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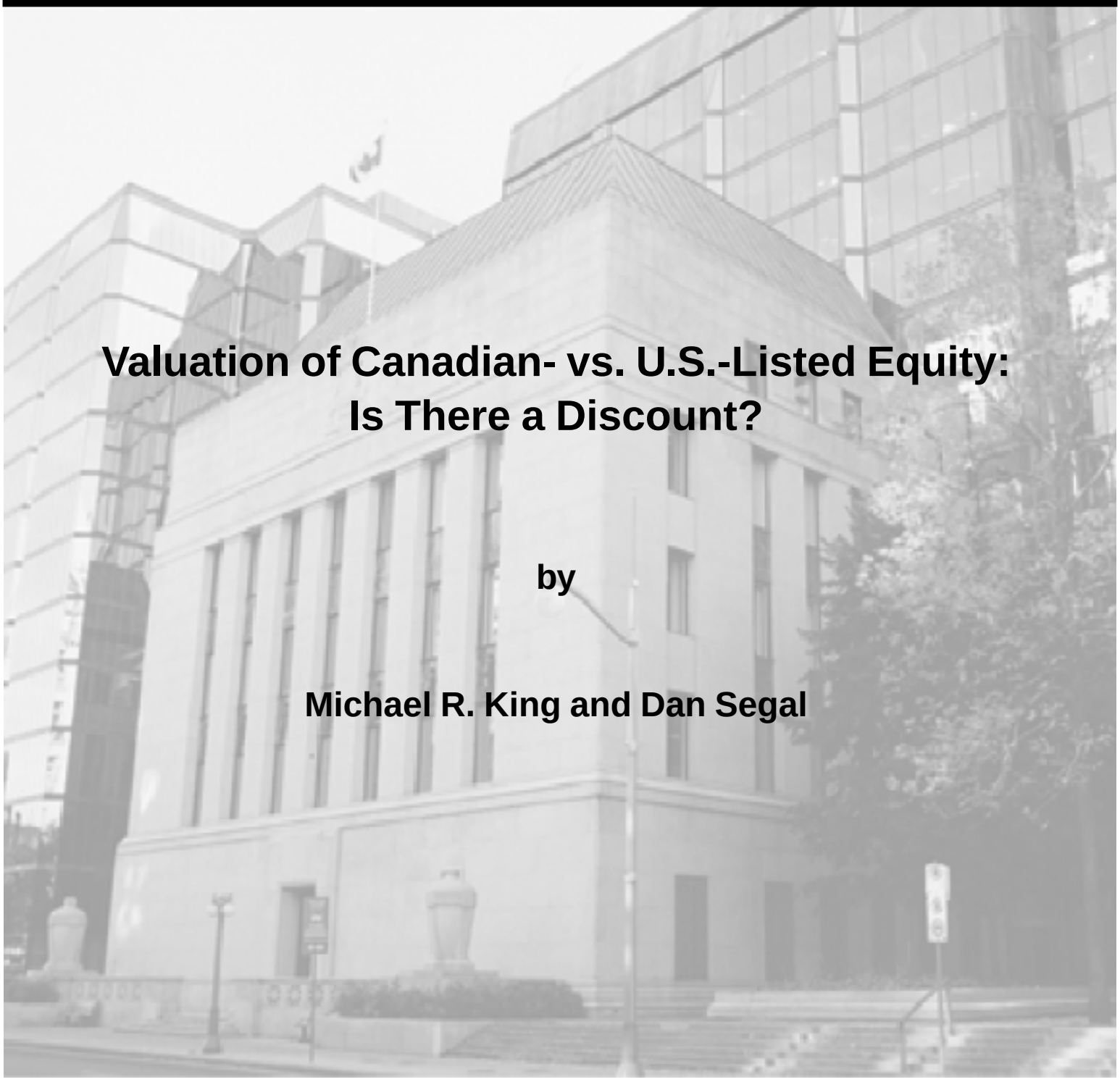

Valuation of Canadian- vs. U.S.-Listed Equity: Is There a Discount?

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Michael R. King[1] and Dan Segal[2]

[1]Financial Markets Department
Bank of Canada
Ottawa, Ontario, Canada K1A 0G9
mking@bankofcanada.ca

[2]Joseph L. Rotman School of Management
University of Toronto
Toronto, Ontario, Canada M5S 3E6
dsegal@rotman.toronto.ca

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Abstract

The authors examine how the valuation multiples assigned to the equity of Canadian-listed firms compare with the equity of comparable firms listed in the United States. They find that Canadian-listed firms trade at a discount to U.S.-listed firms across a range of valuation measures. Differences in accounting do not explain this discount, based on a comparison of Canadian interlisted firms that report under both Canadian and U.S. generally accepted accounting principles. This discount exists despite Canadian-listed firms having a lower cost of equity and higher profitability than comparable U.S-listed firms. Consistent with theory, part of the differences in valuation are explained by company-specific factors, such as industry, firm size, cost of equity, or profitability. The authors also find that characteristics of the stock market where the share is listed affect valuation, such as secondary market liquidity and the relative performance of the overall equity market. They find that a country discount persists after controlling for these company-specific and market-specific factors, which suggests that Canadian and U.S. financial markets remain segmented.

JEL classification: G12, G15
Bank classification: Financial markets

Résumé

Dans cette étude, les auteurs utilisent diverses mesures pour comparer la valeur des actions cotées en bourse au Canada à celle des actions cotées en bourse aux États-Unis. Ils observent, en utilisant à cette fin un large éventail d'instruments d'évaluation, que les actions des sociétés cotées au Canada se négocient à des cours moins élevés que ceux des sociétés cotées aux États-Unis. Se fondant sur une comparaison des cours des actions des sociétés cotées dans ces deux pays — dont les états financiers sont conformes aux principes comptables généralement reconnus —, ils estiment que cet écart ne peut s'expliquer par des différences comptables. Ils observent également que cet écart existe en dépit du fait que le coût des fonds propres est moins élevé pour les sociétés cotées au Canada et que le coefficient de rentabilité de ces dernières est plus élevé que celui de leurs équivalents américains. Conformément aux enseignements de la théorie, l'écart observé est dû en partie à des facteurs propres aux sociétés, notamment le secteur d'activité auquel elles appartiennent, leur taille, le coût de leurs fonds propres et leur rentabilité. Les auteurs observent enfin que l'évaluation est influencée également par les caractéristiques du marché boursier sur lequel se négocient les actions, notamment la liquidité du marché secondaire des titres et la performance relative du marché boursier en général. Cependant, l'écart associé au pays persiste lorsqu'on tient compte des facteurs propres aux sociétés concernées et au marché, ce qui donne à penser que les marchés financiers canadiens et américains demeurent segmentés.

Classification JEL : G12, G15
Classification de la Banque : Marchés financiers

1. Introduction

This paper analyzes differences in the valuation of Canadian- vs. U.S.-listed equity to answer the question, do Canadian-listed firms trade at a discount to comparable firms listed in the United States? Three categories of factors may explain differences across markets: company-specific factors, market-specific factors, and country-specific factors. Company-specific factors are the variables identified in the asset-pricing literature used to derive a price for a company's equity. While there are numerous models with which to derive the value of a share, those models all rely to some extent on factors such as company size, industry, cost of equity, profitability, the dividend policy of a firm, and secondary market liquidity. Market-specific factors capture differences in the features of the equity markets that affect all firms listed and traded on a given stock exchange, such as the relative performance of the overall market. Country-specific factors capture those institutional features of the financial markets that affect all firms listed and traded within a given jurisdiction, such as the accounting systems used to prepare financial statements. This paper tests to see whether there are valuation differences between Canadian- and U.S.-listed equity, and to see how the three categories of factors contribute to these differences.

