Does the Cross-listing Premium that Canadian Firms Gain also reflect their Own Default Probabilities?

By

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Abstract

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Cross-listing has been a popular strategy for business expansion and seems always to be followed by appreciation in firm value. Previous theories explain the existence of this stock premium either due to risk reduction, by committing and then providing better protection to minority shareholders and by improving information environment and media coverage, or due to growth opportunities, by raising capital for potential growth projects and by reducing the cost of capital among a larger investor base. This paper aims to connect stock premium with one of the firms' aptitude, called default probability, and testing whether this relationship is statistically significant in several regression models. 47 Canadian firms from 10 major sectors and 38 industries are selected, which announced officially their cross-listing activities in NYSE or NASDAQ during 1982 to 2002. The financial data are collected from Datastream to measure firm specific factors and cross-sectional models are applied to capture the sector specific factors. It is reasonable to conclude that pre-listing premium and firm size account mostly for the post-listing premium, while default probability also exerts its explanatory power.

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Chapter 1: Introduction

1.1 Purpose of the Study

The majority of promising firms from foreign countries have cross listed their stocks in the U.S. market to partake in a booming market and to reap potentially a large listing premium. This is suggestive that cross-listing in international markets, especially the U.S. market is followed by both gains in wealth and reputation. To be specific, cross-listing in the U.S. market requires a more open and transparent corporate culture, an internationalized management mode, abundant growth opportunities, confidence and determination with stringent scrutiny and disclosure standards. In addition, listing will provide protection for the rights of minority investors in international markets. However, there are trade-offs and costs accompanying the cross-listing are significant. Not only do the companies have to meet certain standards in accounting reporting, but also they must be prepared to accept cultural shocks, media attention and the knowledge that, in the process of accepting international capital funds, foreign investors may know very little about the companies. Apart from balancing the advantages and disadvantages surrounding cross listing, there is a causality puzzle: what makes a huge stock premium possible? For example, is it an aptitude companies already possess that gives rise to the up-valuation of stocks listed in international markets.

The factors include superior company qualifications, such as positive accounting information (revenue and its growth potential), earning signals, developments and innovation in patents and technology, efficient corporate governance and growth opportunities. These will all influence company values after the event of a cross listing. However, cross listing may expose inherent risk due to capital structure. So, the pros and cons all have to be fully absorbed in the financial market.

This paper aims to explore the influence on the cross-listing by one of the company aptitudes called default probability. The analysis in this paper will attempt to explain why cross listing usually creates extra value to most of the companies.

1.2 Background

With the great internationalization of developed capital markets, cross listing has been a popular strategy for firm expansion and value enhancement, while there are also tremendous obstacles that firms have to tackle before they are fully recognized in international markets. Those obstacles have not deterred potential candidates, especially from emerging markets. They make great efforts to meet the entry standards and get their stocks cross listed. While investors understand that financial analysts and policy makers know the potential for value appreciation from cross-listing, what is not fully understood is where the extra value comes from. The question then arises that if cross-listing can increase value for most of the firms, does that mean that weak companies can fool international investors and somehow pass the scrutiny of the marketplace? If so then there is an incentive for them to try everything to obtain a cross–listing. Otherwise, there are reasons behind the occurrence of extra value increase that strong companies generate by cross listing their stocks outside of their domestic markets.

Harmful medium-long term effects for both the companies and investors may lead to a reputational issue for other firms seeking cross-listing If, however, investors accept that the blindness of pursuit in cross-listing might be harmful for firms not financially solid, they will perform due diligence and invest wisely, vouching that it is more likely that those promising companies with better growth potentials and lower probability for default will enjoy higher appreciation in firm value after they successfully cross list.

1.3 Need for the study

In order to determine the factors that better and more fully account for the increase in firm value after cross listing, this paper aims to test the explanatory power of relevant variables that might contribute to the existence of such a stock premium. Previous academic theories, concerning why cross listing makes a firm worth more are mainly done by Doidge et al., (2004), and Sarkissian and Schill (2010). This paper will add another explanatory variable to measure the default probability of firms before any influences of cross listing involved. If this additional variable shows a statistically significant relationship with the dependent variable, the cross listing premium, it may offer another perspective to understand cross listing. Indeed, by focusing on the importance of the core value of firms themselves, it might deter many weaker firms from incurring the costs of seeking a transnational listing.

1.4 Outline of study

This paper is structured as follows. Chapter 2 will demonstrate briefly and concisely the comprehensive literature concerning cross listing. Chapter 3 will focus on the methodologies employed by various authors and will contrast their similarities and differences. In consideration of the benefits of these similarities, this paper will choose one particular methodology as a basis on which then to offer a model consistent with the literature, but with improvements. Chapter 4 will present the data used, regression analysis and interpretation of the results to provide an empirical perspective for understanding the subject issue. Chapter 5 will provide conclusions, including the strengths and weaknesses of this paper and suggest avenues for further research.

Chapter 2: Literature Review

This chapter provides a review of the literature where the cross listing activity is interpreted from various aspects of foreign or minority investors, company controlling shareholders, analysts and other public followers and market regulators. Most previous work explains the reasons for cross listing and verifies these causalities by conducting regression tests for sample firms from various industries globally, and by using dummy variables as a facility to indicate the year that cross-listing occurred, across different countries with differing regulations and legal systems.

2.1 Cross listing and private benefits

It is generally known that private benefits take a particular form as capital committed by minority investors but controlled by managers of firms arbitrarily. However, several other interpretations can also make sense. According to Jensen (1993), the existence of an implicit contract provides managers of firms with the power to engage in wasteful expenditures, which often get unnoticed because minority shareholders have no idea that they are actually the check payers. Besides, private benefits include management entrenchment (Shleifer and Vishny, 1989). For instance, a manager may abuse his power to divert resources from optimum allocation to particular projects for stabilizing his discretionary authority, rather than maximizing the wealth of general shareholders.

