempt to exploit scope and scale economies in securities trading by listing new firms and by attracting volume in existing securities (Arnold et al, 1999). The deregulation and technological advancement have also allowed stock exchanges to integrate by M&As and alliances to enjoy the benefit of scope and scale economies.

In the history, there are mainly three integration waves in the stock exchange industry. The first wave of exchange consolidation started hundreds of years ago. In the Netherlands joint stock companies were created, which let shareholders invest in business ventures. In 1602, the Dutch East India Company issued the first shares on the Amsterdam Stock Exchange. It was the first company to issue stocks and bonds. In 1688, the trading of stocks began on a stock exchange in London and other centralized exchanges in other cities followed. The invention of the telegraph has made it possible to create larger exchanges and contribute to another second wave of consolidation in the 19th century. Since the 1990s, the third wave of stock exchange M&As and alliances emerges all over the world. For example, the NYSE Group and Euronext merged their businesses under a US holding company, NYSE Euronext, to create the first trans-Atlantic equities market. In addition, Nasdaq recently announced an agreement to buy the Nordic stock-exchange operator, OMX.

In our study, we focus on the third wave of stock exchange M&As and alliances. This consolidation wave can be attributed to a range of significant changes of the industry environment. First, the earlier demutualization of exchanges has made this consolidation phase possible because it has allowed the market for corporate control to work in the exchange industry. Starting in the early 1990s, stock exchanges around the world have been undergoing major organizational and operational changes by converting from mutual, not-for-profit organizations to publicly-traded, for-profit firms. Following the example of the Stockholm Stock Exchange, institutions such as the Deutsche Börse, the London, Tokyo, Hong Kong and Toronto Stock Exchanges, and the Sydney Futures Exchange have demutualized. In the United States, the two largest stock markets (the New York Stock Exchange and NASDAQ) and the three main futures exchanges – the Chicago Mercantile Exchange, the Chicago Board of Trade, and the New York Mercantile Exchange – have all adopted the for-profit form.

Second, a major catalyst for the consolidation wave is advances in communication and information technology, creating new forms to conduct

business in this industry (Pirrong, 1999). The advent of advanced computers and other forms of communication has allowed markets to operate worldwide, even as the marketplace itself has changed. Compared with the traditional floor trading activity, remote membership, electronic order book trading, alternative trading systems, and the internalization of order flow by financial intermediaries all emerge in recent years.

Third, the investor demand has changed dramatically. Only a few decades ago, most stocks were held by individuals. Today, the majority of shares are owned by institutions such as mutual funds, hedge funds, pension funds and insurance companies. It would increase costs and making transactions take longer if large institutional trades are broken into numerous smaller ones. Thus, institutions prefer to trade in large exchanges because they can provide vast liquidity.

Fourth, harmonization and financial integration initiatives have created a consolidation-friendly environment, especially in Europe. The introduction of the euro has added further incentives to initiate stock exchange integration activities. Additionally, cross-border stock exchange M&As and alliances can allow exchanges to come across some requirements of domestic regulations and increase their competitiveness globally. For example, the Sarbanes-Oxley requirement has made it pretty unattractive for companies who haven't already listed here to choose the US because of significantly higher compliance costs. Thus, US stock exchanges have more incentive to acquire and alliance with foreign competitors to keep their market share.

It is still an ongoing process for this consolidation wave. There is no doubt that the trend of stock exchange alliances and mergers will continue, and that these exchange conglomerates will seek to further integrate their operations. The exchange initiatives such as these may very well promote competition and the efficiency of capital flows, and thus have the potential to benefit the markets and investors (US Securities and Exchange Commission, 2007).

## 3 Related literature and hypothesis development

### 3.1 Wealth effect of stock exchange M&As and alliances

Stock exchange consolidations can create new economies of scale to reduce trading costs. This attracts more traders and listing companies. Additionally, M&As and alliances between two exchanges enable them to acquire knowledge, skills and governance mechanisms from partner exchanges. Krishnamurti et al (2003) argue that small and medium investors would be attracted to the exchange scoring higher on these variables: use of technology, internal control systems, transparency and investor protection. Thus, shareholders of stock exchanges would benefit from the synergy gains from improved knowledge, skills and governance mechanisms as well as the increased revenue from increased trading volume and IPOs. The existing literature has confirmed the existence of economies of scale and scope among the stock exchanges (Hasan and Malkamäki, 2001). Nielsson (2008) shows that Euronext stock exchange mergers have increased liquidity of the firms listed on them. Arnold et al (1999) show that the merging of US regional stock exchanges attracted market share and led to narrower bid-ask spreads.

Despite the several sound reasons for M&As and alliances between exchanges, stock exchanges cannot compete as ordinary business enterprises because of the manner in which they are regulated and because they function as self-regulatory organizations. Thus, such deals have to incur some costs to overcome legal barriers to benefit from synergy gains. Such integrations also need to overcome the other barriers to capital flows, such as market frictions and differences of price of risk across markets (O'Brien, 1992; Korajczyk, 1997). We summarize the related hypotheses as follows

*Hypothesis 1a: The average stock price response to the announcement of a stock exchange M&A is positive.*

*Hypothesis 1b: The average stock price response to the announcement of a stock exchange joint venture is positive.*

*Hypothesis 1c: The average stock price response to the announcement of a stock exchange alliance is positive.*

Transaction structures involving two parties can range from one-time, discrete, arm's-length market transactions governed by a simple contract to complete integration in which the parties become one firm; joint ventures occupy an intermediate point (Williamson, 1979). Because drafting, organization and

coordination costs increase as one moves from simple contracts to full integration, economic efficiency implies that firms choose simple contracts over intermediate or integrated transaction structures. Agency theory makes the same prediction since alliances avoid the agency costs associated with management's reluctance to release resources under their control once the need for those resources has gone away (Jensen, 1986a,b).

On the other hand, M&As might be preferred to joint ventures or alliances in the stock exchange industry. The reason is that new companies' listing and transaction fees are the most important revenue source of stock exchanges. Equity-involved integrations can allow stock exchange to get materially involved with the new business. Based on these arguments, we provide these two hypotheses

*Hypothesis 2a: More value accrues when the stock exchanges choose M&As over joint ventures.*

*Hypothesis 2b: More value accrues when the stock exchanges choose joint ventures over non-equity alliances.*

## 3.2 Horizontal and vertical activities

In recent years stock exchanges have been increasingly diversifying their operations into related business areas such as derivatives trading, post-trading services and software sales. We define a deal as a horizontal integration if the stock exchange integrates with another exchange with the similar business model. We define a deal as a vertical integration if the stock exchange integrates with another exchange with the different business focus. M&As and alliances between two partners with the same business lines enable stock exchanges to better acquire knowledge, skills and governance mechanisms from partner exchanges than vertical deals. Moreover, they enhance the stock exchange's market power in its own country or other countries. The existing literature (eg, Serifsoy, 2007) has shown that exchanges that diversify into related activities are mostly less efficient than exchanges that remain focused on the cash market. In our paper, we hypothesize that

*Hypothesis 3: More value accrues when the stock exchanges' integration activities are horizontal.*



### 3.3 Domestic and international cooperative activities

The demand for global exchanges has grown as more and more investors, both large and small, have begun to look beyond their own countries' borders for investment opportunities. Cross-border business opportunities are an important driver of stock exchange consolidation activities. Thus, cross-border integration activities can create more value as a result of increased overseas business opportunities than domestic deals. Additionally, there is a bigger difference in use of technology, internal control systems, transparency, and investor protection between the two exchanges located in different countries than those in the same country. Thus, the synergy gain in cross-border deals should be much larger than that obtained in domestic integration activities. Our hypothesis can be formalized as follows

*Hypothesis 4: More value accrues when the stock exchange's integration activities are cross-border.*

### 3.4 Learning-by-doing effects

The stock exchange industry is a highly regulated industry and strict regulation had prevented exchanges from operating across country borders. Consolidations involving large, publicly traded exchanges were a relatively new phenomenon in the 2000s. There was little reliable information available to the market, or even to the exchanges themselves, about which types of mergers would create the most value or which exchanges would be good at planning and executing mergers. As more exchange consolidations occur over time, however, it is reasonable to expect that exchanges learn how to better plan and execute integration activities from their previous experience, and it is similarly reasonable to expect that investors learn how to better value exchange consolidation activities as they observe and evaluate more of them. Based on these arguments, we hypothesize that

*Hypothesis 5: More value accrues when the stock exchanges have undertaken more previous integration activities.*