A principal motivation for this paper is to test whether the financial markets of Canada and the United States are integrated or segmented. If systematic differences in valuation exist between the Canadian and U.S. equity markets, Foerster and Karolyi (1999) argue that firms will have an incentive to adopt financing strategies to reduce any negative effects. Such decisions by individual firms may have an impact on the overall depth and liquidity of a country's financial markets, as well as impact the future viability of those markets. Although a number of studies have addressed the degree of segmentation of Canadian and U.S. financial markets, those studies have produced conflicting results, supporting both a view of integration and of segregation (Doukas and Switzer 2000; Garvey and Giammarino 1998; Jorion and Schwartz 1986). This paper provides an alternative test of the segmentation of the Canadian and U.S. capital markets by comparing the valuation multiples assigned to the equity of Canadian- vs. U.S.-listed equity from 1991 to 2000.

We find that the median Canadian-listed company is priced at a discount to its U.S.-listed peers after controlling for company size and industry, judging from a range of valuation measures that are based on pre-tax and after-tax values: the ratio of book price per share to the market price (book-to-market); the earnings-to-price ratio; the earnings before interest, taxes, depreciation, and amortization-to-enterprise (EBITDA) value; and free cash flow (FCF)-to-enterprise value. This valuation discount exists despite the median Canadian-listed firm being more profitable and having a lower cost of equity. A comparison of valuation and profitability measures calculated using financial statements prepared according to Canadian and U.S. generally accepted

accounting principles (GAAP) allows us to reject an explanation based on accounting systems. We conduct a series of multiple regressions to test whether the discount is explained by company-specific or market-specific factors. While these factors do explain some of the discount, there is also a country discount after controlling for company size, cost of equity, profitability, dividend policy, secondary market liquidity, and the risk-adjusted return of the stock market where the share is listed. This result suggests that the Canadian and U.S. equity markets are segmented, and that country-specific factors other than accounting are important.

This paper is organized as follows. Section 2 outlines a series of hypotheses for explaining differences in valuation across companies. Section 3 tests the existence of significant differences in the valuation of Canadian- and U.S.-listed equity using a univariate hypothesis test. We match the Canadian-listed firms with their U.S.-listed peers based on size and industry membership and compare their valuation using four measures. Having documented a discount, we examine how company-specific factors contribute to this discount using cost of equity, profitability, and dividend policies. Section 4 tests to see whether differences in accounting rules between Canadian and U.S. GAAP can explain our results. Section 5 tests to see whether the discount is explained by characteristics of the stock market where the share is traded. Section 6 offers some conclusions.

2. Hypotheses

Anecdotal evidence suggests that the equity of Canadian-listed firms trades at a discount to U.S.-listed firms. Concerns over this evidence are voiced in the debate over the “hollowing out” of corporate Canada, with critics arguing that Canadian companies are moving their financing and headquarters south of the border to take advantage of more attractive opportunities in the U.S. capital markets. Concerns about hollowing out have been fuelled by a series of high-profile takeovers in recent years, with firms such as MacMillan Bloedel, Gulf Canada, Newbridge Networks, and Seagram being taken over by foreign competitors. If the equity of U.S.-listed firms is assigned a higher valuation multiple than Canadian-listed firms, this valuation difference would create a competitive advantage for U.S.-listed firms. Higher valuations would provide more funding per share sold and give U.S.-listed firms a relatively cheaper “currency” with which to pay for acquisitions, namely their own shares.

The finance literature has provided a number of theoretical reasons to explain differences in the valuation of a company’s equity relative to that of its peers. Differences in valuation may be explained by factors specific to each company, such as firm size, industry membership, profitability, cost of equity, and secondary market liquidity. Other factors that may influence valuation are specific to the stock exchange where a company is listed, such as the overall return

of the stock exchange or its industry composition. In addition, there are differences in performance across countries, owing to different sets of accounting rules and other national institutions. These differences have been termed country-specific factors in the literature, and their existence suggests that financial markets may not be fully integrated. Theoretically, if there were no barriers to international capital flows, all assets in both countries should be priced according to a model of an integrated capital market. Arbitrage between markets would eliminate any differences in valuation across markets for firms that are seen as close substitutes by investors. In other words, differences in the valuation multiples of comparable firms across integrated markets would not exist. A comparison of the valuation of Canadian- and U.S.-listed equity therefore presents an opportunity to test the market segmentation hypothesis, and to determine which factors may contribute to this segmentation.

This section briefly reviews each category of factors outlined in the literature. The impact of these factors on the valuation of Canadian- vs. U.S.-listed firms is examined in section 2.1.

2.1 Company-specific factors

All financial models for deriving the value of a share rely on discounting the future expected cash flows that will accrue to a shareholder, either in the form of dividends or capital gains. Forecasted future cash flows will depend on company-specific factors such as profitability, earnings growth, and the dividend payout chosen by managers. These cash flows are then discounted at a rate that reflects the variability or riskiness of these cash-flow estimates, generally the cost of equity.[1] Systematic differences in cash flows or discount rates between comparable Canadian- and U.S.-listed firms would justify different valuation multiples for these firms.

There are numerous methods for estimating the cost of equity. The most common and most widely used method is the single-factor capital asset pricing model (CAPM) developed by Sharpe and Lintner (Graham and Harvey 2001).[2] Under the CAPM, the cost of equity is a function of a riskless security, the stock's covariance with the overall market portfolio (or beta), and the incremental return from holding the overall market portfolio relative to a risk-free security. Differences in these company-specific factors across two firms may lead to differences in their cost of equity and valuation. Likewise, differences in these factors between a Canadian- and a U.S.-listed firm would justify differences in valuation.

1. The Gordon dividend discount model, for example, views the price of a stock as a function of the cost of equity, the dividend policy proxied by the earnings retention rate, and the growth rate of future earnings.
2. Alternative valuation models rely on multiple factors, as predicted by arbitrage pricing theory. For example, Fama and French (1992, 1995) have identified three factors.

Five points concerning the CAPM are worth emphasizing. First, this framework assumes that firm-specific risk-adjusted returns are captured by the single factor, beta. Other studies have found that other factors influence returns (for example, Fama and French 1992, 1995). As Roll (1977) noted in his famous critique, beta is a relative measure and the use of different proxies for the market portfolio will lead to different values of beta for a given stock. In practice, the beta of a U.S.-listed firm is generally calculated with reference to the Standard and Poor's (S&P) 500, while the beta of a Canadian-listed firm is calculated with reference to the Toronto Stock Exchange (TSE) 300 index. If the returns or volatility of these two markets differ over time, owing perhaps to different industry weightings or membership in each index, these differences could lead to systematic differences between the betas for firms traded in either stock market.

