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Do IPOs Underperform in the Long-Run? New Evidence from the Canadian Stock Market*

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Résumé / *Abstract*

Nous mesurons dans la présente étude la performance des 141 émissions initiales effectuées au Canada de 1986 à 2000. Nous utilisons des portefeuilles de contrôle qui sont systématiquement rééquilibrés et réajustés pour les titres délistés, et qui ne tiennent compte des caractéristiques de taille et de ratio *Book to Market*. Les résultats varient peu suivant la méthode utilisée, qu'il s'agisse de la technique passive, des rendements anormaux cumulés en rendements calendaires (*Calendar Time*) ou non. Les coefficients alpha d'un modèle à trois facteurs inspirés de Fama et French sont utilisés également, sans différences notables. Toutefois, les résultats diffèrent fortement suivant le mode de pondération des portefeuilles. Nous mettons en évidence une sur performance lorsque des portefeuilles équipondérés sont formés, et une sous performance non significative lorsque des portefeuilles pondérés par la valeur boursière sont utilisés. Il semble que les émissions de sociétés financières, ainsi que celles qui appartiennent à des secteurs en croissance aient des performances supérieures à long terme. Les prévisions à long terme des analystes financiers ont une valeur informative quant aux performances futures des émissions initiales.

Mots clés : émission initiale d'action, performance long terme, portefeuille de contrôle, efficience du marché.

We measure the long-run performance of 141 Canadian IPOs between 1986 and 2000, using continuously rebalanced and purged control portfolios (size and book-to-market ratios). Results remain relatively similar irrespective of whether we use an event-time approach (buy-and-hold abnormal returns and cumulative abnormal returns) or a calendar-time approach (mean calendar-time abnormal returns and alphas from the Fama-French three-factor pricing model). However, results do differ significantly whether we use equally-weighted (EW) or value-weighted (VW) portfolios. More specifically, we find significant overperformance when EW portfolios are formed, while no significant outperformance is found when VW portfolios are constructed. As we attempt to explain the long-run performance of Canadian IPOs, we find that financial and underpriced IPOs as well as those in growth sectors outperform in the long-run, and that analysts' long-term growth forecasts are informative of the a firm's future performance.

Keywords*: Initial Public Offerings; Long-Run Performance; Control Portfolios; Market Efficiency.*

Codes JEL : G32.

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* Any errors are of course the responsibility of the authors.

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1 Introduction

In recent years, the academic community has closely examined and intensely debated the performance of initial public offerings (IPOs). An overview of the corresponding studies reveals the existence of severe aftermarket underperformance for issuers. This phenomenon has been reported in the U.S. and in other countries, and is also observed with seasoned equity offerings. If the aftermarket underperformance phenomenon exists, then it raises questions concerning aftermarket efficiency.

Previous research has presented convincing empirical evidence that IPOs underperform in the long run (Ritter, 1991; Loughran and Ritter, 1995). However, Brav and Gompers (1997) have recently challenged the U.S. findings. They find that the underperformance result is sensitive to the method used to evaluate abnormal returns, and is not exclusive to IPO firms. Therefore, it seems important, before accepting or rejecting the efficient market hypothesis, to further examine the robustness of the U.S. findings using non U.S data. Jenkinson and Ljungqvist (2001, p. 166) state "*the importance of investigating IPO phenomena from an international perspective rather than a U.S.-centric one.*" The IPO market in Canada is of special interest, given the fact that companies going public in Canada tend to be much smaller than their U.S. counterparts and that Canadian Exchanges have different listing requirements from those in the U.S. Hence, we may expect dissimilar results.

This paper presents three distinctive features. First, we examine the long-run performance of 141 Canadian IPOs over the period going from 1986 to 2000. While the sample used is smaller than that used by Jog (1997) and Kooli and Suret (2003), due to the availability of the book-to-market ratio, it however covers a longer period, and focuses on larger IPOs. Secondly, the availability of the book-to-market ratio allows a range of metrics for the aftermarket performance, which we measure using an event-time as well as a calendar-time framework. Within each framework, we examine two measures of abnormal returns: i) buy-and-hold abnormal returns and cumulative abnormal returns; ii) mean calendar-time abnormal returns and alphas from the Fama-French three-factor model (*FF-TFPM*). Continuously rebalanced control portfolios (size and book-to-market equity ratios) purged from IPOs are used to measure abnormal returns. Finally, two weighting schemes (equally- and value-weighted IPO portfolios) are analyzed to examine the robustness of our results. We then examine the cross-sectional variance of long-run performance. Existing literature proposes numerous theoretical explanations for the long-run underperformance of IPOs. However, empirical works that support these theories are limited. Consequently, we do not focus on a single possible explanation[1] of the Loughran and Ritter "new issue puzzle," but rather, consider different potential variables that may explain the long-term behaviour of Canadian IPOs.