### 3.5 Difference in market development and governance

In cross-border deals, the difference in stock market development and investor protection between two partners' countries might also influence shareholder value creation. The more developed a stock market is, the more liquidity it can provide. Thus, when the partnering stock exchange locates in the country with a more developed stock market, there should be more synergy gain from increased liquidity. Similarly, the stock exchange with relatively low governance standards may benefit from the governance transfer effect in the process of the consolidation. Specifically, they learn how to govern the firms more effectively from partner exchanges. In the announcement of the alliance between New York Stock and Tokyo Stock Exchange, one potential collaboration area is regulation and governance (more details can be seen in Appendix 1). Frost et al (2006) argue that stock exchange governance mechanism is a concrete manifestation of country-level investor protection in the securities markets. Thus, when the partnering stock exchange locates in the country with higher investor protection, there should be more synergy gain from increased governance effects. In our paper, we hypothesize that

*Hypothesis 6a: The better market development in the partnering exchange's country, the higher the merger and alliance premium.*

*Hypothesis 6b: The better country-level governance in the partnering exchange's country, the higher the merger and alliance premium.*

## 4 Data

### 4.1 Sample description

To pursue our research objectives, we collected data on stock exchange M&A and alliance announcements during the period from January 2000 to August 2008 from a number of sources. The publicly available, monthly newsletters and press releases from the World Federation of Exchanges (WFE, 2000–2008) and the European Federation of Securities Exchanges (FESE, 2000–2008) are the most important data source. We also obtained some data from the internet, press archives and ad hoc announcements of the individual stock exchanges involved in the network deals. To be included in the analysis, at least one of the parent stock exchanges must have stock price data available for a joint venture or a non-equity alliance announcement. For an M&A announcement, the acquirer must have stock

price data available. If one stock exchange in the sample announces the purchase of or alliance with another stock exchange within six months of the previous announcement, we drop the subsequent one from the sample. We also drop 7 uncompleted M&A deals (6 acquirers are publicly traded exchanges).

Our search identified 110 announcements of M&As and alliances involving 102 stock exchanges (including 14 public stock exchanges). These account from roughly 72% of the total number of exchanges in the world. In terms of market capitalization, however, the stock exchanges in the sample represent over 95% of the universe. In our sample, there are 30 M&A events. They are all at least partially stock-financed and there are no hostile deals. Although we only focus on acquirers' stock response, we investigate the ownership structure of target exchanges. We find that only 3 target stock exchanges are publicly traded companies. This result suggests that only a small percentage of exchange M&As combined two publicly traded exchanges. Additionally, there are 16 stock exchange joint ventures and 64 non-equity alliances in our sample. Stock price data are available for two partners in 4 joint ventures and 7 non-equity alliances. We include each partner's announcement as one observation in our sample. Thus, in total, we have 20 observations for joint ventures (8 observations from 4 joint ventures for which stock price data are available for two partners and 12 observations from 12 joint ventures for which stock price data are available for one partner) and 71 event observations for non-equity alliances (14 observations from 7 non-equity alliances for which stock price data are available for two partners and 57 observations from 57 non-equity alliances for which stock price data are available for one partner). Adding 30 observations for M&As together, we have 121 observations in our sample. Each observation represents a single publicly traded exchange involving integration activities.

Panel A of Table 1 presents the sample events by year of announcement. Inspection of Table 1 shows that the number of exchange integrations is not evenly distributed over the 2000–2008 sample period. The largest number of announcements of M&A and strategic alliances in one year is 28 in 2007, followed by 20 in 2006. Panel B classifies the M&A and alliances. 84.55% of total stock exchange integration events are horizontal and 90.00% are cross-border. These results suggest that stock exchanges prefer horizontal and cross-border consolidations. Panel C presents the sample events by the type of technological integration. The results imply that one type of technological integration does not dominate our sample. In Addition, we provide a brief description of each of the types of consolidation agreements in the Appendix 1.

We also check whether alliances represent experimental organizational forms and would eventually evolve into joint ventures or mergers as proposed by Mody (1993). Our result does not support this assertion. Within four years following the formation of an alliance, only four of our sample alliances evolved into a more permanent form of relationship (Joint Ventures or M&As). This result is

consistent with the findings in the sample of US business firms by Chan et al (1997).<sup>8</sup>

## 4.2 Variable definition and summary statistics

In this subsection, we discuss the measurement of four categories of variables: exchange performance measures, deal-specific characteristics, exchange characteristics as well as country-level variables that controlling for macroeconomic conditions, the difference in legal system and language and the difference in governance and financial market development. A detailed description of the variable definitions and sources can also be found in Appendix 2.

### 4.2.1 Exchange performance measures

Shareholder value creation, the outcome variable of interest, can be measured in various ways. In our paper, we use CAR[-1,1] that is the three-day announcement abnormal return calculated based on the extended market model. The extended market model parameters are estimated over the period (-150, -31).<sup>9</sup> The objective of this study is to answer whether the consolidation of stock exchanges create value for exchange shareholders. This is exactly what that three-day announcement abnormal return measures and the one those hypotheses in Section 3 directly relate to. By examining the short-run stock price response instead of the long-run performance measures, we can save more observations in our sample when we focus on the recent stock exchange M&A and alliance activities. Nonetheless, to append to the overall shareholder value creation discussion, the three-year buy-and-hold abnormal return (BHAR<sub>1, 36</sub>) is introduced in Section 5.2, which captures the long-term dimension of shareholder value creation. In Section 5.3, we also introduce the variable, the difference in industry-adjusted ROE (ROA) between the year +2 and the year -2 to measure the change of exchange accounting performance. In Section 5.4, we introduce the variable, the difference in industry-adjusted value of share trading scaled by market capitalization of listed firms between the year +2 and the year -2 to measure the change of exchange liquidity. To measure the change of IPO volume, we introduce the variable, the difference in industry-adjusted market capitalization of IPO scaled by market capitalization of listed firms between the year +2 and the year -2.

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<sup>8</sup> They find that within four years of the formation of an alliance, only five of their sample alliances evolved into a more permanent form of relationship (joint ventures or M&As).

<sup>9</sup> A more detailed description of this measure can be found in section 5.1.1.

## 4.2.2 Deal characteristics

In our estimation, we control for several deal characteristics as follows. *InterType* is equal to 0 when the deal is an M&A, 1 when the deal is a joint venture, and 2 when the deal is a non-equity alliance. *CrossBorder* is a dummy variable, which is equal to 1 when the deal is a cross-border transaction, and is otherwise 0. *Horizontal* is a dummy variable, which equals 1 when the deal is a horizontal transaction, and is otherwise 0. *Public* is a dummy variable, which equals 1 when the partner is a publicly traded exchange, and is otherwise 0. *TechnologicalIntegration* is a series of dummy variables to indicate the type of technological integration (outsourcing, common access, common systems, common operations, complete system integration, and other type of integration).<sup>10</sup>

## 4.2.3 Learning-by-doing variables

Because one stock exchange might engage in several integration activities during our sample period, they can learn some lessons and draw some experience from them. We construct and include the variables, which measure the number of stock exchange own integration activities during the previous period to control for the potential effects of active, internal learning by doing. Specifically, *NoPreMA* is the number of previous M&A events experienced by a given exchange, *NoPreJV* is the number of previous joint venture events experienced by a given exchange, and *NoPreAL* is the number of previous non-equity alliance events experienced by a given exchange.

## 4.2.4 Exchange characteristics

The exchange traits that we control for are firm size, Tobin's *q*, leverage, and cash flow, all of which are measured at the fiscal year-end prior to the integration announcement and come from *Worldscope* database. We define exchange size as the log transformation of total assets ( $\text{Log}(\text{TotalAssets})$ ). We define Tobin's *q* as the ratio of market value of assets over book value of assets (*Q*). Leverage is defined as total liabilities divided by total assets (*Leverage*), and cash flow is equal to operating income before depreciation minus interest expenses minus income taxes minus capital expenditures, scaled by total assets (*CashFlow*). Stock returns are correlated over time. Abnormal returns of a company are driven by the

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<sup>10</sup> Hasan et al (2003) report increased cost and revenue efficiency of exchanges associated with investment in technology-related developments.

same firm factor. We use the variable PriceRunUp to capture this effect, which is the buy-and-hold abnormal return from day -150 to day -31.