Second, different assumptions about the expected return on the market portfolio over the risk-free asset—commonly called the equity premium—may generate systematic different valuations across markets. A number of studies have sought to unravel the so-called equity-premium puzzle.[3] They have documented that the equity premium for Canada differs from that for the United States (Claus and Thomas 2001; Hodrick, Ng, and Sengmueller 1999; Jorion and Goetzmann 1998; Kasa 1997). In particular, Canadian estimates of the equity premium are consistently lower than U.S. estimates.[4] A lower equity premium should create systematic valuation differences between Canadian- and U.S.-listed firms.

Third, differences in the risk-free rate across markets should lead to systematic valuation differences between Canadian- and U.S.-listed firms. The risk-free rate is generally proxied using a government security, either a short-term security such as treasury bills or a longer-term government bond yield. Interest rates have differed between Canada and the United States owing to different macroeconomic conditions and monetary policies. Canadian short-term interest rates were significantly higher than those in the United States from 1990 to 1995 (Table 1), suggesting that this component of the cost of equity was higher. Higher interest rates during the early 1990s have been linked to differences in the stance of monetary policy between Canada and the United States, and to a premium in Canadian interest rates due to the levels of government debt outstanding and political uncertainty in Canada following the Quebec referendum on sovereignty association. Companies listed on a Canadian stock exchange therefore faced a higher risk-free rate during the first half of the 1990s, which would be expected to lead to differences in the cost of equity and a firm's valuation.

3. For a concise discussion of the equity-premium puzzle, see Kocherlakota (1996).
4. Consistent with the literature, different estimates of the equity premium in the two markets show that the equity premium is time-varying and dependent on the methodology used to estimate it. Differences in equity market premiums are taken as an empirical fact that remains for future research to explain.

Fourth, differences in the expected future profitability of Canadian- and U.S.-listed firms may explain differences in their valuation. A common proxy of profitability is return on equity (ROE), which may be broken down into its components using the Dupont decomposition.[5] ROE can be written as a function of the profit margin, asset turnover, and financial leverage. The profit margin can be seen as a proxy for a firm's dominance of its industry, in the belief that market leadership generates higher margins over time. Likewise, asset turnover and financial leverage capture effects related to the productivity of assets and the impact of capital structure choices.

Fifth, differences in valuation may be related to the secondary market liquidity of a firm's share. For prices to be informative, they must incorporate valuation-relevant information that enters the market in a random fashion. This view forms the basis for the efficient market hypothesis, and the conclusion that the stock market follows a random walk. If a company's shares are illiquid, prices may not reflect full information. Studies of interlisting have established that when a public company lists its stock on a second stock exchange, the price of its stock increases at the time of interlisting. This price increase is generally attributed to an increase in the secondary market liquidity of the share, as well as the greater visibility and better reputation associated with listing on a larger or more prestigious stock exchange. Increased liquidity is associated with a decline in expected returns as transparency increases, and risk premiums and costs of investing are reduced, leading to a decline in the cost of equity (Errunza and Miller 2000; Koedijk and Van Dijk 2000).

A company may choose to interlist on a second stock exchange in its home country, or to interlist on a foreign stock exchange. Both the New York Stock Exchange and the London Stock Exchange attract listings from foreign countries, as firms seek to access these capital markets. Studies of international interlisting find that firms with interlisted shares experience an increase in liquidity, evidenced by higher trading volumes, a reduction in trading costs, and an increase in shareholder visibility (Chan, Stulz, and Fong 1994; Doidge, Karolyi, and Stulz 2001; Errunza and Miller 2000; Foerster and Karolyi 1998, 1999; Karolyi 1998). Doukas and Switzer (2000) conduct an event study focusing on Canadian firms that announced their intention to interlist in the United States. The authors document abnormal returns around the announcement, suggesting that the Canadian markets remain mildly segmented. This study implies that Canadian firms can attain a lower risk premium by interlisting in the United States. Given the differences in size and liquidity of the Toronto Stock Exchange and the New York Stock Exchange, it is reasonable to

5. This approach was suggested in Booth and Zhao (2002). An alternative approach is to look at residual income, which Penman (1996, 2001) terms abnormal earnings. Residual earnings recognize that investors reward firms that achieve profitability over and above their cost of equity. Residual income is addressed indirectly in this study, given that both the cost of equity and ROE are considered in this analysis.

expect that listing on both exchanges will lead to differences in the valuation ratios of interlisted shares. This effect will be tested below.

2.2 Market-specific factors

Factors specific to a given stock exchange may affect the valuation of a company's shares. When considering two shares that trade on different exchanges, it is therefore important to control for the relative performance of each market, as well as the volatility of its returns. A comparison of the Canadian-listed firms with U.S.-listed firms must control for the outperformance of the U.S. stock market over the past decade.

Over the past two years, the U.S. stock market has been in decline following the bursting of the high-tech and internet bubble. Many observers believe that the valuations on U.S. stock markets over this period were out of line with historical fundamentals. On 5 December 1996, Federal Reserve Chairman Alan Greenspan mused in a now-famous speech whether "irrational exuberance" might be infecting the U.S. stock market. If U.S. stock market valuations were inflated due to investor sentiment, then controlling for company-specific fundamentals might not capture this element. A rising tide raises all ships, so all companies listed on a U.S. exchange may be expected to be overvalued relative to a stock market that was not displaying this behaviour. Therefore, the impact of this irrational exuberance on valuation needs to be controlled in a comparison across Canadian and U.S. stock markets.

2.3 Country-specific factors

There is a continuing debate in the finance literature on the importance of country-specific factors for explaining stock returns (Akdogan 1996; Asness, Liew, and Stevens 1997; Beach 2001; Beckers et al. 1992; Griffin 2002; Grinold, Rudd, and Stefek 1989; Heston and Rouwenhorst 1995; Lessard 1974). Studies disagree on the relative importance of country-specific factors versus industry factors. One important consideration is the impact of different national accounting rules on financial statements. Valuation depends critically on the inputs derived from a company's financial statements. Differences in accounting rules and operations will therefore lead to differences in valuation (Penman 1996). In particular, differences in accounting rules between Canada and the United States may explain differences in valuation across these two markets.

While Canadian and U.S. GAAP are in large part consistent, there are differences in the treatment of certain items that may lead to differences in both earnings and the book value of equity. Currently, Canada is moving towards harmonization with both U.S. GAAP and the International

Accounting Standards Committee. Recent examples of U.S.-GAAP harmonization are the new standard on business combination, the accounting for post-retirement costs, and the accounting for income taxes. Despite these recent modifications, there were a number of other differences between Canadian and U.S. GAAP over our sample period, including accounting for foreign exchange gains and losses, accounting for gains and losses on marketable securities, and treatment of development costs.

A number of studies have investigated the information content of Canada-U.S. GAAP differences (Bandyopadhyay, Hanna, and Richardson 1994; Barth and Clinch 1998; Bandyopadhyay, Dover, and Richardson 1998). Bandyopadhyay, Hilton, and Richardson (2002) show that Canadian and U.S. GAAP numbers appear to be close substitutes. In other words, differences in the accounting rules between Canada and the United States are not expected to lead to valuation differences across Canadian and U.S. equity markets. The impact of accounting on cross-border valuation will be tested in section 3.