We find underperformance when event-time buy-and-hold abnormal returns and cumulative abnormal returns are used on a value-weighted (*VW*) basis, but these results are not statistically significant. Further, using both mean monthly calendar-time abnormal returns and alphas from the *FF-TFPM* (*VW*), we find no significant underperformance. Overall, on a *VW* basis, the evidence of abnormal performance is very weak, while on an equally-weighted (*EW*) basis, we find that IPOs outperform in the three years following their issuance. We should thus be careful when interpreting long-run abnormal returns. Indeed, the results are sensitive not only to the period chosen, but also to the methodology and to the weighting schema used.

Our investigation of the factors influencing the long-run performance of Canadian IPOs shows that the level of underpricing and analysts' long-term growth forecasts are significant determinants of performance. We also find that financial and "new economy" IPOs are good long-term investments.

The rest of the paper is organized as follows: In the next section, we present the methodology used to measure the aftermarket performance of IPOs. Data and long-run performance results are presented in section 3. We examine several different hypotheses of the cross-sectional variance in abnormal returns in section 4. The last section concludes the paper.

2 Tests of IPO Long-Run Performance

Following the work of Ritter (1991), numerous researchers have revealed that IPOs underperform in the long-run as measured using different benchmarks. Table 1 summarizes some of these works, which analyse the long-term performance of IPOs and their results.

Insert Table 1 about here

As Table 1 shows, the aftermarket phenomenon is not unique to the U.S. IPO market. Recently, long-run performance has been analysed using a methodological approach. Thus, Brav, Geczy and Gompers (2000), Brav and Gompers (1997) and Barber and Lyon (1997) have argued that the choice of a performance measurement methodology directly determines both the size and power of statistical tests. In that context, Lyon et al. (1999) point out that no winner has emerged as the optimal methodology in terms of statistical properties, and that the analysis of long-run abnormal returns is “treacherous.” We first present the conceptual framework and the different methodologies used to examine the long-run performance of Canadian IPOs.

2.1 Conceptual Framework

To guarantee the robustness of our results, we build our conclusions on different methodologies. We distinguish the event-time (*ET*) and the calendar time (*CT*) approaches and use two methodologies within each approach: we first examine the cumulative abnormal returns (*CARs*) and second the buy-and-hold returns (*BHARs*); we then examine the mean *CT* abnormal returns (*MCTARs*) as well as the alphas from the *FF-TFPM*. Moreover, as the literature debates the use of equally- versus value-weighted (*EW* vs *VW*) portfolios which generally represent more severe tests, we also distinguish both weighting schemes.

A key feature of our analysis is the careful construction of reference portfolios, which alleviates the new listing and rebalancing biases (Barber and Lyon, 1997 and Kothari and Warner, 1997). Our reference portfolios are purged from event firms and are formed continually on the basis of firm size and book-to-market ratios. To construct the size control portfolio, all Canadian stocks are ranked each month according to their market capitalisations, and four quartile portfolios are formed (with equal numbers of firms in each portfolio). Independently, all Canadian stocks are also ranked according to their book-to-market ratios,[2] and four portfolios are formed (with equal numbers of firms in each portfolio). The returns of the 16 monthly rebalanced (Rau and Vermealen, 1998) portfolios are calculated as the value-weighted average of the individual-firm monthly returns in each of the size-*BE/ME* quartile intersections. Each IPO is then assigned a control portfolio based on its market capitalisation and book-to-market ratio over the performance test period examined.[3]

2.2 Event-Time Analysis

To analyze the aftermarket performance of Canadian IPOs, we apply the standard event-study methodology. Thus, abnormal returns with respect to our 16 reference portfolios are computed using the *CAR* and *BHAR* measures.

The analysis of *CAR*s is warranted if a researcher is interested in answering the following question: do sample firms persistently earn abnormal monthly returns? Thus, the average cumulative abnormal return $\overline{CAR_{1\,to\,q}}$ for the IPO portfolio from the offering month to the event month *q* (12, 24, 36) is calculated as:

$$\overline{CAR_{1\,to\,q}} = \sum_{s=1}^{q} \overline{AR_s} \text{ with } \overline{AR_s} = \sum_{i=1}^{N_s} w_{i,s}^{*} r_{i,s} \qquad (1)$$

$\overline{AR_s}$: the average abnormal return of the IPO portfolio in event time *s*

N_s: number of firms for which returns are available in event time s (s=1 to 36)

$w_{i,s}^{*}$: weight of firm i[4]

$r_{i,s}$: abnormal return of firm i (the difference between the return from the issuing firm, $R_{i,s}$, and the return from the control portfolio, $R_{cpi,s}$)

The second measure we use (namely, the investor's experience measure) is based on the calculation of the average abnormal return from a buy-and-hold strategy ($\overline{BHAR_{1\,to\,q}}$) from the offering month 1 to the event month *q* (12, 24 , 36):

$$\overline{BHAR_{1\,to\,q}} = \sum_{i=1}^{Nq} w_{i,q}^{*} BHAR_{i,1\,to\,q} \text{ , where } BHAR_{i,1\,to\,q} = \prod_{s=1}^{q} (1+R_{i,s}) - \prod_{s=1}^{q} (1+R_{cpi,s}) \qquad (2)$$