#### 4.2.5 Country-level variables

We use the logarithm of GDP per capita and the logarithm of GDP growth to control for the countries' macroeconomic conditions, which are from World Development Indicator. If two partnering stock exchanges located in the different countries, the difference in legal system and language might create some barrier for integration and reduce the synergy gain. To control for these effects, we construct two dummy variables: SameLanguage, which equals one when two partnering stock exchanges' countries share the same language reported in atlas and zero otherwise and SameLegalSystem, which equals one when two partnering stock exchanges' countries share the same legal origin reported in La Porta et al (1998) and zero otherwise. To measure the difference in stock market development between the partner countries, we construct the difference of three variables that are from World Development Indicator: market capitalization of listed stock scaled by GDP, stock traded turnover ratio, and total value of stock traded scaled by GDP (DifMarketToGDP, DifTurnover and DifStockTradeToGDP). We took the country-level indices on shareholder rights and accounting standards, and the efficiency of the legal system, from La Porta et al (1998) to measure the potential governance transfer effect because stock exchange governance mechanism can be regarded as a concrete manifestation of country-level investor protection in the securities markets (Frost et al, 2006). Then we use the product of the shareholder rights index and the efficiency of the legal system to construct the index of shareholder protection. The difference of the corresponding indices (shareholder protection index and accounting standards) between the two partnering stock exchanges (DifShareholderProtection and DifAccountingStandards) provides an indication of the difference in investor protection between the partnering stock exchanges' countries.

#### 4.2.6 Summary statistics

Table 2 presents the summary statistics of our variables used in the empirical test. Exchange performance measures and exchange characteristics are winsorized at the 1st and 99th percentiles to eliminate the effect of outliers. The summary statistics of these variables are consistent with what are reported in the existing literature. In Panel C, we observe that some exchanges experience several M&A and alliance events in our sample period. For example, the maximum value of the previous M&A (NoPreMA), joint venture (NoPreJV) and alliances (NoPreAL)

events are respectively 6, 3 and 11. As shown in Panels G and H, the mean values of the difference in capital market development and legal environment are all positive. These results suggest that most of the public stock exchanges are located in the countries with relatively more developed capital markets and legal systems.

## 5 Tests and results

### 5.1 Short-run stock abnormal return and the integration activities

#### 5.1.1 Event study findings

We conduct an event study to measure the stock price response associated with the announcement of stock exchange M&As and alliances. Because of the multi-country nature of our event study, we extend the market model by adding a US market return term to calculate abnormal return. The linear equation is specified as

$$r_{it} = \alpha_i + \beta_{1,i}r_{m,jt} + \beta_{2,i}[r_{US,t} + e_{jt}] + \epsilon_{it} \quad (5.1)$$

Where  $i$  is the exchange index,  $j$  is the country market index,  $t$  represents a one-day period time index and  $r_{i,t}$  represents the daily rates of return. These variables are calculated for all stocks in our sample using DataStream's total return index (RI), which includes dividends as well as price changes.  $r_{m,jt}$  is a domestic market return, and  $r_{US,t}$  is the US market return.<sup>11,12</sup> The rate of change in the exchange rate per US dollar is  $e_{jt}$ . When we equation (5.1) using US data, we set  $\beta_{2,i}$  to zero. The announcement day is day zero, the estimation period for the market model estimate begins on day -150 and ends on day -31. We have set the cut-off at 30 days before the announcement date because one of the weakest points of event studies is information leakage, i.e. ie, some inside information is known before the actual event announcement. However, this might not fully solve the problem if the mergers and acquisitions and strategic alliances had been in the making for a long time. Nonetheless, based on Figure 1, the cut-off at 30 days before the announcement date reasonably avoids the information leakage problem. The graphs also show that establishing strategic relationships is good news and creates significant value for the shareholders of the partnering stock exchanges.

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<sup>11</sup> Local market index data is the exchange stock associated market index reported in DataStream.

<sup>12</sup> We use the S&P 500 index to calculate US market return. When we use the Dow Jones Index to calculate US market return, we obtain similar results.

Significance tests in our event study are based on a standardized parametric test statistic constructed to determine whether the mean abnormal return is significantly different than zero (see Mackinlay, 1997, for a detailed description of the test statistics and their calculation). Campbell et al (2007) find that a non-parametric test does a better job than a parametric test in a multi-country event study. Thus, we also report the results of Wilcoxon signed-rank tests.

Panel A of Table 3 shows that the three-day cumulative abnormal return is a statistically significant 1.4% (Z-statistic = 2.24) for stock exchange M&As, 1.1% (Z-statistic = 2.51) for stock exchange joint ventures and 0.95% (Z-statistic = 2.85) for stock exchange non-equity alliances. This evidence suggests that establishing strategic relationships creates significant value for the shareholders of the partnering stock exchanges. The non-parametric tests confirm these findings.

Our finding that average stock price responses around the announcement of stock exchange M&A and alliances are all significantly positive is consistent with the existing literature. Chang (1998) finds that in M&A involving a private target firm and stock payment, bidders experience a positive abnormal return. For the joint ventures, McConnell and Nantell (1985) find significant wealth gains from joint ventures. For the non-equity alliance, Chan et al (1997) reveal that the average stock price response to the formation of a non-equity alliance is positive.

Panel B of Table 3 compares accumulative abnormal return [-1, 1] among two of the three groups of events: stock exchange M&As, joint ventures and non-equity alliances. The mean value of accumulative abnormal return [-1, 1] of stock exchange M&As is significantly higher than that of joint ventures (T-statistic = 4.42). Similarly, the mean value of the accumulative abnormal return [-1, 1] of stock exchange joint ventures is significantly higher than that of non-equity alliances (T-statistic = 4.28).

We further classify our sample into different groups to examine the patterns in subsamples. As shown in Panel A of Table 4, the three-day cumulative abnormal return is a statistically significant 2% (Z-statistic = 3.05) for cross-border stock exchange M&As, 1.13% (Z-statistic = 2.62) for cross-border stock exchange joint ventures and 1.3% (Z-statistic = 3.92) for cross-border stock exchange alliances. The three-day cumulative abnormal returns for cross-border integration events are higher and more pronounced than for other integration events. In contrast, the three-day cumulative abnormal return is not statistically significant and has a lower mean value for domestic integration events. This evidence suggests that more value accrues for the shareholders of the partnering stock exchanges where cross-border strategic relationships are established. The non-parametric tests (sign tests) confirm these findings. Panel B of Table 4 shows similar results, suggesting that more value accrues for the shareholders of the partnering stock exchanges where horizontal strategic relationships are established.

Six acquirers are publicly traded exchanges in seven uncompleted M&A deals. We examine the stock price response for there acquirer stock exchange



when the deal failed and show the results in Panel C of Table 4. We observe that the three-day cumulative abnormal return is a statistically significant -2.76% (Z-statistic = -3.78) for acquirer stock exchanges, insignificant 0.14% (Z-statistic = 0.03) for target stock exchanges in failed M&As. These results suggest that failed M&As reduce shareholder value of acquirer exchanges.

As indicated earlier, in our sample there are three M&As, four joint ventures and seven non-equity-alliances for which price data are available for two partners. In this sub-sample, we examine whether there are wealth transfers between the larger and smaller partners in the alliance. We use the market value of each firm's common stock 31 trading days before the announcement of the integration to measure the relative size. Panel D of Table 4 compares the average cumulative abnormal return [-1, 1], the average market value on event day -31, and the change in wealth in the time interval [-1, 1] around the announcement day (market value on event day -31 multiplied by the average abnormal return [-1, 1]) for the sub-groups defined by the relative sizes of the alliance partner exchanges).

In three M&As deals, The average market value of the acquirers is \$4,022.33 million, which is on average more than three times that of the targets (\$1,065.45 million). Both acquirer and target exchanges experience a significant three-day cumulative abnormal return. These results also suggest that the target exchanges in the M&As receive a larger abnormal return than the acquirer exchanges. However, the wealth gains are almost equal.

In four joint ventures and seven non-equity alliances, the average market value of the larger partner is on average more than ten times that of the smaller ones. The smaller exchanges experience a significant three-day cumulative abnormal return. The larger exchanges experience an insignificant cumulative abnormal. These results suggest that smaller exchanges in the alliance receive a larger abnormal return than the larger exchange. However, the wealth gains are almost equal. We also test the potential wealth transfer between the larger and smaller exchange. The evidence shows that the correlation between the wealth increases experienced by the paired larger and smaller exchange is not significant. These results imply that the wealth is created by the formation of exchange joint venture and non-equity alliances and there is no evidence of wealth transfer between the partners.