Not surprisingly, a cross-border listing usually happens in an established market where enforcement of laws is efficient and private benefits committed by financiers are well protected (La Porta et al., 1997). From the perspective of minority investors, their involvement in foreign contribution of capital depends highly on the degree of guarantee that their money will be used productively and they can be made aware of any misconduct if managers privately take possession of the capital instead. Firms' cross listing rescues minority shareholders from their

disadvantaged positions of losing protection by obeying the same regulations that these investors are familiar with. From the perspective of minority shareholders, the prohibition of misappropriation is considered a heavy burden for firms which have lacked discipline in honoring their responsibilities in domestic markets. Firms will only agree to give up these private benefits when the rewards they gain from external capital internationally is larger relative to the amount of the private benefits they forgo (Benos and Weisbach, 2004).

According to Dyck and Zingales (2004), firms will minimize their international financing activities if they can enjoy private benefits at home. Consequently, this may have the effects of slowing down the development of domestic equity markets given that the financing channels are aimed at international markets, especially U.S. market.

An alternative way to understand protection to private benefits is taking it as a kind of agency cost. This encumbrance to controlling shareholders is too hard to remove that they are more likely to do not list in the U.S. since the eradication of expropriation is demanding (Doidge et al., 2004).

2.2 Cross listing and information efficiency

According to Karolyi (1998), the disclosure requirements of cross listing reduces the extent of information asymmetry between firms' insiders and outsiders and promotes market convergence. The issue of information asymmetry is also resolved by the participation of financial analysts, auditors, consultants and media reporters whose primary tasks are taking full advantage of these messages pervasive in the market (Benos and Weisbach, 2004), which will also improve the information environment in the whole market. It seems that cross listing channels the qualitatively internal information to international investors and this kind of signalling pattern

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generates higher valuation in the equilibrium state afterwards (Moel, 1999; Benos and Weisbach, 2004).

The study of Lang et al., (2003) shows that appreciation in firm value takes place during window periods around cross listing. That is probably because the information environment in the market is enhanced thanks to transparent coverage and the precise forecasting of followers. As a result, many undervalued firms finally realize their fair values for investors. The credibility of the commitment, and then efficiency in the information market, are backed by irreversible implementation of cross listing subsequently, even though firms find out that suspension of cross listing before they start or delisting after they cross listed are optimal

Logically, there is a cycle, combining two inverse relationships, behind this: increased firm disclosure reduces the cost of coverage, and, in turn, the low agency costs lead investors to gain value and to prevent unexpected events in the market (Lang and Lundholm, 1996). The positive fruits by prediction are achieved by investors nationally and internationally who are willing to commit capital when they are satisfied with firm disclosure (Lins et al., 2000).

2.3 Cross listing and bonding hypothesis
Foreign equity financing is essential to launch projects with a positive Net Present Value (NPV) when internal equity and bond issue are costly. Therefore, Stulz (1999) has argued that controlling shareholders of the firms intend to acquire trust emotionally and fund materially from minority shareholders by aligning with them together because firms also may learn advanced technology and more effective business administration. One approach to establish the bonding relationship is to promise the protection to investors by cross listing stocks on a reliable exchange non-domestically (Coffee, 2002). This explanation is known as the bonding hypothesis.

There are several ways of cross-border listing on the U.S. market, either listed directly on NYSE or NASDAQ or indirectly through an American Direct Deposit (ADR), with full registration with the Securities and Exchange Commission (SEC) to protect shareholders' rights (Doidge et al., 2004; Reese and Weisbach, 2001).

As mentioned above, the bonding relationship gains persuasive powers for firms and facilitates their popularity enhancement. Extra equity offerings after cross listing would be a predictable behaviour for firms facing difficulties in local financing with fragile protection to minority shareholders. It is also conceivable that the high similarity between the protection level in domestic markets and foreign markets will not relate to extensive offerings unless the expansion into foreign market is more of a priority than raising funds. (Benos and Weisbach, 2004; Reese and Weisbach, 2001).

Based on the further test of Doidge (2004) on dual-class firms, the tightness of the bonding relation affects the voting premium by up to forty percent for exchange-traded cross listing, such as ADR Level 2 & 3, and, on the other hand, affect neutrally for privately placed issues and Over-the-Counter (OTC), such as Rule 144a and ADR Level 1.

2.4 Cross listing and risk reduction

With the benefit of market efficiency from the information environment, firms that cross listed operate in an open and transparent way so that any threats to shareholders will be identified promptly and eliminated in a timely fashion. Internally, with a low risk of default and low probability of breach of duty by controlling shareholders, this lowers the cost of capital. Externally, the investors' base is enlarged to absorb more risks due to their diverse risk aversions and its sharing effect also helps reduce cost of capital. As Karolyi (1998) further asserts,

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reduction in risk locally is more than enough to offset the increase in risk worldwide. Equivalently, Errunza and Miller (2000) verify a considerable decline in the post-listing cost of financing, which will inversely increase the net present value of growth opportunities and reckon it as part of market liberalization.

Barry and Brown (1985) assert that the cost of capital relates to the deviation of forecasting to its fair value in equilibrium pricing model. Abidance of firms by laws in cross-border market ensure that they will accept inquires and questions from the public and this way of communication brings down estimation bias, leading to a lower financing cost. Gebhardt et al. (2001) certify the inverse relationship between required rates of return with volatility in the earnings estimation, which will decrease as firms become more transparent to the public at large.

However, consistent disclosure doesn't necessarily lead to a decline in the cost of capital if fake information is announced to manipulate the market on purpose or the firm that is cross listing is already followed by many analysts and its transparency level has reached the market standard (Botosan, 1997).

2.5 Cross listing and Sarbanes-Oxley Act (SOX)

The enforcement of Sarbanes-Oxley Act (SOX) in 2002 has led to a deep transformation in financial markets. The collateral damage of this Act has been compelling many firms to reconsider their listing decisions and revoke their status in cross-border marketplace, especially in exchanges where the compliance costs with Section 404 are unbearable (Berger et al., 2005). Specifically, delisting is highly associated with firms in good governance shape (Chaplinsky and Ramchand, 2008).

