# ECONOMIC CONSEQUENCES OF INVOLUNTARY CROSS-LISTING

# OF U.S. RESTAURANT COMPANIES

# ON THE FRANKFURT OPEN STOCK MARKET IN GERMANY

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## ABSTRACT

Even though many stock markets in the world adopted involuntary cross-listing with minimal application procedures, the cross-listing literature has widely ignored this activity. The gap in the literature is critical to U.S. restaurant companies since the number of involuntary cross-listings has significantly increased during the last ten years, despite the corporations' decisions not to cross-list or to change strategies to eliminate cross-listings. Direct communication with those foreign-listed U.S. restaurants reveals that they are unaware of involuntary cross-listing.

This research uncovers the phenomenon of U.S. restaurants' involuntary cross-listing with a focus on the Frankfurt Stock Exchange, in which a majority of U.S. restaurant shares have cross-listings. Specifically, the current dissertation provides trajectories of U.S. restaurant companies' cross-listing, discovers determinants of involuntary cross-listing that are specific to U.S. restaurant companies, and investigates the consequences of informational asymmetry in the U.S. and Germany, specifically the dynamics of stock prices in the two stock markets.

The current dissertation finds that U.S. restaurant companies have widely chosen not to list their shares on foreign exchanges, while many of their shares are subject to involuntary cross-listing on the Frankfurt Stock Exchange by German financial institutions. This study also finds that German financial institutions consider U.S. restaurant companies' sizes, industry growth opportunities, and overall U.S. economic conditions. In addition, the current research finds that U.S. stock prices of U.S. restaurant companies lead the German stock prices of cross-listed U.S. restaurant firms.

Empirical findings of this study have valuable theoretical, managerial, and regulatory implications. Theoretically, the research advances understanding of the economic consequences of involuntary cross-listing, to which the cross-listing literature has paid little attention. Specifically, this dissertation provides sharp insights into German financial institutions and German investors involved in the involuntary cross-listing. The current research also confirms the role of information asymmetry and trading volume on the dynamics of stock prices in multiple stock markets. Practically, this study's contribution to U.S. restaurant industry occurs through acknowledgment and evidence of the involuntary cross-listing phenomenon in which more and more U.S. restaurant companies unknowingly engage. The findings also prompt the Frankfurt Stock Exchange to reconsider their policies regarding involuntary cross-listing, and assist U.S. and German investors to understand better the dynamics of stock prices in both countries.

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*All by God's Amazing Grace*

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# CHAPTER 1

# INTRODUCTION

## 1.1 Definition of Cross-listing

As the world financial markets become globalized, companies have more avenues to acquire external international financing. One of these avenues is cross-listing (Stapleton & Subrahmanyam, 1977), which means that a firm lists its equity, not only on its domestic stock exchange, but also on one or more overseas stock exchanges. Previously, when international capital markets were less closely connected, researchers studied listing changes on domestic stock markets (e.g., Fabozzi, 1981; Grammatikos & Papaioannou, 1986; Hamilton, 1978; McConnell & Sanger, 1984; Van Horne, 1970; Ying, Lewellen, Schlarbaum, & Lease, 1977) or multiple listings in two domestic markets, such as a U.S. company's listings on the New York Stock Exchange (NYSE) and the over-the-counter (OTC) market (Garbade & Sillber, 1979). As companies began to list their securities on foreign exchanges, the scope of the research expanded to an international level, and researchers began to use the terms "international dual listing," "international listing" (e.g., Alexander, Eun, & Janakiramanan, 1988), "foreign listing" (e.g., Pagano, Roell, & Zechner, 2002), or "global cross-listing" (e.g., Foerster & Karolyi, 1999). Some have also used the term "dual listing" without emphasizing the international aspects to refer to a listing in multiple countries (e.g., Foerster & Karolyi, 1993; Lau, Diltz, & Apilado, 1994). While researchers still use different terms with specific definitions for each study, "cross-listing" is most frequent in more recent studies to describe the situation in which a firm lists its stocks on multiple stock exchanges in

different countries. This proposal uses the term "cross-listing" to describe a firm's listing of its securities on one or more foreign exchanges in addition to its domestic listing(s).

## 1.2 Definition of Involuntary Cross-listing

Some firms choose to cross-list while other firms choose not to cross-list. However, a third party can choose to cross-list a firm even without consent or knowledge of the firm: known as involuntary cross-listing (Iliev, Miller, & Roth, 2010). Involuntary cross-listing has appeared in many stock exchanges in the world, mainly to list more foreign companies on their local exchange. For example, on September 5, 2008, the Securities and Exchange Commission (SEC) amended Rule 12g3-2(b) of the Securities Exchange Act of 1934 that unsponsored Depositary Receipt (DR) can be established without a foreign company's written application as long as the company is listed on one or more foreign stock exchanges and its securities are not listed on a U.S. exchange (Bevilacqua, Tiano, Siu, & Kaufman, 2009; Iliev et al., 2010). Before the amendment, SEC mandated that a foreign company file formal application for the issuance of unsponsored DR. The Frankfurt Stock Exchange also allows a registered trading member of the exchange to file an application for foreign listed shares to be traded in the Open Market, and the application can occur without the listed company's awareness. The Mexican Stock Exchange conducts a Global Market which allows third parties to list and trade foreign shares without the consent of the foreign company.

While many companies have voluntarily listed in foreign markets, perhaps to increase their reputations and visibilities among foreign markets, their main target is to expand or to raise capital from overseas markets. This relatively recent phenomenon of

involuntary cross-listing is the result of many world stock markets' relaxing their restrictions for registration and allowing trade of foreign listed stocks without formal filings or even consent of security issuing firms.

## 1.3 Cross-listing of U.S. Restaurant Companies

While ebbs and flows occurred in primary stock markets over the last 100 years, the number of cross-listings has significantly increased from 11 listings in the 1900's to 1,550 in the 1990's (Sarkissian & Schill, 2009) and the trend remains upward. U.S. restaurant companies have nearly 40 years of cross-listing history. In 1974, McDonald's first listed their stock on a foreign exchange: the Toronto Stock Exchange. The company added overseas listings on the Frankfurt Stock Exchange and Munich Stock Exchange in 1982, Paris Stock Exchange (known as Euronext Paris since 2000) and Tokyo Stock Exchange in 1984, and Swiss Stock exchange in 1990.

Besides McDonald's, other U.S. restaurants have not actively participated in cross-listing, preferring to list their shares mainly on U.S. exchanges. Even McDonald's delisted from all foreign exchanges by 2009 since costs outweigh benefits.

Even though U.S. restaurant companies have chosen not to cross-list their shares, in recent years many firms' shares have been listed and traded on foreign exchanges without their consent or knowledge. According to direct communication with the U.S. restaurant companies whose stocks are traded in some foreign stock markets in addition to their domestic stock market, an absolute majority of the companies have no knowledge of the listings, because many stock exchanges adopted involuntary cross-listing in order to list foreign companies' shares in their local stock exchange. Most of the involuntary

cross-listing of U.S. restaurant companies has been on the Frankfurt Stock Exchange's Open Market.

In terms of the domestic listings, the first U.S. restaurant company to go public is McDonald's. McDonald's made its initial public offering (IPO) on the New York Stock Exchange (NYSE) in 1965 followed by Wendy's Inc. and Ground Round Restaurants in 1969. In the 1970s three more U.S. restaurant companies chose to list either on the American Stock Exchange (AMEX) or National Association of Securities Dealers Automated Quotations (NASDAQ). In the 1980s, thirty-five more companies appeared in the U.S. market through IPOs. The huge increase in the number of listings continued in the 1990s and 2000s.

## 1.4 Involuntary Cross-listing and the Frankfurt Stock Exchange

The Frankfurt Stock Exchange operates the Open Market (formerly known as Freiverkehr before October 10, 2005), where the exchange has allows involuntarily cross-listed shares to be traded. As of June 2011, Open Market listings included more than 10,000 securities, of which those from the U.S. represent about 30%. The size and characteristics of the Open Market listing are comparable to the Over-the-Counter Markets (OTC Markets) in the U.S. The official website of the OTC markets, www.otcmarkets.com, identifies listed 10,888 securities, as of August 2011. Both the Open Market and the OTC Markets are regulated, unofficial markets for stock trading.

By comparison, the number of listings on major U.S. stock exchanges, according to the official website of the NYSE Euronext, www.nyse.com, includes 3,260 on the New York Stock Exchange, and 539 on the American Stock Exchange, as of August 2011.

The official website of the National Association of Securities Dealers Automated Quotations (NASDAQ), www.nasdaq.com, identifies 2,819 listings, as of August 2011.

Although the size of the Open Market is significant, judging by the number of companies listed, both the German stock exchanges, in general, and the Open Market, in particular, have not gained sufficient attention from the cross-listing literature. Accordingly, the amount of information regarding U.S. companies listed on the Open Market, as well as on German stock exchanges, in general, is relatively small despite the fact that approximately 3,000 U.S. companies have listings on the Open Market exchange, as of August 2011. The concentration of U.S. restaurant companies' involuntary cross-listings appears primarily on the Frankfurt Stock Exchange's Open Market; therefore, investigation of the involuntary cross-listing of U.S. restaurant companies helps understanding the economic consequences of involuntary cross-listing on the Open Market.

## 1.5 Problem Statement

Despite many stock markets in the world adopting involuntary cross-listing with minimal application procedures, the cross-listing literature has generally ignored this activity. Most cross-listing studies focused on the consequences of voluntary cross-listings. A few studies examined involuntary cross-listing and focused mainly on the cases of non-U.S. companies' U.S. listings (e.g., Iliev et al., 2010) while U.S. companies' involuntary cross-listing has rarely undergone investigation.

The gap in the literature is critical to U.S. restaurant companies since the number of involuntary cross-listings has significantly increased during the last ten years, despite

decisions not to cross-list or changed strategies to no longer engage in cross-listing. Direct communication with those foreign-listed U.S. restaurants reveals that they are unaware of the cross-listing. Therefore, to find possible economic consequences incurred due to the involuntary cross-listing is worthwhile due to four reasons: (1) to inform U.S. restaurant companies of the possibility that their shares trade in foreign stock markets even without consent or knowledge, (2) to discover determinants of involuntary cross-listing specific to U.S. restaurant companies, (3) to find possible financial consequences incurred from involuntary cross-listing, focusing on the lead-lag relationship between stock prices in domestic and foreign markets, and (4) to add to the academic knowledge of involuntary cross-listings, which have received little attention in research, even though such cross-listing has gained importance in the financial markets.

Considering that most involuntary cross-listings of U.S. restaurant companies has occurred on the Open Market in the Frankfurt Stock Exchange, the current research adopts a view from German financial institutions and German investors, involved in involuntary cross-listing of U.S. restaurant companies.

## 1.6 Statement of Purpose

The purpose of this dissertation is to better understand the involuntary cross-listing phenomenon in the context of the U.S. restaurant industry with a focus on the Open Market in the Frankfurt Stock Exchange. First, the current research aims to establish the trajectory of cross-listing, specifically for U.S. restaurant companies, both for voluntary cross-listing and involuntary cross-listing. Since McDonald's first voluntarily cross-listed on the Toronto Stock Exchange in 1976, the current research

seeks to document the change in the number of cross-listing companies and the selected foreign stock markets U.S. restaurant companies have cross-listed, through 2011. In addition, the current research documents the trajectories of involuntary cross-listing, specifically, the changes in number of listed companies and cross-listing venues.

Second, this research identifies the determinants of involuntary cross-listing on the Open Market for U.S. restaurant companies by comparing the cross-listed U.S. restaurant companies with domestic-listed U.S. restaurant companies. The current study customizes the proxies for the determinants so that those better fit for the U.S. restaurant context.

Third, this study expands the examination of the lead-lag relationship of stock returns to an involuntary cross-listing context. The current study investigates the dynamics of information diffusion within the context of involuntary cross-listing on the Frankfurt Stock Exchange (FSE), which does not mandate disclosure of company information. This study also examines whether or not trading volume plays a role in the lead-lag relationship for the specific sample of U.S. restaurant companies cross-listed on the FSE.

## 1.7 Delimitations and Limitations

For three reasons, this study delimits its scope to U.S. restaurant companies that, voluntarily and involuntarily, had or have listings in foreign markets in addition to listings in U.S. markets. First, firms in one industry are likely to be more homogenous, which makes statistical analyses more reliable. For example, Hou (2007) found a

significant lead-lag relationship for intra-industry analysis but significance disappeared for analyses conducted among multiple industries.

Second, focusing on one industry allows finding industry-specific determinants, rather than determinants only generalizable for broader samples. Applying measurements best suited for a specific sample or adjusting measurements to better fit to specific context is less likely for sample covering multiple industries. Delimiting the scope to U.S. restaurant companies allows this study to generate more focused insights and provide more meaningful implications.

With regard to the years investigated, the study covers the entire period of cross-listing of U.S. restaurant companies, from 1974 to 2011, for the chronological review. However, the sample period for the main analyses spans 1996 to 2011, since restaurants' involuntary cross-listings occurred in that period. Since financial data is available only after a year ends, exclusion of 2011 data is a foregone condition.

The study's limitation allows focus only on U.S. restaurant companies despite voluntary and involuntary cross-listings' occurring among other non-U.S. restaurant companies. Investigation of non-U.S. companies' cross-listing activities on U.S. exchanges and non-U.S. exchanges provides a more comprehensive perspective of the cross-listing behavior of the world's restaurant industry. Domestic dual listings, which describe a company's listing in multiple domestic markets (e.g., NASDAQ and OTC markets) or global initial offerings that describe a company's initial offering on a foreign exchange, are appropriate considerations for future topics, since those aspects apply to the restaurant industry as well. However, to date no study has considered the restaurant company context.

Recently, cross-listing researchers have actively studied delisting (e.g., Chaplinsky & Ramchand, 2007; Dobbs & Goedhart, 2008; Marosi & Massoud, 2008; Witmer, 2006). As such, examination of delisting cases can occur within the unique context of the restaurant industry that has high vulnerability to economic conditions and debt levels (Schmidgall, 2006; Sweeney, 2009).

## 1.8 Structure of Dissertation

Chapter 1 presents an overview of the current dissertation, which includes definitions of voluntary and involuntary cross-listing, description of involuntary cross-listing of U.S. restaurant companies and the Frankfurt Stock Exchange's Open Market, and motivations for this dissertation. Chapter 2 comprehensively reviews extant literature on voluntary and involuntary cross-listing. Chapter 3 provides a chronological review of U.S. restaurant companies' voluntary and involuntary cross-listing. Chapter 4 presents the first essay, "Determinants of Involuntary Cross-listing: The U.S. Restaurant Perspective," and Chapter 5 presents the second essay, "Lead-lag Relationships of Involuntarily Cross-listed U.S. Restaurant Stocks in Germany." Chapter 6 concludes the dissertation with discussion of overall observations and implications.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Main Hypotheses of Cross-listing

The main hypotheses developed in the cross-listing literature are for the motivations for cross-listing: the motivations for companies to list their stocks, not only in domestic markets but also in foreign markets. The market segmentation hypothesis has long served as a primary rationale for firms' cross-listing: A firm lists in overseas markets, thereby circumventing barriers, such as foreign ownership restrictions, taxes, information asymmetries, and so on (Miller, 1999; Stapleton & Subrahmanyan, 1977). However, researchers have questioned the hypothesis because it does not explain why more firms do not cross-list and the barriers have decreased among exchanges (Stulz, 1999).

Understanding the limitations of the market segmentation hypothesis, Coffee (1999) and Stulz (1999) explained the cross-listing phenomenon with the bonding hypothesis. The bonding hypothesis argues that managers or controlling shareholders will bond themselves to overseas markets, which strictly regulate listed firms, when managers' or controlling shareholders' benefits from access to external capital by cross-listing exceeds the private benefits managers they forego when they not list shares in foreign countries.

In addition, the liquidity hypothesis focuses on the benefits a controlling shareholder can obtain from increased trading volume after cross-listing (Doidge, 2004). The information disclosure hypothesis focuses on how expanded information affects a

firm after cross-listing. The theories underlying these hypotheses are not mutually exclusive, but rather complement each other (Reese & Weisbach, 2002).

### 2.1.1 Market Segmentation Hypothesis

The market segmentation hypothesis rationalizes cross-listing based on market segmentation in international capital markets. With segmented markets, investors face barriers to their investing activities. Directly, investors may have ownership restrictions or extra taxes imposed by foreign governments, and indirectly they may not have sufficient information of the foreign market's accounting practices or direct knowledge of a firm listed in a foreign market (Merton, 1987; Miller, 1999).

When investment barriers exist, a firm bears a risk premium, to compensate foreign investors for the risk of investing in the firm. Cross-listing allows investors to avoid cross-border barriers, and reduces restrictions, taxes, or information asymmetries, and so on (Bianconi & Tan, 2010). From a cross-listed firm's perspective, foreign investors do not require a risk premium for investing in a risky firm once it cross-lists. Accordingly, the target firm acquires a lower cost of capital and its firm value increases (Stapleton & Subrahmanyan, 1977). As such, corporate financial policies considered cross-listing to effectively reduce the adverse effects of segmented capital markets (Saudagaran, 1988).

The early studies on market segmentation constructed international asset pricing models that incorporated investment barriers and derived equilibrium security prices. Modeling market segmentation by placing various restrictions on investors, with an economy of eight firms and twenty investors, Stapleton and Subrahmanyam (1977)

analyzed the effect of total segmentation as well as four different types of partial segmentation on equilibrium prices. Stulz (1981) constructed a model which incorporates a cost associated with holding foreign securities, which, accordingly, is risky. The model represents the cost, as taxes on the absolute value, rather than net value of the Black (1974) model, for an investor's holding of risky assets. Stulz (1981) concluded that for domestic investors, holding foreign securities is equally costly despite being a long or short position.

Errunza and Losq (1985) derived a valuation model with a mild segmentation hypothesis in which Country 1's investors encounter restrictions for investing in Country 2, while Country 2's investors have no restriction; therefore, the securities of Country 1 are eligible to Country 2's investors while the securities of Country 2 are inaccessible to Country 1's investors. These researchers empirically examined the model with a random sample of U.S. securities and with heavily traded securities from nine less developed countries. The results revealed that the ineligible securities in Country 2 yield higher required return. Borrowing the setting of a two-country example, Alexander, Eun, and Janakiramanan (1987) also suggested that the required return on a cross-listed security can be expected to be lower. While the previous researchers constructed models with perfectly integrated, perfectly segmented or partially integrated markets with a constant degree of integration, Bekaert and Harvey (1995) proposed a model which incorporated the time-varying nature of integration between a local market and the world market.

Later researchers empirically examined models that explain the decline in the cost of capital following cross-listing. Studies frequently measured abnormal returns associated with cross-listing dates or announcement dates using an event study. Most of

the studies examining non-U.S. stocks' U.S. listings found positive abnormal returns before the listing, but increased abnormal returns disappear after the listing (e.g., Alexander et al., 1988; Foerster & Karolyi, 1993, 1999; Miller, 1999). Other researchers calculated and compared cost of capital before and after non-U.S. companies' U.S. listings. In those studies, cost of capital declined after cross-listing (Errunza & Miller, 2000; Hail & Leuz, 2009).

Some studies do not support the positive impact that cross-listing brings to stock prices. Howe and Kelm (1987), in their investigation of U.S. firms' listings on three foreign exchanges (Basel, Paris, and Frankfurt), found negative abnormal returns before a firm's first trading day. Lee (1991), examining U.S. firms' cross-listings on the London Stock Exchange and the Toronto Stock Exchange, found no significant abnormal returns.

Challenges to the market segmentation hypothesis arise from the empirical analyses' inability to uniformly support the decline of the cost of capital. In addition, hypothesis validity is questioned because even after investment barriers' relaxation, and the world markets' substantial integration, some cross-listing firms still receive positive effects from announcements (Doidge, Karolyi, & Stulz, 2004; Stulz, 1999).

### 2.1.2 Bonding Hypothesis

Given that the market segmentation hypothesis does not adequately explain motivations of cross-listing with the asset pricing implications of cross-listing, Coffee (1999, 2002) and Stulz (1999) attempted to explain the motivation from a corporate governance point of view. Trade-offs between the costs and benefits of cross-listing play a role in deriving the bonding hypothesis. The hypothesis argues that it is costly to firms

that are incorporated in a jurisdiction with poorer investor protection to "bond" themselves voluntarily to higher standards of corporate governance since by doing so corporate insiders, such as managers or controlling shareholders, become unable to profit privately. On the other hand, a firm can enjoy benefit from bonding to more stringent governance standards. A firm's access to capital increases, leading to lower cost of capital and increased firm value, when the firm attracts investors who would otherwise be unwilling to invest,. Therefore, when choosing between the trade-off options, firms choose to cross-list when the controlling shareholders' benefits from cross-listing are greater than the private benefits they can enjoy by not listing in a foreign market with stricter standards of corporate governance.

Several empirical studies supported the bonding hypothesis. Reese and Weisbach (2002) and Lins, Strickland, and Zenner (2005) showed that firms from countries with weaker investor protection have greater subsequent equity issues since minority shareholders are better protected by cross-listing on the U.S. exchanges. Tribukait (2003) examined cross-listed Mexican firms' stock price reactions at the time of earnings announcements and found that the companies cross-listed in the U.S. encounter reactions closer to the actual announcement date than those cross-listed in the other countries. Tribukait (2003) argued that the timing of the market reaction occurred later among companies cross-listed in the U.S., since restrictions prevent corporate insiders' taking private benefit, thereby better protecting investors. Doidge et al. (2004) modeled the cross-listing decision as a trade-off between private benefits of control and taking advantage of growth opportunities by using bonding to reduce the cost of capital. They

measured the cross-listing premium with Tobin's Q and found the premium to be higher for companies from countries with weak investor protections.

Some researchers challenge the bonding hypothesis, however, by arguing that cross-listing in the U.S. does not, in fact, improve a firm's corporate governance, and that diversion of external funds to managers' private benefit can occur (Burns, Francis, & Hasan, 2007; Licht, 2003; Siegel, 2005). They reasoned that SEC enforcement is not uniform for cross-listed foreign firms and the domestic U.S. firms, and cross-listed firms seldom encounter enforcement. For example, cross-listed firms have exemption from requirements involving nominations to boards of directors and audit and compensation committees, while U.S. firms must adhere to rules (Licht, 2003), and the U.S. regulatory response to "asset tunneling" cases has been weak (Siegel, 2005). Some claims apply to exchange-listed foreign firms; therefore, weak enforcement is apparently more evident in Level I shares or Rule 144a private placements not required to follow high levels of regulations to which U.S. exchange-listed firms are obligated. Shareholder class-action lawsuit cases are increasingly evident against foreign firms (Lamont & Etzold, 2009), however, and the phenomenon would support the argument of the bonding hypothesis since private lawsuits may work powerfully to protect shareholders.

King and Segal (2004) found that cross-listing premiums were not ubiquitous; premiums increased only when a firm could achieve sufficient turnover in the U.S. market. Pinegar and Ravichandran (2004) also questioned the bonding hypothesis because they found cross-listing premiums for Rule 144a private placement firms, which are not covered by SEC rules that protect investors. Increase in private enforcement

through shareholder class-action lawsuits, however, argues against the non-ubiquitous premiums argument.

### 2.1.3 Liquidity Hypothesis

Firms cross-list to increase their securities' liquidity, which helps controlling shareholders and other corporate insiders to manage their holdings more efficiently (Doidge, 2002). By listing stocks on both domestic and foreign exchanges, a firm gets access to more investors, which leads to higher volume and lower bid-ask spreads, and better-informed prices. Through a market survey, Mittoo (1992) reported that managers of cross-listed companies cite increased trading liquidity as a primary factor for deciding to cross-list.

Researchers have empirically examined the relationship between cross-listing and liquidity using trading volume and/or bid-ask spread. An early research effort on a related topic is the Tinic and West (1974) study. They examined bid-ask spread data for over 1,500 Canadian stocks, 112 of which had simultaneous listings on the NYSE and AMEX. They measured liquidity using spreads after controlling for the underlying volume, volatility, and market capitalization of each individual stock. The spread appeared to correlate negatively with liquidity characteristics, such as the trading volume, the number of shareholders, the number of market-makers trading the stock, and the stock price continuity. In the Tinic and West (1974) study, data spanned only 14 days in November 1971, but showed cross-listed Canadian stocks had lower spreads than?.

Using the bid-ask spread as a proxy for liquidity, Amihud and Mendelson (1986) developed an equilibrium asset pricing model that shows how liquidity influences equity

returns. With empirical analysis, they found evidence that the expected return is an increasing and concave function of the spread from multiple exchange listings. Smith and Sofianos (1997) found an increased turnover rate for non-U.S. stocks that cross-list on the NYSE. They calculated turnover rate by dividing the annualized combined value of trading in a given month by the market value of shares outstanding. Foerster and Karolyi (1998) documented that the spread decreased for firms listed on the Toronto Stock Exchange and U.S. exchanges at the same time.

However, the results of the empirical analyses have not always supported the liquidity hypothesis. For example, Silva and Chavez (2008) found that firms, cross-listed in the U.S. and originating from the main Latin American markets of Argentina, Brazil, Chile, and Mexico do not always exhibit a liquidity advantage in the local markets. They found a liquidity advantage for large firms from Argentina, Brazil, and Mexico compared to their non-cross-listing counterparts at home. The interpretation of the results is that the liquidity effect of cross-listing is subject to the trade-off between information linkages of the home and host markets, and inter-market competition. Halling, Pagano, Randl, and Zechner (2008) found the trading volume of a firm, cross-listed in the U.S., depends on company- and country-level characteristics. Volatility and technological intensity of a company are positively related to trading volume if a firm is from a developed country, but the relationship turns negative for firms from emerging countries.

Another line of studies viewed the liquidity hypothesis from the viewpoint that cross-listing improves external capital access, which is a main motivation for a firm to cross-list. Firms from small capital markets may hesitate to issue new equities locally to find additional capital because an already saturated domestic market will lower their

existing share prices. In such a case, the firm is unable to raise new capital efficiently. On the other hand, if the firm seeks external capital by cross-listing, raising capital would be more efficient, since stock sales would be coincide more closely with existing share prices. As such, liquidity is measured by the ability to sell newly issued securities at existing market prices and trading volume (Saudagaran, 1988).