The biggest advantage of the *BHAR* estimator is that it "precisely measures investor experience," while its disadvantage is that it is more sensitive to the problem of cross-sectional dependence among sample firms (Brav, 2000). However, Fama (1998) and Mitchell and Stafford (2000) argue that abnormal performance measures such as *CAR*s and calendar-time returns are less likely to yield spurious rejections of market efficiency with respect to methodologies that calculate *BHAR*s by compounding single period returns. Mitchell and Stafford (2000) also contradict the results of Loughran and Ritter (2000), who advocate the *BHAR* approach, and confirm that the calendar-time approach is robust for the most serious statistical problems, such as cross-sectional dependence among sample firms (Lyon et al., 1999).

2.3 Calendar-Time Analysis

In addition to the event-time analysis, we employ the calendar-time method, which allows the simulation of an investment strategy that could be implemented by a portfolio manager. Fama (1998) recommends the construction of monthly portfolios in calendar time to be used in measuring the average abnormal long-run performance, for the following reasons: first, monthly returns are less subject to "*the bad model problem;*" secondly, monthly portfolios allow the cross-correlation between the firms in the sample to be taken into consideration, and thirdly, the portfolio returns allow better statistical inferences. [5]

We consider two variations of calendar-time portfolio methods: one based on the use of *MCTAR*s, and the other based on the alphas from the *FF-TFPM*.

For each calendar month, we calculate the abnormal return as the difference between the return for each security and the return on the 16 size-*BE/ME* corresponding reference portfolios ($R_{cpi,t}$): $CTAR_{i,t} = R_{i,t} - R_{cpi,t}$. Then, in each calendar month t, we calculate a mean return ($\overline{CTAR_t}$) across firms in the portfolio: $\overline{CTAR_t} = \sum_{i=1}^{Lt} w_{i,t} CTAR_{i,t}$

L_t: number of firms in the calendar-time month t

$w_{i,t}=1/L_t$ when abnormal returns are equally-weighted and $w_{i,t} = ME_{i,t-1} / \sum_{i=1}^{Lt} ME_{i,t-1}$ when abnormal returns are value-weighted

We subsequently calculate a grand mean monthly abnormal return (*MCTAR*):

$$MCTAR = (1/T)\sum_{i=1}^{T} \overline{CTAR_t} \tag{3}$$

where *T* is the total number of calendar months.

For the alpha coefficient from the *FF-TFPM*, we calculate, for each calendar month, the return on a portfolio composed of firms that issued equity within the following *T* years (*T*=1 to 3) of the calendar month. Then, the calendar-time return on this portfolio is used to estimate the following regression:

$$TFPM:\ R_{p,t} - R_{f,t} = \alpha_p + \beta_p\ (R_{m,t} - R_{f,t}) + s_p\ SMB_t + h_p\ HML_t + e_{p,t} \tag{4}$$

The dependent variable of the regression is the monthly excess return of the portfolios ($R_{p,t}$ - $R_{f,t}$), which corresponds for a given month, *t*, to the returns of the portfolio of IPOs

($R_{p,t}$) less the risk-free rate (the monthly rate of 91-day Canadian Government Treasury bills, $R_{f,t}$). The independent variables are the excess market return and 3 zero-investment portfolios constructed such as to mimic the risk factors common to all securities.[6] β_p, s_p, h_p stand for the loadings of the portfolio on each risk factor: the market, *SMB* (size) and *HML* (book-to-market ratio). The parameter (α) in equation (4) indicates the monthly average abnormal return of our sample of 141 IPOs. Note, as held by Fama (1998) that, if the model only partially explains the expected returns of the IPO portfolios, then the value of (α) will combine the abnormal return due to the event with the unexplained part of the return due to the misspecification of the model.

3 Data and Long-Run Performance of Canadian IPOs

We first present the data, and then the results, on long-run performance for our sample of Canadian IPOs.

3.1 Data

Our database on initial public offerings in Canada is built from the *Record of New Issues* (RNI) held by *The Financial Post Data Group*, and covers the period going from 1986 to 2000.

The following criteria are used in selecting our final sample:

1. We retain only common-share IPOs, and exclude units,[7] closed-end funds, and real estate investment trust offerings.
2. Issuing firms are listed on the Toronto Stock Exchange.
3. Stock price/return data for issuers, market capitalisation and book-to-market ratio are available on the *Research Insight Compustat* database.

Our final sample consists of 141 Canadian IPOs. Table 2 provides details on the amount of proceeds raised by Canadian IPOs in our sample by year.

Insert Table 2 about here

We find that the total amount raised from 1986 to 1999 is $10,111 million. The sample also shows clear evidence of clustering, which is typical with IPOs. For example, 108 of the 141 sample offerings (76.6%) occurred in 1993, 1994, 1996, 1997 and 1998, and 67.12% of the aggregate gross proceeds in the sample was raised in those years alone.