3. Evidence of a Country Discount

3.1 Data and methodology

To study the relative valuation of Canadian and U.S. firms, we use annual company accounts data and monthly pricing data, Standard and Poor's Compustat, and secondary market data from the Canadian Financial Markets Research Center (CFMRC) and the U.S. Center for Research on Stock Prices (CRSP). Data on both company accounts and stock market pricing for Canadian firms are available only for the period 1991 to 2000, limiting the sample size to these dates. Within this constraint, the sample consists of close to 10,000 firms, of which around 7 per cent are Canadian-listed firms and the remainder are U.S.-listed firms. For each company, there is a maximum of 10 years of annual financial results in the sample, although for some firms there are fewer years based on when the share was listed or delisted. As a result, the total sample size is roughly 50,000 firm-year observations.

For each firm-year, we calculate four valuation ratios: book-to-market, earnings-to-price, EBITDA-to-enterprise value, and FCF-to-enterprise value. Following the convention in the literature, the valuation ratios are calculated with the price in the denominator, to mitigate the effect of outliers (Fama and French 1992; Penman 1996).[6] The stock price used for the valuation ratios is the price at the end of March of the following calendar year, adjusted for stock splits and

6. For example, the price-to-earnings multiple is unstable for small positive or negative earnings, causing the multiple to explode. As earnings approach zero, the price-to-earnings multiple approaches infinity.

dividends. This price allows for a delay in the publication of the financial statements for the previous year, to avoid endogeneity in our results.[7] Details on the formulae used to calculate these ratios are given in Appendix A.

We control for industry and size effects that have been shown to influence the valuation of an individual firm by creating a matched sample of U.S. observations for each Canadian observation based on size and industry (Alford 1992; Fama and French 1992, 1995). We match the Canadian and U.S. observations based on the first three digits of the Standard Industrial Classification (SIC) code. We then restrict the set of U.S. comparables to those firms with total assets greater (less) than 50 per cent (150 per cent) of the total assets of the Canadian-listed firms, expressed in U.S. dollars using the end-of-year exchange rate.[8] This matching procedure generates a set of comparable U.S.-listed firms for each Canadian firm based on industry and size. The number of U.S. comparables varies, depending on the industry for each firm. For example, Air Canada has a larger set of comparable firms than Alcan Aluminium, due to the greater number of players in the air-transportation relative to aluminum operations. In cases where there are a large number of matching U.S.-listed peers, we restrict the set of U.S. comparables to the five closest U.S.-listed firms by size, based on the absolute differences with the Canadian-listed firm.[9] For example, when there are more than five comparable firms with the same three-digit SIC code that meet the size restrictions, we keep the closest five U.S.-listed firms by size. In practice, the set of comparable firms is smaller than five due to the accuracy of the SIC code used. For example, this matching process compares Nortel Networks with Alcatel, Ericsson, Motorola, and Nokia.[10] Matching across Canadian- and U.S.-listed firms yielded 10,638 U.S. observations that match 2,884 Canadian observations, for a total sample size of 13,522 observations.

We calculate a number of company-specific ratios for each firm. We measure profitability using the ROE and return on assets (ROA). We estimate the cost of equity for firms in our sample using

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7. The results reported were robust when other prices were used, such as fiscal year-end and one and two months after year-end.
8. The number of digits was chosen based on previous work that tested the set of comparable firms on the accuracy of the price-earnings method (Alford 1992). We cannot find matching U.S. data for 462 Canadian observations: 141 had total assets less than the minimum total assets in the industry, 85 had total assets greater than the maximum total assets in the industry, 24 had no comparable U.S. companies (in terms of a three-digit SIC and year), and the remaining 212 had no matching companies within the range (50 per cent, 150 per cent) specified.
9. An alternative approach would be to find matching firms in the United States for each Canadian firm. While providing a closer match for industry and size, such an approach would increase the standardized errors for other variables of interest, such as beta or leverage. We opt for a larger set of comparables, to reduce the influence of outliers.
10. Three of these comparables are not headquartered in the United States, although they are all listed and trade on the New York Stock Exchange.

the CAPM single-factor model. The cost of equity (K) is a function of riskless investment, the stock's covariance with the market portfolio, and the incremental return of the market portfolio:

$$K = \text{RF} + \text{company-specific beta} * (\text{expected return on market portfolio} - \text{RF}), \quad (1)$$

where RF = risk-free rate. The risk-free rate is the annualized yield on the 90-day treasury bill in each market, as shown in Table 1. The equity premiums for Canada and the United States are taken from Claus and Thomas (2001), who calculate the premium over 1985–98. Using the Gordon dividend discount model and Penman's abnormal earnings model, the equity premium for Canada is 5.89 per cent and 2.23 per cent and for the United States it is 7.34 per cent and 3.40 per cent, respectively (Claus and Thomas 2001).[11] Betas are calculated using monthly returns from 1991–2000 relative to the TSE300 index for Canadian-listed equities, and the S&P500 for U.S.-listed equities. We calculate the unlevered beta for each industry in each country using the median beta for each three-digit SIC code. Then we relever the betas for each firm.[12] Using these inputs, we calculate the cost of equity for each firm by country. We decompose ROE into profit margin, asset turnover, and leverage to see whether there are significant differences in these components between Canadian- and U.S.-listed firms. The company-specific variables are used in a series of tests described below.

3.2 Hypothesis tests

To determine whether there is a statistically significant difference between the ratios of a Canadian-listed firm and its U.S.-listed peers, we compare firms listed exclusively in Canada with firms listed exclusively in the United States. Roughly 160 Canadian firms that are interlisted on both a Canadian and a U.S. stock exchange are excluded from the sample, to provide a sharper contrast between markets. To include interlisted Canadian firms would introduce bias into a comparison of the valuation for a company listed in a single national market, as the valuation of

11. Our results are robust to different values for the equity premium, including the case when the same equity premium is assumed in both markets, or a higher equity premium is assumed for Canada (following Damodoran 2002). Kasa (1997) calculates the equity premium for 1972–93 as 3.28 per cent in Canada vs. 4.64 per cent in the United States using MSCI indices denominated in U.S. dollars. Hodrick, Ng, and Sengmueller (1999) find values of 3.54 per cent for Canada and 5.71 per cent for the United States for 1970–98, using the same methodology. Jorion and Goetzmann (1998) calculate equity premiums in local currencies for 1921–96 of 5.35 per cent in Canada and 6.95 per cent in the United States. Why the equity premium is consistently lower in Canada than the United States is a question for future research.

12. We calculate Dimson betas to account for the illiquidity of shares that are infrequently traded, using one-month leads and lags. We find, however, that these betas are significantly more volatile for the Canadian sample, with many more negative occurrences of beta (Dimson 1979). For this reason, we use the industry betas instead, following Fama and French (1992), who find little significant difference between different betas in their study.

the interlisted Canadian firm's shares is partly driven by market-specific factors and arbitrage between stock markets.

To test whether Canadian- and U.S.-listed firms are valued differently, we employ the following hypothesis test. For each Canadian observation, we calculate the median ratio for the set of U.S. comparables. We then calculate the difference between a given ratio for the Canadian-listed firm and the median ratio of the set of U.S. comparables. For example, the median book-to-market ratio of the U.S. comparables is subtracted from the book-to-market ratio for a Canadian-listed firm to determine the difference in book-to-market. We test whether the difference in the ratios is statistically significant using a non-parametric hypothesis test. A non-parametric test does not rely on the assumption of normality for the distribution of the sampling statistic when testing a null hypothesis. We do not use the conventional *t*-test because the distribution of the valuation ratios violates the assumption of a normal (Gaussian) distribution. The non-parametric hypothesis test chosen is the Wilcoxon signed-rank test, which is designed to test a hypothesis about the location (median) of a population distribution. Studies have found that the Wilcoxon signed-rank test has 95 per cent of the *t*-test's power, when the distribution is in fact Gaussian. Table 2 shows the results of this hypothesis test.