Lins et al. (2003) investigated the relationship between cross-listing and greater access to external capital by examining changes in a firm's dependence on internally generated cash flows after cross-listing, and whether or not cross-listed firms claim in their financial statements improved access to external capital as a main motivation to cross-list. They found a decrease in dependence on internally generated cash flow when firms from emerging markets cross-listed in the U.S. The frequency of claiming access to external capital as a factor influencing cross-listing was greater for firms from emerging markets than those from developed markets.

### 2.1.4 Information Disclosure Hypothesis

A new listing may be an expression of managerial confidence in the business prospects of the firm because without the confidence, a firm would not expect to keep satisfying the requirements of the stock exchanges (Ying et al., 1977). Also, listing may attract investors who may have avoided unlisted shares due to limited information (Fabozzi, 1981). The notion, applied to cross-listing, led researchers to develop signaling models (e.g., Fuerst, 1998). In general, the models show that firms' listings on markets with high disclosure standards signal high value to investors.

Also, a cross-listing tends to associate with increased corporate visibility from increased media attention, greater analysts' coverage, and more accurate analysts' forecasts (Baker, Nofsinger, & Weaver, 2002; Lang, Lins, & Miller, 2003; Saudagaran, 1988). Baker et al. (2002) documented that NYSE listings are associated with greater analysts' coverage and media hits. Lang et al. (2003) documented that cross-listed firms have more than twice the analysts' coverage than non-cross-listed firms, and the increase in forecast accuracy leads to higher Tobin's Q for U.S. cross-listed firms compared with non-U.S. cross-listed firms.

Previous empirical analyses have frequently argued that a firm which is incorporated in a country that requires less information disclosure often lists on a stock market that requires higher information disclosure. However, benefits, such as increased media attention and greater analyst coverage, can be achieved in the case that a firm becomes cross-listed on a stock market with less stringent information disclosure as well. Although some differences exist for requirements, this situation arises from most stock markets' requiring listed firms to periodically disclose information in a form familiar to local investors. In addition, the listed foreign firms are more likely to appear on local media than non-listed firms and gain more attention from local security analysts (Saudagaran, 1988).

Some researchers linked information disclosure to trading volume and return volatility and developed a model from a trader's perspective. The Kyle (1985) model asserted an unaffected stock price variance if private information did not reach the market. Kyle (1985) differentiated traders into three types: (1) insiders who try to maximize profit with private information, (2) liquidity traders who randomly institute orders without

private information, and (3) specialists who use expertise to discover private information by examining price and volume changes. Freedman (1989) extended the Kyle (1985) model and examined the trading of informed investors for a stock that lists in two different markets. These models suggested that cross-listing provides informed traders with more opportunities, thereby gaining profit (Jayaraman, Shastri, & Tandon, 1993).

## 2.2 Involuntary Cross-listing Studies

Cross-listing research commonly investigated voluntary cross-listing by citing cross-listing as an important financial strategy. Voluntary cross-listing typically imposes high levels of legal responsibility on listed firms to protect investors, including information disclosure. Therefore, the trade-off between benefits and costs of cross-listing need examination from various perspectives.

Firms can cross-list either voluntarily and involuntarily. When a firm voluntarily cross-lists, they either list their shares directly on foreign exchanges or list in the form of Depositary Receipts (DRs). A DR is a negotiable financial instrument that represents a foreign company's publicly traded securities (Errunza & Miller, 2000). Creation of DRs occurs when a broker purchases a company's shares from the home stock market on behalf of investors and delivers them to a depositary's local, custodian bank, such as the Bank of New York, Citibank or JP Morgan Chase. These financial intermediaries hold the foreign shares, denominated in foreign currency, and issue the shares, denominated in the investor's currency. When the depositary bank is in the U.S., and accordingly the shares denominated in the U.S. dollars, the instruments are American Depositary

Receipts (ADRs). European banks issue European depositary receipts, and other banks issue global depositary receipts (GDRs).

As DRs are a widely used method to invest in foreign stocks, cross-listing studies have actively used DRs as data samples. Studies examining non-U.S. firms' cross-listing in the U.S. basically used ADRs as the dataset (e.g., Baker et al., 2002; Doidge et al., 2009b; Errunza & Miller, 2000; Gozzi, Levine, & Schmukler, 2008). Few studies have actually studied unsponsored DRs separately. For example, Korczak and Korczak (2011) investigated the relationship between the level of development of a country and demand for depositary receipts for fourteen stock exchanges in the Central and Eastern European (CEE) countries over the period 1991 to 2009. In general the findings produce an inverted U-shaped relationship. For main analyses they focused on sponsored depositary receipts (DRs) while in sensitivity analyses, they included unsponsored DRs. The unsponsored DRs produced different results from sponsored DRs and the researchers argued that the reason is the different nature of the unsponsored DRs: Issuance of the unsponsored DR is not a firm's underlying strategic decision. Therefore, factors that affect sponsored and unsponsored DR's activity differ.

The Iliev et al. (2010) study is an exception to the general tendency not to differentiate unsponsored DRs. They focused on the unsponsored DR, an involuntary cross-listing, especially with regard to the economic consequences of the 2008 amendment to Rule 12g3-2(b). Involuntary cross-listing became more widely available with deregulation and brought changes in financial performances of the involuntarily cross-listed foreign firms and depositary banks, respectively, in the U.S. The amendment significantly lowered the regulations governing issuance of depositary receipts and made

possible depositary banks' establishing unsponsored American Depositary Receipts (ADRs) without consent from foreign issuers as long as the foreign company maintains listings on one or more foreign exchanges. The deregulation significantly increased the number of unsponsored DRs of foreign firms trading in the U.S. Iliev et al. (2010) found that the amendment negatively affected financial performances of the involuntarily cross-listed foreign firms while it positively affected financial performances of the depositary banks that typically register unsponsored cross-listings on local stock markets, and thereby accruing fees from trading. The Iliev et al. (2010) study is important in that it examined unsponsored DRs, widely ignored in previous studies, while stock markets have actively adopted that type of securities issuance in order to survive the severe competition in world stock markets.

In order to attract more foreign companies to their markets, many stock exchanges operate a separate market targeting foreign companies. They typically demand minimal information disclosure and allow third parties, such as depositary banks or brokers to register the shares even without consent or knowledge of a firm. For example, the Frankfurt Stock Exchange initiated the Open Market in 2003 (originally named as "Freiverkehr," but changed the name to "Open Market" in 2005). International shares trade mainly in the market along with German and international bonds, certificates, and warrants. Describing the Open Market listing as "one of the easiest and fastest ways to the stock exchange" (Deutsche Bourse, 2011), the exchange allows a third party to list foreign shares without knowledge of a listed firm. Bolsa Mexicana de Valores (the Mexican Stock Exchange) operates a similar market, "Global Market" since 1997, allowing foreign shares to be quoted and traded among local investors.

A few studies focused on foreign stocks involuntarily listed in markets in Germany or Mexico. As an exceptional case, Bruggemann, Daske, Homburg, and Pope (2011) investigated the impact that adoption of International Financial Reporting Standards (IFRS) brought to individual investors' equity investments. In that study, the sample included Open Market shares in Germany, since the Open Market targets individual investors seeking to trade foreign shares. The researchers compared trading volumes of IFRS adopted firms to the volumes of non-adopted firms at annual earnings announcements and found significantly greater trading volumes for IFRS-adopted firms.

# CHAPTER 3

## CHRONOLOGICAL REVIEW OF THE U.S. RESTAURANTS' CROSS-LISTINGS

A chronological review provides a time-series summary of the evolution of the cross-listing phenomenon, a topic covered by some previous researchers. For example, Pagano, Randl, Roell, and Zechner (2001) showed the changes of the proportion of foreign companies listed on ten European exchanges (Amsterdam, Brussels, Frankfurt, London, Madrid, Milan, Paris, Stockholm, Vienna, and Switzerland) and three U.S. exchanges (NYSE, NASDAQ and AMEX) over the period, 1986 to 1997. They also documented the proportion of domestic companies listed abroad compared to domestic companies listed on domestic exchanges for those thirteen stock exchanges during the same period. Pagano et al. (2002) delineated geographic patterns of cross-listings for ten European exchanges (Amsterdam, Brussels, Frankfurt, London, Madrid, Milan, Paris, Stockholm, Vienna, and European Association of Securities Dealers Automatic Quotation System [EASDAQ]) and the three U.S. exchanges (NYSE, NASDAQ and AMEX) by providing the number of companies from each country that had cross-listed on each stock exchange in 1986, 1991 and 1997. They examined the same pattern for the companies from the rest of the world and documented the number of domestic, foreign and total companies listed on those exchanges over the ten years, 1986 to 1997. They added information of the change of the number of foreign listings on nine European exchanges (Amsterdam, Brussels, Frankfurt, London, Madrid, Milan, Paris, Stockholm, and Vienna) in 1975, 1980, and 1985.

Edison and Warnock (2008) documented the trend of new listings of companies on U.S. exchanges from the emerging countries of Latin America and Asia from 1989 to 2000. Latin American companies' cross-listing activities on U.S. exchanges demonstrated waves with the peak years being 1993 and 1994, a slow-down due to the Peso crisis of December 1994, and a resurgence in 1997. Asian companies' cross-listings showed not much variation over time, but no cross-listing occurred during the fall of 1997 to mid-1998, due to the Asian financial crisis. Fernandes and Giannetti (2009) extended the sample size and sample period by examining cross-listing cases among 89 countries of domicile and 29 exchanges in 24 countries for the period, 1980 to 2006. With this rich dataset, they reported the number of new listings and delistings, proportion of foreign listings, Tobin's Q, IPO equity issues, and adoption of corporate governance codes for each country for each year.

While these studies showed the fluctuations of cross-listing at the country level, Sarkissian and Schill (2009) added industry level analysis. They expanded the time-frame to include 1950 to 2006 and provided the evolution of the stock markets by both country and industry. They argued that the top host countries and industries for cross-listing changed. The popular countries and industries surged because firms could achieve gains with those listings. With regard to industry, they selected the top eight industries for 1950 to 2006 and documented the changes in the proportion of foreign listings. The selected eight industries are: (1) consumer goods, (2) electrical and electronics equipment, (3) financials, (4) diversified industrials, (5) mining, (6) oil and gas, (7) business support, and (8) telecommunication and media.

The current dissertation, at variance with previous studies, examines the evolution of cross-listing by focusing on one industry: the U.S. restaurant industry. More specifically, a summary of cross-listing shows the distribution among host markets from 1974, the first cross-listing year of a U.S. restaurant company, to June, 2011. Table 1 presents U.S. restaurant companies' geographic distribution of voluntary and involuntary cross-listing venues. McDonald's is the only company that cross-listed its securities on overseas exchanges voluntarily. Therefore, the summary of voluntary cross-listings represents McDonald's method for selecting its cross-listing venues during the past 40 years. The descriptive analysis serves as background for those restaurant companies who have cross-listed or plan to cross-list.

The current study collected data from the Capital IQ database and cross-checked information from most sample companies. In some cases, confirming the information with the cross-listed sample companies was not possible because they were either bankrupt or did not reply. The marks signify the year of the first trading date obtained from Capital IQ, and the year of the last trading date for delisting. In the case of involuntary cross-listing, the reason for delisting was delisting from the main stock exchange in the U.S.

Capital IQ provides information on and after 1992 for McDonald's; therefore, the current study obtained the information of the first trading day by directly contacting each stock exchange on which McDonald's voluntarily cross-listed its shares. McDonald's company disclosed the delisting dates of their cross-listed stocks.

Table 1 shows that McDonald's engaged in cross-listing from 1974 to 2009. The first stock exchange on which it cross-listed is the Toronto Stock Exchange, and listings

on the other foreign exchange followed the order of the Frankfurt Stock exchange, and the Munich Stock exchange (in 1982), the Tokyo Stock exchange and Paris Stock Exchange (in 1984), and the Swiss Stock Exchange (in 1990). However, an interview with the company revealed that they made a strategic decision to delist during 1994 to 2009 since costs outweighed benefits. After delisting from the Frankfurt Stock Exchange and the Munich Stock Exchange on April 28, 2005, trading of the shares began immediately on the following day in the form of involuntary cross-listing.

Based on the Capital IQ database and cross-checks with the sample companies, the first venue for involuntary cross-listing was the Munich Stock Exchange. Only three foreign stock exchanges trade U.S. restaurant companies' shares as of June 2011: the Munich Stock Exchange, the Mexican Stock Exchange, and the Frankfurt Stock Exchange. Evidently, involuntary cross-listings of U.S. restaurant companies focused on the Frankfurt Stock Exchange, and most involuntary cross-listings occurred on or after 1998.

Table 1. Trajectories of Cross-listing of U.S. Restaurant Companies

| | Voluntary Cross-listing | | | | | | | | | | | | | | Involuntary Cross-listing | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | BAYB | | ENXTRA | | FSE | | SWX | | TSE | | TSX | | **Total** | | BAYB | | BMV | | BST | | BVL | | FSE | | HMSE | | SEAQ | | **Total** | |
| | L | D | L | D | L | D | L | D | L | D | L | D | **L** | **D** | L | D | L | D | L | D | L | D | L | D | L | D | L | D | **L** | **D** |
| 1974 | | | | | | | | | | | 1 | | **1** | | | | | | | | | | | | | | | | | |
| … | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1982 | 1 | | | | 1 | | | | | | | | **2** | | | | | | | | | | | | | | | | | |
| 1983 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1984 | | | 1 | | | | | | 1 | | | | **2** | | | | | | | | | | | | | | | | | |
| 1985 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| … | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1989 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1990 | | | | | | | 1 | | | | | | **1** | | | | | | | | | | | | | | | | | |
| 1991 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1992 | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | | | **1** | |
| 1993 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1994 | | | | | | | | | | | | 1 | | **1** | | | | | | | | | | | | | | | | |
| 1995 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1996 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1997 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1998 | | | | | | | | | | | | | | | 2 | 1 | | | 1 | | | | | | | | | | **3** | **1** |
| 1999 | | | | | | | | | | 1 | | | | **1** | 2 | | | | | | | | 3 | | | | | | **5** | |
| 2000 | | | | | | | | | | | | | | | | | | | | | 1 | | 2 | | | | | | **3** | |
| 2001 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2002 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2003 | | | | | | | | | | | | | | | | | 1 | | | | | | | | | | | | **1** | |
| 2004 | | | | | | | | | | | | | | | | 1 | | | | 1 | | | 3 | | | | | | **3** | **2** |
| 2005 | | 1 | | | | 1 | | | | | | | | **2** | 1 | | | | | | | | 2 | | | | | | **3** | |
| 2006 | | | | 1 | | | | | | | | | | **1** | | | | | | | | | 6 | | | | 1 | | **7** | |
| 2007 | | | | | | | | | | | | | | | | 1 | | | | | | | 2 | 1 | | | | 1 | **2** | **3** |
| 2008 | | | | | | | | | | | | | | | | 1 | | | | | | | | 1 | | | | | | **2** |
| 2009 | | | | | | | | 1 | | | | | | **1** | | | 1 | | | | | | | | | | | | **1** | |
| 2010 | | | | | | | | | | | | | | | | | 1 | 1 | | | | 1 | 8 | 2 | 1 | 1 | | | **10** | **5** |
| 2011 | | | | | | | | | | | | | | | | | | | | | | | | 2 | | | | | | **2** |
| **Total** | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | **6** | **6** | 6 | 4 | 3 | 1 | 1 | 1 | 1 | 1 | 26 | 6 | 1 | 1 | 1 | 1 | **39** | **15** |
| **Active** | 0 | | 0 | | 0 | | 0 | | 0 | | 0 | | **0** | | 2 | | 2 | | 0 | | 0 | | 20 | | 0 | | 0 | | **24** | |

BAYB represents the Munich Stock Exchange; BMV represents the Mexican Stock Exchange; BST represents the Stuttgart Stock Exchange; BVL represents the Lima Stock Exchange; ENSTPA represents the Euronext Paris (formerly Paris Stock Exchange); FSE represents the Frankfurt Stock Exchange; HMSE represents the Hamburg Stock Exchange; SEAQ represents the London Stock Exchange Automated Quotation System; SWX represents the Swiss Stock Exchange; TSE represents the Tokyo Stock Exchange; TSX represents the Toronto Stock Exchange; L represents the number of listings occurred during the given year; and D represents the number of delistings occurred during the given year.

# CHAPTER 4

# ESSAY I

# DETERMINANTS OF INVOLUNTARY CROSS-LISTING: U.S. RESTAURANT COMPANIES PERSPECTIVE

## 4.1 Introduction

As the barriers to foreign investment diminished worldwide and cross-listing became a strategic option that a company could consider for their financial, marketing, and operational benefits (Saudagaran, 1988), many firms listed their shares on overseas exchanges. However, some chose not to cross-list and remain exclusively in their domestic markets. Some became cross-listed despite no intention or consent for doing so. This involuntary cross-listing occurs because many stock markets in the world changed their rules to significantly simplify listing requirements for companies listed in other stock markets. The simplified rules typically allow third party financial institutions, including market makers and depositary banks, to list companies' shares on their local stock exchange as long as the shares have been listed in one or more other stock exchanges. The nature of foreign-listed firms chosen by third party institutions for listing in a foreign market constitutes a question requiring investigation of determinants of involuntary cross-listing.

To understand the determinants of involuntary cross-listing from U.S. restaurant industry's point of view is important: First, the literature has generally ignored the determinants of involuntary cross-listing despite the phenomenon's importance because of more stock exchanges' adoption. Second, for U.S. restaurants, involuntarily cross-

listing is contrary to their choices not to cross-list and their choice to voluntarily delist from overseas stock exchanges. Having listed in the most advanced stock market in the world (i.e., U.S. exchanges) with abundant capital raising opportunities and high levels of legal protection for minority shareholders, U.S. restaurant companies may lack motivation to cross-list in overseas markets. Third, direct communications with U.S. restaurant companies indicate that the companies have not even been aware of the fact that their shares have been chosen to be cross-listed on foreign exchanges. Understanding the determinants helps for U.S. restaurant companies to better understand the phenomenon. Fourth, previous research found that cross-listing determinants differ among home and host countries' exchanges, as well as industries. For example, Pagano et al. (2002) found that firms with capital raising motives, firms with increasing foreign sales, and those within high-tech sectors tend to cross-list in the U.S. while firms that plan to increase debt capacity opt for cross-listing in the European exchanges. As Table 1 indicates that the majority of U.S. restaurant companies have involuntarily cross-listed on the Frankfurt Open Market, this study seeks to identify factors leading German financial institutions, such as market makers, depositary banks and brokers, to list U.S. restaurant companies on the Open Market, where involuntary cross-listing is allowed. Every stock exchange is unique in terms of regulations, transactions costs, market size, and so on; therefore, focusing on the FSE would provide more reliable results.

## 4.2 Hypotheses Development

Similar kinds of determinant questions have been raised among researchers for the voluntary cross-listing cases. Prior research found that various characteristics of

countries, industries, and firms affect the likelihood of cross-listing as summarized in Table 2. Legal, economic and geographic points of view have examined countries' factors using proxies, such as the basic types of laws governing a country, gross national product (GNP) level, economic proximity between home country and host country, and so on (Doidge, Karolyi, & Stulz, 2009a; Doidge, Karolyi, Lins, Miller, & Stulz, 2009b; Pagano et al., 2002). Industry factors have been controlled for with proxies of global industry Tobin's q or a dummy variable for technological industries (Doidge et al., 2009a, b; Pagano et al., 2002). Global industry Tobin's q, measured by the median Tobin's q value within an industry, indicates the growth opportunities of an industry, and the dummy variable for technological industries is relevant because firms in the technology sector appear to have a particular listing preference for NASDAQ (Pagano et al., 2002). Firm factors examined include: (relative) size, (relative) growth opportunities, leverage, degree of international operation, firm quality, cash holding level, and ownership-related variables including insider ownership or shareholders' private benefits accruing from control.

Since the country factors are invariant, no control for country factors is necessary, but including industry factors in pooled samples allows using the results for comparisons among other industries. The current study focuses on firm-specific factors since those apparently play an important role in explaining determinants of cross-listing. For example, Claessens, Klingebiel, and Schmukler (2003) found in their determinant study that the pseudo $R^2$ declines from 27 percent to 4.2 percent when excluding firm-specific factors. This study also pays close attention to industry-specific factors since industry uniqueness can play a significant role as a determinant. Summarizing various firm-

specific and industry-specific determinants from the literature review, industry report review, and interviews in the subsequent sections allows developing this research's hypotheses.

### 4.2.1 Size

Size matters in cross-listing since larger firms tend to have more visible international identities (Saudagaran, 1988). A third-party institution that considers listing foreign stocks as unsponsored stocks on a local exchange would likely choose a well-known firm. If a cross-listed company is unknown among local investors and trading volume of the stock is low, the institution's costs for cross-listing become greater than the financial benefits. In the case of voluntary cross-listing, prior research has empirically supported the positive impact of size on cross-listing decision (e.g., Doidge et al., 2009a, b; Pagano et al., 2002).

Previous research commonly measured firm size with logged total assets (e.g., Doidge et al., 2009a, b; Pagano et al., 2002). While most studies used the absolute measure of size, Saudagaran (1988) examined the determinants of cross-listing with the relative size of a cross-listed firm within its domestic market. The measurement of relative size was the ratio of a firm's market capitalization to the total market capitalization of its domestic market. In a multinomial logistic analysis, apparently, firms with greater relative size tend to cross-list more frequently.

Although the multinomial logistic regression or the Cox regression has had frequent application to examination of the determinants of cross-listing, some researchers added descriptive information of the differences in size between cross-listed firms and

non-cross-listed firms. In that case, simpler analyses, such as a *t*-test, were used with various size proxies. Saudagaran (1988) found that the cross-listed firms are larger than non-cross-listed firms. Pagano et al. (2002) investigated size differences between the two groups using four proxies: total assets, number of employees, issue market value, and total revenue; the results proved to have statistically significant differences.

German financial institutions' criteria for the selection of U.S. restaurant companies for involuntary cross-listing are unlikely to be an exception to the case that larger firms have greater visibility among foreign investors. Therefore, hypothesis, H1 is:

H1: Larger U.S. restaurant firms are more likely the choice for involuntary cross-listing than smaller U.S. restaurant firms.

### 4.2.2 Growth Opportunities

Pagano et al. (2002) stated that a firm tries to raise capital through an exchange listing when either the company has rapid growth and/or it exhausts its capacity to acquire debt. These researchers applied the logic to the cross-listing context and argued that the cross-listing companies that aim to raise capital are likely to have high growth rates and leverages prior to cross-listing, other things being equal.

High growth rate is not characteristic of all cross-listing cases, however. Researchers empirically found that "growth opportunities" are determinants for cross-listing in the U.S. One of the main motivations for firms to cross-list in the U.S. is raising capital to fuel the company's high growth rate. Meanwhile Pagano et al., (2002)

found that maximizing growth opportunities may not motivate firms' cross-listing in European countries, while they do not specify the main motivations.

Each exchange has its own characteristics and specialties in a given period; therefore, listed firms choose stock exchanges that fit to their characteristics. NASDAQ, for example, was well suited for high-technology firms in the 2000s due to its many analysts who specialize in that sector (Pagano et al., 2002). Nevertheless, popular destinations of the stock markets and types of listing firms have changed over the decades (Sarkissian & Schill, 2009).

Doidge et al. (2009a, b) approached growth opportunities from a corporate governance perspective. They argued that companies choose to list on a foreign exchange when opportunities to raise capital are greater than the private benefits of controlling shareholders, especially when during a company has high growth opportunities. When a company does not find better growth opportunities by cross-listing, the controlling shareholders are unwilling to sacrifice private benefits or accept direct costs, such as listing fees, related to the cross-listing.

In general, U.S. listings involve firms with high growth opportunities; however the association is not statistically significant for U.K. listings. Firms that have growth opportunities are more likely to list in the U.S. than the U.K. and those listing in the U.K. may have other reasons for cross-listing (Doidge et al., 2009a). Among the U.S. listing cases, high growth opportunities may not be a determinant for Rule 144a and Level 1 listings (Doidge et al., 2009b). The reason can be explained that Rule 144a private offerings or Level 1 listings in the U.S. do not involve raising public capital (Miller, 1999). Foreign companies that list in the U.S. choose a level of listing from among the

options: Level III, Level II, Level I, and Rule 144a private placement. Among those, only Level III and Rule 144a programs involve raising capital, while Rule 144a private placement raises capital, not through public offering, but through private offering. Level III and Level II stocks require foreign listing companies to commit to stringent information disclosure while Level I and Rule 144a programs' requirements are much less strict.

Growth opportunities have been measured using proxies of market-to-book ratios (Pagano et al., 2002), total growth of assets (Doidge et al., 2009a; Pagano et al., 2002), and/or total growth of sales (Doidge et al, 2009b). Some researchers measured relative growth opportunities among multiple stock markets. Pagano et al. (2002) examined the relative growth opportunities in foreign exchanges compared to domestic exchanges with the differences of price-to-book value ratios in the foreign market compared to the domestic market. Doidge et al. (2009b) controlled for industry growth opportunities with global industry q, which is the median of Tobin's q values of publicly traded firms within a worldwide industry.

In the case of involuntary cross-listing, raising capital is surely not an intention of listed companies; their listings are the choice of a third party and involuntary cross-listings do not permit companies to raise capital. However, growth opportunities can represent a determinant for involuntary cross-listing by German financial institutions. If a U.S. restaurant company does not possess growth opportunities, German investors are unlikely to be interested in investing in the shares; therefore, a third party German financial institution would not gain significant fees by listing a no-growth stock. For that

reason, U.S. restaurant companies with higher growth opportunities become more likely choices for German third parties' for involuntary cross-listing. The hypothesis, H2, is:

H2: U.S. restaurant firms with higher growth opportunities are more likely the choice for involuntary cross-listing than U.S. restaurant firms with lower growth opportunities.