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The Sarbanes-Oxley Act put an end to some human-caused errors in firms' financial reporting and represents to some observers as a policy with additional constraints. This has been used as the reason for many firms to delist and deregister in U.S. exchanges compared say to the London exchange. However, according to the research of Doidge et al. (2009), shifts of attributes in enterprises, rather than the attributes in exchanges, can explain the reduction in numbers of listings in U.S. market. However, the U.S. premium still persists for years with statistical significance.

2.6 Cross listing and growth opportunity

Growth opportunities can be primary inducements for external financing and then seeking a cross listing for the purpose of future expansion (Doidge et al., 2004). *Ceteris paribus*, the balance between gains and costs of cross-border listing can decide the net effect of cross listing and the major source of cross listing gains are derived from starting new projects. In other words, net gains of cross-border listings are profound for booming firms subject to underdeveloped capital markets and constrained by domestic financing difficulties.

Foerster and Karolyi (1999) and Miller (1999) conducted event studies for ADR listing and confirmed positive cumulative abnormal returns concomitantly. Nonetheless, there are firms underperforming their local benchmarks in a long horizon based on a study of Foerster and Karolyi (2000). Doidge et al. (2004) use Tobin's Q as an approximation of firm value in the American market and find that cross-listing firms are worth more than non-listed peers by 16.5% on average, while exchange listing even augments this disparity.

2.7 Cross listing and market regulation

La Porta et al. (2000) show that equity valuation is associated with the efficiency of containing embezzlement of private benefits within a tolerable level and law system, not bank-centered system, has to maintain sound and thorough as support. Valuable firms could end up with selling trash stocks if investors are too insecure to accept stocks in their fair value. Reversely, Lins et al. (2000) document that cross-border listing is a strategy for firms to escape from deficient local markets where stocks undervaluation is a universal phenomenon.

The measures adopted in previous literatures to distinguish different regulatory environments include subjective variables, for example, a series of cardinal numbers showing self-evaluation by investors (La Porta et al., 2000); and objective variables, for example, dummy variables indicating various origin of legal system existing in their home countries . It is evident that the English Common Law system performs more efficiently than Civil Law System (Reese and Weisbach, 2001).

Chapter 3: Proposed Model

3.1 Objective of study

This study aims at finding the relationship between cross listing premium and the default risk of firms before their cross listing started. The appreciation in firm value after cross listing, in U.S. market, is related to many factors, such as firm-specific, industry-specific and country-specific factors. Previous studies usually include growth in sales and firm size as firm-specific factors. However, default risk, reflected by the corporate financing structure of firms back in their home countries, play a role in the firm value after cross listing as well. The model employed in this study will verify its part quantitatively and test its statistical significance.

3.2 Previous Methodologies

Previous studies mostly applied cross-section analysis, by treating target factors as fixed effects or random effects, using panel data. They would use dummy variables and its interaction terms to control the particular time point, usually the year that the cross listing happened. With independent variables covering financial/accounting indicators, growth opportunities, country/firm-specific factors, estimates of slope parameters show the degree of its influence, positive/negative relationship and its statistical significance.

In the study of Doidge (2004) about private benefits and cross listing in the dual-class firms, a panel data set of 745 non-U.S. firms of 20 countries, from 1994 to 2001, were selected, The private benefits are measured by the voting premium (Lease et al., 1983; Zingales, 1994), which are then regressed on variables measuring both firm and country characteristics and dummy variables representing different types of ADR listing. OLS regression model, random effect model and fixed effect model are both applied, with Hausman test and Newey-West standard error employed for model optimization (Zingales, 1994). However, the primary weakness

inherent in the dual-class approach is the sample selection bias that controllers of firm enjoy a considerable proportion of cash flow profits, apart from their executive authority (DeAngelo and DeAngelo, 1985).

In the study of Lang et al. (2003) about information environment and market value, they use data of 4859 firms from 28 countries based on I/B/E/S and Worldscope for the 11th month of the year. They apply time series analysis to identity the environment changes around cross-listing and construct a *post-ADR dummy* variable to signify the year of cross-issue within six-year window period. The results were consistent with the conclusion of Baker et al. (2002): visibility of cross-listed firms is enhanced by public followings. In addition, Lang uses Tobin's Q as proxy for firm value and regress it on both forecast accuracy and number of analysts to test the significant explanatory relationship, based on the sample of 5539 firms.

In the study of Lins et al. (2000) concerning cross listing on U.S. market and capital constraints, they define a variable called "Investment to Cash Flow" and identify the decline in its slope coefficient, after the FHP methodology (Fazzari et al., 1988) is applied. The second test of their study is to check annual reports expressing worries about external capital. In their third set of tests, it shows firms increase equity issuing after an ADR listing. Their study shows that firms from developing countries are restricted to fund insufficiency compared to U.S. firms and the returns from cross listing are hence more conspicuous.

In the study of Doidge (et al., 2004) about up-valuation of foreign firms listed in the U.S, they obtain data of 1167 firms cross listed in the U.S. from Worldscope, Bank of New York, NYSE, NASDAQ and OTCCB, etc. Tobin's Q is used as valuation measure in the study and three country-level variables obtained from La Porta (et al., 1998), as well as several traditional

country variables, are used for control. The subtleties of their test is the application of individual dummy variables, such as Cross-list, 144a, OTC and Exchange, and interaction dummy variables, such as AD*CL, Capital*Exchange, and SG*AD*CL, among which cross listing premium exists and persists regardless of whichever models, OLS, 2SLS or Heckman (1979) Correction models, are used.

3.3 My suggestion for methodology

Among all the works expounding the cross listing premium, the work of Doidge (et al., 2004) remains the authority. However, there are some shortcomings about the methodology they applied. As indicated by the authors themselves, there exists a selection bias that firms with higher Tobin's Q are selected by chance from countries or industries highly valued generally. Additionally, stock market booms in U.S. in the 1990s contribute to stock appreciation, irrelevant to cross listing (Doidge et al., 2004).