On average, the median Canadian-listed firm traded at a discount to comparable U.S.-listed firms, despite the average Canadian-listed firm being more profitable.[13] The differences between Canadian-listed firms and their U.S. comparables are both statistically significant and economically important. In the pooled results, the Canadian sample had statistically higher book-to-market, earnings-to-price, EBITDA, and FCF ratios (implying lower multiples of book value, past 12-month earnings, EBITDA, and FCF). In contrast, Canadian firms had statistically higher ROE and ROA. The book-to-market of the average Canadian-listed stock was more than 8 per cent higher than the median of its U.S.-listed peers over the period 1991–2000, despite the fact that the Canadian-listed firm had an ROE that was nearly 2 per cent higher.[14] For the annual observations, the impact of the longer and deeper recession in Canada can be seen in the lower profitability and earnings-to-price of Canadian-listed firms in 1991 and 1992. From 1994 onwards, a clear pattern emerges with Canadian-listed stocks trading at a discount to their U.S.-listed peers across the range of valuation measures, despite exhibiting consistently higher profitability for many of those years. Note that the relationship of book-to-market is constant for

13. These findings are consistent with those of Booth and Zhao (2002).
14. Although it is tempting to convert the result into a price-to-book multiple, the inverse will not represent the average price-to-book difference, due to different distributions of the book-to-market and price-to-book statistics.

the whole period, with Canadian-listed firms trading at a lower multiple of book value in nine out of ten years.

3.3 Impact of company-specific variables

Having found that Canadian-listed firms trade at a discount to comparable U.S.-listed firms of the same approximate size and in the same industry, we next consider whether company-specific factors explain this result. Using the same matched set of Canadian-listed firms and their comparable U.S.-listed peers, we test whether there are important differences in the cost of equity, beta, and the components of ROE across these samples. The same non-parametric test is employed, based on the difference between the Canadian-listed firm and the median of its U.S.-listed comparables. Table 3 shows the results of the test.

The Wilcoxon signed-rank test shows that Canadian-listed firms had a cost of equity that was significantly different from that of U.S. firms over the past decade. From 1991 to 1995, the Canadian cost of equity was higher, although it was only statistically higher in 1993–95. This finding may be due to the significantly higher risk-free rates in Canada (see Table 1) than in the United States from 1990 to 1995, combined with the higher betas for Canadian firms. The betas of Canadian-listed firms were statistically higher in the pooled results and in seven out of the ten years. Canadian firms then enjoyed a lower cost of equity from 1996 to 2000, owing no doubt to the lower risk-free rate in Canada, despite the average Canadian-listed firm having a higher beta for most of that period. For the components of ROE, the pooled results show that Canadian-listed companies had higher profit margins but a lower asset turnover than their U.S.-listed peers, while differences in financial leverage were not statistically different from zero.

This section has established that Canadian-listed firms traded at a discount to U.S.-listed firms over the past decade. This finding is consistent across a range of valuation measures. Closer scrutiny reveals that Canadian-listed firms had a statistically lower cost of equity and higher profitability over the past decade as a whole. For the annual observations, Canadian firms were less profitable, with a higher cost of equity at the start of the 1990s, justifying a discount through 1995. Canadian-listed firms then had higher profitability and a lower cost of equity from 1996 onwards, but they continued to trade at a discount to their U.S. peers. Asset pricing theory would suggest that Canadian firms should trade at a premium valuation to their U.S. peers, but they did not, due to other factors. This puzzle will be investigated further in sections 4 and 5. Section 4 will explore whether differences in accounting rules between Canada and the United States explain this result, and section 5 will test other explanations based on market-specific factors.

4. The Impact of Accounting

The impact of accounting differences on the valuation measures tested in this paper may be tested by considering the valuation of Canadian shares that interlist on a U.S. exchange. Almost 160 Canadian firms were interlisted on both a Canadian and a U.S. stock exchange over the period 1990–2000. To list on the New York Stock Exchange, a foreign company must furnish a complete reconciliation of financial accounts that comply with U.S. GAAP (Karolyi 1998). There are different levels of listings, with the more stringent requirements for the higher levels. In practice, Canadian firms list in the United States as ordinary shares, instead of as an American Depository Receipt (ADR), thereby meeting the highest standard, requiring full SEC disclosure on Form 20-F and full GAAP reconciliation of financial statements (Doidge, Karolyi, and Stulz 2001). In other words, these Canadian firms complete financial statements based on Canadian GAAP for their Canadian listing, and reconcile those results to U.S. GAAP for their U.S. listing.

Fortunately, Compustat records both sets of reported results in their Canadian and U.S. databases, respectively. We therefore have a perfect control case by which to test whether valuation is affected by accounting, because we can calculate the valuation and profitability ratios for the same company using Canadian GAAP for one set of calculations and U.S. GAAP for a second set of calculations. We calculate book-to-market, earnings-to-price, EBITDA- and FCF-to-enterprise value, ROE, and ROA for these interlisted firms, and then calculate the differences in these ratios using the same method described above. The difference for each ratio is equal to the Canadian GAAP ratio minus the U.S. GAAP ratio for the same year. The Wilcoxon signed-rank test is used to check whether this difference is statistically different from zero. Table 4 shows the results of this comparison.

The results support the finding of Bandyopadhyay, Hilton, and Richardson (2002) that Canadian and U.S. GAAP results are close substitutes. For both the pooled results and the annual observations, there is no statistical difference in either ROE or ROA, or in earnings-to-price. Book-to-market is statistically different from zero in the pooled results, although the value is not economically significant as it approximates zero. This result is possible because book-to-market varies over the 10-year period, with four years where book-to-market under Canadian GAAP is higher than under U.S. GAAP, and three years where the opposite is true. There appears to be no consistent pattern to these differences, as they cycle back and forth, suggesting timing differences in accounting that are evened out over time. EBITDA- and free cash flow-to-enterprise value show a similar pattern, although the differences are not economically significant. On this basis, we can conclude that accounting differences do not explain the discount of Canadian-listed firms versus their U.S. peers.

Having eliminated accounting differences as the source of valuation differences across markets, in section 5 we will test the impact of market-specific factors using a multivariate analysis. This analysis will control for company-specific factors, as well as market-specific factors, to see whether the country discount persists or is explained by these variables.

5. The Impact of Market-Specific Factors

This section tests for differences in the valuation of Canadian- and U.S.-listed firms using a series of multiple regressions to explain an individual firm's valuation. For these regressions, the dependent variable in one specification is the level of book-to-market, and in the other it is the level of earnings-to-price. The sample is the same as for the hypothesis tests conducted in section 3, although no matching is used to restrict these samples. The number of observations is much larger, because this comparison includes as many observations as are available. The sample includes firms listed either in Canada or the United States, but excludes interlisted Canadian firms.[15] We do not control directly for industry in these regressions, although we do restrict the sample to those three-digit SIC industries that are present in both the Canadian and U.S. samples. This restriction ensures that the valuation of industries not present in both countries does not bias the results. Industry effects are then controlled directly in a second set of regressions through the use of industry dummy variables.