### 5.1.2 Cross-sectional analysis

In this section, we analyze the cross-sectional differences in the short-run abnormal returns for the M&A and alliance announcements using regression analysis. The model specification is as follows

$$\begin{aligned}
CAR[-1,1] = & \alpha_i + \beta_1 DealCharacteristics + \beta_2 LearningByDoing \\
& + \beta_3 ExchangeCharacteristics + \beta_4 MacroDevelopment \\
& + \beta_5 TechnologicalIntegration + \beta_6 DifLegalandLanguage + \varepsilon
\end{aligned} \tag{5.2}$$

where the dependent variable  $CAR[-1, 1]$  is the three-day announcement abnormal return. The independent variable  $DealCharacteristics$  includes  $InterType$  (equal to 0 when the deal is an M&A, 1 when the deal is a joint venture, and 2 when the deal is a non-equity alliance),  $Crossborder$  (equal to 1 when the deal is a cross-border transaction, otherwise 0), and  $Horizontal$  (equal to 1 when the deal is a horizontal transaction, otherwise 0). We use the number of previous integration activities ( $NoPreMA$ ,  $NoPreJV$  and  $NoPreAL$ ) to measure learning-by-doing effects ( $LearningByDoing$ ). The variables to control for exchange characteristics ( $ExchangeCharacteristics$ ) include exchange size ( $Log(TotalAssets)$ ), Tobin's  $q$  ( $Q$ ), leverage ( $Leverage$ ), cash flow ( $CashFlow$ ) and stock price run-up ( $PriceRunUp$ ). We use the logarithm of GDP per capita ( $Log(GDPPerCapital)$ ) and the logarithm of GDP growth ( $Log(GDPGrowth)$ ) to control for the countries' macroeconomic developments ( $MacroDevelopment$ ). We also control for the type of technological integration ( $TechnologicalIntegration$ ) in the regression, whether it is mainly outsourcing, common access, common systems, common operations, complete system integration, or some other type of integration. We use the variable  $Samelanguage$  and  $SameLegalSystem$  to control for the difference in language and legal system ( $DifLegalandLanguage$ ). Country and year fixed effects are also included in our estimation.

The results are shown in Table 5. We uncover three important findings. First, more value accrues when the deal is a stock exchange M&A compared with a joint venture or alliance. Second, horizontal stock exchange integration activities create more synergies than vertical ones. Finally, cross-border stock exchange integration activities create more synergies than vertical ones. These results are not only statistically significant, but also economically significant. On average, the three-day cumulative abnormal return of exchange M&As (joint ventures) is 0.674% higher than that of exchange joint ventures (non-equity alliances). The three-day cumulative abnormal return of horizontal integrations is 2.819% higher than that of vertical integrations. Cross border consolidations generate abnormal returns 2.362% higher than domestic ones.

Our finding that horizontal stock exchange integration activities create synergies while vertical ones do not is similar to results in the existing literature. Ravenscraft and Scherer (1987), Bhagat et al (1990) and Kaplan and Weisbach (1992) show that only mergers between firms in related businesses are likely to generate operating synergies. Johnson and Houston (2000) reveal that only horizontal joint ventures create value for shareholders while vertical ones do not. Chan et al (1997) find that when non-equity alliances involve a transfer or pooling

of technology, the average stock price response is positive for horizontal alliances and there is no significant abnormal return for vertical ones.

It is worth emphasizing that the coefficients of the learning-by-doing variables (NoPreMA, NoPreJV and NoPreAL) are negative and statistically significant. If the exchange experienced one more M&A (joint venture, non-equity alliance), the three-day cumulative abnormal return of the next integration activity will increase by 0.012% (0.010%, 0.014%). Thus, we find evidence to suggest that exchanges engaging in integration activities tend to perform better after they have some experience from their previous integration activities. This finding most likely reflects the fact that the complicated and different regulations in various countries encountered by stock exchanges make previous experiences valuable. We also find that exchange size (Log (TotalAssets)) is inversely related to abnormal return. Price run-up (PriceRunUp) has a negative impact of abnormal return. These results are consistent with the existing literature. The coefficients of SameLanguage and SameLegalSystem are both insignificantly positive (results are not reported for the brevity).

### 5.1.3 The impact of the difference in market development

In cross-border deals, the difference in stock market development between two partners' countries might also influence shareholder value creation. The more developed a stock market is, the more liquidity it can provide. Thus, when the partnering stock exchange locates in the country with a more developed stock market, there should be more synergy gain from increased liquidity. In this subsection, we examine how the difference in capital market development between the countries of the partnering stock exchanges influences the abnormal return. The model specification is as follows

$$\begin{aligned}
 \text{CAR}[1,1] = & \alpha + \beta_1 \text{DealCharacteristics} + \beta_2 \text{LearningByDoing} \\
 & + \beta_3 \text{ExchangeCharacteristics} + \beta_4 \text{MacroDevelopment} \\
 & + \beta_5 \text{TechnologicalIntegration} + \beta_6 \text{DifLegalandLanguage} \\
 & + \beta_7 \text{DifMarketDevelopment} + \varepsilon
 \end{aligned} \tag{5.3}$$

Compared with equation (5.2), we add another term (DifMarketToGDP, DifTurnover or DifStockTradeToGDP) to measure the difference in capital market development between the countries of the participating stock exchanges (DifMarketDevelopment).<sup>13</sup> As shown in Table 6, our main results do not change. The coefficients of the variables DifMarketToGDP, DifTurnover and

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<sup>13</sup> Because these three variables are correlated, we add one into the regression equation at a time.

DifStockTradeToGDP are significantly negative. One percentage of difference in the capital market development of the participating stock exchanges' countries (measured by market capitalization of listed stock scaled by GDP) will lead to a 0.168% increase of the three-day cumulative abnormal return. These results suggest that the better the capital market development in the partner's country, the higher the merger and alliance premium.

#### 5.1.4 The impact of the difference in governance

Similarly, the stock exchange with relatively low governance standards may benefit from the governance transfer effect in the process of the consolidation. Frost et al (2006) argue that stock exchange governance mechanism is a concrete manifestation of country-level investor protection in the securities markets. Thus, when the partnering stock exchange locates in the country with higher investor protection, there should be more synergy gain from increased governance effects. In this sub-section, we assemble country-level corporate governance indices and seek to examine how the difference in the legal environment of the countries of the stock exchanges influences the abnormal return. The model specification is as follows

$$\begin{aligned}
 \text{CAR}[1,1] = & \alpha + \beta_1 \text{DealCharacteristics} + \beta_2 \text{LearningByDoing} \\
 & + \beta_3 \text{ExchangeCharactistics} + \beta_4 \text{MacroDevelopment}_i \\
 & + \beta_5 \text{TechnologicalIntegration} + \beta_6 \text{DifLegalandLanguage} \\
 & + \beta_7 \text{DifMarketDevelopment} + \beta_8 \text{DifGovernance} + \varepsilon
 \end{aligned} \tag{5.4}$$

Compared with equation (5.3), we add another term (DifShareholderProtection or DifAccountingStandards) to measure the difference in the legal environment between the countries of the stock exchanges (DifGovernance).<sup>14</sup> As shown in Table 7, our main results still hold.<sup>15</sup> The coefficients of the variables DifShareholderProtection and DifAccountingStandards are significantly negative. One percentage of difference in the legal environment of the countries of the stock exchanges (measured by the shareholder protection index) will increase the three-day cumulative abnormal return by 0.029%. These results suggest that the better the legal system in the partner's country, the higher the merger and alliance premium.

<sup>14</sup> Because these three variables are correlated, we add one into the regression equation at a time.

<sup>15</sup> In the reported results, we only control for DifTurnover. Our results do not change when we control for DifMarketToGDP or DifStockTradeToGDP.

## 5.2 Long-run abnormal return and the integration activities

From a stock exchange shareholder's viewpoint, the long-run stock return after the integrations might be more important and valuable than the short-run stock return. By looking at the long-term patterns in stock returns, we are able to test whether the positive reaction to the exchange integration is a sign of temporary optimism by investors who newly gain remote access in equity trading, or whether the price reaction is permanent implying an increase in the shareholders' wealth. To formally address this issue, first, we examine the three-year buy-and-hold abnormal return of the partnering exchange. The three-year period includes the following 36 months where months are defined as successive 21-trading-day periods relative to the announcement date. Thus, month 1 consists of event days 2–22; month 2 consists of event days 23–43, etc. The three-year buy-and-hold abnormal return  $BHAR_{1,36}$  is calculated as below

$$BHAR_{1,36} = \prod_1^{36} (1 + R_{i,t}) - \prod_1^{36} (1 + R_{m,t}) \quad (5.5)$$

where  $R_{i,t}$  is the monthly return and  $R_{m,t}$  is the benchmark return, which is the value-weighted exchange industry return.<sup>16,17</sup>

The results show that the three-year abnormal return is significantly positive (T-statistic is 3.34 in T-test; Z-statistic is 3.12 in Wilcoxon signed-rank test).<sup>18</sup> These results suggest that partnering exchanges outperform the value-weighted exchange industry return over the three-year horizon. Second, we use the three-year buy-and-hold abnormal return  $BHAR_{1,36}$  as the dependent variable and conduct a multivariate analysis. The model specification is as follows

$$\begin{aligned} BHAR_{1,36} = & \alpha + \beta_1 DealCharacteristics_i + \beta_2 LearningByDoing \\ & + \beta_3 ExchangeCharacteristics + \beta_4 MacroDevelopment \\ & + \beta_5 TechnologicalIntegration_i + \beta_6 DifLegalandLanguage \\ & + \beta_7 DifMarketDevelopment + \beta_8 DifGovernance + \varepsilon \end{aligned} \quad (5.6)$$

The results are reported in Table 8 and these patterns are consistent with the results when we examine the short-run abnormal return. First, there is more improvement in long-run abnormal return when the deal is an M&A compared

<sup>16</sup> Whether we use market index return or equal-weighted industry average return as the benchmark return, we draw the same conclusion. The results are not reported, but are available upon request.