### 4.2.3 Leverage

The other factor that Pagano et al. (2002) identified as a motivation for cross-listing, in addition to funding growth opportunities, is to increase debt capacity. Firms that have high leverage and exhausted debt capacities in their home markets tend to use cross-listing as an outlet for raising capital. Pagano et al. (2002) found that the motivation for European companies to cross-list in other European countries is to increase debt capacity (i.e., raise new equity). Doidge et al. (2009a, b) documented that firms that cross-list in the U.S. tend to have lower leverages while those that cross-list in the U.K. tend to have higher leverages, although the difference is weakly significant. Some researchers measured leverage with the ratio of total debt to total assets (e.g., Doidge et al., 2009a, b), while some calculated the ratio by dividing total debt by the value calculated from total assets, minus book value of common stock, plus the market value of common stock (e.g., Pagano et al. 2002).

The measures signify that the level of leverage depends on a firm's growth prospects and the nature of its assets (Pagano et al., 2002), and each industry has a different level of leverage. From the perspective of a third party that considers listing a company's shares on a local stock exchange with purpose of obtaining fees, high levels

of leverage can represent high possibility of growth. A firm with high leverage may represent risk due to weak past performance as well. U.S. restaurant companies typically have high leverage (Schmidgal, 2006), nevertheless, a high level of leverage needs not represent a risk, but more likely, a growth opportunity. The hypothesis, H3, is:

H3: U.S. restaurant firms with higher leverages are more likely the choice for involuntary cross-listing than U.S. restaurant firms with lower leverages.

### 4.2.4 Financial flexibility

Given that raising capital is a core purpose motivating a company to list its shares in an overseas stock market, a firm with higher liquidity would not need to list in a large foreign capital market as much as one with lower liquidity. For this reason, Doidge et al. (2009b) counted financial flexibility as a possible predictor for a non-U.S. firm to cross-list in the U.S. That research constructed a financial flexibility index as a variable, which adds points, one for high cash and liquid assets, one for high dividends, and one for low capital expenditures.

When raising capital is not a cross-listing factor and a third party financial institution seeks companies to cross-list, a firm with financial flexibility receives consideration as a soundly managed firm. These firms are more likely to have a favorable perception from investors, therefore, become more likely candidates for involuntary cross-listing. Hypothesis, H4, is:

H4: U.S. restaurant firms with a higher financial flexibility index are more likely the choice for involuntary cross-listing than U.S. restaurant firms with a lower financial flexibility index.

### 4.2.5 Degree of International Operation

A degree of international operation is, apparently, an important determinant for cross-listings. Studies often measured the degree of international operations by the foreign sales percentage compared to total sales (e.g., Doidge et al., 2009b; Pagano et al., 2002; Saudagaran, 1988) and found that statistic to predict a firm's likelihood for cross-listing in the U.S., while positive but insignificant for listings in European countries. The firms that cross-list in European countries do not depend on foreign sales to the degree of firms cross-listing in the U.S. Saudagaran (1988) focused on investigating the relationship between the degree of international operations and the likelihood of cross-listing and measured the degree of international operations with three different proxies: the proportion of foreign assets to total assets, the proportion of the number of foreign employees to the number of total employees, and the proportion of foreign sales to total sales. Among the three, only the proportion of foreign sales to total sales seems to be a predictor of cross-listing.

The fundamental idea behind the degree of international operations as a determinant of cross-listing is that firms with higher degrees of international operations are likely to be better known among the foreign investors. When the involuntary cross-listing decision arises, the degree of international operation serves as an important determinant, since third party financial institutions that apply for foreign listed firms

would like to list firms that local investors know well. As third-party institutions, they would not promote a foreign company; therefore, a foreign company's visibility would be an important factor to consider when choosing companies to list. Therefore, the hypothesis, H5, is:

H5: U.S. restaurant firms with higher degrees of international operations are more likely the choice for involuntary cross-listing than U.S. restaurant firms with lower degrees of international operations.

### 4.2.6 Firm Profitability

Firm profitability becomes a determinant for cross-listing because firms with high profits may choose to cross-list to signal their quality (Doidge et al., 2009b). Prior studies examined whether firm profitability affects a firm's cross-listing decision making. Although not always significant, it has been found, in general, that firms with higher profitability tend to cross-list more frequently (Doidge et al., 2009b; Pagano et al., 2002). Return on assets is a commonly chosen proxy (e.g., Doidge et al., 2009b; Pagano et al., 2002).

In the context of involuntary cross-listing in Germany, firm profitability can be a factor for different reasons. When a third party German financial institution seeks foreign listed firms for involuntary cross-listing, the institution prefers companies with high profitability, since those companies are more likely to gain attention from investors and trade more frequently. Hypothesis, H6, is:

H6: U.S. restaurant firms with higher profitability are more likely the choice for involuntary cross-listing than U.S. restaurant firms with lower profitability.

### 4.2.7 Insider Ownership

Prior literature argued that corporate governance plays an important role in a company's decision to cross-list. Doidge et al. (2009a, b) stated that firms with abilities to control shareholders' taking private benefit would not cross-list if their ability to raise external capital is greater than the amount of private benefit. Given the importance of the private benefits of controlling shareholders, Doidge et al. (2009b) directly measured the relationship between private benefits of control for controlling shareholders on the likelihood of cross-listing. They adopted various measures including cash flow rights, control rights, and family/management control rights as proxies. In general, the findings indicate that firms with smaller private benefits from control are more likely to cross-list in the U.S.

Doidge et al. (2009a) applied closely held shares as a proxy for insider ownership, when closely held shares refers to the shares owned by individuals closely related to the company. They stated that this variable is not directly comparable to the variables examined in Doidge et al. (2009b). Nevertheless, the results from Doidge et al. (2009a) supported the findings of Doidge et al. (2009b) that firms with less closely held stocks tend to cross-list more frequently.

Inside ownership is not applicable to the U.S. restaurant companies' involuntary cross-listings for two reasons: First, involuntary cross-listings do not involve raising capital, which is an important factor in the argument of insider ownership. Second, this

study focuses on the U.S. restaurant companies whose home market has stringent requirements for listing. Therefore, better corporate governance is not likely to occur by listing their shares in overseas stock markets. For these reasons, the Doidge et al. (2009a, b) argument for the private benefits of controlling shareholders or insider ownership argument is not applicable to the U.S. restaurants' involuntary cross-listing cases. Therefore, I do not hypothesize that this determinant explains involuntary cross-listings.

### 4.2.8 Privatization

Pagano et al. (2002) argued that privatization affects a firm's likelihood of cross-listing. Privatization describes a government's divestiture of holdings, often involving a large quantity of securities. In order to obtain an attractive price for the issues, privatization tends to involve cross-listing. Pagano et al. (2002) developed a dummy variable, which acquires the value of 1 when the government makes a public offering of the company's shares. The privatization concept is not applicable to the U.S. restaurant companies both for voluntary and involuntary cross-listing cases; therefore, no hypothesis arises for this variable.

### 4.2.9 Overall Economic Condition in the U.S.

In addition to the determinants that previous cross-listing literature examined, this study investigates restaurant industry's specific determinants. Typically, the restaurant industry maintains a database of various statistics that represent overall economic conditions (Kolb, 2011) due to their impact on restaurant sales and in turn a company's

financing decision making. Conventionally, the restaurant industry has a high vulnerability to economic conditions since patrons visit restaurants when their disposable incomes allow (Basham, 2010), and confidence in the economy affects consumers' sentiments (Shamir, 1985). With regard to the relationship between overall economic condition and restaurant sales, Kolb (2011) introduced six key industry statistics that restaurant analysts frequently consult: (1) real growth in Gross Domestic Product (GDP), (2) changes in disposable, personal income, (3) consumer confidence index, (4) consumer price index, (5) unemployment rate, and (6) interest rates. When the four statistics, real growth in GDP, change of disposable personal income, consumer confidence index, and interest rates are positive or high, overall economic conditions are strong; therefore, restaurants' sales levels tend to be increase. Meanwhile, low levels for the remaining statistics, the consumer price index and unemployment rate, signal strong overall economic condition, which will lead to restaurants' increased sales.

When overall U.S. economic conditions are strong and U.S. restaurant sales are strong, companies are more likely to enjoy a favorable perception among investors. More investors trading stocks produce more income from fees for depositary banks. Therefore, U.S. restaurant companies are more likely to be chosen to be listed on the German stock exchange by a German third party when overall U.S. economic conditions are strong. Based on this logic, a positive relationship exists between overall U.S. economic conditions and the likelihood of cross-listing; therefore hypothesis H7 is:

H7: U.S. restaurant firms enjoying stronger economic conditions are more likely the choice for involuntary cross-listing than U.S. restaurant firms during worse economic conditions.

### 4.2.10 Industry Growth Opportunities

Previous studies of determinants of cross-listing examined industry growth opportunities (Doidge et al., 2009a, b). Doidge et al. (2009a, b), which included industry growth opportunities based on the bonding hypothesis argument. These researchers argued that during the time with high growth opportunities, controlling shareholders are more likely to sacrifice private benefits in favor of using the benefits to raise capital from overseas markets. The argument is not directly applicable to U.S. restaurant context since the companies do not bond themselves to a stock market that applies stringent regulations for listed companies. However, industry-wide growth opportunities can be a determinant for involuntary cross-listing of U.S. restaurant companies because during perceived high growth opportunities, companies in the industry gain favorable consideration among investors. Hypothesis, H8 is:

H8: U.S. restaurant firms with high industry growth opportunities are more likely the choice for involuntary cross-listing than U.S. restaurant firms with lower industry growth opportunities.

### 4.2.11 Restaurant Types

Restaurant type can be a determinant for involuntary cross-listing of U.S. restaurant firms due to the different levels of accessibility among fast-food restaurants and full-service restaurants. These two business models are focus of the current study for restaurant companies. Fast-food restaurants may enjoy greater accessibility, since the business concept seeks high volume sales while full-service restaurants concentrate on selling high-margin items to fewer patrons compared to fast-food restaurants (First Research, April 2011). For that reason, fast-food restaurants may enjoy higher levels of visibility compared to full-service restaurants. For internationally operating restaurant firms, fast-food restaurants may be more likely to cross-list since foreign investors recognize those fast-food restaurant companies with relative ease.

H9: U.S. fast-food restaurant firms are more likely the choice for involuntary cross-listing than U.S. full-service restaurant firms.

### 4.2.12 Local Operation

Local operation may lead an unsponsored share into a success. An interview with a director at Citibank ADR group indicates that local operation is an important factor for a depositary bank to select foreign firms for unsponsored ADR issuance since local investors would be better aware of foreign firms when they operate in their country.

Literature also confirms the view. Ke, Ng, and Wang (2010) investigated U.S. equity holdings of non-U.S. mutual funds among 22 countries and found that the local

presence is, apparently, an important factor when non-U.S. mutual fund managers make an investment decision involving U.S. stocks. In an examination of equity holdings of mutual funds from 26 countries, Chan, Covrig, and Ng (2005) documented that investors prefer stocks using the same language, have close geographic locations, and have a significant volume of trade.

H10: U.S. restaurant firms with German operation are more likely the choice for involuntary cross-listing in Germany than U.S. restaurant firms without German operation.

### 4.2.13 Market Awareness

Foreign investors' favorable reaction toward firms with high familiarity is apparent (e.g., Chan et al., 2005; Grinblatt & Keloharju, 2001; Ke et al., 2010). However, even for voluntary cross-listing cases, not all cross-listed companies enjoy investor recognition. Sarkissian and Schill (2004) reported that some companies remain unrecognized by local investors even after cross-listing and consequently remain illiquid. To a depositary bank whose income with regard to unsponsored ADR is generated by fees calculated based on trading volume, it is critical to select foreign firms that have high possibility to have high liquidity. Therefore, defined as "a market's familiarity with a particular firm, brand, or product" (Qian & Li, 2003), market awareness can be a candidate for a determinant for involuntary cross-listing. Covrig, Lau, and Ng (2006) support the argument by documenting that investors prefer firms with high international visibility since it increases familiarity among investors with those stocks. Morck and

Yeung (1991) also argue that advertising is an important factor that increases value of multinational firms since it promotes reputation, brand name, and consumer goodwill.

Extant studies have measured market awareness using advertising expenditure, typically with a ratio that divides a firm's annual advertising expenditure by its annual sales (e.g., Anand & Delios, 2002; Qian & Li, 2003) or annual advertising expenditure (e.g., Morck & Yeung, 1991). The current study adopts both measures to examine market awareness.

H11: U.S. restaurant firms with higher market awareness are more likely the choice for involuntary cross-listing in Germany than U.S. restaurant firms with less market awareness.

Table 2. Determinants of Cross-listing

| Level | Determinants | Characteristics | Doidge et al. (2009a) | | Doidge et al. (2009b) | | | Pagano et al. (2002) | | Saudagaran (1988) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | US | UK | London | 144a/Level1 | US | US | Europe | |
| Firm factor | Total assets (Log) | Size | | | + | +*** | +*** | +** | +*** | |
| | Market cap /total domestic market cap | Relative size | | | | | | | | +** |
| | Issue market-to-book ratio | Growth opportunities | | | | | | +*** | + | |
| | Total assets growth | | +*** | - | | | | +*** | + | |
| | Total sales growth | | | | + | - | +* | | | |
| | Foreign price-to-book ratio - domestic PBV | Relative growth opportunities | | | | | | + | - | |
| | Leverage | Leverage | -*** | + | + | - | - | + | - | |
| | Financial flexibility index | Financial flexibility | | | + | - | + | | | |
| | Foreign assets percentage | Degree of international operation | | | | | | | | - |
| | Foreign employee percentage | | | | | | | | | + |
| | Foreign sales percentage | | | | + | +*** | +*** | +** | + | +* |
| | Return on assets | Firm profitability | | | + | + | + | +* | +*** | |
| | Ownership | Insider ownership | -*** | - | | | | | | |
| | 2nd blockholder | Private benefits of control by controlling shareholder | | | + | +* | + | | | |
| | Cash flow rights | | | | - | - | -** | | | |
| | Control rights | | | | - | - | -*** | | | |
| | Control - cash | | | | + | - | -*** | | | |
| | Family/Management control rights | | | | - | + | -** | | | |
| | Government owned | | | | - | + | + | | | |
| | Privatization | | | | | | | +* | +*** | |
| Industry factor | Global industry q | industry growth opportunities | +*** | +*** | + | +** | +*** | | | |
| | High tech dummy | Technology Level | | | | | | +** | - | |

Table 2 (continued)

| Level | Determinants | Characteristics | Doidge et al. (2009a) | | Doidge et al. (2009b) | | Pagano et al. (2002) | | | Saudagaran (1988) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | US | UK | London | 144a/Level1 | US | US | Europe | |
| Country factor | Civil law | | | | - | -* | -* | | | |
| | Economic proximity | | | | - | - | -* | | | |
| | GNP (Log GNP) | | -*** | - | | | | | | |
| | GNP/capita (log GNP/capita) | | | | - | -** | - | | | |
| | Legal | | +*** | +*** | | | | | | |
| | Market cap/GDP | | -*** | - | | | | | | |
| | Regional (Northern Europe) | | | | | | | - | +** | |
| | Regional (Southern Europe) | | | | | | | - | + | |
| | Regional (Eastern Europe) | | | | | | | - | + | |

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

## 4.3 Data

This study focuses on U.S. restaurant firms' cross-listing behaviors and consequences on the FSE Open Market. Therefore, sample firms of interest consist of the U.S. restaurant firms that have or had listings in the U.S. stock market as well as the FSE Open Market. For the sake of comparison, domestically listed U.S. restaurant firms also undergo examination. To build the dataset, Capital IQ is an appropriate database since it provides comprehensive financial data including: name of stock markets on which a company has or had listing, duration of the listing, stock prices at each exchange, and other essential financial information, such as total assets, total liabilities, total revenue, and so on. Other cross-listing literature has used Capital IQ as a main source of data or for a cross-checking purposes (e.g., Licht, Li, & Siegel, 2011; Prather-Kinsey, Jermakowicz & Vongphanith, 2008).

An initial data project affirmed the availability of an appropriate dataset for the study's analyses. The screening tool of the Capital IQ allows identifying the U.S. headquartered full-service restaurants and fast-food restaurants that have or had listings in the U.S. as well as foreign countries. Frequently used financial information, such as total assets, total revenue, total equity, total debt, and so on, for those companies are available from the Capital IQ data base. All financial information follows calendar year since fiscal year information may represent different calendar year when fiscal year does not end in December.

Initially, the Capital IQ database provided a list of 168 U.S. restaurant companies. Out of the 168 companies, the number of cross-listed firms identified is 31, of which 26 companies have involuntarily cross-listed on the FSE as summarized in Table 3. Five

companies (Applebee's International Inc., Boston Market Corporation, California Pizza Kitchen, Planet Hollywood International Inc., Taco Cabana Inc.) have cross-listed on other exchange other than the FSE: either the Munich Stock Exchange, the Stuttgart Stock Exchange in Germany, or the Mexican Stock Exchange in Mexico. Among the 26 FSE listed companies, 3 companies (McDonald's Corp., Morton's Restaurant Group Inc., and Yum! Brands) are cross-listed on other foreign stock exchanges as well. The five non-FSE cross-listed companies are excluded from the analysis since each stock exchange may apply different criteria to select foreign companies to list.

Of the 26 companies, 15 companies are full-service restaurants, and 11 companies are fast-food restaurants. The categorization follows the Capital IQ criteria, which categorized restaurant firms based on the Global Industry Classification Standard (Bhojraj, Lee, & Oler, 2003), a joint product of Standard and Poor's and Morgan Stanley Capital International. The basis for sub-categories of the restaurant firms (e.g., fast-food restaurant, full-service restaurant, etc.) are SIC, NAICS and some other coding systems, according to the Capital IQ.

The collection of domestic listings of U.S. restaurant companies contains an initial list of 137 companies. Of the 137 companies, 36 companies are fast-food restaurants and 85 companies are full-service restaurants.

Table 3. U.S. Companies Involuntarily Cross-listed on the FSE

| Company | Restaurant Type | Ticker in the U.S. | Ticker on FSE | First Trade day on FSE |
|---|---|---|---|---|
| CKE Restaurant, Inc. | Fast-food | NYSE: CKR | CKE | 07/21/1999 |
| Papa John's International Inc. | Full-service | NASDAQ: PZZA | PP1 | 08/11/1999 |
| Brinker International Inc. | Full-service | NYSE: EAT | BKJ | 11/09/1999 |
| Jack in the Box Inc. | Fast-food | NASDAQ: JACK | JBX | 05/12/2000 |
| Eat at Joes Ltd. | Full-service | OTCPK: JOES | JOS | 08/18/2000 |
| Pacific Restaurant Holdings Inc. | Fast-food | OTCPK: PSPR | PPU | 05/17/2004 |
| P.F. Chang's China Bistro Inc. | Full-service | NASDAQ: PFCB | PF2 | 05/21/2004 |
| Domino's Pizza Inc. | Fast-food | NYSE: DPZ | EZV | 07/14/2004 |
| McDonald's Corp. | Fast-food | NYSE: MCD | MDO | 04/29/2005 |
| Kona Grill Inc. | Full-service | NASDAQ: KONA | K5G | 08/17/2005 |
| Chipotle Mexican Grill Inc. | Fast-food | NYSE: CMG | C9F | 01/26/2006 |
| Morton's Restaurant Group Inc. | Full-service | NYSE: MRT | M8G | 02/09/2006 |
| Burger King Holdings Inc. | Fast-food | NYSE: BKC | E6X | 05/16/2006 |
| OSI Restaurant Partners LLC. | Full-service | NYSE: OSI | OB3 | 08/23/2006 |
| Nathan's Famous Inc. | Fast-food | NASDAQ: NATH | NFA | 10/30/2006 |
| Cracker Barrel Old Country Store Inc. | Full-service | NASDAQ: CBRL | OLD | 12/12/2006 |
| Yum! Brands Inc. | Fast-food | NYSE: YUM | TGR | 01/08/2007 |
| Spicy Pickle Franchising Inc. | Fast-food | OTCPK: SPKL | 4S3 | 10/02/2007 |
| The Wendy's Company | Fast-food | NYSE: WEN | TQK | 03/03/2010 |
| Ruby Tuesday Inc. | Full-service | NYSE: RT | RYW | 06/01/2010 |
| Darden Restaurants Inc. | Full-service | NYSE: DRI | DDN | 08/11/2010 |
| Denny's Corporation | Full-service | NASDAQ: DENN | DE8 | 08/11/2010 |
| The Cheesecake Factory Inc. | Full-service | NASDAQ: CAKE | CF2 | 08/11/2010 |
| Buffalo Wild Wings Inc. | Full-service | NASDAQ: BWLD | BWW | 09/28/2010 |
| Bravo Brio Restaurant Group Inc. | Full-service | NASDAQ: BBRG | IZA | 11/02/2010 |
| Texas Roadhouse Inc. | Full-service | NASDAQ: TXRH | ROW | 12/14/2010 |

## 4.4 Models

To test the determinants of the cross-listing, prior literature used the logistic regression (e.g., Doidge et al., 2009b; Saudagaran, 1988) and the Cox proportional hazard model (e.g., Doidge et al., 2009b). The current study applies both approaches to provide comprehensive analysis. First, the logistic regression's frequent application in studies established determinants (e.g., Gao & Ritter, 2010; Hovakimian, Hovakimian, & Tehranian, 2004; Jung, Kim, & Stulz, 1996; Nance, Smith & Smithson, 1993) with a binomial dependent variable. For example, in the case of the current study that investigates the determinants of cross-listing of the U.S. restaurant firms on the FSE Open Market, dichotomizing the dependent variable occurs by either cross-listed firms or those that have not been cross-listed yet. With panel data of U.S. restaurant firms that have domestic listings in the U.S. as well as those listed domestically and on FSE at the same time for 1996-2010, a pooled logistic regression establishes the determinants. This sample period covers the maximum years of cross-listing of U.S. restaurant companies, 1999-2010, setting 2010 as a last year of examination.

The literature review provides the basis for examining, eleven potential determinants: (1) size, (2) growth opportunities, (3) leverage, (4) financial flexibility, (5) degree of international operation, (6) firm profitability, (7) overall economic condition, (8) industry growth opportunities, (9) restaurant type, (10) local operation, and (11) market awareness. The significance and direction of the determinants displayed differences in prior studies depending on home and host countries, as well as industries. The hypotheses, developed specifically for U.S. restaurant companies in this study and the

measurements choices for each potential determinant are necessary to better fit to the industry.

For size, logged total asset is frequently the adopted proxy in the literature. In the U.S. restaurant industry case, however, logged total revenue serves as a better proxy than logged total assets due to the fact that the industry widely uses franchising as an expansion strategy. The degree of franchising affects the level of total assets since restaurant franchisees invest their own assets (Koh, Lee, & Boo, 2009). Considering that the sample period is 16 years, from 1996 to 2010, the Consumer Price Index (CPI) is the basis for adjusting the revenue variable.

To measure growth opportunities, scholars adopted market-to-book ratio, total assets growth, and/or total sales growth. Considering that total assets can underestimate the size of a firm when the firm has a high degree of franchising, examination does not include total assets growth. The market-to-book ratio and total sales growth undergo separate examination. The market-to-book ratio, calculated by dividing the market capitalization of a firm at the end of each year by book value of common shares, follows Pagano et al. (2002). In calculating the total sales growth, the absolute sales level will be adjusted with CPI before calculating the growth. The adjusted sales growth rate for the last two years will then be averaged (Doidge et al., 2004; King & Segal, 2009).

In measuring leverage, Doidge et al. (2009a, b) used a ratio that divided total debt by total assets, and Pagano et al. (2002) deducted book value of common stock and added the market value of common stock from the total assets for the denominator while having total debt as numerator, similar to Doidge et al. (2009a, b). For the current study, given that total assets may not represent the true value of total assets in restaurant companies

with high degrees of franchising, calculation of leverage occurs by dividing total debt by total market value of equity.

With regard to financial flexibility, this study adopts the Doidge et al. (2009b) measurement while making adjustment to better fit the data of U.S. restaurant companies. A count variable, one point, created for each of three categories constitutes a proxy that represents financial flexibility. The three investigated categories are: (1) high cash and liquid assets, (2) high dividends, and (3) low capital expenditures. The criteria that decide "high" and "low" are an amount above the $75^{th}$ percentile or below the $25^{th}$ percentile among U.S. restaurant companies having or had listings on U.S. exchanges during 1996-2010. This study adjusts the calculated index by scaling by total revenue, a size measurement. Without the adjustment, the first category, high cash and liquid assets, may merely reflect large size while the third category, low capital expenditures, may merely reflect small size.

In terms of degree of international operations, researchers dominantly adopted foreign sales percentage as a proxy. Therefore, this study follows the conventional method and uses the ratio to measure the degree of international operations. Foreign sales percentage is a calculation of foreign sales divided by total sales.

Firm profitability, measured by return on assets in the previous literature, is the same for the current study but adds one more proxy, return on sales, due to the concern that underestimation of assets may result for firms with high degrees of franchising, leading to overestimation of a firm's profitability. Reports for return on assets and return on sales are separate.

With regard to overall economic condition, U.S. restaurant industry analysts have frequently consulted six statistics: (1) real growth in Gross Domestic Product (GDP), (2) changes of disposable personal income, (3) consumer confidence index, (4) consumer price index, (5) unemployment rate, and (6) interest rates. Among these, this study uses changes to disposable personal income as a proxy since it most directly affects the performance of restaurant companies. Other statistics such as unemployment rate and interest are lagging indicators of economic condition.

The current study follows the norm of measuring industry growth opportunities with the industry q, the median of the Tobin's q among the companies in a specific sector (Doidge et al., 2009a, b).

Restaurant types categorize into two types according to their primary businesses: (1) fast-food restaurants and (2) full-service restaurants. The Capital IQ database provides the sub-industry category and the current study uses that categorization. The database uses the Global Industry Classification Standard (GICS) to identify the restaurant industry. For sub-industry categorization, the database confirms the use of the Standard Industrial Classification (SIC), the North American Industry Classification System (NAICS) and some other coding systems.

Local operation categorizes into two dummy variables that equal to one if a company is operating in Germany, otherwise zero. Market awareness is measured in two ways: (1) annual advertising expenditure, and (2) a ratio that divides annual advertising expenditure by annual sales.