5.1 Methodology

The rationale for using a regression is to try to identify the impact of different explanatory variables on the dependent variable. The dependent variable in these regressions is the level of book-to-market and earnings-to-price for a given firm. A multivariate regression provides added power by considering the interaction of a number of explanatory variables. This approach contrasts with the earlier univariate tests that were designed to test a hypothesis about two sampling distributions. The test statistic for the univariate hypothesis tests was the difference in book-to-market and earnings-to-price ratios between a Canadian firm and its U.S.-listed peers. The hypothesis tests are described as univariate because they tested for differences between the sample distributions based on a single variable, either the book-to-market or the earnings-to-price. The univariate tests controlled for other variables indirectly, owing to the matching method used to construct the sample and generate the test statistic. By contrast, multivariate regressions include a range of company-specific variables on the right-hand side as explanatory variables. By including these variables in the regression, we control for their impact on the dependent variable,

15. Our results were robust when we included interlisted Canadian firms as Canadian-listed observations.

either the book-to-market or the earnings-to-price of a firm. By controlling for one set of factors, we can then measure the additional explanatory power on book-to-market and earnings-to-price from including other factors as explanatory variables.

In the regressions using earnings-to-price as the dependent variable, we considered firms that had only positive earnings, in line with other studies in the literature.[16] For this reason, the number of observations for the regressions on earnings-to-price is consistently lower than the comparable regressions on book-to-market. The regressions on book-to-market are more robust to firms with losses, as book value is a stock measure of cumulative retained earnings and is therefore less volatile. For this reason, we view the results of the regressions on book-to-market as more robust and informative. In all our regressions, we follow the method recommended by Belsley, Kuh, and Welsch (1980) to identify influential observations and eliminate outliers.[17] We conducted standard diagnostic tests that confirmed the robustness of our model.[18] The results suggest that our model is robust and well-specific, with a fit that is consistent with similar studies in the literature.

5.2 Choice of explanatory variables

We control for company-specific factors that may explain differences in valuation across individual firms by including proxies for a company's profitability, cost of equity, dividend policy, and secondary market liquidity. We control for firm size by including a variable measuring the log of total assets, denominated in U.S. dollars. Consistent with previous studies, the log of total assets is statistically significant in most of the regressions. Each regression is run with two specifications, to check the robustness of our measures for cost of equity and ROE. In the second specification, we replace ROE with profit margin, asset turnover, and leverage. Likewise, we check the robustness of the cost of equity by substituting the components from the CAPM formula, namely the risk-free rate and the company-specific equity risk premium. In addition, we control for the impact of greater liquidity for a company's shares by including a measure of share turnover. The intensity of share turnover is proxied using the average number of shares traded in a month divided by the total number of shares outstanding, adjusted for stock splits, dividends, and other factors.

16. The rationale is that a negative earnings-to-price does not make sense from a valuation perspective, as it suggests that investors assign value to the losses of the firm.
17. Any observations that exceeded the thresholds recommended in Belsley, Kuh, and Welsch (1980) for the studentized residual, the covariance ratio, and a statistic generated by SAS, called DFFITS (similar to Cook's T), were dropped.
18. These regression diagnostics are available upon request.

We control for differences in the risk-adjusted equity returns of Canadian and U.S. stock exchanges by measuring risk-adjusted returns. For each stock market, we calculate the standardized return on the overall market measured as the value-weighted return of the overall market over the past year, divided by the standard deviation of the market return for the past three years.[19] This variable is included to capture any premium valuation of U.S.-listed firms that may be due to the "irrational exuberance" witnessed in U.S. equity markets over the mid-to-late 1990s. In theory, a rise in the overall stock market should lead to a rise in the valuation of individual firms listed on this stock market. In other words, when the stock market rises, the valuation of the firm is expected to increase. We tested the robustness of this market-specific measure by substituting a Sharpe ratio for each market, based on the market's excess return over its standard deviation. The results reported below are the same.

We also test to see whether there is a systematic country effect between Canadian- and U.S.-listed firms after controlling company-specific and market-specific factors, by including a country dummy variable. We estimate the following model:

$$VM = \alpha + \beta_1[\text{company-specific and market-specific factors}] + \beta_2 \text{CTRY} + \varepsilon, \qquad (2)$$

where *VM* stands for the valuation measure, using the book-to-market ratio in one specification and the earnings-to-price ratio in another. The dummy variable CTRY takes a value of 1 for Canadian-listed firms and zero for U.S.-listed firms. If the country effect identified in the univariate tests is explained by company-specific and market-specific factors, then the coefficient on the country dummy variable (β_2) should not be statistically different from zero. If, however, the country dummy variable is statistically significant, it will imply that there is a systematic country effect over and above the variables used as controls in the regression.

5.3 Regression results

The results of the regressions are shown in Table 5. The first regression uses book-to-market as the dependent variable. The log of total assets is negative and significant in the first part, suggesting that larger firms in this sample had a lower book-to-market (implying a higher price-to-book multiple). Firms in this sample with higher ROE had a higher book-to-market. This finding, which is consistent with theories of the mean reversion of earnings, is called the Molodovsky effect (Penman 2001, p. 537). Mean reversion suggests that firms that exhibit above-average profitability in one period can be expected to experience a fall in earnings in the future, as new entrants are attracted into this business and profit margins are reduced through greater

19. We would like to thank Raymond Chan for suggesting this control variable.

competition. Over time, earnings revert to the mean level for a given business, with no firm being able to sustain above-average earnings growth. Recent studies have documented mean reversion and link it with valuation ratios similar to our findings (Bauman, Conover, and Cox 2002; Fama and French 2000).

The direction and statistical significance of the coefficient for cost of equity is consistent with theory. Firms with a higher cost of equity receive a lower valuation as future cash flows are discounted more heavily to arrive at the correct current share price. A firm with a higher cost of equity than comparable firms will therefore have a higher book-to-market ratio and a higher earnings-to-price ratio, implying a valuation discount on those two measures. Note that the earnings retention rate is negative for both specifications of this regression, but is significant only for the second specification. The sign implies that firms that retain a greater share of earnings are assigned a lower book-to-market.

Share turnover is negative and statistically significant in all the regressions. Firms that exhibit higher share turnover trade at a premium to firms whose shares exhibit lower turnover. This result confirms the findings in the interlisting literature. The coefficient of the variable measuring the standardized return on the overall market is consistent with our expectations. The coefficient is negative and statistically significant. Firms' valuations based on both book-to-market and earnings-to-price increased when the risk-adjusted return of the market was greater.

The coefficient of the country dummy variable is positive and statistically significant. Canadian-listed firms have a higher book-to-market in both specifications, and a higher earnings-to-price in one specification. These results suggest that Canadian-listed firms trade at a discount to U.S.-listed firms, consistent with the findings of the hypothesis tests. More importantly, the country effect is still essential for explaining differences in valuation across markets after including control variables such as size, profitability, cost of equity, dividend policy, share turnover, and the risk-adjusted return on the overall market. In other words, firm-specific valuation reflects a country effect, suggesting that Canadian and U.S. stock markets remain segmented.