Our data differs in two ways from that of Jog (1997) and Kooli and Suret (2003), who also examined the long-run performance of Canadian IPOs. First, we use firms listed on the Toronto Stock Exchange (TSE) during the 1986-2000 period. Jog (1997) uses IPOs listed on the TSE from 1971-1992, while Kooli and Suret (2003) use firms listed on all Canadian markets from 1991-1998. Our average gross proceeds amount to $71.71 million, while the Kooli and Suret (2003) sample average gross proceeds come up to $32.93 million.[8] Secondly, while Jog (1997) uses both the TSE 300 Composite Index and the TSE-Western Index as benchmarks, Kooli and Suret (2003) compute long-run abnormal returns using matching firm procedures (without rebalancing). The latter look only to the size of issuers, and do not take into account the availability of the book-to-market ratio as a selection criterion for firms. This restriction explains why the number of IPOs in our sample is lower than that of Jog (1997) and Kooli and Suret (2003), and also induces a bias in favour of large IPOs. In doing so however, we can apply a range of metrics to measure long-run performance, and can compare them to previous U.S. results.

3.2 Event-Time Returns

In this section, we present analyses of the returns of Canadian IPOs in event time. Table 3 presents the *CAR*s for the three years following the issue.

Insert Table 3 about here

The data shows that *EW-CAR*s are quite high in the three years following the issue. For example, they reach 14.56% (*t*-statistic= 3.02) over 1 year, 20.83% (*t*-statistic= 2.93) over 2 years, and 17.64% (*t*-statistic= 1.84) over 3 years. It should be noted however, that a further examination of the data reveals the existence of few outliers that affect this result. In this context, we argue that the *VW-CAR*s capture more accurately the wealth effect experienced by investors. Also, it would be unusual for a large institutional investor to hold an *EW* portfolio. Thus, value-weighted performance may provide a more useful benchmark. The *VW-CAR*s follow a somewhat different pattern. *CAR*s are positive (7.87%) and significantly different from 0 at 1% in the first year only; positive (2.91%) and not significant in year two, but negative (-5.37%), and not significant in year three. Figure 1 provides the cumulative raw returns of our IPO sample and the cumulative average returns of their corresponding reference portfolios.

Once performance is measured using *BHAR*s (Table 4), we get a similar picture of long-run performance.

Insert Table 4 about here

On an *EW* basis, our IPO sample outperforms the reference portfolio, while value-weighting tends to somewhat decrease the returns. Nevertheless, none of the *VW-BHAR*s are statistically different from zero, except for the one-year performance. For example, the *VW-BHAR*s average 7.82% (*t*-statistic = 2.12) over 1 year, 3.07% (*t*-statistic= 0.41) over 2 years, and -8.8% (*t*-statistic = -0.99) over 3 years. Thus, year–to-year performance appears to decrease, as is observed by several researchers (Aggarwal and Rivoli, 1990; Loughran and Ritter, 1995; Levis, 1993; Aggarwal, Leal and Hernandez, 1993; Firth, 1997; Cai and Wei, 1997, and Lee and Walter, 1996, among others).

Brav and Gompers (1997) document that (Loughran and Ritter's) IPO underperformance anomaly disappears entirely when control firms are selected on a book-to-market and size-matching firm basis. The initial picture derived from our sample shows that the IPO underperformance anomaly is not quite obvious; in other words, there is no "new issues puzzle "(Loughran and Ritter, 1995).

Our results using size / book-to-market matched control portfolios are not similar to the results found by Kooli and Suret (2003) using the matching firm method. First, our *EW-BHAR*s and *CAR*s are higher than *VW-BHAR*s and *CAR*s on average. Secondly, our *VW-CAR* is negative, but not significant, and thirdly, *EW* abnormal returns on an event-time basis are positive and significant. This provides clear evidence that long-run abnormal returns are highly sensitive to the choice of the benchmark, to the period chosen, and to the weighting schemes used.

3.3 Calendar-Time Returns

In this section, we examine calendar-time returns for our sample of Canadian IPOs. As mentioned previously, calendar-time portfolios represent an important improvement over the traditional event methodology, which assumes independence of individual-firm abnormal returns. Returns are once more equally- and value-weighted.

The results from the mean monthly calendar-time (*MCTAR*) analysis (Table 5) show that on an *EW basis*, issuing firms have significantly positive abnormal returns in the three years following the IPO, averaging 1.78% per month or 21.36% over one year (*t*-statistic = 1.90), 1.21% per month or 29.04% over 2 years (*t*-statistic = 2.43), and 0.92% per month or 33% over 3 years (*t*-statistic = 2.05). Again, this abnormal performance on an EW basis is more attributable to the presence of a few outliers, and as mentioned previously, value-weighted performance may be an economically more meaningful construct than equal-weighted performance (Brav et al., 2000). On a *VW* basis, there is no evidence of significant abnormal returns. For example, the *MCTAR* averages 1.18% per month or 14.16% over one year (*t*-statistic = 1.27), 0.38% per month or 9.12% over 2 years (*t*-statistic = 0.87), and 0.036% per month or 1.32% over 3 years (*t*-statistic = 0.10).