Having the eleven determinants candidates, the binomial logistic models will be estimated as follows:

$$Pr(Crosslisting) = \frac{1}{1+e^{-u}} \quad ,$$

where $u = \beta_0 + \beta_1 Size + \beta_2 GrowthOpportunities + \beta_3 Leverage + \beta_4 FinancialFlexibility + \beta_5 DegreeOfInternationalOperation + \beta_6 FirmProfitability + \beta_7 OverallEconomicCondition + \beta_8 IndustryGrowthOpportunities + \beta_9 RestaurantTypes + \beta_{10} LocalOperation + \beta_{11} MarketAwareness + \varepsilon$

The study applies pooled logistic regression with panel dataset. For estimating standard errors, the study uses the company-clustered standard errors technique. Panel data residuals tend to correlate, both cross-sectionally and over time, due to inclusion of repeated observations for the same set of firms, leading to biased standard errors. Context of the current data set produces more concern for autocorrelation because dependent variable, involuntary cross-listing, remains the same for domestic companies. Cross-listed companies may suffer from the same problem, since once cross-listed, the status does not change over time. There is possibility for cross-sectional correlation of errors, but economic condition variable may capture the effect.

Logistic regression is static in nature since the estimation's basis is the information for a specific year (Doidge et al., 2009b). To capture the changing characteristics of the firms over the years (e.g., the duration during which a firm took from domestic listing to cross-listing) and to examine the determinants more dynamically, some scholars adopted the Cox proportional hazard model (e.g., Doidge et al., 2009b; Pagano et al., 2002). Doidge et al. (2009a) used the competing risks model which extends the Cox model to measure the determinants for two competing stock markets of the U.S. and the U.K.

The Cox proportional hazard model, also called a duration analysis, has acquired different names in other disciplines: duration analysis or transition analysis in economics, event history analysis in sociology, reliability analysis or failure time analysis in engineering (Allison, 2010). The main benefit of Cox regression over logistic regression is that the former incorporates the duration required of an event to transit its status (Allison, 2010; Bhattacharjee, Higson, Holly, & Kattuman, 2009). In this study, the Cox regression models the duration that a firm took to transition from domestic listing to cross-listing. The logistic regression performs analysis with a dichotomous dependent variable: whether or not cross-listing or domestic listing occurred within a given year.

The Cox proportional hazard model can also provide meaningful information to this study: First, the period of listing is an important factor that affects the return from stocks (Barry & Brown, 1984), which, in turn affects a firm's cross-listing decision making. Second, the study uses panel data that covers multiple years, from 2000 to 2010, which allows the study to apply the Cox proportional hazard model (Pagano et al., 2002). The hazard model requires the information of covariates before the transition of a status and predicts a probability for transitioning, based on the information. Considering that all the cross-listing companies in the sample have domestic listings in the U.S. and filed their financial information for the years of the sample period, the hazard model can be applied.

In the context of cross-listing, the Cox proportional hazard model predicts the probability of cross-listing in year, *t*, given that a firm has not yet cross-listed. The probability of cross-listing is the hazard rate, *h(t)*, in this case. The model development is a function of the independent variables, Xs:

$$h(t) = h_0(t)exp(X'\beta),$$

where $h_0(t)$ is the baseline hazard rate at time, $t$, when setting the covariate vector, X at 0, and $\beta$ is a vector of coefficients. The Cox model has merit in that it calculates the $\beta$s without specifying the baseline hazard rate (Wooldridge, 2001). This study reports the hazard ratios, representing the hazard ratios relative to the base hazard ratios, in the exponential form for each variable. In duration analysis, the hazard rate is of interest since it responds to the question of the probability of transition of status (e.g., domestic listing to cross-listing) given the before-transition status has lasted (Kennedy, 2008).

The explanatory variables are the same as in the case of logistic regression: (1) size, (2) growth opportunities, (3) leverage, (4) financial flexibility, (5) degree of international operation, (6) firm profitability, (7) overall economic condition, (8) industry growth opportunities, (9) restaurant type, (10) local operation, and (11) market awareness.

## 4.5 Results

### 4.5.1 Descriptive Statistics

The current study performed descriptive analysis, and Table 4 presents the results. Involuntary cross-listing (CL) has a mean value of 0.06 with a range from 0 to 1 since it is a dummy variable. SIZE shows a mean value of 9.75 with a minimum value of 0.28 and a maximum value of 16.09. Market-to-book ratio (M2B) ranges from 0 to 38.68, with an average of 2.63, and sales growth ranges from -0.58 to 5.77 with a mean value of 0.12. Financial flexibility (FFLEX) ranges from 0 to 3, and a mean value is 0.65. Two

international operation measures, degree of international operation (DIO) and the international operation dummy variable (INTOP), have mean values of 0.03 and 0.17, respectively. The continuous variable, degree of international operation, ranges from 0 to 0.66, and the dummy variable ranges from 0 and 1. Profitability measures, return on assets (ROA), and return on sales (ROS) show mean values of -0.01 and -0.05, respectively, with a range of -14.78 to 0.83, and -15.85 to 0.43, respectively. Economic condition (ECONC), measured with changes to disposable personal income, ranges from -0.01 to 0.04. Industry Q (INDQ), which represents industry growth opportunities, shows a mean value of 1.38, with a minimum value of 1.02 and a maximum value of 1.89. Fast food restaurant (FAST) is a dummy variable, and its average value is 0.34. This means that more full-service restaurants are included in the sample than fast-food restaurants. German operation (GERMAN) is also a dummy variable, and its average value is 0.03. This value signifies that few U.S. restaurant companies actually operate in Germany. Advertising expenditure (ADEXP) and the ratio of advertising expenditure to total revenue (ADEXPS), representing market awareness, range from 0.00 to 6.68, and 0.00 to 2.53, with average values of 2.23 and 0.06, respectively.

Table 4. Summary of Descriptive Statistics

| | Obs. | Mean | S.D. | Min | Max |
|---|---|---|---|---|---|
| **CL** | 2445 | 0.06 | 0.23 | 0 | 1 |
| **SIZE** | 1212 | 9.75 | 2.60 | 0.28 | 16.09 |
| **M2B** | 884 | 2.63 | 3.45 | 0.00 | 38.68 |
| **SG** | 935 | 0.12 | 0.44 | -0.58 | 5.77 |
| **LEV** | 982 | 1.29 | 3.54 | 0 | 36.73 |
| **FFLEX** | 1116 | 0.65 | 0.66 | 0 | 3 |
| **DIO** | 783 | 0.03 | 0.11 | 0 | 0.66 |
| **INTOP** | 2113 | 0.17 | 0.38 | 0 | 1 |
| **ROA** | 1204 | -0.01 | 0.71 | -14.78 | 0.83 |
| **ROS** | 1209 | -0.05 | 0.83 | -15.85 | 0.43 |
| **ECONC** | 2445 | 0.02 | 0.01 | -0.01 | 0.04 |
| **INDQ** | 2445 | 1.38 | 0.24 | 1.02 | 1.89 |
| **FAST** | 2385 | 0.34 | 0.47 | 0 | 1 |
| **GERMAN** | 2210 | 0.03 | 0.18 | 0 | 1 |
| **ADEXP** | 592 | 2.23 | 1.70 | 0.00 | 6.68 |
| **ADEXPS** | 451 | 0.06 | 0.20 | 0 | 2.53 |

CL represents involuntary cross-listing, measured by a dummy variable where the value equals to 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by average of the last two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts high cash and liquid assets, high dividends, and low capital expenditures; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operations, measured by a dummy variable where the value equals 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic condition, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals 1 when a company operates in Germany and 0 otherwise, and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

This study performed a Pearsons correlation analysis and Table 5 presents the results. The dependent variable, involuntary cross-listing, has a positive and significant correlation with size ($r$ = 0.35; $p$-value less than 0.001), market-to-book ratio ($r$ = 0.15; $p$-value less than 0.001), financial flexibility ($r$ = 0.09; $p$-value less than 0.01), degree of international operation ($r$ = 0.38; $p$-value less than 0.001), international operation dummy ($r$ = 0.34; $p$-value less than 0.001), industry growth opportunities (measured by industry Q) ($r$ = 0.05; $p$-value less than 0.01), fast-food dummy ($r$ = 0.08; $p$-value less than 0.001), operations in Germany ($r$ = 0.25; $p$-value less than 0.001), and market awareness (measured by annual advertising expenditure) ($r$ = 0.26; $p$-value less than 0.001). Involuntary cross-listing showed a negative and significant correlation with overall economic conditions ($r$ = -0.08; $p$-value less than 0.01). No significant correlation appears between involuntary cross-listing and the variables of sales growth, leverage, return on assets, return on sales, and the ratio of advertising expenditure to total revenue. Pearson's correlation only measures a bivariate linear relationship between two variables. Logistic regressions will more rigorously test the constructs in an effort to control for other independent variables.

The current study has eleven candidates as determinants of involuntary cross-listing of U.S. restaurant companies on the Frankfurt Stock Exchange. Among the eleven potential determinants, examination includes four factors with two proxies: growth opportunities (market-to-book ratio and sales growth), international operations (proportion of foreign sales to total sales, and an international operation dummy variable), profitability (ROA and ROS), and market awareness (advertising expenditure and the ratio of advertising expenditure to total revenue). The correlations between the double

measures show a positive and significant relationship except for advertising expenditure and the ratio of advertising expenditure to total revenue.

Among independent variables which measure different factors, some combinations significantly correlate with *r* values greater than 0.50. For example, size shows a positive and significant relationship with the degree of international operation ($r = 0.55$; *p*-value less than 0.001), and advertising expenditure ($r = 0.75$; *p*-value less than 0.001). International operation measures, degree of international operation and its dummy show a positive and significant correlation with advertising expenditures ($r = 0.70$ and 0.57, respectively; *p*-value less than 0.001 for both). German operation also exhibits a positive and significant relationship with advertising expenditure ($r = 0.57$; *p*-value less than 0.001). Due to a possible multicollinearity problem among those variables, the current study estimates the variance inflation factor (VIF). This study also conducts logistic analysis with either international operation measures or advertising expenditures in order to provide reliable results. Since the two measures, degree of international operation and the market awareness measures (advertising expenditure and the ratio of advertising expenditure to total revenue) have the most missing values, the current study conduct analysis excluding either measures (i.e., international operation measures or market awareness measures), or both measures. By excluding these variables in the model, the analysis includes a greater number of observations. The results are compared with the full models.

Table 5. Summary of Pearson's Correlation

| | CL | SIZE | M2B | SG | LEV | FFLEX | DIO | INTOP | ROA | ROS | ECONC | INDQ | FAST | GERMAN | ADEXP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **SIZE** | 0.35*** | | | | | | | | | | | | | | |
| **M2B** | 0.15*** | 0.09** | | | | | | | | | | | | | |
| **SG** | -0.02 | -0.12** | 0.08* | | | | | | | | | | | | |
| **LEV** | -0.05 | -0.04 | 0.08* | -0.05 | | | | | | | | | | | |
| **FFLEX** | 0.09** | -0.06 | 0.07 | 0.09* | -0.01 | | | | | | | | | | |
| **DIO** | 0.38*** | 0.55*** | 0.27*** | -0.05 | -0.08 | 0.22*** | | | | | | | | | |
| **INTOP** | 0.34*** | 0.47*** | 0.18*** | -0.06 | -0.09** | 0.08** | 0.64*** | | | | | | | | |
| **ROA** | 0.04 | 0.30*** | -0.08* | -0.01 | -0.02 | -0.03 | 0.05 | 0.10** | | | | | | | |
| **ROS** | 0.01 | 0.34*** | -0.07* | -0.11** | 0.01 | -0.12** | 0.08* | 0.12*** | 0.38*** | | | | | | |
| **ECONC** | -0.08*** | -0.06* | 0.01 | 0.10** | -0.01 | 0.06* | -0.05 | -0.01 | 0.01 | -0.02 | | | | | |
| **INDQ** | 0.05** | 0.01 | 0.14*** | 0.00 | -0.16*** | -0.07* | 0.02 | -0.01 | -0.05 | -0.04 | 0.14*** | | | | |
| **FAST** | 0.08*** | -0.04 | 0.29*** | 0.02 | 0.03 | 0.22*** | 0.31*** | 0.20*** | -0.08** | -0.12*** | -0.00 | 0.00 | | | |
| **GERMAN** | 0.25*** | 0.39*** | 0.17*** | -0.06 | -0.04 | 0.10** | 0.76*** | 0.44*** | 0.07* | 0.07* | -0.00 | 0.01 | 0.19*** | | |
| **ADEXP** | 0.26*** | 0.75*** | 0.15** | -0.16* | -0.02 | 0.05 | 0.70*** | 0.57*** | 0.19*** | 0.18** | 0.01 | -0.03 | 0.30*** | 0.57*** | |
| **ADEXPS** | -0.07 | -0.27*** | 0.06 | -0.03 | -0.04 | 0.18** | -0.06 | -0.09 | -0.32*** | -0.36*** | 0.12** | -0.10* | 0.19*** | -0.04 | 0.08 |

CL represents involuntary cross-listing, measured by a dummy variable where the value equals to 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by average of the last two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts high cash and liquid assets, high dividends, and low capital expenditures; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operations, measured by a dummy variable where the value equals 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic condition, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals 1 when a company operates in Germany and 0 otherwise, and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

### 4.5.2 Main Findings

The current study performed logistic regression using company–clustered, standard errors that adjust for possible autocorrelation problems within a company's data. Based on literature review, this study examined four candidates of determinants with two measures: (1) market-to-book ratio and sales growth for growth opportunities, (2) proportion of foreign sales to total sales, and international operation dummy for international operation, (3) ROA and ROS for profitability, and (4) advertising expenditure and the ratio of advertising expenditure to total sales for market awareness. The multiple combinations provide the results with a greater number of observations, and accordingly with a greater number of sample companies, thereby better representing the U.S. public restaurant companies.

Among the pairs, the current study adopts the results from the measures of market-to-book ratio, international operation dummy, ROS and advertising expenditure for the main analyses, and provides results with other measures for sensitivity analyses. Market-to-book ratio compares a company's market price to its book value. Under this study's context, the ratio may intuitively represent investors' perceptions of a company's shares in general. The current study chose international operation dummy over the degree of international operation due to the fact that the dummy variable has almost three times the number of observations as the other variable, as shown in Table 4. ROS, chosen over ROA, is the selected variable because total assets can be underestimated for the U.S. restaurant companies that have high degrees of franchising. Absolute level of annual advertising expenditure is used rather than ratio of advertising expenditure scaled by total revenues because the absolute value of the former better fits the current study's

context; the higher the absolute value of advertising expenditure, the more likely a company has recognition among investors.

The findings, in general, show that the size of a company consistently determines involuntary cross-listing of U.S. restaurant firms on the FSE while international operations, profitability, economic conditions, and industry growth opportunities play a role in some models. When focusing on the models which include approximately 70 companies or more, the significant variables narrow down to three: size, economic condition, and industry growth opportunities. The detailed results are: First, the current study performed logistic regression with all eleven independent variables. Table 6 suggests that the model accounts for significant variances of involuntary cross-listing (pseudo $R^2 = 0.4007$) while having no severe multicollinearity problem (VIF < 10, as suggested by Hair, Anderson, Tatham, and Black (1998)). Involuntary cross-listing of U.S. restaurant companies on the FSE arises from positive size (SIZE) (*z*-value = 3.57; *p*-value less than 0.001), positive international operations (INTOP) (*z*-value = 2.63; *p*-value less than 0.01), and industry growth opportunities (INDQ) (*z*-value = 2.24; *p*-value less than 0.05), and negative ROS (*z*-value = -2.32; *p*-value less than 0.05). In other words, U.S. restaurant companies with greater size, greater international operations, greater industry growth opportunities, and smaller profitability determine involuntary cross-listing on the FSE.

Second, current study performed logistic regression excluding advertising expenditures since only one fourth of the observations have data points for that variable. Accordingly, the number of observations increased from 234 with all variables to 365 excluding advertising expenditures. The value of pseudo $R^2$ increased from 0.4007 to

0.4410. The results present no VIF values over 10; therefore, multicollinearity is not a concern. Positive and significant results with SIZE remain the same (*z*-value = 2.45; *p*-value less than 0.05). Positive and significant results with INTOP and negative and significant results with ROS disappeared. In this model, overall economic conditions (ECONC) indicate involuntary cross-listing, but in a negative direction (*z*-value = -2.22; *p*-value less than 0.05). That means that when overall economic conditions are unfavorable in the U.S., German financial institutions chose to list shares of U.S. restaurant companies on the FSE.

Due to the positive and significant correlation between the international operation dummy (INTOP) and ADEXP ($r = 0.51$; *p*-value less than 0.001), the study conducted a logistic regression analysis by eliminating INTOP, but with ADEXP. The results are the same with the full model except that the positive and significant results with INDQ disappear. The current study conducted additional analysis, which also excluded ADEXP in order to increase the number of observations. The positive and significant results with SIZE remained the same (*z*-value = 5.16; *p*-value less than 0.001); however, in this model, the significance of ROS disappears (*z*-value = -1.53; *p*-value greater than 0.05) while a negative and significant results appear for ECONC and a positive and significant results appear for INDQ (*z*-value = -4.33 with *p*-value less than 0.001 for ECONC; *z*-value = 2.75 with *p*-value less than 0.01 for INDQ).

The current study extends the logistic analyses to include all the combinations of double measures for the four potential determinants; growth opportunities, profitability, international operation, and market awareness. The double measures of the four factors generate sixteen combinations for the full model with all eleven candidates for

determinants. Table 7 provides results with the market-to-book ratio with eight combinations of the other three double-measure variables, and Table 8 provides results from sales growth along with the eight combinations. The number of observations ranges from 127 to 244 in the full models. Pseudo $R^2$ ranges from 0.2718 to 0.6739, which signifies that the full model, comprised of eleven potential determinants, explains significant variations in involuntary cross-listing (CL). Models with M2B and DIO exhibit severe multicollinearity problems since DIO and GERMAN consistently shows VIF values higher than 10 (Hair et al., 1998).

The results, in general, suggest that SIZE constantly predicts involuntary cross-listing. Among the four cases of insignificant findings among all model combinations, three are significant at the 10% significance level. International operation generates positive and significant results with involuntary cross-listing when the current study measures the factor with the dummy and in the models that contains market awareness measures. The results also show that lower ROS tends to exhibit negative and significant results in the full models while ROA does not provide any significant indication. Worse overall U.S. economic conditions (ECONC), in general, determine the involuntary cross-listing of U.S. restaurant companies on the FSE, especially when the number of sample companies reaches 47. INDQ significantly determines involuntary cross-listing when pairing it with INTOP, and when the number of sample companies reaches 69. Restaurant type (FAST) consistently provides insignificant results and local operations (GERMAN) tend to show significant results when paired with M2B in the full models. ADEXP provides a negative and significant predictability of involuntary cross-listing in the full models while ADEXPS, in general, provides insignificant results.

Table 6. Summary of Logistic Regression Analysis – Main Model

| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 1.32 | -0.01 | -0.02 | -0.15 | 2.53 | -6.34 | -29.32 | 1.69 | -0.08 | -0.88 | -0.90 | 234 | 35 | 0.4007 |
| *t*-stat. | 3.57*** | -0.15 | -0.05 | -0.28 | 2.63** | -2.32* | -1.69 | 2.24* | -0.06 | -0.70 | -2.11 | | | |
| VIF | 3.83 | 1.53 | 1.08 | 1.17 | 2.12 | 1.77 | 1.11 | 1.14 | 2.01 | 2.30 | 4.24 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.92 | 0.10 | -3.62 | 0.14 | 2.68 | -2.74 | -40.63 | 0.80 | 1.77 | -5.09 | | 365 | 47 | 0.4410 |
| *t* -stat. | 2.45* | 0.81 | -1.90 | 0.22 | 0.48 | -1.24 | -2.22* | 0.74 | 1.46 | -1.03 | | | | |
| VIF | 2.51 | 1.56 | 1.16 | 1.17 | 6.06 | 1.57 | 1.07 | 1.12 | 1.50 | 6.77 | | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.28 | 0.03 | 0.21 | 0.10 | | -6.07 | -22.25 | 11.51 | 0.33 | -1.70 | -0.53 | 235 | 36 | 0.3367 |
| *t* -stat. | 3.58*** | 0.54 | 0.85 | 0.19 | | -2.11* | -1.16 | 1.84 | 0.25 | -1.26 | -1.14 | | | |
| VIF | 3.63 | 1.52 | 1.08 | 1.17 | | 1.84 | 1.12 | 1.13 | 1.82 | 2.15 | 4.03 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.83 | 0.04 | -0.17 | -0.23 | | -2.74 | -43.58 | 1.23 | 0.67 | -1.20 | | 610 | 70 | 0.3581 |
| *t* -stat. | 5.16*** | 0.72 | -0.71 | -0.59 | | -1.53 | -4.33*** | 2.75** | 0.83 | -0.89 | | | | |
| VIF | 1.43 | 1.27 | 1.08 | 1.11 | | 1.19 | 1.06 | 1.10 | 1.27 | 1.46 | | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals to 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by average of the last two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditure; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operation, measured by a dummy variable where the value equals to 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals to 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals to 1 when a company operates in Germany and 0 otherwise; and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

Table 7. Summary of Logistic Regression Analysis - Full Model with M2B

| | SIZE | M2B | LEV | FFLEX | DIO | ROA | ECONC | INDQ | FAST | GERMAN | ADEXP | N of obs. | N of Com. | Pseudo $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 3.90 | 0.65 | -4.85 | 0.80 | 46.91 | 3.91 | -63.54 | -0.60 | 3.60 | -31.07 | -5.03 | 127 | 23 | 0.6561 |
| *z*-stat. | 2.53* | 2.89** | -2.11* | 0.76 | 3.19*** | 3.45*** | -2.14* | -0.27 | 1.27 | -3.71*** | -2.53* | | | |
| VIF | 10.82 | 2.18 | 1.07 | 1.17 | 21.39 | 2.52 | 1.14 | 1.18 | 2.49 | 21.81 | 9.87 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **DIO** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.21 | 0.50 | -4.30 | 0.38 | 56.63 | 3.75 | -50.34 | 0.88 | 0.35 | -36.09 | 16.71 | 127 | 23 | 0.5295 |
| *z*-stat. | 0.91 | 2.58** | -1.64 | 0.39 | 2.39* | 2.31* | -1.65 | 0.54 | 0.27 | -2.38* | 0.46 | | | |
| VIF | 3.39 | 2.18 | 1.07 | 1.17 | 21.55 | 2.54 | 1.16 | 1.21 | 2.61 | 21.11 | 1.19 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 10.63 | 0.74 | -3.70 | 1.75 | 50.74 | -10.18 | -57.26 | -0.11 | 3.26 | -33.86 | -11.66 | 127 | 23 | 0.6739 |
| *z*-stat. | 2.58** | 3.06** | -1.11 | 1.71 | 3.27*** | -1.85 | -1.98* | -0.06 | 0.88 | -3.69*** | -2.52* | | | |
| VIF | 10.54 | 2.16 | 1.07 | 1.17 | 20.53 | 2.76 | 1.13 | 1.18 | 2.60 | 21.47 | 9.93 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.63 | 0.29 | -2.11 | 0.58 | 42.93 | -2.19 | -41.68 | 1.43 | -1.73 | -26.60 | 9.74 | 127 | 23 | 0.5024 |
| *z*-stat. | 1.69 | 1.74 | -0.84 | 0.51 | 1.97* | -0.71 | -1.54 | 1.15 | -0.72 | -2.00* | 0.44 | | | |
| VIF | 3.31 | 2.17 | 1.07 | 1.17 | 20.87 | 2.75 | 1.16 | 1.21 | 2.70 | 20.95 | 1.18 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.03 | 0.07 | -0.25 | -0.13 | 2.24 | -1.87 | -31.47 | 1.28 | 0.62 | -1.53 | -0.87 | 234 | 35 | 0.3303 |
| *z*-stat. | 3.50*** | 1.18 | -0.39 | -0.21 | 2.59** | -1.63 | -2.04* | 1.67 | 0.51 | -1.26 | -2.27* | | | |
| VIF | 3.94 | 1.57 | 1.08 | 1.17 | 2.11 | 2.05 | 1.13 | 1.14 | 2.03 | 2.24 | 4.32 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.64 | 0.10 | -0.03 | -0.07 | 1.60 | -1.96 | -34.36 | 1.41 | 0.47 | -2.82 | -22.68 | 234 | 35 | 0.2932 |
| *z*-stat. | 2.33* | 1.33 | -0.06 | -0.14 | 1.98* | -0.81 | -2.24* | 1.89 | 0.43 | -2.25* | -1.22 | | | |
| VIF | 2.83 | 1.60 | 1.07 | 1.18 | 2.00 | 2.10 | 1.14 | 1.15 | 2.19 | 2.18 | 1.30 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.32 | -0.01 | -0.02 | -0.15 | 2.53 | -6.34 | -29.32 | 1.69 | -0.08 | -0.88 | -0.90 | 234 | 35 | 0.4007 |
| *z*-stat. | 3.57*** | -0.15 | -0.05 | -0.28 | 2.63** | -2.32* | -1.69 | 2.24* | -0.06 | -0.70 | -2.11* | | | |
| VIF | 3.83 | 1.53 | 1.08 | 1.17 | 2.12 | 1.77 | 1.11 | 1.14 | 2.01 | 2.30 | 4.24 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.96 | 0.03 | 0.17 | -0.07 | 2.29 | -6.47 | -31.77 | 1.94 | 0.02 | -2.47 | -43.93 | 234 | 35 | 0.3929 |
| *z*-stat. | 2.94** | 0.28 | 0.47 | -0.15 | 2.20* | -2.43* | -1.89* | 2.56** | 0.01 | -2.01* | -2.64** | | | |
| VIF | 2.57 | 1.52 | 1.07 | 1.18 | 2.01 | 1.75 | 1.12 | 1.15 | 2.08 | 2.22 | 1.23 | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by the average of the previous two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditures; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operations, measured by a dummy variable where the value equals to 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals to 1 when a company operates in Germany and 0 otherwise, and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