<sup>17</sup> When we calculate the value-weighted industry return for a sample exchange, we do not include that sample exchange.

<sup>18</sup> See Barber and Lyon (1997) for more details about various measures and statistical tests used to detect long-run abnormal return.

with a joint venture or an alliance. Second, horizontal (cross-border) stock exchange integration activities have higher long-run abnormal return for the stock exchange than vertical (domestic) ones. We also find that the learning-by-doing effect still holds in terms of the stock exchange's accounting ratio performance. Finally, the better the shareholder protection, accounting standards, and capital market development in the partner's country, the higher long-run abnormal return for the stock exchange.

### 5.3 Accounting performance, liquidity, IPO and the integration activities

In this subsection, we use accounting ratios (ROA and ROE) to measure exchange performance because accounting ratios capture actual financial performance over a period of time, while market returns are forward-looking measures of expected earnings. First, we calculate industry-adjusted accounting performance measures by subtracting asset-weighted industry performance from the levels of each of two performance metrics (ROA and ROE) in the years -2 and +2.<sup>19,20</sup> Using T tests and Wilcoxon signed-rank tests, the evidence shows that industry-adjusted accounting performance measures are significantly positive in the years tested. The results suggest that exchanges entering into M&A and alliances tend to display superior performance relative to their industry counterparts both prior to and after the announcement of integration activities. We also use T tests and Wilcoxon rank-sum tests to determine whether the differences in industry-adjusted performance measures between the year -2 and the year +2 are statistically significant. We find evidence that performance improves significantly from the year -2 to the year +2.<sup>21</sup> Second, we conduct a multivariate analysis to examine which characteristics contribute to improving exchanges' long-run accounting performance. The model specification is as follows

$$\begin{aligned}
 \text{ChangeofPerformance} = & \alpha + \beta_1 \text{DealCharacteristics} + \beta_2 \text{LearningByDoing} \\
 & + \beta_3 \text{ExchangeCharacteristics} + \beta_4 \text{MacroDevelopment} \\
 & + \beta_5 \text{TechnologicalIntegration} \\
 & + \beta_6 \text{DifLegalandLanguage} \\
 & + \beta_7 \text{DifMarketDevelopment} + \beta_8 \text{DifGovernance} + \varepsilon
 \end{aligned} \tag{5.7}$$

<sup>19</sup> When calculating asset-weighted industry performance for a sample exchange, we do not include that sample exchange.

<sup>20</sup> When we use equal-weighted industry average accounting performance, we obtain the similar results. The results are not reported here, but are available upon request.

<sup>21</sup> A copy of the test results associated with all the performance metrics is available from the author upon request. See Barber and Lyon (1996) for more details of various measures of performance and statistical tests used to detect abnormal operating performance.

where the dependent variable *ChangeofPerformance* is the difference in industry-adjusted ROA or ROE for integration *i* between the year +2 and the year -2. The results are reported in Table 9. First, the performance increases more when the deal is a stock exchange M&A compared with a joint venture or an alliance. Second, horizontal (cross-border) stock exchange integration activities increase performance more for the stock exchange than vertical (domestic) ones. Finally, the better the shareholder protection, accounting standards, and capital market development in the partner's country, the better accounting ratio performance for the stock exchange. These patterns are consistent with the results when we investigate exchanges' short-run and long-run abnormal return.

The exchange accounting performance are mainly driven by the revenue from trading and IPOs. Thus, we examine the pattern in liquidity and IPO after the announcement of integration activities. We obtain the data from the website of World Exchange Federation. The exchange liquidity is measured as the value of share trading divided by market capitalization of listed stocks. The exchange IPOs is measured as the market capitalization of IPOs divided by market capitalization of listed stocks. Similar to industry-adjusted accounting performance measures, we construct two variables: industry-adjusted liquidity and industry-adjusted IPOs and do a multivariate analysis. As shown in Table 10, we obtain similar results compared with those we got when we examine the accounting performance.

## 5.4 Robustness tests

To make sure our results are not driven by a specific model, we examine another model based on Jin and Myers (2006) incorporating lagged market returns to avoid the influence of nonsynchronous trading. We use different event window, ie  $[-2, 2]$  and  $[-3, 3]$  to calculate abnormal return. We also calculate heteroskedasticity robust t-statistics by regressing  $CAR[-1,1]$  on an intercept. For the four joint venture announcements and the seven non-equity alliance announcements for which we have return data on multiple partners, we combine the returns of all partners in the same joint venture or non-equity alliance to form a value-weighted portfolio using the market values of the partner firms on event day -31 as weights. We then treat the portfolio as a single observation in conducting our event study. By combining the returns of partner firms in a given non-equity alliance, we avoid the problem of a lack of independence in sample observations because there may be a correlation in the partner firms' returns. These procedures do not qualitatively change our findings.<sup>22</sup>

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<sup>22</sup> The results are available upon request, although not reported.

## 6 Summary and conclusions

We provide evidence concerning the impact of M&As and strategic alliances on the wealth of the partnering stock exchanges' shareholders. We find significant positive wealth effects, on average, from the formation of such M&As and alliances. These results support the conjecture that global exchange integration activities may well promote the efficiency of cross-border capital flows and increased governance standards, and thus have the potential to benefit the markets and investors around the world.

Stock exchanges can cooperate in different ways, through for example simple contractual agreements, the formation of a joint venture or full integration. We find that stock exchange alliances lead to the creation of less value for both partner firms than joint ventures. Similarly, less value accrues through stock exchange joint ventures compared with M&As. We also provide evidence regarding the types of stock exchange integration activities that have the greatest wealth impact on the partnering firms. We find that horizontal integration activities tend to produce larger wealth effects than vertical ones. In addition, cross-border integration activities tend to produce larger wealth effects than domestic ones. Additionally, there is evidence of learning-by-doing in stock exchange integration activities. Finally, we find that the better the shareholder protection, accounting standards and capital market development in the partnering exchange's country, the higher the merger and alliance premium. These patterns are consistent when we examine the long-run performance measures such as the three-year buy-and-hold abnormal return, the change in ROA (ROE), the change in liquidity and the change in market capitalization of IPO between the year +2 and the year -2.

The results of this paper have significant implications for managers of stock exchanges. In general, the use of M&As and alliances by stock exchanges creates value for their shareholders. Furthermore, expanding horizontally into international markets provides stock exchanges with the opportunity to capitalize on their domestic expertise and reap handsome profits. The paper can also give investors some guidance on how to value stock exchange shares.



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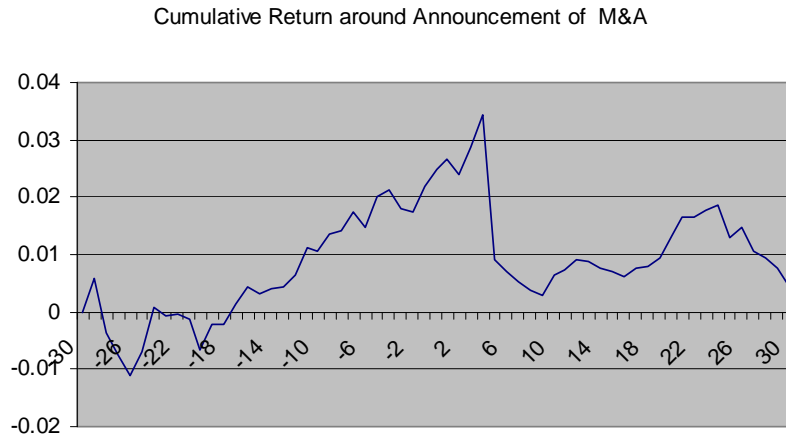
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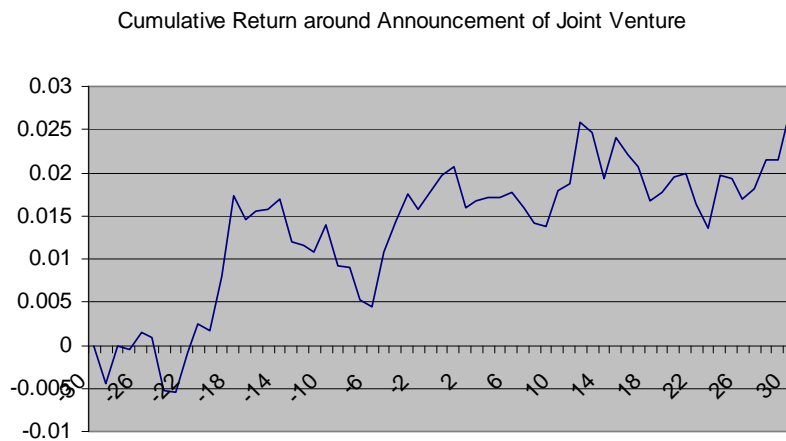
Figure 1.