To address the subject of cross listing with default probability, the method employed in this study follows the work of Sarkissian and Schill (2010). Their studies examine the universality, not the peculiarity, of cross listing premium by also checking U.S. firms cross listed in non-U.S. markets and non-U.S. firms cross listed in non-U.S. markets. Compared with the influence of regulation system, the pre-listing value premium, indicated by Q (-2) in their regression, shows markedly pertinence in explaining post-listing premium.

In this paper, the measure of firms' pre-listing behaviors is captured by their pre-listing premium exactly one year before their announcement date of cross-listing. Market efficiency theory asserts that semi-strong market would absorb news quickly and efficiently as long as they are made public, i.e. official announcement of firms. This explains the reason why the

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announcement date of cross-listing, not the actual date of cross-listing, accounts for the dividing timeline between pre-listing and post-listing.

Consistent with the work of Bharath and Shumway (2008), the concept of Black-Scholes-Merton model for option pricing can be used to capture the valuation of equity and the concept of Value at Risk can be used to measure the probability that firm value is less than their liabilities, i.e. firm defaults. Apart from the classic Merton Distance to Default model verified in their research, the naïve Model introduced also shows statistical significance in out-of-sample forecasting of CDS spread regression and bond yield spread regression. This may result from the similar functional formula and same basic inputs of these two models and hence high correlation between default probabilities they produce. Therefore, the default probability measure used in this paper would be based on the naïve model to avoid the numerical iteration process.

3.4 Model Introduction

3.4.1 Model

Based on the model used by Sarkissian and Schill (2010), this study will continue to include firm specific variables to characteristics, such as growth opportunity and firm size. Besides, another variable indicating the default probability (Bharath and Shumway, 2008) of firms before they started cross listing is also taken into consideration. What's more, Tobin's Q is applied in this model to measure premium in firm value both before and after their cross-listing activities. Cross-sectional methodology is used to differentiate the sector specific effect and will replace the variable called $Industry\ Q_i$, introduced by Sarkissian and Schill (2010).

$$Post_{listing}Q_i = \beta_0 + \beta_1 Sales\ Growth_i + \beta_2 Log(Net\ Sales)_i + \beta_3 Pre_{listing}Q_{i,(-1)} + \beta_4 naiveEDF_i + u_i + \varepsilon_i$$

The adjustment made in this model to its original version generates extra benefits. Firstly, the sample for regression analysis are all Canadian firms that cross-listed their stocks in the U.S.

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market, and this eliminates the country differences in both home markets and foreign markets, as well as the differences in regulation environment and legal systems. Secondly, in order to distinguish multiple sectors that these firms belong to, the cross-sectional data are applied in both Fixed and Random effects models. This alternative method avoids the problem of choosing the proper sector variable measuring the general states of each sector in the specific time of listing announcement. Thirdly, the application of the naïve model to get corporate default probability reduces numerical process, but also provides with accurate results compared with that from the more complicated Merton DD model.

3.4.2 Variables

Although the concept of Tobin's Q used in measuring cross listing premium in stock valuation is different from the one introduced by Tobin and Brainard (1968), the pervasive usage of Tobin's Q is due to its advantage that it captures the value of firms' intangible assets in the market value of equity. Besides, since the market value of equity is considered as the present value of future cash flows, Tobin's Q possesses the perceptiveness in evaluating the future equity value of the firm (Sarkissian and Schill, 2010).

The following shows the established practice in measuring stock premium:

$$Tobin's\ Q = \frac{Total\ Asset\ Value - Book\ Value\ of\ Equity + Market\ Value\ of\ Equity}{Total\ Asset\ Value}$$

$Post_{listing}Q$: measured as the Tobin's Q based on the inputs just after the announcement date of cross-listing.

$Sales\ Growth$: measured as a geometric growth rate in sales per share for the latest six months before announcement of cross-listing.

$Log(Net\ Sales)$: measured as the natural logarithm of the firms' net sales, which represent the size effects. Net sales reflect accurately the actual sales generated by firms by deducting the returns by customers, allowance for damaged or missing goods, and any discount from the gross sales.

$Pre_{listing}Q_{i,(-1)}$: measured as the Tobin's Q based on the inputs exactly one year prior to the announcement date of cross-listing.

$naiveEDF_{i,t}$: measured by approximating the market value of firm's debt with its face value and approximating the total volatility of the firm is calculated as follows:

$$naive\sigma_v = \frac{E}{E+D}\sigma_E + \frac{D}{E+D}(5\% + 25\% * \sigma_E)$$

After approximating the expected return on the firm's assets with stock's return over the previous period, the "naïve distance to default" is calculated as follows:

$$naiveDD = \frac{\ln[(E+D)/D] + (R_{t-1} - 0.5 * naive\sigma_V{}^2) * T}{naive\sigma_V * \sqrt{T}}$$

Then, the default probability is defined as: $naiveEDF = N(-niaveDD)$

The value of equity and debt is measured at their market values just before the announcement date of cross-listing. R_{t-1} is measured as the stock return in the last period just before the announcement date of cross-listing. σ_E is measured as the standard deviation of stock return for the last three years prior to the announcement date of cross-listing.

Chapter 4: Regression Analysis

4.1 Source of Data

The sample of Canadian firms is based on the data used by Roosenboom and van Dijk (2009) in

their research: "The Market Reaction to Cross-Listings: Does the Destination Market Matter?"

Since this present study only considers cross-listing of Canadian firms in NYSE or NASDAQ,

54 firms are targeted who announced their cross-listing during the period of 1982 to 2002. After

collecting financial data from Datastream 5.0, 7 firms with incomplete data are eliminated,

leaving 47 valid samples from 10 sectors and 38 industries.