Table 8. Summary of Logistic Regression Analysis - Full Model with SG

| | SIZE | SG | LEV | FFLEX | DIO | ROA | ECONC | INDQ | FAST | GERMAN | ADEXP | N of obs. | N of Com. | Pseudo $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 2.73 | 1.60 | -0.75 | 0.66 | -0.87 | -0.01 | -60.58 | 0.01 | 0.72 | 0.48 | -3.06 | 141 | 26 | 0.4519 |
| *z*-stat. | 4.14*** | 0.74 | -3.03** | 1.14 | -0.22 | -0.00 | -2.53* | 0.01 | 0.24 | 0.17 | -4.98*** | | | |
| VIF | 9.53 | 1.22 | 1.15 | 1.09 | 4.73 | 1.92 | 1.10 | 1.15 | 3.01 | 6.76 | 8.68 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **DIO** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.62 | 0.66 | -0.17 | 0.57 | -3.16 | 0.03 | -47.69 | 0.67 | 0.41 | 0.07 | -26.45 | 141 | 26 | 0.2718 |
| *z*-stat. | 1.75 | 1.29 | -1.07 | 1.14 | -0.78 | 0.01 | -2.64** | 0.75 | 0.18 | 0.03 | -1.06 | | | |
| VIF | 3.35 | 1.21 | 1.11 | 1.09 | 4.61 | 1.94 | 1.12 | 1.18 | 3.21 | 7.04 | 1.21 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 5.20 | 0.76 | -0.94 | 1.18 | -0.19 | -10.18 | -66.60 | 0.50 | -0.06 | 0.80 | -5.34 | 143 | 27 | 0.5396 |
| *z*-stat. | 6.45*** | 0.70 | -3.40*** | 1.80 | -0.05 | -5.30*** | -2.67** | 0.44 | -0.03 | 0.40 | -6.82*** | | | |
| VIF | 8.99 | 1.16 | 1.14 | 1.08 | 4.28 | 2.19 | 1.13 | 1.16 | 2.84 | 5.84 | 7.22 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.15 | 0.77 | -0.07 | 1.02 | -4.00 | -6.76 | -46.38 | 1.31 | -1.87 | 1.56 | -43.25 | 141 | 26 | 0.3499 |
| *z*-stat. | 2.18* | 1.07 | -0.58 | 1.73 | -0.95 | -1.98* | -1.96* | 1.53 | -0.82 | 0.70 | -1.63 | | | |
| VIF | 3.32 | 1.27 | 1.11 | 1.08 | 4.16 | 2.13 | 1.13 | 1.18 | 3.26 | 6.24 | 1.21 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.03 | -1.77 | -0.12 | 0.30 | 2.40 | -1.06 | -35.34 | 1.55 | 1.24 | -0.99 | -1.13 | 242 | 39 | 0.3616 |
| *z*-stat. | 3.17** | -1.33 | -0.57 | 0.55 | 2.70** | -0.74 | -2.28* | 2.25* | 0.88 | -0.63 | -2.63** | | | |
| VIF | 4.01 | 1.12 | 1.06 | 1.14 | 2.10 | 1.60 | 1.11 | 1.13 | 2.27 | 2.38 | 4.20 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.47 | -1.01 | 0.01 | 0.23 | 1.69 | -0.83 | -39.51 | 1.68 | 1.00 | -1.88 | -27.95 | 242 | 39 | 0.2829 |
| *z*-stat. | 1.89 | -0.54 | 0.11 | 0.46 | 2.31* | -0.42 | -2.58** | 2.89** | 0.73 | -1.10 | -0.94 | | | |
| VIF | 2.72 | 1.12 | 1.06 | 1.13 | 2.02 | 1.62 | 1.12 | 1.14 | 2.48 | 2.39 | 1.28 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.33 | -1.84 | -0.07 | 0.29 | 2.79 | -2.98 | -33.58 | 1.81 | 0.80 | -0.96 | -1.29 | 244 | 40 | 0.4217 |
| *z*-stat. | 3.35*** | -1.52 | -0.36 | 0.54 | 2.68** | -3.27*** | -2.11* | 2.65** | 0.55 | -0.65 | -2.60** | | | |
| VIF | 4.16 | 1.11 | 1.06 | 1.14 | 2.11 | 1.66 | 1.13 | 1.13 | 2.24 | 2.35 | 3.91 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.87 | -1.45 | 0.07 | 0.27 | 2.52 | -6.31 | -38.21 | 2.26 | 0.33 | -2.03 | -50.97 | 242 | 39 | 0.3935 |
| *z*-stat. | 3.17** | -1.11 | 1.00 | 0.56 | 2.55* | -2.07* | -2.52* | 3.53*** | 0.23 | -1.41 | -2.65** | | | |
| VIF | 2.65 | 1.14 | 1.06 | 1.13 | 2.02 | 1.52 | 1.12 | 1.13 | 2.37 | 2.33 | 1.27 | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by the average of the previous two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditures; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operations, measured by a dummy variable where the value equals to 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals to 1 when a company operates in Germany and 0 otherwise, and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

The current study conducted further logistic analysis of the models without market awareness measures (ADEXP and ADEXPS) since the two measures have the lowest number of observations and highly correlate with international operations measures, as seen in Table 4 and Table 5. Table 9 summarizes the results of eight combinations of models. Numbers of observations range from 365 to 609, and pseudo $R^2$ ranges from 0.2820 to 0.4410. No concerns for multicollinearity arose. In general, the findings identify SIZE, ECONC, and INDQ as predicting U.S. restaurant companies' involuntary cross-listing on the FSE. Large firms and weak economic conditions in the U.S. determine involuntary cross-listing. INDQ appears to be significant when paired with INTOP, while the significance disappears when paired with DIO.

This study conducted logistic regressions of the models without international operation measures (DIO and INTOP) due to few data points for DIO, whose number of observation is 783, and exhibits a positive and significant correlation with ADEXP. However, these combinations resulted in observations of around 240, as seen in Table 10. Pseudo $R^2$ ranges from 0.2265 to 0.3380. No VIF value over 10 appears; therefore, no concerns arise for a multicollinearity problem. The results show that SIZE constantly determines U.S. restaurant companies' involuntary cross-listing. Negative ROS also appears to determine involuntary cross-listing while ROA does not produce any significant results. Results also indicate that weak economic conditions (i.e., negative ECONC) in the U.S. and positive industry growth opportunities (i.e., positive INDQ) tend do provide a positive and significant result with CL.

Table 9. Summary of Logistic Regression Analysis – Without ADEXP(S)

| | SIZE | M2B | LEV | FFLEX | DIO | ROA | ECONC | INDQ | FAST | GERMAN | N of obs. | N of Com. | Pseudo $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 0.81 | 0.17 | -3.39 | 0.16 | 3.02 | -0.31 | -45.22 | 0.50 | 1.86 | -5.54 | 365 | 47 | 0.4246 |
| z-stat. | 2.43* | 1.39 | -2.27* | 0.26 | 0.57 | -1.17 | -2.67** | 0.44 | 1.77 | -1.19 | | | |
| VIF | 2.51 | 1.51 | 1.14 | 1.17 | 6.09 | 1.44 | 1.07 | 1.12 | 1.50 | 6.70 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.92 | 0.10 | -3.62 | 0.14 | 2.68 | -2.74 | -40.63 | 0.80 | 1.77 | -5.09 | 365 | 47 | 0.4410 |
| z-stat. | 2.45* | 0.81 | -1.90 | 0.22 | 0.48 | -1.24 | 2.22* | 0.74 | 1.46 | -1.03 | | | |
| VIF | 2.51 | 1.56 | 1.16 | 1.17 | 6.06 | 1.57 | 1.07 | 1.12 | 1.50 | 6.77 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.77 | 0.04 | -0.31 | -0.23 | 1.11 | -3.05 | -45.21 | 1.23 | 0.15 | -1.40 | 609 | 69 | 0.3627 |
| z-stat. | 4.26*** | 0.62 | -1.05 | -0.60 | 1.52 | -1.34 | -4.43*** | 2.75** | 0.17 | -1.10 | | | |
| VIF | 1.79 | 1.22 | 1.08 | 1.10 | 1.53 | 1.26 | 1.08 | 1.09 | 1.44 | 1.46 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.81 | 0.02 | -0.25 | -0.30 | 1.15 | -2.83 | -48.34 | 1.28 | 0.16 | -1.30 | 609 | 69 | 0.3856 |
| z-stat. | 4.19*** | 0.25 | -0.93 | -0.76 | 1.52 | -2.48* | -4.90*** | 2.94** | 0.18 | -1.07 | | | |
| VIF | 1.69 | 1.25 | 1.08 | 1.11 | 1.54 | 1.18 | 1.07 | 1.09 | 1.44 | 1.47 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **DIO** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.70 | 0.71 | -0.20 | 0.72 | -3.51 | 0.57 | -53.28 | 1.10 | 1.22 | -0.23 | 364 | 49 | 0.3884 |
| z-stat. | 1.65 | 1.18 | -1.12 | 1.48 | -0.75 | 0.07 | -3.15** | 1.30 | 0.85 | -0.08 | | | |
| VIF | 2.71 | 1.08 | 1.07 | 1.14 | 3.49 | 1.37 | 1.07 | 1.08 | 1.56 | 4.42 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **DIO** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.80 | 0.40 | -0.16 | 0.78 | -3.79 | -1.62 | -50.27 | 1.30 | 1.12 | -0.22 | 366 | 50 | 0.4034 |
| z-stat. | 1.80 | 0.39 | -0.91 | 1.43 | -0.97 | -1.75 | -2.80** | 1.52 | 0.67 | -0.08 | | | |
| VIF | 2.79 | 1.05 | 1.07 | 1.14 | 3.33 | 1.38 | 1.07 | 1.08 | 1.57 | 4.27 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.60 | -1.60 | 0.06 | 0.26 | 0.52 | -2.41 | -35.89 | 1.49 | 1.05 | -1.05 | 593 | 72 | 0.2820 |
| z-stat. | 3.67*** | -1.08 | 0.96 | 0.68 | 0.76 | -1.39 | -3.96*** | 4.25*** | 1.31 | -0.85 | | | |
| VIF | 1.90 | 1.03 | 1.07 | 1.10 | 1.58 | 1.25 | 1.06 | 1.07 | 1.44 | 1.61 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **INTOP** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.62 | -1.48 | 0.07 | 0.27 | 0.54 | -2.07 | -34.75 | 1.50 | 1.01 | -1.21 | 595 | 73 | 0.2971 |
| z-stat. | 3.54*** | -0.98 | 1.28 | 0.69 | 0.77 | -1.17 | -3.71*** | 4.26*** | 1.22 | -1.04 | | | |
| VIF | 1.87 | 1.02 | 1.07 | 1.10 | 1.59 | 1.16 | 1.07 | 1.07 | 1.45 | 1.60 | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by the average of the previous two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditure; DIO represents a firm's international operations, measured by foreign sales proportion to total sales; INTOP represents a firm's international operations, measured by a dummy variable where the value equals 1 when a firm operates outside the U.S. and 0 otherwise; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; and GERMAN represents local operation, measured by a dummy variable where the value equals 1 when a company operates in Germany and 0 otherwise.

Table 10. Summary of Logistic Regression Analysis – Without DIO/INTOP

| | SIZE | M2B | LEV | FFLEX | ROA | ECONC | INDQ | FAST | GERMAN | ADEXP | N of obs. | N of Com. | Pseudo $R^2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 0.95 | 0.11 | -0.03 | 0.04 | -1.56 | -26.57 | 1.12 | 1.10 | -2.23 | -0.53 | 235 | 36 | 0.2679 |
| z-stat. | 3.63*** | 1.70 | -0.07 | 0.07 | -0.86 | -1.58 | 1.26 | 0.95 | -1.57 | -1.36 | | | |
| VIF | 3.73 | 1.56 | 1.07 | 1.17 | 2.12 | 1.13 | 1.14 | 1.85 | 2.10 | 4.11 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.71 | 0.13 | 0.05 | 0.05 | -1.50 | -28.41 | 1.19 | 0.98 | -3.13 | -17.03 | 235 | 36 | 0.2549 |
| z-stat. | 3.08** | 1.66 | 0.13 | 0.09 | -0.44 | -1.72 | 1.33 | 1.11 | -2.47* | -1.08 | | | |
| VIF | 2.23 | 1.59 | 1.07 | 1.18 | 2.16 | 1.14 | 1.15 | 1.94 | 2.09 | 1.29 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.28 | 0.03 | 0.21 | 0.10 | -6.07 | -22.25 | 11.51 | 0.33 | -1.70 | -0.53 | 235 | 36 | 0.3367 |
| z-stat. | 3.58*** | 0.54 | 0.85 | 0.19 | -2.11* | -1.16 | 1.84 | 0.25 | -1.26 | -1.14 | | | |
| VIF | 3.63 | 1.52 | 1.08 | 1.17 | 1.84 | 1.12 | 1.13 | 1.82 | 2.15 | 4.03 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.07 | 0.07 | 0.28 | 0.16 | -6.17 | -24.41 | 1.55 | 0.39 | -2.76 | -26.22 | 235 | 36 | 0.3380 |
| z-stat. | 3.50*** | 0.89 | 1.23 | 0.29 | -2.31* | -1.29 | 1.81 | 0.32 | -2.27* | -1.51 | | | |
| VIF | 2.00 | 1.51 | 1.07 | 1.18 | 1.82 | 1.13 | 1.14 | 1.84 | 2.12 | 1.22 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.93 | 0.12 | -0.03 | 0.38 | -1.01 | -32.81 | 1.46 | 1.73 | -1.16 | -0.71 | 244 | 40 | 0.2716 |
| z-stat. | 3.26*** | 0.37 | -0.24 | 0.58 | -0.86 | -2.00* | 1.87 | 0.26 | -0.64 | -1.73 | | | |
| VIF | 3.84 | 1.18 | 1.06 | 1.16 | 1.69 | 1.12 | 1.13 | 2.03 | 2.31 | 4.05 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.55 | 0.25 | 0.02 | 0.28 | -0.94 | -36.39 | 1.51 | 1.38 | -1.71 | -15.27 | 244 | 40 | 0.2265 |
| z-stat. | 2.63** | 0.99 | 0.32 | 0.46 | -0.63 | -2.28* | 2.20* | 1.11 | -1.03 | -0.69 | | | |
| VIF | 2.15 | 1.18 | 1.05 | 1.16 | 1.71 | 1.12 | 1.14 | 2.22 | 2.35 | 1.27 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXP** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 1.15 | 0.05 | 0.01 | 0.45 | -2.48 | -29.42 | 1.63 | 1.45 | -1.22 | -0.80 | 246 | 41 | 0.3206 |
| z-stat. | 3.56*** | 0.13 | 0.06 | 0.71 | -3.37*** | -1.73 | 1.97* | 1.02 | -0.71 | -1.84 | | | |
| VIF | 3.96 | 1.16 | 1.06 | 1.16 | 1.70 | 1.13 | 1.14 | 1.98 | 2.27 | 3.74 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **ADEXPS** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.90 | -0.12 | 0.07 | 0.39 | -5.54 | -31.21 | 1.84 | 0.83 | -1.74 | -28.00 | 244 | 40 | 0.3124 |
| z-stat. | 3.89*** | -0.25 | 1.02 | 0.70 | -0.83 | -0.84 | 2.54* | 0.56 | -1.11 | -1.27 | | | |
| VIF | 2.09 | 1.21 | 1.05 | 1.16 | 1.61 | 1.13 | 1.14 | 2.09 | 2.29 | 1.25 | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by the average of the previous two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditure; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; GERMAN represents local operation, measured by a dummy variable where the value equals 1 when a company operates in Germany and 0 otherwise; and ADEXP (ADEXPS) represents market awareness, measured by annual advertising expenditure (the proportion of annual advertising expenditure to total revenue).

Last, this study conducted logistic analysis excluding both international operations measures (i.e., DIO or INTOP) and market awareness measures (i.e., ADEXP or ADEXPS), the factors that have the lowest number of data points. The number of observation ranges from 595 to 610, pseudo $R^2$ from 0.2681 to 0.3581 with these combinations, as shown in Table 11. No concerns for multicollinearity arose. The results show that positive SIZE and INDQ, and negative ECONC predict U.S. restaurants' probability to be selected for involuntary cross-listing. Other variables that showed significant results with CL in some combinations of models lost the significance when the number of observations reaches approximately 600 and the number of sample companies reaches approximately 70.

A summary of the results of the eleven potential determinants of U.S. restaurant companies' involuntary cross-listing on the FSE appears in Table 12. Of eleven candidates for determinants, the current study found three variables significant: firm size, overall economic conditions in the U.S., and industry growth opportunities. Among the significant determinants, the current study found that firm size and industry growth opportunities positively determine U.S. restaurant companies' involuntary cross-listing as hypothesized. Overall economic conditions in the U.S. reveal the opposite results than originally hypothesized. This study discusses the issue in the section that follows this one.

Table 11. Summary of Logistic Regression Analysis – Without DIO/INTOP & ADEXP(S)

| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Coeff. | 0.80 | 0.06 | -0.24 | -0.18 | -3.17 | -41.37 | 1.19 | 0.64 | -1.29 | 610 | 70 | 0.3371 |
| *z*-stat. | 5.18*** | 1.09 | -0.84 | -0.46 | -0.87 | -4.14*** | 2.54* | 0.78 | -0.92 | | | |
| VIF | 1.53 | 1.24 | 1.07 | 1.11 | 1.28 | 1.08 | 1.10 | 1.27 | 1.46 | | | |
| | **SIZE** | **M2B** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.83 | 0.04 | -0.17 | -0.23 | -2.74 | -43.58 | 1.23 | 0.67 | -1.20 | 610 | 70 | 0.3581 |
| *z*-stat. | 5.16*** | 0.72 | -0.71 | -0.59 | -1.53 | -4.33*** | 2.75** | 0.83 | -0.89 | | | |
| VIF | 1.43 | 1.27 | 1.08 | 1.11 | 1.19 | 1.06 | 1.10 | 1.27 | 1.46 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROA** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.61 | 0.02 | 0.05 | 0.31 | -2.52 | -34.61 | 1.53 | 1.20 | -0.76 | 595 | 73 | 0.2681 |
| *z*-stat. | 3.66*** | 0.03 | 0.82 | 0.79 | -1.43 | -3.61*** | 3.79*** | 1.68 | -0.58 | | | |
| VIF | 1.61 | 1.06 | 1.07 | 1.11 | 1.28 | 1.06 | 1.07 | 1.26 | 1.61 | | | |
| | **SIZE** | **SG** | **LEV** | **FFLEX** | **ROS** | **ECONC** | **INDQ** | **FAST** | **GERMAN** | **N of obs.** | **N of Com.** | **Pseudo $R^2$** |
| Coeff. | 0.62 | 0.03 | 0.06 | 0.32 | -2.16 | -33.54 | 1.53 | 1.17 | -0.94 | 597 | 74 | 0.2818 |
| *z*-stat. | 3.48*** | 0.05 | 1.08 | 0.81 | -1.21 | -3.43*** | 3.94*** | 1.59 | -0.76 | | | |
| VIF | 1.57 | 1.04 | 1.06 | 1.10 | 1.18 | 1.06 | 1.07 | 1.27 | 1.60 | | | |

*, **, and *** represent a significant level of 0.01, 0.05, and 0.001, respectively.

CL represents involuntary cross-listing, measured by a dummy variable where the value equals 1 when cross-listed and 0 otherwise; SIZE refers to a firm's size, measured by logged total revenue; M2B represents market-to-book ratio, measured by the ratio of market capitalization to book value of common shares; SG represents sales growth, measured by the average of the previous two years CPI adjusted sales growth; LEV represents a firm's leverage, measured by debt-to-equity ratio; FFLEX represents a firm's financial flexibility, measured by an index that accounts for high cash and liquid assets, high dividends, and low capital expenditure; ROA(ROS) represents a firm's profitability, measured by return on assets (return on sales); ECONC represents overall economic conditions, measured by changes to disposable personal income; INDQ represents industry growth opportunities, measured by median industry Tobin's q; FAST represents restaurant type, measured by a dummy variable where the value equals 1 when a company is a fast-food restaurant and 0 when a company is a full-service restaurant; and GERMAN represents local operation, measured by a dummy variable where the value equals 1 when a company operates in Germany and 0 otherwise.

Table 12. Summary of Results for Eleven Hypotheses

| | **Hypotheses** | **Proxies** | **Results** | **Hypothesis Support** |
|---|---|---|---|---|
| H1 | Size | Logged total revenue | Positive & Significant | Supported |
| H2 | Growth Opportunities | Market-to-book ratio | Insignificant | Not supported |
| | | Sales growth | Insignificant | Not supported |
| H3 | Leverage | Total debt/Total market value of equity | Insignificant | Not supported |
| H4 | Financial Flexibility | High cash, high dividends, and/or low capital expenditure | Insignificant | Not supported |
| H5 | International Operation | Degree of international operation | Insignificant | Not supported |
| | | International operation dummy | Insignificant | Not supported |
| H6 | Profitability | ROA | Insignificant | Not supported |
| | | ROS | Insignificant | Not supported |
| H7 | Overall U.S. Economic Condition | Changes to disposable personal income in the U.S. | Negative & Significant | Not supported |
| H8 | Industry Growth Opportunities | Median industry Q | Positive & Significant | Supported |
| H9 | Restaurant Type | Fast-food dummy | Insignificant | Not supported |
| H10 | Local Operation | German operation dummy | Insignificant | Not supported |
| H11 | Market Awareness | Advertising expenditure | Insignificant | Not supported |
| | | Advertising expenditure/ Total revenue | Insignificant | Not supported |

The original intent of the current study was an examination of the determinants of U.S. restaurant companies' involuntary cross-listing on the FSE using the Cox proportional hazard model in addition to the logistic regression, since some of previous studies applied the Cox methodology (e.g., Doidge et al., 2009b). The Cox proportional hazard captures the time span prior to an event (Box-Steffensmeier & Stanfill, 2008). In the context of the current study, the Cox model could provide the probability that an involuntary cross-listing will occur at time, *t*, among U.S. restaurant companies given that the companies have no prior cross-listing on the FSE though time *t* - 1.

This study conducted a Cox regression with all 36 combinations as it did for the logistic regression. However, the analyses failed to provide results for about 40% of the models' combinations. Several reasons may explain the discrepancy: First, originally, the Cox model assumes fixed covariates over time (Aalen, Borgan, & Gjessing, 2008). In contrast, the covariates of the current study change over time with few exceptions. Accordingly, this study controlled for the time varying covariates, but obtained results for the 14 missing cases. Second, this study investigates eleven potential determinants and some of the variables have substantial missing data points. As Table 4 shows, for example, ADEXPS (the ratio of advertising expenditure to total revenue) has data points only for 19% of total observations since companies usually do not provide such information. The current study failed to obtain substantial observations for ADEXP (annual advertising expenditure) and DIO (degree of international operations) as well. Obtaining amounts for foreign sales is a common difficulty (e.g., Doidge et al., 2009b; Pagano et al., 2002). Missing data points across different variables and different years generated substantial missing data points, and for that reason, the model includes only

127 observations for the full model both in the logistic regression and the Cox regression. Significant missing data points prohibit the Cox regression from providing reliable results since capturing duration is difficult when significant data points are absent, while logistic regression does not necessarily require provision of consequent data points. Last, observations included in the analysis have sporadic missing data points, which prohibit the Cox regression measure to establish the time period required for cross-listing to occur. For these reasons, the current study concludes that logistic regression is more appropriate for this particular study since the logistic regression does not maintain the assumptions of the Cox proportional hazard models.

## 4.6 Discussion

Results of the logistic regression analyses indicate three determinants for U.S. restaurant companies' involuntary cross-listing on the FSE: large firm size, sluggish overall economic conditions in the U.S., and high industry growth opportunities. The literature identified large firm size as a determinant of voluntary cross-listing since large size firms tend to be better known among the investors than smaller firms (e.g., Doidge et al., 2009a, b; Pagano et al., 2002; Saudagaran, 1988). Visibility among investors is important for a company that seeks listing its shares on overseas stock exchanges, since without recognition of the shares a company would not achieve the purposes of cross-listing while incurring costs of cross-listing. For German financial institutions that select U.S. restaurant companies for involuntary cross-listing, size can have the same influence. Even though a German financial institution lists a U.S. restaurant company's shares on

the FSE, if the stock is not recognized among German investors, the listing agent would not obtain fees generated from transactions, resulting only wasted resources.

High industry growth opportunities also support the hypothesis that German investors perceive U.S. restaurant industry's high growth potential with favor. German investors are more likely to obtain shares in the industry, which has more growth opportunities, since higher profits are expected for such stocks in the long run. If German investors' favorable considerations positively relate to trading volume of stocks, which in turn, directly relates to a German financial institution's income from involuntary cross-listing.

Overall economic conditions in the U.S. appear to be significant, but in a direction opposite to the expected. The finding that involuntary cross-listing occurs during sluggish economic conditions in the U.S. does not support the hypothesis of the current study, but delivers an interesting message. An interview with a director of a main depositary bank in the U.S. indicates that transaction volumes, not necessarily increased during economic upturns, generate depositary banks' fee income. During sluggish economic conditions in the U.S., the U.S. stock market with trading of underlying U.S. restaurant shares becomes volatile, and both U.S. and German investors may buy or sell their shares more frequently. The increased transaction volume generates more income from fees, especially involving shares of a company in an industry with high growth potential.

In summary, German financial institutions would choose U.S. restaurant companies for involuntary cross-listing when a company's size is big, when industry reveals growth opportunities, and when economic condition is not favorable in the U.S.

In other words, industry specific characteristics and external factors such as overall economic conditions in the U.S. are important determinants while size represents company characteristics.

This study contributes to the literature by finding determinants of involuntary cross-listing with a homogeneous sample of U.S. restaurant companies and with a focus on the stock trading venue of the FSE Open Market. Despite the fact that many stock markets have increasingly adopted involuntary cross-listing, previous studies provide little empirical examination. Accordingly, industry specific studies of involuntary cross-listing have had minimal attention, if any, despite the industry's significant role in determining economic consequences for firms (Hou, 2007).