Insert Tables 5 and 6 about here

Table 6 presents the three-factor time series regression results for the three years following the issue. The intercept from the *FF-TFPM* regression in the *EW* portfolio is positive (0.54%) and not significant (*t*-statistic=1.30, a 19.66% return for 36 months). When the IPOs are value-weighted, the performance for year 3 is poor: the intercept is negative (-0.117%) and not significant (*t*-statistic= -0.36, a -4.21% return for 36 months). Thus, both *EW* and *VW* 3-year abnormal returns using *FF-TFPM* are not statistically significant,[9] while they are statistically significant using the *MCTAR*s, but only on an *EW* basis. The sensitivity to market risk is significantly higher than that for the *VW* portfolio and the significantly negative *HML* loading means that the Canadian IPOs examined are glamour stocks.

Overall, Canadian IPOs do not appear to underperform on a calendar-time basis. Schwert (2003) notes that there is a tendency for anomalies to disappear once identified. Our result from the Canadian IPO market may support this observation. Further, we find that abnormal returns are much lower when measured in event time (*CAR* and *BHAR*) than in calendar time (*MCTAR* and *alpha TFPM*)[10]. Table 7 and Figures 1 and 2 confirm our observation.

Insert Table 7 and Figures 1 and 2 about here

This result is also observed in other studies. For example, Gompers and Lerner (2003) find that US IPOs issued over 1935-1972 underperform in event time but not in calendar time. Using an event-time approach, Espenlaub et al. (1999), in a study of UK IPOs issued between 1985 and 1992, find that while there are substantial negative abnormal returns to an IPO after three years, the significance of the observed underperformance is less marked when returns are measured in calendar-time.

4 Explanations of the Cross-Sectional Variance of Canadian IPO Long-Run Performance

4.1 Framework

We use the individual alphas from the *FF-TFPM* as the dependent variable (estimated over three years). Table 8A reports the correlation between the three event-time performance measures considered in the previous section. It indicates a high correlation between these measures. Therefore, using *BHAR* or *CAR* as dependent variables will not change our results.

Insert Table 8A about here

As independent variables, we use the level of underpricing, analysts' long-term growth forecasts, and variables that control for the financial and the growth sectors, and the market conditions during the offering. We report results from the ordinary least square (*OLS*) estimations for the IPO portfolio returns. However, to control for potential heteroskedasticity, and for consistency with our previous long-run performance analysis, we also report results from weighted least square (*WLS*) estimations. The following is the general estimated model:

$$alpha_i = \gamma_0 + \gamma_1.UND_i + \gamma_2.FINANCE_i + \gamma_3.GROWTH_i + \gamma_4.HOT_i + \gamma_5.LTEGF_i + e_i \quad (5)$$

where *UND* = degree of underpricing of the IPO measured as 100%* [(first closing market price-offering price) / offering price]; *GROWTH* = a dummy variable with the value 1 assigned to *GROWTH* if the IPO is in the growth sectors (telecommunications, media, health care and technology), and 0 otherwise; *FINANCE* = a dummy variable with the value 1 assigned to *FINANCE* if the IPO is in the financial sector, and 0 otherwise; *HOT* = a dummy variable with the value 1 assigned to *HOT* if the IPO is issued during hot periods, defined as 1993, 1994, 1996, 1997, and 1999, and 0 otherwise. *LTEGF* = analysts' long-term forecast of earnings growth obtained from *I/B/E/S*.

In an attempt to explain aftermarket performance, Jog (1997) uses gross proceeds, the level of underpricing, issue price, and variables that control for market conditions, and the mining, oil and gas and manufacturing sectors as independent variables. Kooli and Suret (2003) also consider the level of underpricing and variables that control for market conditions and the technology sector to explain long-run abnormal returns.

4.2 Motivation

Before addressing our results, we provide a brief rationale for including these variables in our analyses.[11] Previous researchers, such as Allen and Falhuaber (1989) and Grinblatt and Huang (1989), use the level of underpricing as an indicator of firm quality. However, the empirical evidence on the information value of underpricing is mixed. Shiller (1990) argues that underwriters underprice new issues not to signal firm quality, but rather, to create the appearance of excess demand. Consequently, high underpriced stocks should have the lowest subsequent long-run returns. We also incorporate a dummy that controls for the growth sectors which represent the "new economy," and another dummy for financial services. Ritter (1991) finds that financial institution IPOs outperformed the corresponding firms, and Murgulov and Naughton (2002) find that on average, Australian "new economy" IPOs do not underperform the market benchmark in the long-run.