Figure 4.1
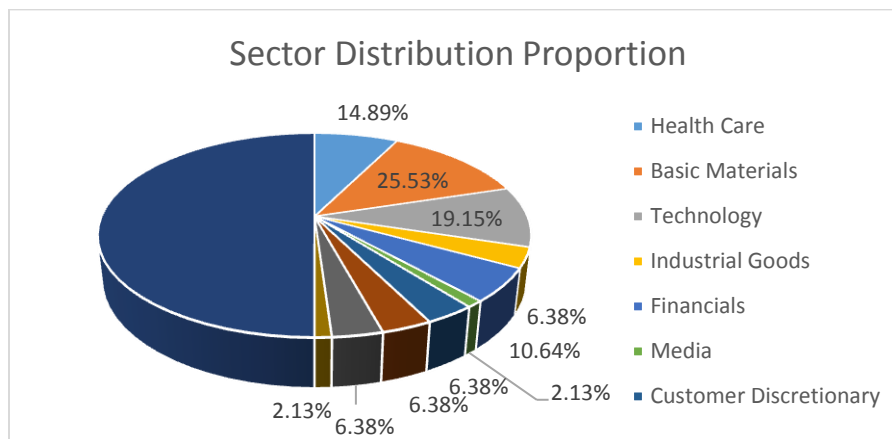
According to the declaration about data sources by Roosenboom and van Dijk (2009), the

survivorship bias is fully considered by including firms that announced their cross-listing during

the target period but already delisted after 2002. Besides, issues of common shares, GDRs and

ADRs cross border are all taken into consideration as long as their announcement dates are

reliable from various sources and their stock price data 250 days prior to their announcement can

be obtained.

4.2 Regression Results

4.2.1 Pooled OLS Regression

Table 4.1

```
. reg post_q growthrate size_effect pre_q naiveEDF
```

Source	SS	df	MS		Number of obs =	40
					F(4, 35) =	39.26
Model	1.17037429	4	.292593573		Prob > F =	0.0000
Residual	.260856418	35	.007453041		R-squared =	0.8177
					Adj R-squared =	0.7969
Total	1.43123071	39	.036698223		Root MSE =	.08633

post_q	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
growthrate	.1158391	.1522517	0.76	0.452	-.1932483	.4249264
size_effect	.0199947	.0076849	2.60	0.014	.0043934	.035596
pre_q	.751976	.0728033	10.33	0.000	.6041773	.8997746
naiveEDF	-.0689295	.0451929	-1.53	0.136	-.1606759	.0228169
_cons	-.1788727	.0956347	-1.87	0.070	-.3730214	.015276

The Pooled OLS Regression ignores sector specific effects to which those Canadian firms belong. Generally, the adequacy of model is decent as shown in the R-square and adjusted-R square, both up to 80%. Besides, size effect and pre-listing premium are both statistically significant, indicating that large firms already with higher market valuations are more likely to gain higher appreciation in stock value after their listing cross-border. As for the measure of default probability, its negative slope coefficient indicates that post-listing premium is more related to firms with lower default risk in their home countries. However, this relationship is not statistically significant.

4.2.2 Fixed Effects Within-Group Regression

The Fixed Effect Model reckons sector specific effects as the same within each sector but different among all the ten sectors. The advantage of using this model, compared with the Pooled OLS Model, is that firms are compared and analysed within their own sectors to measure some particular phenomenon accounting for stock premium but hard to be embodied as one

independent variable. Specifically, stocks in some sectors are higher valued compared with similar firms in different sectors. If these effects are particularly related to sectors, rather than randomly, the application of the Fixed Effect Model will capture them properly.

Table 4.2

```
. xtreg post_q growthrate size_effect pre_q naiveEDF, fe

Fixed-effects (within) regression               Number of obs      =         40
Group variable: groupindic~r                    Number of groups   =         10

R-sq:  within  = 0.8007                          Obs per group: min =          1
       between = 0.7920                                          avg =        4.0
       overall = 0.8085                                          max =         10

                                                 F(4,26)            =      26.12
corr(u_i, Xb)  = -0.0507                          Prob > F           =     0.0000

─────────────┬────────────────────────────────────────────────────────────────
      post_q │      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
─────────────┼────────────────────────────────────────────────────────────────
  growthrate │   .2779482   .1633023     1.70   0.101    -.0577245    .6136209
 size_effect │   .0125579   .0084747     1.48   0.150    -.0048621     .029978
       pre_q │   .7868808   .0853373     9.22   0.000     .6114674    .9622942
    naiveEDF │  -.0558614   .0506248    -1.10   0.280    -.1599221    .0481994
       _cons │  -.1029507    .103974    -0.99   0.331    -.3166724    .1107709
─────────────┼────────────────────────────────────────────────────────────────
     sigma_u │   .058398
     sigma_e │  .0806597
         rho │ .34391071   (fraction of variance due to u_i)
─────────────┴────────────────────────────────────────────────────────────────
F test that all u_i=0:     F(9, 26) =      1.57              Prob > F = 0.1778
```

As shown in the Table 4.2, a pre-listing premium retains its significance while other variables are all insignificant. Besides, their coefficients still show a reasonable relationship with post-listing premium. That is to say, large firms with high growth rates and low default risks in domestic countries are more likely to enjoy higher cross-listing premium in foreign countries. The statistical significance of growth rate improves markedly from 45.2% to around 10%, demonstrating that growth rates within each sector are similar and stay comparable. However, default probabilities of firms seem irrelevant to whatever sector they belong to, manifesting that insolvency riskiness has no significant generality within sectors.

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The F-statistic is relatively small compared with the corresponding critical value, and demonstrates that the fixed effect in this sample is not strong and obvious.

4.2.3 Random Effects GLS Regression

The Random Effect Model considers the sector specific effect as the random variable irrelevant to any sectors. The advantage of using this model, compared with the Pooled OLS Model, is that the sector effect is not completely ignored as error term but specifically treated as the random part of the error term also influencing the dependent variable. The Random Effect Model assumes that some stocks are overvalued while others are undervalued in all of the ten sectors and the stock premium is not a universal phenomenon is any sectors. This suggests that stock value may not be recognized even in the most promising industries and vice versa.