Furthermore, those exceptional studies focused on the U.S. market (e.g., Iliev et al., 2010) while involuntary cross-listing in non-U.S. stock markets has not gained attention. By focusing on U.S. restaurant companies' involuntary cross-listing, the study provides more reliable results about involuntary cross-listing in non-U.S. countries. Especially, the study focuses on the involuntary cross-listing in Germany since an absolute majority of U.S. restaurant companies' involuntarily cross-listed shares appear on the FSE Open Market.

Findings of the current study provide some meaningful managerial implications. First, this study acknowledges the possibility that U.S. restaurant companies' shares are cross-listed on a foreign exchange, even without consent. Direct communications with U.S. cross-listed restaurant companies indicate that only few companies are aware of the possibilities, and none of them acknowledged that their shares have actually been cross-listed and traded on the FSE. Even though involuntary cross-listing may not directly

affect stock performances on the U.S. stock exchanges, the possibility remains that a company might face some issues in regard to their German shareholders of whose existence the company is unaware. As the number of federal securities' class actions against foreign companies listed on U.S. stock exchanges have significantly increased (Lamont & Etzold, 2009), no guarantee exists that such class actions could not occur against U.S. companies involuntarily cross-listed in overseas markets.

Second, the findings provide information to U.S. restaurant companies regarding when and what characteristics of companies are more likely to be selected for involuntary cross-listing by German financial institutions. Size represents firm characteristics while overall economic conditions in the U.S. and industry growth opportunities play significant roles. With this information, the managers of U.S. restaurant companies may better understand the nature of involuntary cross-listing on the FSE Open Market. Visibility matters for involuntary cross-listing, since shares with high visibility are likely to lead increases in transaction volumes, which in turn afford increases in incomes from fees for German financial institutions. External factors such as industry growth opportunities and overall economic conditions in the U.S. also affect German financial institutions decisions for involuntary cross-listing. Restaurant specific factors, restaurant type, seem to be an insignificant for German institutions.

Last, the managers of U.S. restaurant companies may consider voluntary cross-listing as a financial strategy to increase liquidity of their shares, especially when the U.S. market is sluggish. As foreign financial institutions regard increased stock volatility during sluggish U.S. economic activity as an opportunity for generating higher numbers

of transactions, a restaurant company may consider a slow economy as a chance to increase liquidity and expose its securities to foreign investors.

## 4.7 Limitations and Suggestions for Future Studies

The current study finds determinants of involuntary cross-listing that German financial institutions can consider. Accordingly, not only overall economic conditions in the U.S. where the underlying U.S. restaurant shares have listings, but also overall economic conditions in Germany may play a significant role. When overall economic conditions in Germany are sluggish, the German stock market is likely to become volatile, which may increase trading volumes of stocks, including involuntarily cross-listed shares. Therefore, German financial institutions may increase the number of applications for involuntary cross-listing.

In addition, German trading volumes of involuntarily cross-listed shares may affect German financial institutions' decisions to file new applications for cross-listings. When trading volume on the FSE Open Market is low, fee income from involuntary cross-listing for German financial institutions would decrease. This situation may create a motivation for German financial institutions to select more firms to cross-list to compensate for decreased income from fees. Future studies profit from including overall economic conditions in Germany as well as trading volumes on the FSE Open Market.

The current study produced results that focus on U.S. restaurant companies that are involuntarily cross-listed on the FSE Open Market. Considering the industry specific factor, restaurant type, does not appear to be significant, the results of this study may help understanding involuntary cross-listing of U.S. companies in other industries. However,

it is an empirical question, and considering more than 3,000 U.S. companies have cross-listings on the FSE Open Market, with high probability of involuntary cross-listing, it would be worthwhile to investigate whether or not the results of the current study are generalizable for other U.S. companies in other industries.

# CHAPTER 5

# ESSAY II

# LEAD-LAG RELATIONSHIPS OF INVOLUNTARILY CROSS-LISTED U.S. RESTAURANT STOCKS IN GERMANY

## 5.1 Introduction

Random walk theorists argue that stock prices change randomly because information by definition reaches the market randomly; therefore, prices are unpredictable *ex-ante*. Bachelier's "The Theory of Speculation" (1900) is an early advocate for the random walk hypothesis. The Fama (1965, 1970) efficient-markets-hypothesis studies, which argue that financial markets are efficient to exploit available information in setting security prices, served as a theoretical foundation for much subsequent research. Many empirical studies, however, expose limitations of the hypothesis in the real world, especially the assumption that transactions costs (including information acquisition costs) are zero. Systematic stock price correlations among financial markets and among different characteristics of stocks in a market are evident in the literature, indicating that not all markets incorporate new information in a timely manner. For example, stock index futures represent precedents for stock prices (e.g., Harris, 1989; Stoll & Whaley, 1990), and stock markets lead option markets (e.g., Stephen & Whaley, 1990). In a single stock market, the lead-lag effect seems to operate as well. Lo and MacKinlay (1990a), for example, found that returns of large firm portfolios lead those of small firm portfolios in the U.S., consistent with transactions

costs (including information acquisition costs) being lower for large firms than small firms.

Evidence for the lead-lag relationship has also been investigated across stock markets. Hasbrouck (1995) examined the lead-lag effect among multiple stock exchanges in the U.S. and found that stock returns of firms listed on the New York Stock Exchange (NYSE) lead those of firms listed on non-NYSE regional exchanges. Karolyi and Stulz (1996), using American Depositary Receipts (ADRs) backed with Japanese stocks, investigated the factors that affect the daily cross-stock return dynamics between the U.S. stock market and the Japanese stock market. They found that large shocks to national market indices such as Nikkei Stock Average and Standard and Poor's 500 Stock Index give a positive impact on the return relations between ADRs and its underlying Japanese stocks whereas U.S. macroeconomic announcements, shocks to the Yen/Dollar foreign exchange rate and Treasury bill returns did not have any significant impact on the relationship even after controlling for industry. Chang, McQueen, and Pinegar (1999) investigated the cross-autocorrelation between small and large portfolios across six Asian stock exchanges (Hong Kong, Japan, Singapore, South Korea, Taiwan, and Thailand) and the NYSE, and found, in general, no significant relationship. The lead-lag relationship, also called cross-autocorrelation, exists when systematic autocorrelation is present with regard to other categories of stock returns and/or other financial markets.

One argument to explain some stock prices' moving faster than others is that cross-autocorrelation occurs because of measurement error; stock prices are not sampled at the same time, but non-synchronously (e.g., Atchison, Butler, & Simonds, 1987; Dimson, 1979; Lo & MacKinlay, 1990b; Scholes & Williams, 1977). Some stocks trade

more frequently than others; therefore, for example, Stock A's last trade on a day can occur at 3 p.m.; whereas, Stock B's last trade on the same day can occur at 5 p.m. If new information arrives at 4 p.m., the closing price of Stock B reflects the new information; whereas, the price of Stock A will not reflect the information until the next day that trading occurs in this stock.

While supporting the above argument, Chan (1993) explained that the lead-lag effect could occur if market makers adjust smaller firms' stock prices after observing larger firms' past stock price changes. The argument assumes that larger firms produce and disseminate better quality information than smaller firms. The assumption is plausible insofar as larger firms tend to have smaller marginal information costs (Ho & Michaely, 1988). Amount and quality of information disseminated can be different among stock exchanges. For a sample of 107 firms cross-listed on U.K. and/or U.S. exchanges during 1989, Frost and Pownall (1994a) found that firms make more frequent mandatory and voluntary disclosures in the U.S. stock market regardless of their domicile. Frost and Pownall (1994b) examined 110 firms listed in both the U.S. and U.K. during 1988 to 1990, and found that on average the U.S. stock market reacts more quickly to earnings announcements consistent with it being more liquid.

Chan's (1993) theoretical argument and Frost and Pownall's (1994a, b) empirical evidence suggest investigation of the lead-lag relationship of U.S. stocks cross-listed on the Frankfurt Stock Exchange (FSE). Unique characteristics of the FSE are that the exchange provides two different markets for trading shares. The basis for these trading markets is legal requirements to provide information: (1) E.U. Regulated market, where foreign companies voluntarily apply and must provide information in accordance with

strict E.U. regulations, and (2) regulated unofficial market (also called the Open Market), in which foreign listed shares can involuntarily be listed and traded with neither an issuer's consent or knowledge nor obligation to provide information to German investors.

Based on Chan's (1993) argument, this study seeks to empirically investigate the three issues: (1) whether or not stock returns of U.S. underlying shares lead stock returns of involuntarily cross-listed shares on the FSE due to high requirement for information disclosure in the U.S. and minimal requirement for information disclosure in the FSE Open Market; (2) whether or not the lead-lag relationship of U.S. shares involuntarily cross-listed on the FSE Open Market is significantly greater than the relationship of U.S. shares voluntarily cross-listed on the E.U. Regulated FSE based on differences in the level of information provided and distributed in Germany, and (3) whether or not the lead-lag relationship of involuntarily cross-listed U.S. shares with high trading volume in Germany is significantly less delayed than the relationship of those with lower trading volume in Germany based on the liquidity argument.

To ensure that the sample includes companies that are involuntarily listed on the Open Market, U.S. restaurant companies are the choice for the dataset. The U.S. restaurant industry fits the current study's intent well since no U.S. restaurant company, with the exception of McDonald's which delisted its shares from the FSE on April 28, 2005, has listed on the E.U. Regulated market. Afterwards, McDonald's had an involuntary listing on the Open Market. Finding an industry that only cross-listed on the Open Market involuntarily is critical for this study since having voluntarily listed shares in the same industry on the FSE would add noise to discovering the true lead-lag relationship for involuntarily cross-listing cases.

Strategic decisions among companies within the same industry interact since they compete with similar products (Hou, 2007). Also, share prices react similarly to external factors such as market trends and changes in regulations (Hou, 2007). Therefore, if U.S. companies from the same industry cross-list on the FSE both voluntarily and involuntarily, German investors may follow German returns of voluntarily cross-listed U.S. shares from the same industry as well as the underlying shares' returns in the U.S. This study argues that the U.S. restaurant industry is unusual in that the companies have generally chosen not to cross-list. Sarkissian and Schill (2009) documented the waves of cross-listing, by industry, over the last century, from the 1900s to the 2000s, across cross-listings on 33 foreign stock exchanges from 73 home markets. Their summary provided the number of cross-listings among 16 industries: (1) Chemicals, (2) Construction, (3) Consumer Goods and Food, (4) Electronics, (5) Financials, (6) Healthcare, (7) Industrials, (8) Leisure, (9) Mining, (10) Oil and Gas, (11) Paper, (12) Retail and Distributors, (13) Support Services, (14) Telecom and Media, (15) Transport, and (16) Utilities. Although their categories do not follow standard industry classifications such as the Global Industry Classification Standard (GICS), North American Industry Classification System (NAICS), or Standard Industrial Classification (SIC), matches with those benchmarks reveal that companies have cross-listed at least for four decades, as summarized at Table 13. The restaurant industry, sub-categorized in those industry classifications, falls in the Consumer Goods and Food category, but from exhaustive examination, a study of cross-listing for a specific industry is little investigated in the literature. Meanwhile, direct contact with a sample of U.S. restaurant companies revealed that they have not

voluntarily cross-listed in foreign exchanges, and they are usually unaware of their shares' being listed and traded on the FSE.

Empirical examination of the stock return dynamics between U.S. and German stock markets, focusing on the U.S. restaurant industry, is worthwhile since uniqueness of each stock market (e.g., market size, foreign ownership limitation, transaction costs and so forth) plays a role in the dynamic and industry takes an important role in the lead-lag relationship (Hou, 2007). Hou (2007) found the lead-lag relationship exhibits within the same industry stocks, while significant relationship disappears when examining across multiple industries.

Table 13. Number of Cross-Listings by Industry: from the 1900s to 2000s

| Industries | 1900s | 1910s | 1920s | 1930s | 1940s | 1950s | 1960s | 1970s | 1980s | 1990s | 2000s | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chemicals | | | | 2 | | 16 | 17 | 14 | 27 | 52 | 18 | 146 |
| Construction | | | | | | | | 5 | 13 | 52 | 20 | 90 |
| Consumer Goods & Food | 1 | | 1 | 5 | 3 | 9 | 20 | 20 | 64 | 126 | 43 | 292 |
| Electronics | | 1 | 1 | 1 | | 6 | 12 | 40 | 74 | 178 | 117 | 430 |
| Financials | 3 | | | 2 | 3 | 3 | 9 | 38 | 95 | 190 | 89 | 432 |
| Healthcare | | | | | | 4 | 6 | 16 | 35 | 97 | 80 | 238 |
| Industrials | | 1 | 6 | 6 | 2 | 25 | 25 | 39 | 95 | 145 | 47 | 391 |
| Leisure | | | | | | | | 5 | 17 | 23 | 14 | 60 |
| Mining | 1 | 2 | 2 | 3 | 8 | 23 | 13 | 16 | 101 | 124 | 89 | 382 |
| Oil & Gas | 1 | 1 | 7 | 2 | 2 | 10 | 12 | 21 | 65 | 100 | 50 | 271 |
| Paper | | | | | | 3 | 2 | 6 | 12 | 35 | 4 | 62 |
| Retail & Distributors | | | 2 | | | 2 | 4 | 16 | 21 | 47 | 15 | 107 |
| Support Services | | | | | | 1 | 3 | 8 | 27 | 138 | 82 | 259 |
| Telecom & Media | 1 | | | 4 | | 5 | 8 | 7 | 56 | 157 | 82 | 320 |
| Transport | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 20 | 44 | 26 | 106 |
| Utilities | 2 | | 2 | 3 | | 4 | 2 | 2 | 19 | 42 | 20 | 96 |
| Total | 11 | 7 | 22 | 29 | 20 | 114 | 135 | 255 | 741 | 1550 | 797 | 3683 |

This table is adopted from Sarkissian and Schill (2009). This table provides the industry-by-industry frequency distribution of the sample of overseas listings from 1900s to 2000s. Their total sample is comprised of 3,683 overseas listings from 73 home markets placed in 33 host markets.

## 5.2 Literature Review

During the last 30 years, stock return dynamics have been a subject for examination for stocks, which have different characteristics, and among different stock markets. The majority of such studies investigated lead-lag relationships between large stocks and small stocks within a single market, and the most common stock market investigated is the New York Stock Exchange (NYSE). As seen in Table 14, the phenomenon of returns of large stocks leading those of small stocks is common in the markets of many countries, during various sample periods, and over various intervals of daily, weekly, and monthly returns. In addition to size, criteria, such as stocks favored or not by institutional investors (e.g., Badrinath et al., 1995), or stocks owned by foreigners or domestic investors (e.g., Chui & Kwok, 1998), were standards for investigating the lead-lag relationship.

One background argument behind the lead-lag relationship commonly asserts that groups of stocks with high quality information lead other groups of stocks with poor quality information. Some researchers differentiated the information as good news and bad news, and investigated the lead-lag relationship between large size stocks and small size stocks (Marshall & Walker, 2002; McQueen, Pinegar, & Thorley, 1996). The results differed among the nations.

Examination of the lead-lag relationship also considered multiple stock exchanges. Earlier studies investigated stock return dynamics in multiple stock exchanges in the U.S. (e.g., Garbade & Silber, 1979; Hasbrouck, 1995), and later studies extended the investigation to an international context (Karolyi & Stulz, 1996; Chang et al., 1999).

Table 14. Stock Return Lead-lag Relationship Studies

| Authors (Year) | Country | Period | Stock Prices Dynamics |
|---|---|---|---|
| **Stock Price Dynamics in Single Market** | | | |
| Altay (2003) | Germany, Turkey | January 1993 – November 2002 | Monthly returns of large size stocks lead the returns of small size stocks in Germany, and in one of the sub-period in Turkey |
| Bae et al. (2011) | 31 emerging countries | December 1988 – April 2003 | Weekly returns of stocks with large access of foreign investment lead returns of stocks with no foreign investment |
| Badrinath et al. (1995) | U.S. | 1981 - 1988 | Monthly returns on institutionally favored stocks lead returns on stocks not favored by institutional investors. |
| Chan (1993) | U.S. | 1980 - 1989 | Daily returns of large firms lead those of small firms |
| Chang et al. (1999) | Hong Kong, Japan, Singapore, South Korea, Taiwan, Thailand, U.S. | 1976 (or 1978) - 1995 | Monthly returns of large size stocks lead the returns of small size stocks in all six Asian exchanges and the NYSE |
| Chui & Kwok (1998) | China | 1993 - 1996 | Daily returns for foreigner owned stocks lead those Chinese owned stocks |
| Kanas & Kauretas (2005) | U.K. | 1955 - 2000 | Monthly returns for a portfolio of large stocks lead returns for a portfolio of small stocks |
| Lo & MacKinlay (1990a) | U.S. | July 1962 – December 1987 | Weekly returns for a portfolio of large stocks lead returns for a portfolio of small stocks |
| Marshall & Walker (2002) | Chile | 1991 - 1998 | Large cap portfolios react to both good and bad news sooner than the small cap portfolios do |
| McQueen et al. (1996) | U.S. | 1963 - 1994 | Small and large cap portfolios' reactions to bad news are fast, but the reactions of small cap portfolios to good news are slower |
| Ratner & Leal (2003) | Brazil | 1986 - 1999 | Large stock portfolio returns lead small stock portfolio returns, but the lagged response of small stock portfolio returns diminish following financial liberalization |
| Tang (2011) | China | March 1992 – February 2001 | Price differences between shares owned by domestic investors and foreign investors are higher in firms with higher information disclosure disparity. |

Table 14 (continued)

| **Stock Price Dynamics in Multiple Markets** | | | |
|---|---|---|---|
| Chang et al. (1999) | Hong Kong, Japan, Singapore, South Korea, Taiwan, Thailand, U.S. | 1976 (or 1978) - 1995 | Found only in one case: monthly returns of large size Japanese stocks lead those of small size Thailand stocks |
| Frost & Pownall (1994b) | U.S. and U.K. | 1988 – 1990 | Stock price response to earnings disclosure is significantly greater in the U.S. than in the U.K. |
| Garbade & Silber (1979) | U.S. (NYSE, Midwest Stock Exchange, and Pacific Stock Exchange) | August 1973 – September 1975 | Transactions prices on regional exchanges contain information relevant for NYSE traders. |
| Hasbrouck (1995) | U.S. (NYSE and regional stock exchanges) | August 1993 – October 1993 | Daily return of stocks on NYSE lead those on other regional stock exchanges in the U.S. |
| Karolyi & Stulz (1996) | U.S. and Japan (NYSE-traded ADRs) | 1988 - 1992 | Large shocks to broad-based market indices positively impact the daily return correlations |

## 5.3 The Frankfurt Stock Exchange and its Market Structure

The Frankfurt Stock Exchange (FSE), especially the Open Market, has served as one of the main overseas trading venues for many U.S. companies. Uniquely, many of the cross-listings were not initiated by the U.S. companies involved, but by third party financial institutions such as German banks and brokerage firms. Such involuntary cross-listing became possible when the FSE started the Open Market (formerly known as Freiverkehr before October 10, 2005) in order to attract more international shares. The Open Market is a regulated, unofficial market and does not impose high levels of regulations similar to those required of firms listed on its official markets (i.e., Prime Standard and General Standard stocks).

The FSE has four levels of standards between two markets: Prime Standard and General Standard in the E.U. Regulated Market, and Entry Standard and Open Market (First and Second Quotation Boards) for the regulated unofficial market. A summary of the details of the different requirements for each level of standards appear in Figure 1.

The FSE significantly reduced the level of regulations and procedural requirements for Open Market shares to the extent that listing is possible even without the consent or knowledge of underlying foreign companies so long as those companies are listed on an overseas stock exchange. Also, no requirement exists for further information disclosure for the listed companies. Accordingly, German investors have limited access to information of the Open Market cross-listed companies. Company news or analysts' coverage information often remains absent on the official FSE website for those companies, while transaction-related information (e.g., price and/or trading volume in Germany) is available. Due to the low level of investor protection caused by low levels of information disclosure requirements, the FSE designed their website such that without clicking the "I agree" button, indicating the person has read and accepted warnings of riskiness in investing the stock, information about a listed company on the Open Market would not be available. Information on Prime Standard and General Standard stocks are readily available without such warnings or the clicking step. The notice that appears on the FSE website when attempting to view information of the Open Market listed shares is:

> The following information is exclusively addressed to qualified investors, who are able to thoroughly evaluate and accept potential risks related to an investment in shares issued by this organization. The following

information provided by the issuer does neither present an offer to sell nor an invitation to buy or subscribe for shares of this organization.

The shares of the organizations are neither admitted to trading on the Regulated Market nor included in trading on the Regulated Market. They are included in trading in the Entry Standard segment on the Open Market (Unofficial Regulated Market) of FWB Frankfurter Wertpaperborse (the Frankfurt Stock Exchange). Investors must be aware of the fact that this part of the Unofficial Regulated Market on the Frankfurt Stock is not subject to the high Europe-wide transparency standards and strict provisions for investor protection on organized markets.
Copying and forwarding information from the following web pages is not permitted.

Upon clicking on the "I agree" button below, and thus confirming that you have read and accepted the above-mentioned warning, you will be directed to the requested content.

Due to the differences in nature of the Open Market shares, previous researchers often excluded shares listed on the Open Market in their analyses (e.g., Gozzi, Levine & Schmukler, 2008).

Figure 1. Transparency Level for Investors and Companies on the FSE


1) WpHG, the German Securities Trading Act, 2) WpÜG, the Securities Acquisition and Takeover Act
3) WpPG, the German Securities Prospectus Act
4) For non-EU companies with prospectus IFRS, US GAAP, Japanese GAAP or Canadian GAAP

Source: Deutsche Bourse official website at
http://deutsche-boerse.com/dbag/dispatch/en/kir/gdb_navigation/lc/100_Market_Structure/10_transparency_standards

## 5.4 Hypotheses Development

Chan (1993) explained the lead-lag relations in two ways. First, he supported the argument that the relationship occurs due to non-synchronous trading (e.g., Atchison, Butler, & Simonds, 1987; Dimson, 1979; Lo & MacKinlay, 1990b; Scholes & Williams, 1977). Prices of high liquidity stocks tend to adjust to information more quickly than prices of low liquidity stocks. Second, markets focus on the shares that provide better quality information and use prices as a reference. Better quality information has application for many cases including more frequent disclosures (Frost & Pownall, 1994a), shares owned by foreigners (e.g., Chui & Kwok, 1998; Tang, 2011) and shares favored by institutional investors (e.g., Badrinath et al., 1995). The current study seeks to extend the context to U.S. shares involuntarily cross-listed in Germany where better quality information of the U.S. restaurant companies are found in the U.S. rather than Germany.

The investigation of the lead-lag relationship incorporates three aspects. First, the U.S. firms arguably disclose more and better quality information in the U.S. than in Germany; therefore, stock returns in the U.S. are expected to lead those in Germany. The involuntarily cross-listed U.S. shares in Germany have an obligation to provide information regularly to U.S. investors through filings with the Securities and Exchange Commission (SEC). In addition, domestic investors apparently have an information advantage over foreign investors (e.g., Grinblatt & Keloharju, 2001; Sjoo & Zhang, 2000). Meanwhile, involuntarily cross-listed shares do not have such an obligation in Germany.

On the other hand, information diffusion from Germany to the U.S. is possible since the hours of operation of the FSE precede the hours of operation of the U.S. major

stock exchanges by six hours with two hours of overlap. For that reason, when world market information arrives at the FSE prior to the U.S. markets' opening, the returns on the FSE can precede those on U.S. exchanges. Also, if a majority of German investors are institutional investors who have the capacity to access and analyze the information submitted to U.S. regulatory agencies (e.g., SEC) and media, stock returns in the U.S. may not necessarily lead those in Germany.

The extent to which world information affects stock prices of cross-listed U.S. shares and its frequency, however, can be sporadic and minimal, and German institutional investors' capabilities and intentions to search for necessary information for those involuntarily cross-listed shares can be negligible. Meanwhile, U.S. companies have the legally mandated obligation to provide regularly high levels of information to investors; therefore, the quality and amount of information is guaranteed in the U.S. market. For these reasons, the first hypothesis is:

H1: Stock returns of U.S. restaurants' underlying shares listed on the U.S. exchanges lead stock returns of their shares involuntarily cross-listed in Germany.

Since the FSE operates two kinds of markets depending on the level of requirements, the cross-listed shares can be categorized into two groups: voluntarily listed shares in the E.U. Regulated Market or the unofficial Open Market, and involuntarily listed shares in the Open Market. Being cross-listed on the Open Market, those U.S. companies are not obliged to provide information to German investors. Even at the time of application for Open Market listing, a third party financial institution can

list a stock without consent or acknowledgement of the issuing firm. Accordingly, information provided to German investors is basic company information such as name of company, address, and name of the listing stock market. In contrast, other U.S. companies that have voluntarily cross-listed on the E.U. Regulated Market are required to provide information specifically suited for the German market. Accordingly, quality of information in the U.S. is not necessarily better than that in the Germany. Therefore, stock returns of underlying shares listed in the U.S. do not necessarily lead those of voluntarily cross-listed shares in Germany.[1] Technically, it is possible to voluntarily cross-list on the FSE Open Market, and in that case the issuer may disclose higher level of information than involuntarily cross-listed firms. The current study excludes such cases.

In summary, the lead-lag relationship is expected to exist among the involuntarily cross-listed shares on the FSE Open Market whereas the relationship is not necessarily expected to exist among the voluntarily cross-listed shares on E.U. Regulated Market. With this logic, examination of the differences in the lead-lag relationship between the involuntarily cross-listed group and the voluntarily cross-listed group leads to the second hypothesis:

H2: The lead-lag relationship of U.S. restaurants' shares involuntarily cross-listed on the FSE Open Market is significantly greater than the lead-lag relationship of U.S. shares voluntarily cross-listed on the E.U. Regulated Market on the FSE.

[1] This assumes that foreign firms are diligent about following the rules and/or that market regulators are diligent in pursuing violators. Frost & Pownall (1994a) find that many cross-listed firms violated such disclosure requirements in both the U.S. and U.K. markets during 1989, and that regulators rarely disciplined violators. While this study examines a more recent period, a similar situation might still prevail on the Regulated FSE markets.