### Cumulative return around announcement of stock exchange M&A, joint venture and non-equity alliance

Panel A



Panel B



Panel C

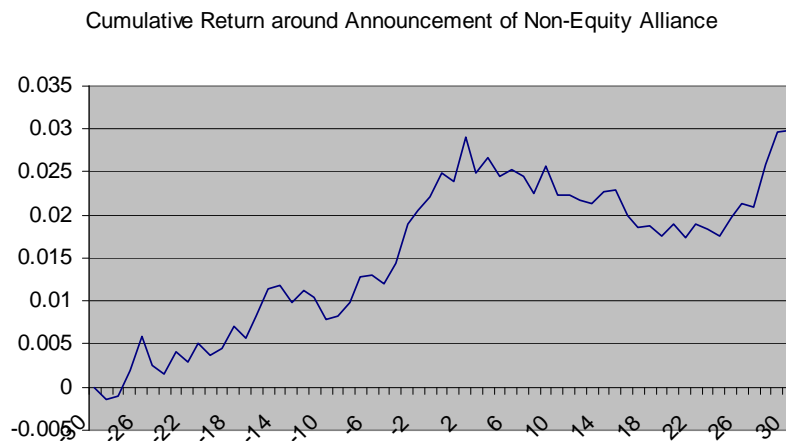


Table 1.

### Announcements of stock exchange M&As and alliances

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% levels.

Year of announcement	Number of announcements	Percentage of total
2000	5	4.55
2001	8	7.27
2002	8	7.27
2003	12	10.91
2004	13	11.82
2005	14	12.73
2006	20	18.18
2007	28	25.45
2008	2	1.82
Total	110	100

Panel A: Annual distribution of stock exchange integration activities

Type of integration activities	Number of announcements	Percentage of total
Horizontal	93	84.55
Vertical	17	15.45
Cross-border	99	90.00
Domestic	11	10.00

Panel B: Distribution of stock exchange integration activities by type

Type of technological integration	Number of announcements	Percentage of total
Outsourcing	17	15.45
Common access	9	8.18
Common systems	5	4.55
Common operation	6	5.45
Complete system integraton	16	14.55
Other type of integration	55	50.00

Panel C: Distribution of stock exchange integration activities by type of technological integration

Table 2. **Summary statistics**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. Exchange performance measures and exchange characteristics are winsorized at the 1st and 99th percentiles. Variable definitions are given in Appendix 2.

Variable	Obs	Mean	Std. Dev.	Min	Max
CAR[-1,1](%)	121	1.08	0.33	-5.96	6.48
BHAR <sub>1,36</sub> (%)	70	97.37	26.45	-66.56	212.44
Difference in industry-adjusted ROE between the year +2 and the year -2 (%)	52	7.89	2.45	-4.93	16.52
Difference in industry-adjusted ROA between the year +2 and the year -2 (%)	60	3.25	0.81	-2.47	8.01
Difference in industry-adjusted exchange liquidity between the year +2 and the year -2 (%)	58	0.12	0.04	-0.15	0.27
Difference in industry-adjusted exchange IPO between the year +2 and the year -2 (%)	58	0.11	0.03	-0.13	0.28
Panel A: Exchange performance measures					
InterType	121	1.36	0.87	0.00	3.00
Horizontal	121	0.82	0.39	0.00	1.00
Cross Border	121	0.89	0.31	0.00	1.00
Public	121	0.12	0.31	0.00	1.00
Panel B: Deal characteristics					
NoPreMA	121	1.21	1.73	0.00	6.00
NoPreJV	121	0.54	0.85	0.00	3.00
NoPreAL	121	3.08	2.76	0.00	11.00
Panel C: Learning-by-doing variables					
MarketValue (\$ millions)	121	4,045.91	5,841.73	12.86	34,753.22
TotalAssets (\$ millions)	116	7,292.16	14,817.00	30.70	60,535.95
CashFlow	116	0.11	0.10	0.01	0.41
Leverage	112	0.59	0.17	0.39	0.79
Q	112	2.74	2.07	1.11	8.66
PriceRunUp (%)	121	10.00	6.00	-16.00	23.00
Panel D: Exchange characteristics					
GDPPerCapita (\$)	91	25,867.41	8,831.08	949.18	39,824.08
GDPGrowth (%)	91	2.99	2.41	-2.40	10.00
Panel E: Difference in language and legal system					
SameLanguage	121	0.54	0.22	0.00	1.00
SameLegalSystem	121	0.33	0.21	0.00	1.00
Panel F: Macroeconomic development variables					
DifMarketToGDP (%)	91	0.18	0.77	-2.62	2.43
DifTurnOver (%)	90	0.20	0.58	-1.54	1.59
DifStockTradeToGDP (%)	91	0.28	0.90	-2.52	1.91
Panel G: Difference in capital market development					
DifShareholderProtection	75	.79	20.68	-41.00	50.00
DifAccountingStandards	71	4.66	13.41	-21.00	59.00
Panel H: Difference in governance					

Table 3.

**Cumulative return [-1, 1] around announcement of  
stock exchange M&A, joint venture and non-equity  
alliance**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% levels.

Event type	Number of observations	CAR[-1,1](%)	Z-statistic	Prportion of positive value (sign test)
M&A	30	1.4	2.24*	73.33%***
Joint venture	20	1.1	2.51*	70%*
Non-equity alliance	71	0.95	2.85**	69.44%**

Panel A: Announcement period cumulative return [-1,1]

Two group of events	Number of observations	Difference of CAR[-1,1](%)	T-statistic	P value (Wilcoxon rank-sum test)
M&A and joint venture	50	0.33	4.42***	0.01***
M&A and non-equity alliance	101	0.44	4.56***	0.03**
Joint venture and non-equity alliance	91	0.11	4.28***	0.01***

Panel B: Comparison of announcement period cumulative return [-1,1] among M&A, joint ventures, and non-equity alliances

Table 4.

**Cumulative return [-1, 1] around announcement of stock exchange M&A, joint venture and non-equity alliance in sub-sample**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% levels.

Event type	Number of observations	CAR[-1,1](%)	Z-statistic	Proportion of positive value (sign test)
Cross-border M&A	23	2.00	3.05***	78% **
Domestic M&A	7	-0.59	-0.37	57%
Cross-border joint venture	19	1.13	2.62***	74% *
Domestic joint venture	1	-0.23	-0.12	0%
Cross-border non-equity alliance	66	1.3	3.92***	71%***
Domestic non-equity alliance	5	-3.7	-2.21	40%

Panel A: Comparison of announcement period cumulative return [-1,1] between cross-border and domestic deals

Event type	Number of observations	CAR[-1,1](%)	Z-statistic	Proportion of positive value (sign test)
Horizontal M&A	22	1.88	2.66***	77% **
Vertical M&A	8	0.05	0.04	63%
Horizontal joint venture	15	1.24	2.82***	73% *
Vertical joint venture	5	0.51	0.5	60%
Horizontal non-equity alliance	62	1.1	3.47***	69%***
Vertical non-equity alliance	9	-0.6	-0.51	66%

Panel B: Comparison of announcement period cumulative return [-1,1] between horizontal and vertical deals

Exchange type	Number of observations	CAR[-1,1](%)	Z-statistic	Proportion of positive value (sign test)
Acquirer exchange	6	-2.76	-3.78***	0%***
Target exchange	5	0.14	0.03	25%

Panel C: Analysis of failed M&A deals

Exchange type	Number of observations	CAR[-1,1](%)	Z-statistic	Mean market value (\$m.)	Mean change in wealth (\$m.)
Acquirer exchange	3	0.90	4.33***	4,022.33	36.20
Target exchange	3	2.83	4.55***	1,065.45	30.15
Larger joint venture partner	4	0.21	0.99	3,300.12	6.93
Smaller joint venture partner	4	2.55	6.33***	280.54	7.15
Larger alliance partner	7	0.18	1.05	3,046.41	5.48
Smaller alliance partner	7	2.23	6.12***	230.82	5.15

Panel D: Analysis of wealth effects by relative partner size



Table 5.