Furthermore, in attempting to examine the window of opportunity hypothesis suggested by Ritter (1991) and Loughran and Ritter (1995) as an explanation for the long-run underperformance of IPOs, we incorporate the *HOT* variable. We expect investors' overoptimism during hot issue periods to influence long-run performance. Finally, another strand of research identifies analyst overoptimism as a possible source of the anomalous long-term performance of IPOs. Rajan and Servaes (1997) examine data on analysts following a sample of IPOs completed over the 1975-1987 period, and find that firms with the highest projected growth substantially underperform three benchmarks, whereas firms with the lowest growth projections outperform these benchmarks. Meanwhile, focusing on the return performance of an investment strategy rather than on corporate events, Barber et al. (2001) provide surprisingly strong evidence that investors would be better off purchasing shares in firms with more favourable consensus recommendations and selling shares in those with less favourable consensus recommendations. Security analyst recommendations thus have investment value. Dechow, Hutton and Sloan (1999) find that the long-term growth forecasts of sell-side analysts are systematically overly optimistic around equity offerings and that analysts employed by the lead managers of the offerings make the most optimistic growth forecasts. Given these results, we include in our analysis the long-term growth forecast of analysts as an explanatory variable to examine whether or not investors should follow analysts to detect IPO "losers" or "winners." Rajan and Servaes (1997, p.12) note that "*long-term growth projections are more useful for investors with longer horizons and they provide evidence on analysts' beliefs about the long term prospects of these corporations*".[12]

4.3 Empirical Results

Descriptive statistics for the independent variables described above are presented in Table 8B.

Insert Table 8B about here

To test for potential heteroscedasticity in the residuals, we use the Breusch-Pagan and the White tests. We reject the null hypothesis of homoscedasticity and confirm[13] that the variance of residuals is positively related to the square of the inverse of the standardized weights used for the value-weighting schema. We retain them in the *WLS* estimates (see Table 9) to explain the aftermarket performance of our IPO sample. We also report the *OLS* estimates to better understand the effect of heteroscedasticity on the regression estimates.

Insert Table 9 about here

At first glance, it is clear from Table 9 that the adjusted R^2 is substantially higher for the WLS regression than for the *OLS* regression, suggesting that the presence of outliers is a particular problem in explaining long-term abnormal returns. Table 9 also shows that the 3-year IPO performance is significantly positively related to the *LTEGF*.[14] This confirms the fact that analysts' long-term growth forecasts are informative of a firm's future performance, and contradicts the dramatic findings of Rajan and Servaes (1997), who observe a significant inverse relation between the long-run performance of US IPOs and analysts' forecasts of their long-term potential. One possible explanation of this difference in results is that we fulfill the missed *LTEGF*s by those of the corresponding industry. Besides, the Canadian IPO market is smaller than its US counterpart in size, and generally, only optimistic analysts start following a small group of issuers. [15]

Furthermore, we find that the dummy on *FINANCE* is significantly positively related to the performance of IPOs, which is consistent with the Loughran and Ritter (1995) results. More interestingly, we find that the dummy on growth sectors is significantly positively related to the performance of IPOs. Thus, Canadian new-economy IPOs outperform in the long-run for the particular period examined. While the *HOT* coefficient is not significant, its sign is consistent with the window of opportunity hypothesis and with the explanation[16] of behaviouralists. Finally, we find that the underpricing is significantly positively related to the long-run performance of Canadian IPOs, which corroborates the signalling models. In other words, Canadian issuers use underpricing to signal long-term performance.

In summary, we find that growth sector, financial and underpriced IPOs were a good investment in the long-run. We also find that analysts' long-term growth forecasts are informative of a firm's future performance. However, we do not find any evidence that when analysts predict high growth rates, Canadian investors are overoptimistic about the future of the company.

5 Conclusion

This study attempts to fulfill the need for a Canadian evidence on the long-run performance of IPOs. Using a sample of 141 Canadian IPOs that occurred from 1986 to 2000, we first examine the long-run performance following IPOs, and secondly, we analyze the cross-sectional variance in abnormal performance. Our results differ from those of Jog (1997) and Kooli and Suret (2003) because the availability of the book-to-market ratio induces large discrepancies in the samples (period, size of the IPOs considered) and in the methodologies. In particular, it allows the construction of control portfolios based on size and book-to-market ratios, and the use of both event-time and calendar-time approaches. Within each approach, we examine two alternative measures of abnormal returns (*CAR*s and *BHAR*s versus *MCTAR* and alphas from the *FF-TFPM*, which allow for cross-sectional dependence).

The main results are the following: First, the results on long-run performance are significantly different depending on whether we consider equally-weighted or value-weighted portfolios. Equally-weighted portfolios post significant overperformance over the three years following the IPO, except for the alpha measure of abnormal performance. On the other hand, the abnormal returns of value-weighted portfolios are not statistically significant, whatever the methodology considered. Thus, an investor who would have followed a value-weighted calendar-time strategy in these 141 Canadian IPOs would not have known any abnormal return during the 1986-2000 period. Overall, our findings for Canadian IPOs support the conclusion from Mitchell and Stafford (2000, p. 288) that "*measuring long-term abnormal performance is treacherous.*"

Secondly, as we attempt to explain the long-run performance of Canadian IPOs, we find that underpriced IPOs outperform in the long-run. This result confirms the signalling hypothesis for the explanation of IPO long-run performance in the Canadian capital market. We also find that growth sector and financial IPOs are a good long-term investment, and that investors should not avoid IPOs with high long-term growth forecasts by analysts.