Another argument suggests that differences in trading volume represents one of the reasons cross-autocorrelation occurs (e.g., Atchison, Butler, & Simonds, 1987; Dimson, 1979; Lo & MacKinlay, 1990b; Scholes & Williams, 1977). Frequently traded shares are more likely to incorporate new information into share prices than less frequently traded shares. Therefore, the lead-lag relationship is expected to be present among the involuntarily cross-listed U.S. shares with high trading volume in Germany. However, such relationship may not be present in the short run among those with sporadic trading volume in Germany. With this logic, examination of the differences in the lead-lag relationship between the high German trading volume group and low German trading volume group leads to the third hypothesis:

H3: German returns tend to be more delayed relative to U.S. returns among the Open Market cross-listed U.S. restaurants' shares with low trading volume in Germany than those with high trading volume in Germany.

## 5.5 Methodology

### 5.5.1 Data

This study focuses on U.S. restaurant companies that have cross-listings on the FSE in addition to their U.S. listings. Examinations include (1) the stock return lead-lag relationship among restaurant companies' underlying shares in the U.S. and their involuntarily cross-listed shares in Germany, (2) differences in the lead-lag relationship between shares cross-listed in E.U. Regulated Market (i.e., Prime Standard and General Standard) and the Open Market (i.e., Second Quotation Board), and (3) differences of the

lead-lag relationship between involuntarily cross-listed companies with higher trading volumes and lower trading volumes in Germany for U.S. restaurant companies. The FSE website provides categories for stocks listed in the E.U. Regulated Market and those in the unofficial Open Market. Verification of domicile of the firms on the list uses Capital IQ for cross-checking. Capital IQ also allows obtaining daily stock returns and trading volumes for the stocks cross-listed in both German and U.S. markets. All returns' denominations are Euros for German listed shares and U.S. dollars for the underlying shares listed in the U.S. The stock return lead-lag relationship will be examined for each company and varying sample periods for each company. The ending date is June 30, 2011, the last day with maximum data availability at the time of analysis.

Since U.S. restaurant firms largely chose not to cross-list on foreign stock exchanges, the industry is chosen to represent involuntary cross-listing. The involuntary nature was checked by examining Forms 10-K filed with the SEC and via direct contact with the companies. While U.S. restaurant companies largely chose not to list their shares in overseas stock exchanges, one exception was McDonald's. However, the company's manager in investor relations confirmed that McDonald's delisted its shares on overseas markets during 1999 to 2009, and has not cross-listed in any overseas exchanges afterwards. The company voluntarily listed their shares in 1982 on the FSE and delisted on April 28, 2005, from that exchange. A German market-maker immediately listed McDonald's shares on the unofficial Open Market on the following day. The FSE confirmed that since April 29, 2005, McDonald's shares have traded on the Open Market.

Meanwhile, shares of U.S. restaurant companies began appearing on the FSE in 1999 and the trend is upward; 7 of 21currently traded companies first appeared on the FSE in 2010. Except the one case of McDonald's, all U.S. restaurant shares have or had their shares involuntarily listed and traded on the Open Market.

An initial data collection for cross-listed shares under the Regulated Market used the FSE's official website http://www.boerse-frankfurt.de. A search tool on the website produces a list of equities with various search characteristics including market segment, transparency level, and region/country. Setting Prime Standard for transparency level and the U.S.A. for region/country, identified only one company; General Standard and U.S.A. categories rendered eight companies. Cross-checking the companies with Capital IQ for their listings on the FSE and domicile in the U.S.A identified three of the eight to be domiciled outside the U.S.A.; therefore the study excluded those three from the sample. Subsequently, the study finalized six companies as members of the E.U. Regulated securities group.

The current study conducted the second round of data collection for delisted U.S. companies cross-listed on the FSE utilizing the same official website of the FSE. This study checked each delisted company with their country of domicile, market segment, and transparency level. However, cross-checking with Capital IQ exhibited that only one U.S. company, Burger King Holdings, Inc., has stock price information available. Capital IQ confirmed that the reason for missing information for delisted company is that the stock market, the FSE, only provides financial information such as stock prices and trading volume of the companies that currently trade in that market. Burger King Holdings, Inc. is an exceptional case that Capital IQ provides since the company delisted

from the exchange relatively recently in 2010. Therefore, the current study does not include delisted U.S. companies from the FSE.

Data collection for involuntarily cross-listed shares used Capital IQ and its screening tool, which identified 26 U.S. headquartered full-service and fast-food restaurants that had or have listings on both one U.S. exchange and the FSE. Verification of availability of historical data specifically, stock prices and trading volumes in Germany, identified five companies (CKE Restaurants, Inc., Eat at Joes Ltd., OSI Restaurant Partners, LLC., Pacific Restaurant Holdings, Inc., and Spicy Pickle Franchising, Inc.) with unavailable data, and therefore, this study excluded those companies from the sample. This study excluded one more company, Burger King Holdings, Inc., since the company is no longer traded on FSE as its underlying shares delisted its shares from NYSE in 2010. Twenty homogeneous companies remained for the dataset for analyzing involuntarily cross-listed shares. The companies that voluntarily and involuntarily cross-listed on the FSE are listed in Table 15.

Table 15. U.S. Restaurant Companies Cross-listed on the FSE

| Company | Ticker in the U.S. (Exchange) | Ticker on FSE | First Trade day on FSE |
|---|---|---|---|
| **Voluntarily Cross-listed Companies (Prime Standard)** | | | |
| Rofin-Sinar Technologies Inc. | RSTI (NASDAQ) | RSI | 06/13/1997 |
| **Voluntarily Cross-listed Companies (General Standard)** | | | |
| El DuPont Nemours & Co. | DD (NYSE) | DUP | 01/02/1992 |
| Caterpillar Inc. | CAT (NYSE) | CAT1 | 02/16/1999 |
| Dow Chemical Corp. | DOW (NYSE) | DCH1 | 05/24/1999 |
| Archer Daniels Midland Company | ADM (NYSE) | ADM | 07/21/1999 |
| The Central European Russia Fund Inc. | CEE (NYSE) | EEE | 01/24/2007 |
| **Involuntarily Cross-listed Restaurant Companies (Open Market)** | | | |
| Papa John's International Inc. | PZZA (NASDAQ) | PP1 | 08/11/1999 |
| Brinker International Inc. | EAT (NYSE) | BKJ | 11/09/1999 |
| Jack in the Box Inc. | JACK (NASDAQ) | JBX | 05/12/2000 |
| P.F. Chang's China Bistro Inc. | PFCB (NASDAQ) | PF2 | 05/21/2004 |
| Domino's Pizza Inc. | DPZ (NYSE) | EZV | 07/14/2004 |
| McDonald's Corp. | MCD (NYSE) | MDO | 04/29/2005 |
| Kona Grill Inc. | KONA (NASDAQ) | K5G | 08/17/2005 |
| Chipotle Mexican Grill Inc. | CMG (NYSE) | C9F | 01/26/2006 |
| Morton's Restaurant Group Inc. | MRT (NYSE) | M8G | 02/09/2006 |
| Nathan's Famous Inc. | NATH (NASDAQ) | NFA | 10/30/2006 |
| Cracker Barrel Old Country Store Inc. | CBRL (NASDAQ) | OLD | 12/12/2006 |
| Yum! Brands Inc. | YUM (NYSE) | TGR | 01/08/2007 |
| The Wendy's Company | WEN (NYSE) | TQK | 03/03/2010 |
| Ruby Tuesday Inc. | RT (NYSE) | RYW | 06/01/2010 |
| Darden Restaurants Inc. | DRI (NYSE) | DDN | 08/11/2010 |
| Denny's Corporation | DENN (NASDAQ) | DE8 | 08/11/2010 |
| The Cheesecake Factory Inc. | CAKE (NASDAQ) | CF2 | 08/11/2010 |
| Buffalo Wild Wings Inc. | BWLD (NASDAQ) | BWW | 09/28/2010 |
| Bravo Brio Restaurant Group Inc. | BBRG (NASDAQ) | IZA | 11/02/2010 |
| Texas Roadhouse Inc. | TXRH (NASDAQ) | ROW | 12/14/2010 |

### 5.5.2 Models

To examine the lead-lag relationship for U.S. restaurant companies involuntarily cross-listed on the FSE Open Market, the current study applies a vector autoregression (VAR) model. Sims (1980) developed the model by extending univariate autoregression, a single time series model, capturing current value of a variable based on its own lagged values. In contrast, a VAR consists of multiple time series, which explain multiple variables' own lagged values and the lagged values of all other variables included in the model (Stock & Watson, 2007). Accordingly, a VAR model allows researchers to examine cross-autocorrelations after controlling for autocorrelations (Chordia & Swaminathan, 2000), which have been found to affect stock returns (e.g., Chordia & Swaminathan, 2000; Fargher & Weigand, 1998; Hameed, 1997; Roll, 1984). The current study applies Granger (1969) causality regressions developed by Brennan, Jegadeesh, and Swaminathan (1993) to examine H1 since that test allows comparison of the predictability of the lead-lag relationship between stock returns in Germany and U.S. (i.e., whether or not U.S. returns predict German returns better than the reverse). Time series A is said to Granger-cause another time series B when lagged values of A forecast future values of B.

The model developed for testing H1 is:

$$r_{G,t} = a_0 + \sum_{k=1}^{K} a_k r_{G,t-k} + \sum_{k=1}^{K} b_k r_{US,t-k} + u_{t,} \quad (1)$$

$$r_{US,t} = c_0 + \sum_{k=1}^{K} c_k r_{G,t-k} + \sum_{k=1}^{K} d_k r_{US,t-k} + v_t. \quad (2)$$

where $r_{G,t}$ and $r_{G,t-k}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed in Germany; $r_{US,t}$ and $r_{US,t-k}$ are the contemporaneous and lagged stock returns of underlying stocks in the U.S., and $u_{t,}$ and $v_t$ are error terms at time, *t*. Calculation of the sum of coefficients for the lagged returns provides more stringent results than estimating each corresponding coefficients for each lag (Chordia & Swaminathan, 2000; Hou, 2007).

The current study examines the lead-lag relationship using daily, weekly, and monthly returns of underlying U.S. shares and their cross-listed shares in Germany. Multiple lags allow researchers to find time-series dependency in returns beyond one lag. Although multiple lags might add noise to estimations, this methodology produces more reliable results because trading frequency and trading volume in Germany vary considerably among U.S. restaurant shares cross-listed in Germany. Following Chordia and Swaminathan (2000), estimates use daily returns with five lags. Following Chiao, Hung, and Lee (2004), weekly returns' estimates use three lags, and monthly returns' estimates use one lag. The current study tests H1 by investigating if the sum, $\sum_{k=1}^{k} b_k$, in Equation (1) is greater than the sum, $\sum_{k=1}^{k} c_k$ , in Equation (2). The comparison is between a portfolio of returns in Germany and a portfolio of the underlying shares in the U.S. The current study uses equally weighted returns since lagged returns of large firms tend to be noisier; therefore, lagged returns of small firms may exhibit stronger lead-lag relationships (Hou, 2007). Accordingly, using size-weighted returns may underestimate the true lead-lag relationship between German returns and the underlying U.S. returns.

The model developed for testing H2 is:

$$r_{G,t}^{O} = a_0 + \sum_{k=1}^{K} a_k r_{G,t-k}^{O} + \sum_{k=1}^{K} b_k r_{US,t-k}^{O} + \sum_{k=1}^{K} c_k r_{G,t-k}^{E} + \sum_{k=1}^{K} d_k r_{US,t-k}^{E} + u_{t,} \quad (3)$$

$$r_{US,t}^{O} = e_0 + \sum_{k=1}^{K} e_k r_{G,t-k}^{O} + \sum_{k=1}^{K} f_k r_{US,t-k}^{O} + \sum_{k=1}^{K} g_k r_{G,t-k}^{E} + \sum_{k=1}^{K} h_k r_{US,t-k}^{E} + v_{t,} \quad (4)$$

$$r_{G,t}^{E} = j_0 + \sum_{k=1}^{K} j_k r_{G,t-k}^{O} + \sum_{k=1}^{K} k_k r_{US,t-k}^{O} + \sum_{k=1}^{K} l_k r_{G,t-k}^{E} + \sum_{k=1}^{K} m_k r_{US,t-k}^{E} + w_{t,} \quad (5)$$

$$r_{US,t}^{E} = n_0 + \sum_{k=1}^{K} n_k r_{G,t-k}^{O} + \sum_{k=1}^{K} o_k r_{US,t-k}^{O} + \sum_{k=1}^{K} p_k r_{G,t-k}^{E} + \sum_{k=1}^{K} q_k r_{US,t-k}^{E} + z_t \quad (6)$$

where $r_{G,t}^{O}$ and $r_{G,t-k}^{O}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed on the Open Market in Germany; $r_{US,t}^{O}$ and $r_{US,t-k}^{O}$ are the contemporaneous and lagged stock returns of underlying stocks in the U.S. of those cross-listed on the Open Market in Germany; $r_{G,t}^{E}$ and $r_{G,t-k}^{E}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed on the E.U. regulated market in Germany; $r_{US,t}^{E}$ and $r_{US,t-k}^{E}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed on the E.U. regulated market in Germany; and $u_t$, $v_t$, $w_t$ and $z_t$ are error terms at time, *t*.

The current study compares the lead-lag relationship between the Open Market listed group and the E.U. Regulated Market listed group. This study does not assume a cross-group lead-lag relationship. For example, the expectation is that the U.S. lagged stock returns of the Open Market listed group affect the contemporaneous German stock returns of the same group, while not assuming an effect on contemporaneous German stock returns of the E.U. Regulated market. Therefore, the coefficients of lagged stock returns of the other group have a 0 constraint (i.e., $c_k$, $d_k$, $g_k$, $h_k$, $j_k$, $k_k$, $n_k$ and $o_k$). The current study tests H2 by examining if the sum of the coefficients, $\sum_{k=1}^{k} b_k$, in

Equation (3) is greater than the sum of the coefficients, $\sum_{k=1}^{k} m_k$, in Equation (5). The examination of the lead-lag relationship is daily, weekly, and monthly with lags of 5, 3, and 1 as specified for H1, and the comparison occurs for each case.

The model developed for testing H3 is:

$$r_{G,t}^{H} = a_0 + \sum_{k=1}^{K} a_k r_{G,t-k}^{H} + \sum_{k=1}^{K} b_k r_{US,t-k}^{H} + \sum_{k=1}^{K} c_k r_{G,t-k}^{L} + \sum_{k=1}^{K} d_k r_{US,t-k}^{L} + u_{t,} \quad (7)$$

$$r_{US,t}^{H} = e_0 + \sum_{k=1}^{K} e_k r_{G,t-k}^{H} + \sum_{k=1}^{K} f_k r_{US,t-k}^{H} + \sum_{k=1}^{K} g_k r_{G,t-k}^{L} + \sum_{k=1}^{K} h_k r_{US,t-k}^{L} + v_{t,} \quad (8)$$

$$r_{G,t}^{L} = j_0 + \sum_{k=1}^{K} j_k r_{G,t-k}^{H} + \sum_{k=1}^{K} k_k r_{US,t-k}^{H} + \sum_{k=1}^{K} l_k r_{G,t-k}^{L} + \sum_{k=1}^{K} m_k r_{US,t-k}^{L} + w_{t,} \quad (9)$$

$$r_{US,t}^{L} = n_0 + \sum_{k=1}^{K} n_k r_{G,t-k}^{H} + \sum_{k=1}^{K} o_k r_{US,t-k}^{H} + \sum_{k=1}^{K} p_k r_{G,t-k}^{L} + \sum_{k=1}^{K} q_k r_{US,t-k}^{L} + z_t \quad (10)$$

where $r_{G,t}^{H}$ and $r_{G,t-k}^{H}$ are the contemporaneous and lagged stock returns for high trading volume, U.S. restaurant stocks cross-listed on the Open Market in Germany; $r_{US,t}^{H}$ and $r_{US,t-k}^{H}$ are the contemporaneous and lagged stock returns of underlying stocks in the U.S. of those high trading volume cross-listed stocks on the Open Market in Germany; $r_{G,t}^{L}$ and $r_{G,t-k}^{L}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed on the Open Market in Germany and having low trading volumes; $r_{US,t}^{L}$ and $r_{US,t-k}^{L}$ are the contemporaneous and lagged stock returns for U.S. restaurant stocks cross-listed on the Open Market in Germany and having low trading volumes; and $u_t$, $v_t$, $w_t$ and $z_t$ are error terms at time, *t*.

The current study compares the lead-lag relationship between the high trading volume group and low trading volume group of Open Market in Germany, of cross-listed U.S. restaurant companies' stocks. This study does not assume a cross-group lead-lag relationship. For example, the expectation is that U.S. lagged stock returns of the high

trading volume group affect the contemporaneous German stock returns of the same group, while assuming no effect on contemporaneous German stock returns with low trading volume. Therefore, the coefficients of lagged stock returns of the other group is constrained to zero (i.e., $c_k,\ d_k,\ g_k,\ h_k,\ j_k,\ k_k,\ n_k$ and $o_k$). The current study tests H3 by examining if the sum of the coefficients, $\sum_{k=1}^{k} b_k$, in Equation (7) is greater than the sum of the coefficients, $\sum_{k=1}^{k} m_k$, in Equation (9). As for H2, examination of the lead-lag relationship is made daily, weekly, and monthly with lags of 5, 3, and 1, respectively.

## 5.6 Results

### 5.6.1 Descriptive Statistics

Table 16 provides a descriptive summary of the data. The Open Market portfolios are to examine H1. The German portfolio (GMO) from the Open Market portfolio is of equally weighted stock returns of U.S. restaurant companies cross-listed on the Open Market, and the U.S. portfolio (USO) from the Open Market portfolio is of equally weighted stock returns of the underlying shares in the U.S. Each of the pairs has three subsets of portfolios for daily, weekly, and monthly stock returns.

To examine H2, the current study generated E.U. Regulated Market portfolios with equally weighed returns. This study compares the lead-lag relationship of the Open Market portfolios to the E.U. Regulated Market portfolios for each subset of daily, weekly, and monthly stock returns.

The Open Market portfolio, subcategorized by trading volume in Germany, examines H3. Examination of trading volume of cross-listed U.S. restaurant companies clearly dichotomize two extremes: a high trading volume group with annual German

trading volumes greater than 50,000 shares, on average, and low trading volume group with annual German trading volumes of less than 50,000 shares, on average. German trading frequency for each group shows clear differences between the groups. The high trading volume group appeared to trade on more than 200 business days in Germany, on average; whereas, low trading volume group exhibited a frequency of less than 100 business days of trading, on average. The high trading volume group includes two companies, McDonald's and Yum! Brands, and low trading volume group includes the remaining eighteen companies.

CKE Restaurant, Inc. is the first U.S. restaurant company to appear involuntarily on the Open Market. However, data was not available for the company; therefore, the current study excluded the company from the sample. Papa John's International is the second U.S. restaurant company to appear involuntarily on the Open Market, and data was available; therefore, calculation of stock returns begins after the first trading day, August 11, 1999, and the number of observations for daily stock returns is approximately 2,900 for the years 1999 to 2011. Although U.S. companies began cross-listing in 1992 (El DuPont Nemours & Co.), calculation of stock returns from the E.U. Regulated Market began on August 11, 1999, as well, to control for any year's confounding effect. The number of observations of the German portfolio with high trading volume on the Open Market is 1,488, since McDonald's shares began trading involuntarily on the Open Market on April 29, 2005, after the company delisted its stock from the FSE on April 28, 2005.

Table 16. Summary of Descriptive Statistics

| Interval | Portfolios | No. of obs. | Mean return | S.D. of return | Min. | Max |
|---|---|---|---|---|---|---|
| H1: Portfolios on the Open Market (German portfolio = GMO; US portfolio = USO) | | | | | | |
| Daily | GMO | 2867 | 0.0001 | 0.0248 | -1.0000 | 0.1224 |
| | USO | 2866 | -0.0001 | 0.0365 | -1.0000 | 0.1207 |
| Weekly | GMO | 604 | 0.0021 | 0.0371 | -0.1984 | 0.2258 |
| | USO | 604 | 0.0026 | 0.0366 | -0.1704 | 0.1903 |
| Monthly | GMO | 135 | 0.0087 | 0.0734 | -0.1681 | 0.2932 |
| | USO | 135 | 0.0120 | 0.0737 | -0.2260 | 0.3700 |
| H1 & H2: Portfolios on the E.U. Regulated Market (German portfolio = GME; US portfolio = USE) | | | | | | |
| Daily | GME | 2881 | 0.0005 | 0.0168 | -0.1057 | 0.1176 |
| | USE | 2881 | 0.0006 | 0.0174 | -0.1116 | 0.1601 |
| Weekly | GME | 601 | 0.0025 | 0.0362 | -0.1597 | 0.1534 |
| | USE | 601 | 0.0028 | 0.0345 | -0.1848 | 0.1298 |
| Monthly | GME | 133 | 0.0097 | 0.0748 | -0.1857 | 0.3233 |
| | USE | 133 | 0.0144 | 0.0748 | -0.2385 | 0.3173 |
| H3: Portfolios on the Open Market Categorized by Trading Volume (German portfolio with high trading volume = GMH; GMH corresponding US portfolios: USH; German portfolio with low trading volume = GML; GML corresponding US portfolios) | | | | | | |
| Daily | GMH | 1488 | 0.0000 | 0.0310 | -1.0000 | 0.1228 |
| | GML | 2867 | 0.0001 | 0.0253 | -1.0000 | 0.1224 |
| | USH | 1486 | -0.0012 | 0.0475 | -1.0000 | 0.1043 |
| | USL | 2866 | -0.0004 | 0.0368 | -1.0000 | 0.1207 |
| Weekly | GMH | 314 | 0.0027 | 0.0334 | -0.3016 | 0.1378 |
| | GML | 604 | 0.0021 | 0.0388 | -0.1984 | 0.2258 |
| | USH | 314 | 0.0036 | 0.0288 | -0.1559 | 0.0867 |
| | USL | 604 | 0.0024 | 0.0386 | -0.1917 | 0.1903 |
| Monthly | GMH | 71 | 0.0110 | 0.0643 | -0.2863 | 0.1314 |
| | GML | 135 | 0.0084 | 0.0782 | -0.1973 | 0.2932 |
| | USH | 71 | 0.0176 | 0.0540 | -0.1066 | 0.1436 |
| | USL | 135 | 0.0115 | 0.0784 | -0.2571 | 0.0037 |

### 5.6.2 Main Findings

Panel A in Table 17 presents the VAR estimation results for daily returns for H1. Autocorrelation appears within the German Open Market returns for Lag 1 ($z$-value = -4.32; $p$-value less than 0.001), but the significance disappears, over time. The underlying U.S. returns do not reveal autocorrelation. However, when controlling for trading volume, the underlying U.S. returns show autocorrelation ($z$-value = -2.43; $p$-value less than 0.05 for the high trading volume portfolio; $z$-value = 2.27 and $p$-value less than 0.05 for low trading volume portfolio) as shown at Table 19. This signifies that trading volume is an important factor that affects the lead-lag relationship of U.S. restaurants' cross-listed shares in Germany and the underlying shares in the U.S. As hypothesized, U.S. underlying returns significantly predict the Open Market returns in Germany on a daily basis ($z$-value = 24.33; $p$-value less than 0.001). Meanwhile, the explanatory power of the Open Market returns to predict the underlying U.S. returns apparently has no significance. To confirm the relationship, the current study conducted the Wald Test with the summation of coefficients. Asymmetric cross-autocorrelations are evident ($\chi^2$-value = 47.33; $p$-value less than 0.001).

Panel B in Table 17 shows the VAR estimation results for weekly returns for H1. The results are very similar to the results for daily returns. Autocorrelation within the Open Market returns are negative and significant ($z$-value = -6.88; $p$-value less than 0.001), while autocorrelation within the underlying U.S. market returns are not significant ($z$-value = 1.05; $p$-value greater than 0.05). For the weekly returns, however, significance of the autocorrelation within the underlying U.S. shares remained insignificant after controlling for trading volume, as shown in Table 19 ($z$-value = 0.79

and *p*-value greater than 0.05 for high trading volume portfolio; *z*-value = 1.27 and *p*-value greater than 0.05 for low trading volume portfolio). Cross-autocorrelation results for weekly returns support H1, as well. The underlying U.S. market returns predict the Open Market returns for both Lag 1 (*z*-value = 9.32; *p*-value less than 0.001) and Lag 2 (*z*-value = 2.68; *p*-value less than 0.01) with weekly examination of the return. However, the cross-autocorrelation decays over time and Lag 3 does not reveal any significance. On the other hand, the Open Market weekly returns do not predict the underlying U.S. returns for any of the lags. The Wald test results for cross-autocorrelation confirms the Granger causality in the form of a summated coefficient in this study ($\chi^2$-value = 13.41; *p*-value less than 0.001).

This study examined H1 with monthly returns, as well. Panel C in Table 17 presents the VAR estimation results for monthly returns. The analysis applies no multiple lags since cross-autocorrelation for multiple months generates too much noise. The results show neither autocorrelation nor cross-autocorrelation between the Open Market returns in Germany and the underlying returns in the U.S. for the U.S. restaurant companies. Naturally, the Wald test results confirms the insignificant cross-autocorrelation ($\chi^2$-value = 0.74; *p*-value greater than 0.05).