5.4 Regressions with industry dummies

While the regressions in Table 5 limit the overall sample to those industries that are common in both the Canadian and U.S. samples, these regressions do not control for an industry-membership effect directly. Research by Liu, Nissim, and Thomas (2001) suggests that different industries do not have different "best" multiples of earnings, cash flow, and book value. A skeptical observer, however, may argue that the relative weighting of industries across the Canadian and U.S.

samples may be an important omitted variable explaining our results. We therefore repeated our regressions while controlling for industry membership directly.

We treated each four-digit SIC code as a separate industry, as shown in Table 6. Owing to the availability of observations in our sample, we were able to rerun a separate regression for each of five industries. Table 6 identifies the industries categorized under each broad SIC code. Each regression included the same company-specific, market-specific, and country dummy variables as in Table 5. Running a regression on each industry greatly increased the fit of the regressions, as seen in the higher adjusted R-squared.[20] The problem with this approach is that it is econometrically very costly. First, there are fewer Canadian observations relative to U.S. observations, and this approach divides the Canadian observations across five industries. Second, the reduction in observations for each regression reduces the degrees of freedom.

Table 7 shows the regressions on earnings-to-price and book-to-market for each industry. As before, the sample is Canadian-listed firms and U.S.-listed firms, excluding Canadian firms interlisted on a U.S. stock exchange. The first three regressions use book-to-market as the dependent variable, followed by three regressions on earnings-to-price. Each regression is run with the company-specific variables (ROE, cost of equity, earnings retention rate), the market-specific variables (share turnover, the standardized return of the overall market), and the country dummy. Only the results for the country dummies are shown. Results are not shown for the intercept and other variables, but they are consistent with the results reported in Table 5. The regression in Table 7 shows that the book-to-market is higher for all industries. In other words, the discount based on book-to-market is consistent for Canadian-listed firms in all industries. The results for regressions on earnings-to-price on the right side of Table 7 are weaker, due to the exclusion of firms with negative earnings. Three out of five industries, however, show a discount for Canadian-listed firms, consistent with the results on book-to-market. Taken together, the regressions by industry provide support to the earlier results.

6. Conclusion

This study has found that Canadian-listed firms are not valued as highly as their U.S.-listed peers, based on comparisons across a series of valuation measures. Over the past decade, Canadian-listed firms exhibited lower multiples of book-to-market, earnings-to-price, EBITDA-to-enterprise value, and free cash flow-to-enterprise value than comparable U.S.-listed firms. This

20. Similar results were found by running the regressions simultaneously using one industry as the reference industry or base case, with an interaction term of industry and the country dummy. But such an approach complicated interpretation of the results unnecessarily, without providing new insights.

discount exists despite the median Canadian-listed firm having a lower cost of equity and higher profitability over the past decade than its U.S.-listed peer. Using a sample of Canadian firms that report their results under both Canadian and U.S. GAAP, we were able to reject differences in accounting rules between countries as the source of this discount. We tested for the existence of a country effect using a dummy variable in regressions that controlled for company-specific and market-specific factors. While variables such as cost of equity, secondary market liquidity, and the risk-adjusted return of the overall market did explain part of the discount, Canadian-listed firms still exhibited a systematic discount. A series of regressions that controlled for industry membership showed that this Canadian discount is present across a range of industries. These results confirm earlier studies suggesting that Canadian and U.S. equity markets are segmented, and not integrated as theory would suggest. Given the findings of this paper, more research is needed to identify the sources of this market segmentation.

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Table 1: Annualized 90-Day Treasury-Bill Rates (Nominal) in Canada and the United States (per cent)

Year	Canada	U.S.	Canada – U.S.
1990	13.26	7.98	5.28
1991	9.67	5.85	3.82
1992	7.24	4.12	3.12
1993	5.11	2.93	2.18
1994	5.39	3.53	1.86
1995	8.22	5.81	2.41
1996	5.03	5.09	-0.06
1997	3.19	5.29	-2.10
1998	4.57	5.13	-0.56
1999	4.75	4.45	0.30
2000	5.28	5.82	-0.54

Source: Compustat

Table 2: Differences in Valuation and Profitability across Samples after Matching on Industry and Size (Canadian firm minus mean of U.S. comparables)

	Book-to-market	Earnings-to-price	EBITDA-to-enterprise value	Free cash flow-to-enterprise value	Return on equity	Return on assets
1991–2000	0.084**	0.015**	0.019**	0.107**	0.017**	0.005**
1991	0.125**	-0.017**	-0.009	0.025	-0.017**	-0.006*
1992	0.132**	-0.021**	-0.019	0.011	-0.038**	-0.012**
1993	0.09**	0.008	-0.003	-0.008	0.011	0.002
1994	0.097**	0.03**	0.019**	0.147**	0.025**	0.011**
1995	0.095**	0.024**	0.031**	0.127**	0.025*	0.013**
1996	0.027	0.011**	0.018**	0.08**	0.006*	0.002
1997	0.128**	0.012**	0.018**	0.101**	0.009**	0.005*
1998	0.069**	0.017**	0.024**	0.098**	0.031**	0.003**
1999	0.088**	0.022**	0.027**	0.117**	0.031**	0.019**
2000	0.083*	0.027**	0.044**	0.17**	0.057**	0.015**

Note: Level of statistical significance for two-tailed test: ** = 1 per cent, * = 10 per cent.

Table 3: Differences in Company-Specific Variables across Samples after Matching on Industry and Size (Canadian firm minus median of U.S. comparables)

Variable	Cost of equity	Beta	Profit margin	Asset turnover	Financial leverage
1991–2000	-0.006**	0.088**	0.015**	-0.017**	-0.031
1991	0.028	0.031	-0.011**	-0.015	0.046
1992	0.021	-0.002	-0.011**	-0.057*	0.112*
1993	0.016*	0.181**	0.007**	-0.009*	0.198**
1994	0.013**	0.272**	0.03**	-0.039	0.07*
1995	0.019**	0.195**	0.021**	0.012	0.079
1996	-0.007**	0.179**	0.01**	-0.027	-0.005
1997	-0.028**	0.171**	0.015**	-0.008	-0.132
1998	-0.017**	-0.04**	0.011**	-0.042*	-0.131**
1999	-0.006**	0.065*	0.03**	0.001	-0.104
2000	-0.011**	0.131**	0.033**	-0.03	-0.035

Note: Level of statistical significance for two-tailed test: ** = 1 per cent, * = 10 per cent.

Table 4: Differences in Ratios for Interlisted Canadian Companies, 1991–2000 (Canadian GAAP minus U.S. GAAP)

	Book-to-market	Earnings-to-price	EBITDA-to-enterprise value	Free cash flow-to-enterprise value	Return on equity	Return on assets
1991–2000	0**	-0.00004	0.000001	0.00007	0	0
1991	0.00004	0.00011	0.00037*	0.00022	0	0
1992	-0.01531**	-0.00016	-0.00105*	-0.00388**	0	0
1993	0.0074**	0.00019	0.00053**	0.00251**	0	0
1994	-0.01933**	-0.00034	-0.00155**	-0.00469**	0	0
1995	0.00102	0	0.00003	0.00013	0	0
1996	0.00055	0	0.00008	0.00009	0	0
1997	-0.00244**	-0.00019	-0.00033**	-0.00056**	0	0
1998	0.00275**	0.00007	0.00021*	0.00136**	0	0
1999	0.01147**	0.00022	0.00075**	0.00515**	0	0
2000	0.00267**	-0.00004	0.00012**	0.00062**	0	0

Note: Level of statistical significance for two-tailed test: ** = 1 per cent, * = 10 per cent.