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Table 1

International evidence on the aftermarket performance of IPOs. The aftermarket performance is measured from the first closing market price using the formula: $[(1+R_{ipo,T})/(1+R_{m,T})] - 1$, where $R_{ipo,T}$ is the average total return on the IPOs from the first closing market price until the earlier of the delisting date or 3 years; $R_{m,T}$ is the average of either the market return or matching-firm returns over the same interval.
* Brav, Geczy and Gompers (2000) use 5 reference portfolios: *S&P500*, *NASDAQ* Composite, *CRSP VW*, *CRSP EW* and size and book-to-market.

Country	Author(s)	Number of IPOs	Issuing years	Aftermarket performance
Australia	Lee, Taylor & Walter (1996)	266	1976-89	-46.5%
Austria	Aussenegg (1997)	57	1965-93	-27.3%
Brazil	Aggarwal, Leal & Hernandez (1993)	62	1980-90	-47.0%
Canada	Kooli and Suret (2003)	445	1991-98	-16.86%
Chile	Aggarwal, Leal & Hernandez (1993)	28	1982-90	-23.7%
Finland	Keloharju (1993)	79	1984-89	-21.1%
Germany	Ljungqvist (1997)	145	1970-90	-12.1%
Japan	Cai & Wei (1997)	172	1971-90	-27.0%
Korea	Kim, Krinsky & Lee (1995)	99	1985-88	+2.0%
New Zealand	Firth (1997)	143	1979-87	-10.00%
Sweden	Loughran, Ritter & Rydqvist (1994)	162	1980-90	+1.2%
United Kingdom	Levis (1993)	712	1980-88	-8.1%
United States	Loughran & Ritter (1995)	4,753	1970-90	-20.0%
United States	Eckbo & Norli (2001)	6,379	1972-98	-28.8%
United States	Brav, Geczy & Gompers (2000) *	4,622	1975-92	-44.2%, -31.1%, -28.4% and 6.6%

Table 2

Distribution of IPOs by year. The sample consists of 141 Canadian IPOs by firms subsequently listed on the Toronto Stock Exchange, from January 1986 through December 1999.

Year	Number of IPOs	Gross proceeds ($ million)
1986	5	$135,21
1987	4	$389,00
1988	1	$246,16
1989	1	$20,00
1990	1	$875,00
1991	4	$993,81
1992	4	$280,25
1993	30	$1 520,30
1994	18	$1 580,44
1995	8	$231,00
1996	18	$698,73
1997	20	$1 728,93
1998	22	$1 258,36
1999	5	$154,08
Total	141	$10 111,28

Table 3

Cumulative abnormal returns. The sample consists of 141 Canadian IPOs by firms subsequently listed on the Toronto Stock Exchange, from March 1986 through December 2000. Cumulative abnormal return from month 1 to month q is defined as: $CAR_{1\ to\ q} = \sum_{s=1}^{q} AR_s$ where $ARs = \sum_{i=1}^{n_s} w_{i,s}^{*} r_{i,s}$ with $w_{i,s}^{*}$ representing a weight and $r_{i,s}$ the abnormal return of stock *i* in month *s*. The statistical test for the $CAR_{1\ to\ q}$ is: $t(CAR_{1\ to\ q}) = CAR_{1\ to\ q} * \sqrt{n_q} \ / \ \sqrt{[q * var + 2 * (q - 1) * cov]}$ where *var* is the average of the cross-sectional variations over *q* months (q=12, 24 or 36) of the r_{it}, and *cov* is the first order auto-covariance of the *AR* series. *CAR*s are equally-weighted (*EW*) and value-weighted (*VW*).
*** significant at 1%, ** significant at 5%, and * significant at 10%.

Month	CAR_t **(EW)**	***t*-statistic**	CAR_t **(VW)**	***t*-statistic**
12	14.56%***	3.02	7.87%***	2.74
24	20.83%***	2.93	2.91%	0.68
36	17.64%*	1.84	-5.73%	-0.99

Table 4

Buy-and-hold abnormal returns. The sample consists of 141 Canadian IPOs by firms subsequently listed on the Toronto Stock Exchange, from March 1986 through December 2000. The buy-and-hold abnormal return (*BHAR*) is defined as follows: $BHAR_{1\,to\,q} = \sum_{i=1}^{Nq} w^{*}_{i,q} BHAR_{i,1\,to\,q}$ where Nq is the number of securities for which returns are available in month q, $w^{*}_{i,q}$ is a weight, $BHAR_{i,1\,to\,q} = \prod_{s=1}^{q}(1+R_{i,s}) - \prod_{s=1}^{q}(1+R_{cpi,s})$, where q=12, 24, and 36 months, $R_{i,s}$ is the raw return of the firm *i* during month s and $R_{cpi,s}$ is the return on the reference portfolio during the corresponding time period. *EW* is the equally-weighted base and *VW* is the value-weighted base. To test the null hypothesis of zero mean buy-and-hold return, we use the skewness-adjusted t statistic. The t statistic is defined as:

t = $\sqrt{n} \times \left(S + \frac{1}{3}\hat{\gamma} S^2 + \frac{1}{6n}\hat{\gamma} \right)$ where S = $\frac{\overline{BHAR}}{\sigma(BHAR)}$ and $\hat{\gamma}$ is an estimate of the skewness coefficient

$$= \hat{\gamma} = \frac{\sum_{i=1}^{n}(BHAR_{it} - \overline{BHAR}_t)^3}{n\sigma(BHAR_t)^3};$$