Table 17. Summary of Autocorrelations for Hypothesis 1

| **Panel A: Daily Returns (No. obs = 2,349)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LHS | $r_{G,t-1}$ | $r_{G,t-2}$ | $r_{G,t-3}$ | $r_{G,t-4}$ | $r_{G,t-5}$ | $r_{US,t-1}$ | $r_{US,t-2}$ | $r_{US,t-3}$ | $r_{US,t-4}$ | $r_{US,t-5}$ |
| $r_{G,t}$ | -0.1528 | -0.0221 | -0.0139 | -0.0113 | -0.0002 | 0.6913 | 0.0504 | 0.0169 | -0.0011 | -0.0118 |
| | -4.32*** | -0.64 | -0.40 | -0.33 | -0.01 | 24.33*** | 2.34* | 0.79 | -0.05 | -0.55 |
| $r_{US,t}$ | -0.0483 | -0.0693 | 0.0357 | 0.0115 | -0.0835 | 0.0389 | -0.0143 | 0.0189 | -0.0048 | -0.0022 |
| | -0.94 | -1.38 | 0.71 | 0.23 | -1.90 | 0.94 | -0.46 | 0.61 | -0.15 | -0.07 |
| Wald Test: $\sum_{k=1}^{5} b_k = \sum_{k=1}^{5} c_k$ = 47.33*** | | | | | | | | | | |
| **Panel B: Weekly Returns (No. obs = 580)** | | | | | | | | | | |
| LHS | $r_{G,t-1}$ | $r_{G,t-2}$ | $r_{G,t-3}$ | | | $r_{US,t-1}$ | $r_{US,t-2}$ | $r_{US,t-3}$ | | |
| $r_{G,t}$ | -0.4146 | -0.0957 | 0.0366 | | | 0.5400 | 0.1726 | 0.0378 | | |
| | -6.88*** | -1.53 | 0.65 | | | 9.32*** | 2.68** | 0.61 | | |
| $r_{US,t}$ | -0.0951 | -0.0092 | -0.0132 | | | 0.0633 | -0.0014 | 0.1175 | | |
| | -1.52 | -0.14 | -0.23 | | | 1.05 | -0.02 | 1.85 | | |
| Wald Test: $\sum_{k=1}^{3} b_k = \sum_{k=1}^{3} c_k$ = 13.41*** | | | | | | | | | | |
| **Panel C: Monthly Returns (No. obs = 130)** | | | | | | | | | | |
| LHS | $r_{G,t-1}$ | | | | | $r_{US,t-1}$ | | | | |
| $r_{G,t}$ | -0.1410 | | | | | 0.2552 | | | | |
| | -0.88 | | | | | 1.60 | | | | |
| $r_{US,t}$ | 0.0625 | | | | | -0.0201 | | | | |
| | 0.38 | | | | | -0.12 | | | | |
| Wald Test: $\sum_{k=1}^{1} b_k = \sum_{k=1}^{1} c_k$ = 0.42 | | | | | | | | | | |

*, **, and *** denote significant at the 0.01, 0.05, and 0.001 levels, respectively.

# Table 18. Summary of Autocorrelations for Hypothesis 2

| **Panel D: Daily Returns (No. obs = 2,325)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LHS | $r^{O}_{G,t-1}$ | $r^{O}_{G,t-2}$ | $r^{O}_{G,t-3}$ | $r^{O}_{G,t-4}$ | $r^{O}_{G,t-5}$ | $r^{O}_{US,t-1}$ | $r^{O}_{US,t-2}$ | $r^{O}_{US,t-3}$ | $r^{O}_{US,t-4}$ | $r^{O}_{US,t-5}$ |
| $r^{O}_{G,t}$ | -0.1630 | -0.0502 | -0.0063 | -0.0141 | -0.0113 | 0.6645 | 0.0523 | 0.0262 | 0.0011 | -0.0088 |
| | -9.77*** | -3.08** | -0.38 | -0.86 | -0.79 | 49.17*** | 5.18*** | 2.62** | 0.11 | -0.89 |
| $r^{O}_{US,t}$ | -0.0201 | -0.0432 | -0.0145 | 0.0264 | -0.0397 | 0.0178 | -0.0147 | 0.0158 | -0.0018 | -0.0044 |
| | -0.84 | -1.84 | -0.62 | 1.13 | -1.92 | 0.91 | -1.02 | 1.10 | -0.13 | -0.31 |
| | $r^{E}_{G,t-1}$ | $r^{E}_{G,t-2}$ | $r^{E}_{G,t-3}$ | $r^{E}_{G,t-4}$ | $r^{E}_{G,t-5}$ | $r^{E}_{US,t-1}$ | $r^{E}_{US,t-2}$ | $r^{E}_{US,t-3}$ | $r^{E}_{US,t-4}$ | $r^{E}_{US,t-5}$ |
| $r^{E}_{G,t}$ | -0.3887 | -0.1115 | -0.0563 | -0.0239 | -0.0742 | 0.6446 | 0.2203 | 0.0447 | 0.0344 | 0.0378 |
| | -16.61*** | -4.48*** | -2.26* | -0.97 | -3.86*** | 34.28*** | 9.11*** | 1.80 | 1.38 | 1.66 |
| $r^{E}_{US,t}$ | -0.0178 | -0.0042 | -0.0074 | 0.0216 | -0.0299 | -0.0258 | -0.0130 | 0.0113 | -0.0087 | 0.0115 |
| | -0364 | -0.14 | -0.25 | 0.75 | -1.31 | -1.15 | -0.46 | 0.39 | -0.30 | 0.43 |
| Wald Test: $\sum_{k=1}^{5} b_k = \sum_{k=1}^{5} c_k$ = 11.85*** | | | | | | | | | | |
| **Panel E: Weekly Returns (No. obs = 565)** | | | | | | | | | | |
| LHS | $r^{O}_{G,t-1}$ | $r^{O}_{G,t-2}$ | $r^{O}_{G,t-3}$ | | | $r^{O}_{US,t-1}$ | $r^{O}_{US,t-2}$ | $r^{O}_{US,t-3}$ | | |
| $r^{O}_{G,t}$ | -0.4683 | -0.1455 | -0.0351 | | | 0.6055 | 0.1903 | 0.0710 | | |
| | -8.55*** | -2.53** | -0.70 | | | 11.51*** | 3.21*** | 1.26 | | |
| $r^{O}_{US,t}$ | -0.0671 | -0.0197 | -0.0691 | | | 0.0486 | -0.0295 | 0.1381 | | |
| | -1.19 | -0.33 | -1.33 | | | 0.90 | -0.48 | 2.39* | | |
| | $r^{E}_{G,t-1}$ | $r^{E}_{G,t-2}$ | $r^{E}_{G,t-3}$ | | | $r^{E}_{US,t-1}$ | $r^{E}_{US,t-2}$ | $r^{E}_{US,t-3}$ | | |
| $r^{E}_{G,t}$ | -0.3415 | -0.0045 | 0.1127 | | | 0.4288 | -0.0145 | -0.0758 | | |
| | -5.36*** | -0.07 | 1.79 | | | 6.57*** | -0.21 | -1.13 | | |
| $r^{E}_{US,t}$ | -0.0507 | 0.0596 | 0.0362 | | | 0.0618 | -0.0673 | 0.0714 | | |
| | -0.83 | 0.95 | 0.60 | | | 0.98 | -1.03 | 1.11 | | |
| Wald Test: $\sum_{k=1}^{3} b_k = \sum_{k=1}^{3} c_k$ = 13.92*** | | | | | | | | | | |
| **Panel F: Monthly Returns (No. obs = 125)** | | | | | | | | | | |
| LHS | $r^{O}_{G,t-1}$ | | | | | $r^{O}_{US,t-1}$ | | | | |
| $r^{O}_{G,t}$ | -0.2415 | | | | | 0.2987 | | | | |
| | -0.59 | | | | | 2.00* | | | | |
| $r^{O}_{US,t}$ | 0.0300 | | | | | -0.0115 | | | | |
| | 0.19 | | | | | -0.07 | | | | |
| | $r^{E}_{G,t-1}$ | | | | | $r^{E}_{US,t-1}$ | | | | |
| $r^{E}_{G,t}$ | 0.0667 | | | | | 0.1410 | | | | |
| | -0.42 | | | | | 0.88 | | | | |
| $r^{E}_{US,t}$ | 0.0349 | | | | | 0.0770 | | | | |
| | 0.22 | | | | | 0.48 | | | | |
| Wald Test: $\sum_{k=1}^{1} b_k = \sum_{k=1}^{1} c_k$ = 0.74 | | | | | | | | | | |

*, **, and *** denote significant at the 0.01, 0.05, and 0.001 levels, respectively.

Table 19. Summary of Autocorrelations for Hypothesis 3

| **Panel G: Daily Returns (No. obs = 1,219)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| LHS | $r^H_{G,t-1}$ | $r^H_{G,t-2}$ | $r^H_{G,t-3}$ | $r^H_{G,t-4}$ | $r^H_{G,t-5}$ | $r^H_{US,t-1}$ | $r^H_{US,t-2}$ | $r^H_{US,t-3}$ | $r^H_{US,t-4}$ | $r^H_{US,t-5}$ |
| $r^H_{G,t}$ | -0.3571 | -0.2357 | -0.0654 | -0.0320 | -0.0152 | 0.5693 | 0.2211 | 0.0752 | 0.0661 | 0.0995 |
| | -10.76*** | -6.73*** | -1.86 | -0.92 | -0.49 | 14.50*** | 5.09*** | 1.71 | 1.50 | 2.35* |
| $r^H_{US,t}$ | 0.0273 | -0.0114 | 0.0363 | 0.0191 | -0.0129 | -0.0889 | -0.0515 | -0.0391 | -0.0248 | -0.0253 |
| | 0.91 | -0.36 | 1.13 | 0.60 | -0.45 | -2.43* | -1.27 | -0.95 | -0.60 | -0.64 |
| | $r^L_{G,t-1}$ | $r^L_{G,t-2}$ | $r^L_{G,t-3}$ | $r^L_{G,t-4}$ | $r^L_{G,t-5}$ | $r^L_{US,t-1}$ | $r^L_{US,t-2}$ | $r^L_{US,t-3}$ | $r^L_{US,t-4}$ | $r^L_{US,t-5}$ |
| $r^L_{G,t}$ | -0.3450 | -0.1227 | -0.0986 | -0.0337 | -0.0283 | 0.7854 | 0.2917 | 0.0982 | 0.0920 | 0.0271 |
| | -7.36*** | -2.54* | -2.06* | -0.73 | -0.97 | 26.95*** | 6.21*** | 2.06* | 1.95 | 0.61 |
| $r^L_{US,t}$ | 0.0518 | -0.0033 | -0.0030 | 0.1062 | -0.0186 | 0.0688 | -0.0201 | 0.0170 | -0.0292 | -0.0927 |
| | 1.09 | -0.07 | -0.06 | 2.26* | -0.63 | 2.27* | -0.41 | 0.34 | -0.60 | -2.03* |
| Wald Test: $\sum_{k=1}^{5} b_k = \sum_{k=1}^{5} m_k$ = 4.48* | | | | | | | | | | |
| **Panel H: Weekly Returns (No. obs = 302)** | | | | | | | | | | |
| LHS | $r^H_{G,t-1}$ | $r^H_{G,t-2}$ | $r^H_{G,t-3}$ | | | $r^H_{US,t-1}$ | $r^H_{US,t-2}$ | $r^H_{US,t-3}$ | | |
| $r^H_{G,t}$ | -0.1997 | -0.0309 | -0.0097 | | | 0.2311 | 0.0229 | 0.0285 | | |
| | -2.88** | -0.44 | -0.14 | | | 2.78** | 0.27 | 0.35 | | |
| $r^H_{US,t}$ | -0.0085 | -0.0297 | -0.0684 | | | -0.0504 | 0.0016 | 0.1275 | | |
| | -0.16 | -0.56 | -1.31 | | | -0.79 | 0.02 | 2.00* | | |
| | $r^L_{G,t-1}$ | $r^L_{G,t-2}$ | $r^L_{G,t-3}$ | | | $r^L_{US,t-1}$ | $r^L_{US,t-2}$ | $r^L_{US,t-3}$ | | |
| $r^L_{G,t}$ | -0.4441 | -0.0037 | 0.1160 | | | 0.5600 | 0.1825 | -0.0337 | | |
| | -5.63*** | -0.05 | 1.62 | | | 7.97*** | 2.34* | -0.46 | | |
| $r^L_{US,t}$ | -0.0809 | 0.0640 | 0.1412 | | | 0.0943 | -0.0046 | 0.0061 | | |
| | -0.98 | 0.74 | 1.89 | | | 1.27 | -0.06 | 0.08 | | |
| Wald Test: $\sum_{k=1}^{3} b_k = \sum_{k=1}^{3} m_k$ = 5.12* | | | | | | | | | | |
| **Panel I: Monthly Returns (No. obs = 68)** | | | | | | | | | | |
| LHS | $r^H_{G,t-1}$ | | | | | $r^H_{US,t-1}$ | | | | |
| $r^H_{G,t}$ | -0.3430 | | | | | 0.4220 | | | | |
| | -2.42* | | | | | 2.49* | | | | |
| $r^H_{US,t}$ | -0.1424 | | | | | 0.1090 | | | | |
| | -1.21 | | | | | 0.77 | | | | |
| | $r^L_{G,t-1}$ | | | | | $r^L_{US,t-1}$ | | | | |
| $r^L_{G,t}$ | -0.0707 | | | | | 0.3357 | | | | |
| | -0.35 | | | | | 1.63 | | | | |
| $r^L_{US,t}$ | 0.2676 | | | | | -0.0947 | | | | |
| | 1.35 | | | | | -0.47 | | | | |
| Wald Test: $\sum_{k=1}^{1} b_k = \sum_{k=1}^{1} m_k$ = 0.13 | | | | | | | | | | |

*, **, and *** denote significant at the 0.01, 0.05, and 0.001 levels, respectively.

The second hypothesis extends the asymmetric cross-autocorrelations between the cross-listed stock returns on the Open Market in Germany and the underlying shares in the U.S. to the shares cross-listed on the E.U. Regulated Market in Germany. The argument for this is that German investors have better information on the U.S. firms when the firms list their stocks on the E.U. Regulated Market since those companies must provide information in the form that German investors understand (e.g., some financial information is mandatorily provided in German). Furthermore, voluntarily cross-listed U.S. firms are more likely to send press releases to German media than involuntarily cross-listed U.S. firms, likely giving the former more exposure in German newspapers and TV. Meanwhile, Open Market investors are unlikely to obtain as much information as that for the shares cross-listed on the E.U. Regulated Market since neither the issuing company nor German financial institutions applying for cross-listing has the responsibility to provide information for investors, although German financial institutions might try to do so to increase trading volumes and attendant brokerage commissions. Therefore, German investors would closely follow the returns of the underlying shares in the U.S.

Panel D in Table 18 supports the second hypothesis. German returns for the shares cross-listed on the Open Market gain significant prediction from the underlying U.S. shares for the first lag (*z*-value = 49.17; *p*-value less than 0.001), the second lag (*z*-value = 5.18; *p*-value less than 0.001), and the third lag (*z*-value = 2.62; *p*-value less than 0.01), even though the predictability decays over time. For the shares cross-listed on E.U. Regulated Markets, the current study found a cross-autocorrelation. U.S. returns predict the return for cross-listed German shares for the first lag (*z*-value = 34.28; *p*-value less

than 0.001) and the second lag ($z$-value = 9.11; $p$-value less than 0.001). The next comparison, using summation of coefficients with the Wald Test, is for the predictability between the Open Market listed shares and the E.U. Regulated Market listed shares. The Wald Test results support the second hypothesis that the lead-lag relationship for the Open Market listed shares are significantly stronger than for the E.U. Regulated Market listed shares ($\chi^2$-value = 11.85; $p$-value less than 0.001).

The current study examined the second hypothesis with weekly returns as well. Panel E of Table 18 exhibits the VAR estimation results. The weekly results support H2. Underlying U.S. returns for the shares cross-listed on the Open Market significantly predict the German returns on the Open Market for the first lag ($z$-value = 11.51; $p$-value less than 0.001) and the second lag ($z$-value = 3.21; $p$-value less than 0.001). Underlying U.S. returns for the shares cross-listed on the E.U. Regulated Market significantly predict the German returns, as well, but for the first lag only ($z$-value = 6.57; $p$-value less than 0.001). The current analysis compares the lead-lag relationship of each group using the summation of coefficients following Chordia and Swaminathan (2000) and Hou (2007). The Wald Test results support the second hypothesis ($\chi^2$-value = 13.92; $p$-value less than 0.001).

Panel F in Table 18 shows the VAR estimation results for monthly returns. For the cross-listed shares on the Open Market, underlying U.S. shares significantly predict the German returns ($z$-value = 2.00; $p$-value less than 0.05). On the other hand, the cross-autocorrelation is not apparent for the cross-listed shares on the E.U. Regulated Market ($z$-value = 0.88; $p$-value greater than 0.05). However, the Wald test results reveal no

significant differences between the predictability of the Open Market listed shares and the E.U. Regulated Market listed shares ($\chi^2$-value = 0.74; *p*-value greater than 0.05).

Since the literature found trading volume to be an important determinant for lead-lag relationships (Chordia & Swaminathan, 2000; Hou, 2007), the current study tests the lead-lag relationship as associated with dependence on the level of German trading volume for the U.S. restaurant shares cross-listed on the Open Market. The underlying argument is that German returns from a high German trading volume portfolio transmits information from the U.S. underlying shares significantly faster than a low German trading volume portfolio. Panel G in Table 19 presents the VAR estimation results for daily stock returns, and those support the argument. For the high German trading volume group, the German daily stock returns gain significant prediction from the underlying U.S. returns for the first lag (*z*-value = 14.50; *p*-value less than 0.001), the second lag (*z*-value = 5.09; *p*-value less than 0.001) and the fifth lag (*z*-value = 2.35; *p*-value less than 0.05). The low trading volume portfolio exhibits a similar pattern. German daily stock returns of the low German trading volume group gains a significant prediction from the underlying U.S. returns for the first lag (*z*-value = 26.95; *p*-value less than 0.001), the second lag (*z*-value = 6.21; *p*-value less than 0.001), and the third lag (*z*-value = 2.06; *p*-value less than 0.05). A comparison of predictability between the high German trading volume group and the low German trading volume group uses the Wald Test. The results support the third hypothesis ($\chi^2$-value = 4.48; *p*-value less than 0.05).

The current study examined H3 with weekly returns. Panel H in Table 19 presents the VAR estimation results, which are similar to the daily returns' cases. The study found that the underlying U.S. returns predict the German returns among the high

German trading volume group at the first lag (*z*-value = 2.78; *p*-value less than 0.001). The lead-lag relationship is also evident among the low German trading volume group at the first lag (*z*-value = 7.97; *p*-value less than 0.001) and the second lag (*z*-value = 2.34; *p*-value less than 0.05). A comparison of predictability between the high German trading volume group and the low German trading volume group uses the Wald Test. The results support the third hypothesis for weekly returns' cases ($\chi^2$-value = 5.12; *p*-value less than 0.05).

Last, this study examined H3 with monthly returns. Panel I in Table 19 shows that U.S. monthly returns significantly predict the German returns among the high German trading volume group (*z*-value = 2.39; *p*-value less than 0.05). No similar, significant predictability appears among the low German trading volume group (*z*-value = 1.63; *p*-value greater than 0.05). However, the Wald test results show that the predictability between the two groups is not significantly different ($\chi^2$-value = 0.13; *p*-value greater than 0.05).

## 5.7 Discussion

The main purposes of the current study are threefold: (1) to examine if stock returns of U.S. underlying shares lead stock returns of involuntarily cross-listed shares on the Open Market due to information asymmetry; (2) to investigate if the lead-lag relationship is more evident among securities involuntarily cross-listed on the Open Market than securities voluntarily cross-listed on the E.U. Regulated Market due to differences in regulation in information disclosure; and (3) to examine if the lead-lag relationship is less delayed among shares with high trading volume on the Open Market

compared to shares with low trading volume on the Open Market. To achieve the aims, the current study estimated cross-autocorrelations using vector autoregressions (VARs), and confirmed the hypotheses with the Wald Test. The results support all the three hypotheses, with daily and weekly returns, but not with monthly returns. The reason that monthly returns exhibit no lead-lag relationship at the first hypothesis would be that monthly returns contain too much noise (Hou, 2007). Given that monthly returns are not a precise measure for the lead-lag relationship for U.S. restaurant companies' shares, unsurprisingly, the results with the monthly returns do not support the second and third hypotheses.

The logic behind the first hypothesis is that the U.S. stock market has higher quality information for U.S. restaurant companies than the German stock market, especially the Open Market; therefore, German investors closely follow stock returns in the U.S. The sampled restaurant companies voluntarily listed their shares on U.S. exchanges, which require high levels of information disclosure. Therefore, U.S. restaurant companies have legal obligations to provide information to the U.S. market. On the other hand, German investors have limited information for involuntarily listed U.S. restaurant firms because neither the issuing firm nor German financial institutions have a legal responsibility to provide information about the involuntarily cross-listed firms. For this reason, German stock returns follow U.S. stock returns for the underlying shares to a significantly greater degree than the opposite case of U.S. stock returns following German stock returns. This phenomenon is known as Granger causality, which suggests that it is more likely that the information in U.S. stock returns causes German investors to trade than vice versa. The current study examined the Granger causality with summation

of coefficients over multiple lags for daily and weekly returns. The significant difference in the lead-lag relationship reveals that German investors are unlikely to have information for U.S. restaurant companies as quickly as U.S. investors do. Rather, they closely follow the U.S. returns assuming that U.S. stock returns contain more timely and detailed information about U.S. companies.

The argument supporting the second hypothesis is that the Granger causality is stronger among Open Market shares' lead-lag relationship than among E.U. Regulated Market shares' lead-lag relationship. Contrary to the Open Market, the E.U. Regulated Market mandates the listed firms disclose company information to meet the stringent level of E.U. regulations, in a form familiar to German investors (e.g., information written in German, statements reflecting German or European accounting rules, order of information disclosure, etc.). Having information on shares considered for investment, German investors are less likely to rely on stock returns of underlying U.S. shares as much as the investors of Open Market shares do. Further, U.S. firms are more likely to disseminate firm information voluntarily in the German market to serve their German investors when they voluntarily cross-list.

In fact, the findings show that Granger causality exists for the E.U. Regulated shares as well. That means German investors who invest in cross-listed shares on the E.U. Regulated Market still closely follow the stock returns of their underlying U.S. stock returns. However, the extent to which they rely on the U.S. stock returns is significantly lower than in the case of the shares cross-listed on the Open Market.

The third hypothesis examines whether or not the Granger causality is stronger when the Open Market shares have higher trading volumes in Germany than when the

shares have lower trading volumes in Germany. Differences in liquidity can cause differences in levels of the Granger causality, because when trading volume is high in Germany, information is more likely to be transmitted from the U.S. stock markets to the Open Market more promptly. On the other hand, when trading volume is low in Germany, more time is necessary to incorporate information in the U.S.

The current study confirms Chan's (1993) argument on information asymmetry and trading volume that information and trading volume differences significantly determine the lead-lag relationship of the U.S. restaurant shares involuntarily cross-listed on the Open Market in Germany. Previous studies often examined the role of information diffusion in the lead-lag relationship of stock returns by comparing size, analyst coverage, and market share (e.g., Brennan et al., 1993; Badrinath et al., 1995; Hou, 2007). The current study examines differences in information diffusion in the context of involuntary cross-listing. Information discrepancy is evident between German investors and U.S. investors for the U.S. restaurant companies due to regulation requirements' differences as well as likely voluntary disclosure differences. This study also confirms the role of trading volume in the lead-lag relationship that previous literature found (e.g., Chordia & Swaminathan, 2000; Hou, 2007) among involuntarily cross-listed samples. Among the Open Market shares whose German investors have limited information about the firm, trading volume played a role in the lead-lag relationship.

The finding suggests that significantly reducing the information disclosure regulations prohibits investors from obtaining necessary information of a firm with potential for investment and inhibits better decisions. As competition among the world

stock markets increases, many stock exchanges have reduced their regulations. An example is the SEC's amendment of Rule 12g3-2(b). But stock markets should understand that deregulation of involuntary cross-listing may be counterproductive for the protection of its investors. Furthermore, competition between stock exchanges could lead to a "race to the bottom" in disclosure to investors (e.g., Dye & Sunder, 2001).

From the U.S. restaurant industry's point of view, involuntary cross-listing means that these companies may have shareholders of which the companies are unaware. Also, those investors are outside the firm's obligation to disseminate information. Therefore, information of the company is not likely to be efficiently transmitted to shareholders. If a U.S. restaurant company finds a need to communicate with those foreign investors more effectively, they may need to consider providing some information to a foreign stock exchange or the foreign media where their shares are involuntarily cross-listed. Voluntary information disclosure on the foreign exchange can be critical considering more and more class action lawsuits are occurring between local shareholders and foreign companies (Lamont & Etzold, 2009).

By understanding both the benefits and losses that deregulation of information disclosure brings for involuntary cross-listing, the FSE Open Market may mandate the applying third party financial institutions to inform the involuntary cross-listing to issuing companies so that those involuntarily cross-listed companies would be able to choose to provide information to their German shareholders. The regulation amendment would help German investors be better informed of the shares they invest in the FSE Open Market and issuing companies better communicate with their shareholders while easiness of application of German financial institutions is not hugely hampered.

## 5.8 Limitation and Suggestions for Future Studies

This study examined the role of information asymmetry caused by differences of information disclosure regulation on lead-lag relationships between U.S. shares cross-listed in Germany and the underlying shares listed in the U.S. The differences of the listing nature between involuntariness and voluntariness may also be reflected in the press releases to media. Voluntarily listed firms may issue press releases to media in the foreign market similar to practices in their domestic market, and thus gain foreign media coverage. In contrast, involuntarily cross-listed firms would be less likely to seek media coverage in the foreign media. Future studies may compare the foreign media coverage to support the argument on information discrepancy in domestic stock market and foreign stock market.

The current study has a small sample size by focusing on specific group of U.S. restaurant companies cross-listed on the FSE. Therefore, portfolios tend to be thin. This is a trade-off for analyzing with homogenous group of sample while producing less noisy results. This study may have a survival bias since the sample companies only contains those who are currently listed on the FSE. It is because the FSE only provides financial information such as stock prices and trading volume of the companies that currently trade in that market.

The FSE prices for involuntarily cross-listed shares can be bid or ask prices where no actual transaction occurred. A better analysis might be of bid prices and ask prices, separately, since that context differentiates buyer-initiated prices from seller-initiated ones (Hasbrouck, 1995). However, the FSE does not provide information for the price's being a bid price or an ask price for the prices associated with no actual transaction.

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