Table 4.3

```
. xtreg post_q growthrate size_effect pre_q naiveEDF, re

Random-effects GLS regression              Number of obs     =        40
Group variable: groupindic~r               Number of groups  =        10

R-sq:  within  = 0.7949                     Obs per group: min =        1
       between = 0.8185                                     avg =       4.0
       overall = 0.8169                                     max =        10

                                           Wald chi2(4)      =    149.93
corr(u_i, X)   = 0 (assumed)               Prob > chi2       =    0.0000

------------------------------------------------------------------------------
      post_q |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  growthrate |   .1521005    .150881     1.01   0.313    -.1436209    .4478219
 size_effect |   .0177268    .007729     2.29   0.022     .0025781    .0328754
       pre_q |   .7627245   .0740354    10.30   0.000     .6176179    .9078312
    naiveEDF |  -.0610268   .0447959    -1.36   0.173    -.1488251    .0267716
       _cons |  -.1589729   .0951345    -1.67   0.095    -.3454331    .0274874
-------------+----------------------------------------------------------------
     sigma_u |   .0268379
     sigma_e |   .0806597
         rho |  .09967438   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

As shown in the Table 4.3, pre-listing premium and size effect show their statistical significance indicating that large firms with higher pre-listing valuation in their home countries will have a

higher post-listing premium. Besides, coefficients of growth rate and naiveEDF also verify the

relationship between these two variables and post-listing premium as tested previously.

However, the considerable improvement in P-value of size effect and naiveEDF manifest that

firm size and their default probability are various within and between sectors. It shows that large

firms with low default risk will gain higher stock valuation after cross-listing, regardless of

which sector they belong to.

Table 4.4

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        post_q[groupindicator,t] = Xb + u[groupindicator] + e[groupindicator,t]

        Estimated results:
                                 Var       sd = sqrt(Var)
                      _____

                post_q |      .0366982          .1915678
                     e |       .006506          .0806597
                     u |      .0007203          .0268379

        Test:   Var(u) = 0
                            chibar2(01) =      0.15
                          Prob > chibar2 =    0.3507
```

The Lagrangian-Multiplier (LM) test for random effect model (Table 4.4) indicates that the

random error term is not significant and thus the random effects among all ten sectors are not

strong.

4.2.4 Hausman Test for Fixed or Random Effects

The individual tests for fixed effect and random effect show that both methods are not superior to

the other, due to the fact that sector effect does not show particular properties fixedly or

randomly. The Hausman Test is conducted to give preference between these two models.

21

Table 4.5

```
. hausman fixed random, sigmaless

                ──── Coefficients ────
                  (b)            (B)            (b-B)       sqrt(diag(V_b-V_B))
                 fixed          random        Difference          S.E.

  growthrate     .2779482       .1521005       .1258477         .0688615
 size_effect     .0125579       .0177268      -.0051688         .0037796
       pre_q     .7868808       .7627245       .0241563         .0447584
    naiveEDF    -.0558614      -.0610268       .0051654         .0251035

                        b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

   Test:  Ho:  difference in coefficients not systematic

              chi2(4) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                      =        4.10
           Prob>chi2 =      0.3930
```

As shown in the test results in Table 4.5, the Hausman Test Statistic is only 4.1, which is way smaller than its corresponding critical values at the significance level of 10%, 5% and 1%. It indicates that random effect model is preferred even though the sector effect is not entirely random among all the ten sectors. It demonstrates that sector has no definite influence on the stock premium after their cross-border listing in foreign countries. Firm valuation is more related to firm specific factors than sector/industry factors.

4.3 Interpretation of Results
Based on the Random Effect Model:

$$Post_{listing}Q_i = (-0.1590) + (0.1521) * Sales\ Growth_i + (0.0177) * Log(Net\ Sales)_i$$

$$+ (0.7627) * Pre_{listing}Q_{i,(-1)} + (-0.0610) * naiveEDF_i + u_i + \varepsilon_i$$

Note:

u_i is treated as random variable measuring sector premium among all ten sectors.

The coefficient of $Log(Net\ Sales)_i$ is significant at 5% level.

The coefficient of $Pre_{listing}Q_{i,(-1)}$ is significant at 1% level.

The regression result shows that large firms with higher growth opportunities, higher stock valuations and lower default risks before their announcement of cross-listing activities will gain a higher stock premium in foreign capital market after they accomplish the stock listing cross-border.

Since the sector effect is already incorporated structurally in the regression model, the remaining explanatory variables are all related to firm specific factors concerning firms' growth opportunity, scale of business, stock valuation nationally and risk management for default in existence. Specifically, the firm size and pre-listing premium are more significant in influencing the post-listing premium of stocks, indicating that foreign investors will prefer to invest in large firm with already high market recognition in their home countries.

The coefficient of naiveEDF is negative 0.061, showing that an increase in default probability by one percentage point would decrease the post-listing premium by 0.061 percentage points. Although this variable is not statistically significant, it shows a negative relationship with stock premium and indicates that good financial state, i.e. low default probability, would increase stock premium in foreign countries. Obviously, foreign investors would choose to provide capital for firms with a good history of low default risk. Even though Canadian firms have to reach the similar standards to sell their stocks internationally, firms with high creditability financially will be recognized easily in a foreign market and thus get more capital support for their stocks, resulting in a higher market valuation and higher post-listing premium.

4.4 Feasibility of Model
4.4.1 Multicollinearity Test

Table 4.6

```
. correlate naiveEDF growthrate size_effect pre_q
(obs=40)

             |  naiveEDF growth~e size_e~t    pre_q
─────────────┼────────────────────────────────────
   naiveEDF  |   1.0000
 growthrate  |   0.0526   1.0000
size_effect  |   0.0126   0.2496   1.0000
      pre_q  |   0.0392   0.0489   0.3567   1.0000
```

As shown in the correlation coefficient matrix (Table 4.6), the correlations between explanatory

variables are low, with the maximum level to 35.67%. So, there is no obvious correlation

problem with the independent variables in the regression model.

4.4.2 Heteroscedasticity Test—White Test

Varying volatility is common for cross-sectional data, which necessities the White test for

Heteroscedasticity and the use Heteroscedasticity-Consistent Standard Error for further analysis.