Table 5: Regression on Book-to-Market and Earnings-to-Price, 1991–2000 (standard errors in parentheses)

	1		2	
Dependent variable	Book-to-market		Earnings-to-price[a]	
Specification	1a	1b	2a	2b
Intercept	0.45** (0.022)	0.642** (0.028)	0.053** (0.002)	0.032** (0.003)
Log of total assets	-0.0037** (0.0018)	0.0009 (0.0018)	0 (0.0002)	0.0007** (0.0002)
Return on equity	0.036** (0.005)		0.082** (0.003)	
Profit margin		0.003** (0)		0.089** (0.003)
Asset turnover		-0.099** (0.006)		0.011** (0.001)
Leverage		-0.012** (0.001)		0.002** (0)
Cost of equity	4.308** (0.219)		0.081** (0.026)	
Risk-free rate		0.279 (0.459)		-0.057 (0.044)
Premium (beta x equity premium)		7.431** (0.262)		0.272** (0.032)
Earnings retention rate	-0.0022 (0.0021)	-0.0029 (0.0021)	0.008** (0.001)	0.009** (0)
Share turnover	-97.246** (2.903)	-105.313** (2.848)	-7.186** (0.409)	-6.738** (0.401)
Risk-adjusted return on the stock market	-0.015** (0.001)	-0.017** (0.002)	-0.0002 (0.0002)	-0.0003 (0.0002)
Country dummy (1 = Canada)	0.115** (0.013)	0.156** (0.013)	0.002 (0.001)	0.005** (0.001)
Observations	18,182	18,334	11,186	11,236
Adj. R-Sq	8.8	11.5	10.7	13.7
F - value	251**	237**	193**	177**

a. Excludes negative earnings.
Note: Level of statistical significance for two-tailed test: ** = 1 per cent, * = 10 per cent.

Table 6: 1987 Standard Industrial Classification Codes and Dummy Variables

SIC code	Industry	Regression[a]
0–999	Agriculture, Forestry & Fishing	--
1,000–1,999	Mining, Utilities, Construction	1
2,000–2,999	Manufacturing	2
3,000–3,999	Manufacturing	3
4,000–4,999	Transportation	4
5,000–5,999	Wholesalers, Retailers	--
6,000–6,999	Financial Services, Insurance, Real Estate	5
7,000–8,999	Services (arts, entertainment, accommodation, food)	--
9,000–9,999	Public administration	--

a. Industries not included did not have enough observations.

Table 7: Regressions using Country Dummy Variables by Industry, 1991–2000 (standard errors in parentheses)

Dependent variable		3 Book-to-market		4 Earnings-to-Price[a]	
Industry	Country dummy	3a	3b	4a	4b
Mining, Utilities, Construction (SIC 1,000–1,999)	Country 1	0.102** (0.024)	0.124** (0.024)	0 (0.003)	0.008** (0.003)
Manufacturing (SIC 2,000–2,999)	Country 2	0.303** (0.03)	0.384** (0.031)	0.022** (0.003)	0.022** (0.004)
Manufacturing (SIC 3,000–3,999)	Country 3	0.203** (0.03)	0.33** (0.03)	0.01** (0.003)	0.012** (0.003)
Transportation (SIC 4,000–4,999)	Country 4	0.152** (0.071)	0.1** (0.048)	0.006 (0.004)	0.005 (0.004)
Financial Services, Insurance, Real Estate (SIC 6,000–6,999)	Country 5	0.13** (0.03)	0.21** (0.03)	-0.001 (0.003)	0.003 (0.003)

a. Excludes negative earnings. Intercepts and control variables from earlier regressions not shown.
Specification (a) uses ROE and cost of equity, while specification (b) replaces ROE with profit margin, asset turnover and financial leverage, and replaced cost of equity with the risk-free rate and the firm-specific equity market premium.
Level of significance for two-tailed test:** = 1 per cent,* = 10 per cent.

Appendix A

Data were taken from Standard and Poor's Compustat, the Canadian Financial Markets Research Centre database, and the U.S. Center for Research on Stock Prices database. The initial sample consisted of 14,525 U.S.-listed firms and 1,146 Canadian-listed firms, representing 90,562 and 6,948 firm-year observations, respectively. All firm-year observations with negative or zero assets, book value of equity, sales, price per share, or common shares outstanding were excluded. In addition, to control for timing effects due to companies having different fiscal year-ends, only firms with a December fiscal year-end were used. We excluded all firms for which we could not estimate cost of equity. These criteria reduced the sample to 50,720 firm-year observations, of which 2,392 (474 companies) are observations of firms listed only in Canada; 47,311 (8,865 companies) are firms listed only in the United States; and 1,017 (158 companies) are observations of Canadian shares interlisted on both a Canadian and a U.S. stock exchange. Table A1 shows statistics on the total assets of each of these three samples. As would be expected, all three samples are positively skewed, due to the tendency of Compustat to capture data on the largest companies in both markets. The ratios used in this paper were computed as follows (the Compustat data variable name is shown where applicable):

Earnings-to-price = earnings before extraordinary items per common share / price = (DATA18 / DATA25) / price

EBITDA-to-enterprise value = operating income before depreciation per common share / (LT debt + debt in current liabilities + preferred stock + market value of equity) = (DATA13 / DATA25) / [DATA9 + DATA34 + DATA130 + (DATA25 * price)]

Free cash flow-to-enterprise value = (Cash from operations + Cash from financing) per common share / (LT debt + debt in current liabilities + preferred stock + market value of equity) = [(DATA308 + DATA313) / DATA25] / [DATA9 + DATA34 + DATA130 + (DATA25 * price)]

Book-to-market = book value per share / price = (DATA60 / DATA25) / price

Cost of equity = annualized 3 month Treasury bill rate + beta (equity premium)

Equity premium = return on equity market - annualized 3 month Treasury bill rate

Return on Equity (ROE) = net income before extraordinary items / common equity = DATA18 / DATA60

Return on Assets (ROA) = net income before extraordinary items / total assets = DATA18 / DATA6

Earnings Retention = 1 – (Dividends paid to common / net income before extraordinary items) = 1- (DATA21 / DATA18)

Profit Margin = net income before extraordinary items / sales = DATA18 / DATA12

Asset Turnover = sales / total assets = DATA12 / DATA6

Financial Leverage = total assets / common equity = DATA6 / DATA60

Risk-adjusted return on the stock market = (total equity market return over past year) / (standard deviation of total market return over 3 years)

Share turnover = (average monthly volume of shares traded) / (number of shares outstanding, adjusted for stock splits and stock dividends)

Table A1: Total Assets of U.S.-Listed, Canadian-Listed, and Interlisted Canadian Firms (converted to US$ at year-end exchange rate)

Sample	Number of firms	Median (US$ millions)	1st quartile (US$ millions)	3rd quartile (US$ millions)
U.S.-listed	8,865	196	41	1,015
Canadian-listed	474	115	36	526
Interlisted Canadian	158	421	45	2,244

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