### Cross-sectional analysis of CARs upon announcement

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the three-day cumulative abnormal return (CAR) in percentage points. Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	CAR[-1,1]			
	(1)	(2)	(3)	(4)
<i>Deal characteristics</i>				
InterType	-0.674* (-1.761)	-0.598*** (-4.493)	-0.558*** (-4.352)	-1.100** (-2.013)
Horizontal	2.819** (2.270)	2.800** (2.227)	2.464* (1.811)	3.073* (1.933)
CrossBorder	2.362** (2.069)	2.376** (2.006)	2.023*** (3.437)	2.143*** (3.188)
Public	0.002 (0.005)	0.006 (0.007)	0.003 (0.006)	0.003 (0.008)
<i>Learning-by-doing variables</i>				
NoPreMA		0.012*** (4.684)	0.023*** (3.354)	0.017*** (3.250)
NoPreJV		0.010*** (4.019)	0.016*** (4.495)	0.030*** (4.707)
NoPreAL		0.015*** (5.563)	0.018*** (4.375)	0.021*** (4.626)
<i>Exchange characteristics</i>				
Log(TotalAssets)			-0.646* (-1.852)	-0.364*** (-4.650)
Q			0.335 (1.315)	0.052 (0.141)
Leverage			-3.139 (-1.261)	-0.162 (-0.036)
CashFlow			0.020 (0.362)	0.072 (1.052)
PriceRunUp			-0.905*** (-4.234)	-0.901*** (-5.001)
<i>Macroeconomic variables</i>				
Log(GDPPerCapita)				-1.028 (-1.574)
Log(GDPGrowth)				0.332 (0.574)
<i>Control for</i>				
Technological integration dummy variables	Yes	Yes	Yes	Yes
Difference in language and legal environment	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.14	0.12	0.16	0.18
No. of observations	121	121	112	83

Table 6.

**Cross-sectional analysis of CARs upon  
announcement controlling for the difference  
in capital market development**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the three-day cumulative abnormal return (CAR) in percentage points. Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	CAR[-1,1]		
	(1)	(2)	(3)
<i>Deal characteristics</i>			
InterType	-1.136* (-1.997)	-1.139** (-2.014)	-1.093* (-1.978)
Horizontal	3.125* (1.936)	3.082* (1.890)	3.056* (1.903)
CrossBorder	2.085*** (4.138)	2.120*** (4.148)	2.171*** (4.187)
Public	0.002 (0.003)	0.002 (0.003)	0.004 (0.004)
<i>Learning-by-doing variables</i>			
NoPreMA	0.019*** (4.186)	0.011*** (5.207)	0.013*** (4.269)
NoPreJV	0.015*** (4.738)	0.018*** (4.736)	0.015*** (4.715)
NoPreAL	0.013*** (4.626)	0.020*** (4.605)	0.010*** (3.636)
<i>Difference in capital market development</i>			
DifMarketToGDP	-0.168*** (-4.250)		
DifTurnover		-0.168*** (-5.196)	
DifStockTradeToGDP			-0.076*** (-4.140)
<i>Control for</i>			
Exchange characteristics	Yes	Yes	Yes
Macroeconomic variables	Yes	Yes	Yes
Technological integration dummy variables	Yes	Yes	Yes
Difference in language and legal environment	Yes	Yes	Yes
Country effect	Yes	Yes	Yes
Year effect	Yes	Yes	Yes
Adjusted R-squared	0.18	0.19	0.19
No. of observations	83	81	83

Table 7.

**Cross-sectional analysis of CARs upon  
announcement controlling for the Difference  
in governance**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the three-day cumulative abnormal return (CAR) in percentage points. Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	CAR[-1,1]	
	(1)	(2)
<i>Deal characteristics</i>		
InterType	-0.943*** (-4.234)	-1.032*** (-4.454)
Horizontal	1.913*** (5.026)	2.437*** (4.459)
CrossBorder	1.843*** (5.981)	2.104*** (4.201)
Public	0.004 (0.001)	0.001 (0.001)
<i>Learning-by-doing variables</i>		
NoPreMA	0.018*** (4.614)	0.011*** (4.405)
NoPreJV	0.016*** (4.044)	0.018*** (4.056)
NoPreAL	0.014*** (4.698)	0.019*** (4.377)
<i>Difference in capital market development</i>		
DifTurnover	-0.065*** (-4.055)	-0.042*** (-4.382)
<i>Difference in governance</i>		
DifShareholderProtection	-0.029*** (-3.920)	
DifAccountingStandards		-0.132*** (-2.790)
<i>Control for</i>		
Exchange characteristics	Yes	Yes
Macroeconomic variables	Yes	Yes
Technological integration dummy variables	Yes	Yes
Difference in language and legal environment	Yes	Yes
Country effect	Yes	Yes
Year effect	Yes	Yes
Adjusted R-squared	0.20	0.21
No. of observations	54	51

Table 8.

**Cross-sectional analysis of three-year BHARs**

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the three-year buy-and-hold abnormal return (BHAR). Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	BHAR <sub>(1, 36)</sub>	
	(1)	(2)
<i>Deal characteristics</i>		
InterType	-3.825*** (-4.256)	-3.315*** (-5.866)
Horizontal	8.141*** (4.135)	16.677*** (5.111)
CrossBorder	3.832*** (4.344)	3.422*** (4.224)
Public	0.014 (0.001)	0.013 (0.001)
<i>Learning-by-doing variables</i>		
NoPreMA	1.182*** (4.656)	1.422*** (5.434)
NoPreJV	1.101*** (4.235)	1.131*** (4.345)
NoPreAL	1.165*** (4.254)	1.173*** (5.123)
<i>Difference in capital market development</i>		
DifTurnover		-1.209*** (-4.185)
<i>Difference in governance</i>		
DifShareholderProtection		-1.134*** (-4.521)
<i>Control for</i>		
Exchange characteristics	No	Yes
Macroeconomic variables	No	Yes
Technological integration dummy variables	Yes	Yes
Difference in language and legal environment	Yes	Yes
Country effect	Yes	Yes
Year effect	Yes	Yes
Adjusted R-squared	0.18	0.41
No. of observations	70	40

Table 9.

### Cross-sectional analysis of exchange accounting performance

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the difference in the industry-adjusted ROA or the industry-adjusted ROE between the year +2 and the year -2. Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	Difference in industry-adjusted ROA between the year +2 and the year -2		Difference in industry-adjusted ROE between the year +2 and the year -2	
	(1)	(2)	(3)	(4)
<i>Deal characteristics</i>				
InterType	-0.652*** (-5.371)	-0.251*** (-4.688)	-1.445*** (-5.849)	-0.948*** (-5.365)
Horizontal	1.914*** (5.513)	3.454*** (6.202)	4.951*** (5.224)	5.730*** (6.316)
CrossBorder	0.520*** (5.277)	0.214*** (6.404)	2.261*** (5.505)	1.862*** (6.064)
Public	0.006 (0.002)	0.008 (0.004)	0.012 (0.004)	0.013 (0.003)
<i>Learning-by-doing variables</i>				
NoPreMA	0.062*** (3.342)	0.21*** (4.200)	0.027*** (4.296)	0.066*** (5.248)
NoPreJV	0.081*** (5.878)	0.010*** (4.813)	0.046*** (5.020)	0.014*** (4.896)
NoPreAL	0.043*** (5.954)	0.037*** (4.580)	0.013*** (6.036)	0.063*** (4.248)
<i>Difference in capital market development</i>				
DifTurnover		-0.088*** (-4.185)		-0.137*** (-5.576)
<i>Difference in governance</i>				
DifShareholderProtection		-0.027*** (-4.521)		-0.101*** (-5.807)
<i>Control for</i>				
Exchange characteristics	No	Yes	No	Yes
Macroeconomic variables	No	Yes	No	Yes
Technological integration dummy variables	Yes	Yes	Yes	Yes
Difference in language and legal environment	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.19	0.46	0.16	0.32
No. of observations	60	34	52	33

Table 10.

### Cross-sectional analysis of exchange liquidity and IPO

By searching public news, we identified 110 announcements of M&As and alliances. Specifically, there are 30 M&A events, 16 joint venture events and 64 non-equity alliance events in our sample of 121 observations. The dependent variable is the difference in the industry-adjusted exchange liquidity or the industry-adjusted exchange IPO between the year +2 and the year -2. Variable definitions are given in Appendix 2. In brackets are t-statistics based on standard errors adjusted for heteroskedasticity and country clustering. \*, \*\* and \*\*\* stand for significance at the 10%, 5% and 1% level respectively.