Table 4.7

```
. estat imtest, white

White's test for Ho: homoskedasticity
        against Ha: unrestricted heteroskedasticity

        chi2(14)    =     21.15
        Prob > chi2 =    0.0978

Cameron & Trivedi's decomposition of IM-test
```

Source	chi2	df	p
Heteroskedasticity	21.15	14	0.0978
Skewness	11.63	4	0.0204
Kurtosis	0.01	1	0.9028
Total	32.80	19	0.0254

The White test above shows that Heteroscedasticity exists in sample data since null hypothesis is easily rejected when $\chi^2 = 21.15$ (Table 4.7). This result indicates that simple OLS regression is not proper to capture the characteristics of sample data.

Table 4.8

```
. reg post_q growthrate size_effect pre_q naiveEDF, vce(robust)

Linear regression                               Number of obs =       40
                                                F(  4,    35) =    28.03
                                                Prob > F      =   0.0000
                                                R-squared     =   0.8177
                                                Root MSE      =   .08633
```

post_q	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
growthrate	.1158391	.1299412	0.89	0.379	-.1479555	.3796336
size_effect	.0199947	.0080466	2.48	0.018	.0036593	.0363301
pre_q	.751976	.1046587	7.19	0.000	.5395076	.9644444
naiveEDF	-.0689295	.0399171	-1.73	0.093	-.1499656	.0121066
_cons	-.1788727	.0910313	-1.96	0.057	-.363676	.0059306

As shown in the robust regression, three variables, i.e. size effect, pre-listing premium and naiveEDF are all significant at the level of 5%, 1% and 10%, respectively (Table 4.8). Compared with both Pooled OLS Model and Random Effect Model, the Heteroscedasticity-Consistent Model dramatically improves the significance of the variable called naiveEDF. The mechanism of using Heteroscedasticity-consistent standard errors in replace of actual various standard errors is an efficient remedy, but lack practical economic sense. And it also pooled all the sample firms together without differentiating sectors in which they are individually involved. Conclusively, although the results from Heteroscedasticity-consistent Model looks superior to those of Random Effect Model, analysis in this paper is still based on the Random Effect Model to capture the cross-sectional effects among diversified sectors.

4.4.3 Specification Test—Remsey's Reset Test

$$Post_{listing}Q_i = \beta_0 + \beta_1 Sales\ Growth_i + \beta_2 Log(Net\ Sales)_i + \beta_3 Pre_{listing}Q_{i,(-1)}$$

$$+ \beta_4 naiveEDF_i + \gamma_1 yhat_{square} + \gamma_2 yhat_{cubic} + \gamma_3 yhat_{quartic} + u_i + \varepsilon_i$$

Table 4.9

```
. reg post_q growthrate size_effect pre_q naiveEDF yhat_square yhat_cubic yhat_q
> uartic
```

Source	SS	df	MS		Number of obs =	40
					F(7, 32) =	31.19
Model	1.24828133	7	.178325904		Prob > F =	0.0000
Residual	.182949385	32	.005717168		R-squared =	0.8722
					Adj R-squared =	0.8442
Total	1.43123071	39	.036698223		Root MSE =	.07561

post_q	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
growthrate	.1581029	.1504535	1.05	0.301	-.1483609	.4645666
size_effect	.0082453	.0158428	0.52	0.606	-.0240253	.0405159
pre_q	.2245741	.6049986	0.37	0.713	-1.007768	1.456916
naiveEDF	-.0488836	.0624266	-0.78	0.439	-.1760425	.0782752
yhat_square	2.575312	4.706143	0.55	0.588	-7.010788	12.16141
yhat_cubic	-6.280984	10.39559	-0.60	0.550	-27.45611	14.89414
yhat_quartic	5.251676	7.099535	0.74	0.465	-9.209604	19.71296
_cons	.0106129	.1759705	0.06	0.952	-.3478273	.369053

$$F^* = \frac{(R_u^2 - R_r^2)/3}{(1 - R_u^2)/(n-8)} = \frac{(0.8722 - 0.8177)/3}{(1 - 0.8722)/32} \approx 4.5488$$

The F test shows no specification error because that F-statistic is less than its corresponding

critical value and the null hypothesis can no longer be rejected, indicating that the model is fairly

specified.

Chapter 5 Conclusions, Limitations and Recommendations

5.1 Conclusions

This paper aims at verifying the relationship between post-listing premium and firms' default probability before the announcement of cross-listing. By using 47 firms in the sample from ten sectors in the Canadian market, and collecting their financial data before and after firms' official announcement date of cross-listing in the U.S. market, firms' post-listing premium are properly measured by Tobin's Q ratio and then regressed on several firm specific variables. In addition to the target variable measuring default risk in the domestic market, other factors that have potential in influencing stock valuation in the NYSE or NASDAQ are all incorporated as explanatory variables, such as growth rate, firm size and pre-listing premium. Since sector specific factors are hard to identify and measure properly, they are included in the structure of the model rather than as variables. The preferences of Random Effect Model to Fixed Effect Model supports that sector specific factor share no definite influence on the stock valuation of firms in various sectors.

Among all these regression models, pre-listing premium and size-effect possess statistical significance in explaining the post-listing premium in U.S. market while the naiveEDF measuring the firm default probability only shows its high statistical relevance in the Heteroscedasticity-Consistent model. Firstly, it indicates that default riskiness of firms have firm individuality rather than sector universality based on all the sample firms in ten sectors. Since the Heteroscedasticity phenomenon is general in cross-sectional data, simply treating data with its remedy approach would provide surprising results. Secondly, it demonstrates that default probability of cross-listed firms may not be seriously taken into consideration by foreign investors in deciding whether they should buy the newly cross-listed stocks or not. Possibly,

probabilities of default are so complicated to measure properly that investors will choose to ignore them when investing newly cross-listed firms just for short-term investment. Or, the survivorship of those cross-listing firms hoodwink part of those investors who have no expertise in analysing firm valuation and in figuring out what is the real internal financial state. However, the negative coefficient of naiveEDF manifests that high default risk would inversely influence the stock premium in foreign capital markets, which is tested in all the regression models applied and also has its economic sense.