Dependent variable	Difference in industry-adjusted liquidity between the year +2 and the year -2		Difference in industry-adjusted exchange IPO between the year +2 and the year -2	
	(1)	(2)	(3)	(4)
<i>Deal characteristics</i>				
InterType	-0.032*** (-4.234)	-0.023*** (-4.483)	-0.025*** (-4.367)	-0.020*** (-4.854)
Horizontal	0.193*** (4.893)	0.321*** (6.001)	0.705*** (4.689)	0.243*** (5.087)
CrossBorder	0.048*** (4.145)	0.020*** (5.234)	0.039*** (4.654)	0.019*** (5.112)
Public	0.007 (0.001)	0.008 (0.001)	0.006 (0.004)	0.005 (0.002)
<i>Learning-by-doing variables</i>				
NoPreMA	0.006*** (4.392)	0.020*** (4.675)	0.007*** (4.643)	0.019*** (4.243)
NoPreJV	0.007*** (5.145)	0.001*** (4.235)	0.008*** (5.876)	0.002*** (4.123)
NoPreAL	0.003*** (5.172)	0.004*** (4.765)	0.002*** (5.432)	0.003*** (4.142)
<i>Difference in capital market development</i>				
DifTurnover		-0.009*** (-4.654)		-0.005*** (-4.134)
<i>Difference in governance</i>				
DifShareholderProtection		-0.004*** (-4.345)		-0.005*** (-4.135)
<i>Control for</i>				
Exchange characteristics	No	Yes	No	Yes
Macroeconomic variables	No	Yes	No	Yes
Technological integration dummy variables	Yes	Yes	Yes	Yes
Difference in language and legal environment	Yes	Yes	Yes	Yes
Country effect	Yes	Yes	Yes	Yes
Year effect	Yes	Yes	Yes	Yes
Adjusted R-squared	0.24	0.40	0.17	0.33
No. of observations	58	36	58	35

# Appendix 1

## Sample descriptions of M&As and alliances

The following material provides a brief sample description of each of the types of cooperative agreements studied. The information for each description is taken directly from the news item used to identify the announcement of the events.

### A1.1 M&As

At the NYSE Group's first meeting as a public company, the chief executive, John A. Thain, complained that the United States was losing lucrative stock listings to markets overseas because of the Sarbanes-Oxley Act. Of the largest 25 initial public offerings last year, 23 did not list in the United States, he said. This year, 9 of the 10 largest offerings went elsewhere. 'That is a very negative statistic for the competitive position of the United States', Mr. Thain said.

After a whirlwind weekend of trans-Atlantic travel, Mr. Thain sealed a deal for the NYSE Group to buy Euronext, the pan-European stock and derivatives exchange, for \$10.2 billion, forming the first trans-Atlantic marketplace. Euronext, which was formed from mergers of the Paris, Amsterdam and Brussels stock exchanges, as well as the London derivatives exchange Liffe, will become part of NYSE Euronext, the American holding company that will be created. Regulators from each country where stocks trade will continue to oversee that activity. (The New York Times, June 2, 2006)

### A1.2 Equity alliances (joint ventures)

The American Stock Exchange, the global leader and pioneer in exchange-traded funds (ETFs) and Euronext, the first pan-European exchange, signed a memorandum of understanding to create a joint venture, subject to regulatory approval, to cross list and trade US, European and other internationally sourced ETFs. The joint venture will be a part of a global network of ETF marketplaces aiming at offering the best facilities for trading, cross listing, information dissemination, and marketing of the products globally. Ultimately the partners hope to achieve seamless 24-hour global trading of ETFs.

'Bringing Amex-listed ETFs to Europe, a critical market, is the essential next step in our strategy to develop a global ETF trading network', said Salvatore F. Sodano, Amex chairman and chief executive officer. 'The Amex-Euronext

alliance is truly revolutionary, as it aims to provide investors with the opportunity to trade the same class of ETF shares across time zones.’ (American Stock Exchange Official Website, February 7, 2001)

### A1.3 Non-equity alliances (simple contracts)

In a deal that allies the two biggest stock markets in the world, the NYSE Group, parent of the New York Stock Exchange, confirmed that it had signed a letter of intent to form a strategic alliance with the Tokyo Stock Exchange. The alliance calls for cooperation on joint listings, trading technology and marketing, with the possibility of investing in each other in the future. The exchange’s non-exclusive alliance with Tokyo – loosely defined and less substantive than its merger with Euronext or its ownership stake in India’s national stock exchange – is an agreement to work together, the chief executives from the two exchanges said. Working groups are in place to examine possible linkages in areas like trading technology, cross-listings, new products including exchange-traded funds and areas of corporate governance and regulation. (The New York Times, February 1, 2007)



## Appendix 2

### Brief descriptions of all the variables and their sources

Variables	Description	Sources
<b>Exchange performance measures</b>		
CAR [-1, 1]	Three-day cumulative abnormal return (in percentage points) calculated using the extended market model. The extended market model parameters are estimated over the period (-150, -31)	Computed
BHAR <sub>1, 36</sub>	Three-year buy-and-hold abnormal return (in percentage points). The benchmark is the value-weighted exchange industry return	Computed
Industry-adjusted ROE	ROE minus asset-weighted industry ROE (in percentage points)	Computed
Industry-adjusted ROA	ROA minus asset-weighted industry ROA (in percentage points)	Computed
Exchange liquidity	Value of share trading divided by market capitalization of listed stocks	World Exchange Federation
Industry-adjusted exchange liquidity	Exchange liquidity minus asset-weighted industry exchange liquidity	Computed
Exchange IPO	Market capitalization of IPOs divided by market capitalization of listed stocks	World Exchange Federation
Industry-adjusted exchange IPO	Exchange IPO minus asset-weighted industry exchange IPO	Computed
<b>Deal characteristics</b>		
InterType	It is equal to 0 when the deal is an M&A, 1 when the deal is a joint venture, and 2 when the deal is a non-equity alliance	Hand collected
Horizontal	It equals 1 when the deal is a horizontal transaction, otherwise 0	Hand collected
CrossBorder	It is equal to 1 when the deal is a cross-border transaction, otherwise 0	Hand collected
TechnologicalIntegration	Dummy variables to indicate the type of technological integration (outsourcing, common access, common systems, common operations, complete system integration, and other type of integration)	Hand collected
Public	It is equal to 1 when the target exchange is a publicly traded exchange in an M&A or the partner is a publicly traded exchange in a joint venture (non-equity alliance), otherwise 0	Hand collected
<b>Learning-by-doing variables</b>		
NoPreMA	The number of previous M&A events experienced by a given exchange	Computed
NoPreJV	The number of previous joint venture events experienced by a given exchange	Computed
NoPreAL	The number of previous non-equity alliance events experienced by a given exchange	Computed
<b>Exchange characteristics</b>		
MarketValue	Market value on the 31st trading day prior to announcement date	DataStream
TotalAssets	Total assets	Worldscope
CashFlow	Operating income before depreciation – interest expenses – income taxes – capital expenditures, scaled by total assets	Worldscope

Variables	Description	Sources
Leverage	Total liabilities scaled by total assets	Worldscope
Q	Market value of assets over book value of assets	Worldscope
PriceRunUp	Buy-and-hold abnormal return during the period (-150, -31)	Computed
<b>Macroeconomic development variables</b>		
GDPPerCapita	GDP per capita	World Development Indicator
GDPGrowth	GDP growth	World Development Indicator
<b>Difference in language and legal environment</b>		
SameLanguage,	It equals one when two partnering stock exchanges' countries share the same language and zero otherwise	World Atlas
SameLegalSystem,	It equals one when two partnering stock exchanges' countries share the same legal origin and zero otherwise	La Porta et al (1998)
<b>Difference in capital market development</b>		
DifMarketToGDP	The difference in the market capitalization of listed stock scaled by GDP between the two partnering stock exchanges' countries	World Development Indicator
DifTurnover	The difference in the stock traded turnover ratio between the two partnering stock exchanges' countries	World Development Indicator
DifStockTradeToGDP	The difference in the total value of stock traded scaled by GDP between the two partnering stock exchanges' countries	World Development Indicator
<b>Difference in governance</b>		
DifShareHolderProtection	The difference in the shareholder protection index (the product of the shareholder rights index and the efficiency of the legal system) between the two partnering stock exchanges' countries	La Porta et al (1998)
DifAccountingStandard	The difference in accounting standard index between the two partnering stock exchanges' countries	La Porta et al (1998)

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