5.2 Limitations
Firstly, from the perspective of data collection, this study is based on a small sample of Canadian firms cross-listed in the U.S. market from 1982 to 2002. These samples are randomly selected without any preference to any sectors or industries. The only constraint relating to selection process is the availability of their official announcement data of cross-listing from whatever sources. In accordance with the announcement date, all the financial data before and after the announcement date are hand-collected from Datastream, which is so time-consuming that the analysis has to be narrowed down to only 47 Canadian firms with time ending to 2002. As for the sectors of Media and Utilities, only one firm is left for each of the sector and is clearly not fully representative of all information in that sector. However, as a matter of fact, the regression results show no markedly differences by excluding these two firms and two sectors.

Secondly, the superiority of using Fixed / Random Effect Model to measure sector specific factors, compared with Pooled OLS Model, is that it considers cross-sectional effect rather than ignoring it. But the regression result by the Random Effect Model is inferior to the Heteroscedasticity-Consistent Model. It simply treats all the difference in volatility as selection biases, not sector specific. Although the Random Effects Model has more economic sense, this

approach may mistakenly consider sector specific factor as the entire "random" part of the error term under assumptions in cross-sectional models. The truth is, there are other factors incorporated in the error term in addition to sector factor.

Thirdly, the variable used as measure of default probability is called naiveEDF. As its name indicated, this probability is calculated in a simplified approach based on a lot of assumptions about market value of debt and volatility of total asset. The feasibility of using this measure rather than the actual probability measure based on BSM model and iteration process is on the basis of the conclusion in the work of Bharath, and Shumway (2008). However, this measure may lose its degree of accuracy in other test environment on different dataset.

5.3 Recommendations

In view of three limitations mentioned above in this paper, the corresponding recommendations are proposed for further study:

A larger dataset should be included in the analysis chapter, which may contain more firms from different sectors with a longer time span. Additionally, firms from other domestic countries who cross-listed their stocks in other major capital markets can also be incorporated in the study to test whether this causality relationship is related to origination / destination markets. With more comprehensive samples to analyze, the regression results will be more accurate and the conclusions more credible.

Besides, in order to accurately capture the sector specific effect to which these sample firms belong to, two alternative methods can be used rather than adopting different model formats. Following previous academic work, the Industry Tobin's Q is applied to measure the average level of firm valuation in the overall industry, which can approximate industry effect to stock

valuation. Otherwise, the general equity index for each industry can be identified and be traced for its historical performance in the exact time when firms published their cross-listing news officially. Both methods require extensive collection of massive data.

What's more, I would suggest using the BSM method and iteration process to get the actual default probability rather than based on its simplified version in approximation. The complicated calculation process and rigorous mathematical demonstration would improve the veracity in measuring default probability and thus increase precision of regression test. Otherwise, standard indicators for insolvency from authorities, for example credit rating agencies, can be used to measure firms' financial states as long as they may influence listing premium reasonably.

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Appendix

Firm Name	Sector	Industry
AETERNA LABS.	Healthcare	Biotechnology
AGNICO-EAGLE MNS.	Basic Materials	Gold
AGRIUM	Basic Materials	Agricultural Chemicals
ALBERTA ENERGY DEAD - MERGER 916229 - TOT RETURNIND	Basic Materials	Oil & Gas
ALL.ATLANTIS COMMS.'A' VTG.SHS.	Technology	Computer software
ANGIOTECH PHARMS.	Health Care	Pharmaceuticals
ATI TECHNOLOGIES	Industrial Goods	Metal Fabrication
AXCAN PHARMA	Health Care	Pharmaceuticals
BALLARD PWR.SYS.	Industrial Goods	Industrial Electrical Equipment
BANK OF MONTREAL QUE.	Financial	Money Center Banks
BIOVAIL	health care	pharmacy
BROOKFIELD PROPS.	Financials	Real Estate Development
CAMECO	Basic Materials	Industrial Metal & Minerals
CANWEST GLOBAL COMMUNICATIONS CORP	Media	Broadcasting
CGI GP.'A'	Industrial Goods	Trucking
CRYPTOLOGIC	Technology	Internet software services
DATAMIRROR	Technology	Application Software
DESCARTES SYS.GP.	Technology	Enterprise Software
DOREL INDS.'A'	Consumer Discretionary	Home Furnishings
ENBRIDGE	Basic Materials	Oil & Gas pipelines
EXTENDICARE 'A'	Healthcare	Health Care Plans
FOUR SEASONS HTLS.VTG. SHS.	Consumer discretionary	Hotels Resorts and Cruise Lines
GILDAN ACTIVEWEAR SBVTG.'A'	Consumer goods	textile
INTERTAPE POLYMER GP.	Consumer goods	Packing
INTRAWEST	Consumer discretionary	Hotels Resorts and Cruise Lines
IPSCO	Basic Materials	Steel
IVANHOE EN.	Energy	Oil & Gas
KINGSWAY FINL.SVS.	Financials	Property & causality insurance
MDS	Health care	Health Care Technology
NEXEN	Energy	Oil & Gas
NORANDA	Basic Materials	Aluminum
PAN AMER.SILV.	Basic Materials	Silver Mining
PETRO CANADA	Energy	Integrated Oil and Gas

PRECISION DRILLING	Basic Materials	Oil & Gas
RESEARCH IN MOTION	Technology	Phones & Handheld devices
ROGERS COMMS.'A'	Technology	Wireless Communication
ROYAL BANK CANADA	Financials	Banks
SHAW COMMS.'B'	Consumer Discretionary	Cable and Satellite
SIERRA WIRELESS	Technology	communication net working
SUNCOR ENERGY	Basic Materials	Oil & Gas
TALISMAN EN.	Basic Materials	Oil & Gas
TELESYSTEM INTL.WRLS. INC.SBVTG.SHS.	Technology	wireless communication services
TELUS	Technology	wireless communication services
TESCO	Basic Materials	oil gas equipment services
TLC VIS.	Health care	Health care facilities
TRANSALTA	Utilities	Diversified utilities
WESTAIM	Financials	Asset Management