*** significant at 1%, ** significant at 5%, and * significant at 10%.

Month	$BHAR_{1toq}$ (EW)	*t*-statistic	$BHAR_{1toq}$ (VW)	*t*-statistic
12	22.67%***	3.89	7.82%***	2.12
24	54.41%***	3.30	3.07%	0.41
36	30.41%***	2.21	-8.80%	-0.99

Table 5

Mean monthly calendar-time abnormal returns. The sample consists of 141 initial public offerings issued by firms listed on the Toronto Stock Exchange during the period of March 1986 through December 2000. For each calendar month (12, 24 or 36), the abnormal return for each security is calculated using the returns on the 16 size-BE/ME reference portfolios: $CTAR_{it} = R_{it} - R_{mt}$. In each calendar month t, a mean return across firms in the portfolio is calculated as $\overline{CTAR_t} = \sum_{i=1}^{Lt} w_{it} CTAR_{it}$, where the weight w_{it} is $1/L_t$ when abnormal returns are equally-weighted and $ME_{it} / \sum_{i=1}^{Lt} ME_{it}$ when abnormal returns are value-weighted. ME is the market value equity, and L_t is the number of companies in the calendar month t. A grand mean monthly abnormal return is calculated as $MCTAR = 1/T \times \sum_{i=1}^{T} \overline{CTAR_t}$, where T is the total number of calendar months. To test the null hypothesis of zero mean monthly abnormal returns, a t-statistic is calculated using the time-series standard deviation of the mean monthly abnormal returns: $t(MCTAR) = MCTAR \times \sqrt{T} / \sigma(MCTAR_t)$.
*** significant at 1%, significant at 5%, and * significant at 10%.

Month	$MCTAR_t$ (EW)	*t*-statistic	$MCTAR_t$ (VW)	*t*-statistic
12	1.78%	1.90	1.18%	1.27
24	1.21%**	2.43	0.38%	0.87
36	0.92%**	2.05	0.036%	0.10

Table 6

Fama-French (1993) three-factor regression on initial public offering (IPO) portfolio. The sample consists of 141 initial public offerings issued by firms listed on the Toronto Stock Exchange during the period of March 1986 through December 2000. Excess returns are regressed on the FF factors in a calendar framework where the 36 post-issue months are considered; *EW* and *VW* respectively stand for equally-weighted and value-weighted (*t*-statistics are in parentheses). H_0 for the beta coefficient is beta=1. *T*-values are reported in parentheses. * significant at 1%, **significant at 5%, and *** significant at 10%.

	12 months		**24 months**		**36 months**	
Factor loadings	***EW***	***VW***	***EW***	***VW***	***EW***	***VW***
μ_p	1.08%	1.06%	0.76%	0.41%	0.54%	-0.117%
	(1.35)	(1.35)	(1.57)	(1.02)	(1.30)	(-0.36)
b_p	1.14	1.31	1.07	1.30*	1.12	1.31*
	(0.76)	(1.67)	(0.69)	(3.14)	(1.20)	(4.12)
s_p	0.06	-0.07	0.26***	-0.20	0.29**	-0.004
	(0.25)	(-0.31)	(1.80)	(-1.64)	(2.29)	(-0.05)
h_p	-0.33	-0.24	-0.10	-0.35*	-0.11	-0.32*
	(-1.44)	(-1.07)	(-0.76)	(-2.98)	(-0.96)	(-3.38)
Adjusted R^2	22.85%	26.82%	40.23%	58.93%	49.48%	70.22%

Table 7

Summary of the results from the different methodologies used to test the null hypothesis for the 3-year window. *CAR* (cumulative abnormal returns), *BHAR* (buy-and-hold abnormal returns), alphas from the Fama and French *TFPM* on a 36-month basis, and *MCTAR* (mean calendar-time returns) on a 36-month basis.

		Equally-weighted portfolios	Value-weighted portfolios
Event-time approach			
	CAR	17.64%* (1.84)	-5.73% (-0.99)
	BHAR	30.41%*** (2.21)	-8.80% (-0.99)
Calendar-time approach			
	alpha (*TFPM*)	19.66% (1.30)	-4.21% (-0.36)
	MCTAR	33.07%** (2.05)	1.32% (0.1)

Table 8A

Correlation between dependent variables. *CAR* (cumulative abnormal returns), *BHAR* (buy-and-hold abnormal returns) and alphas from the Fama and French *TFPM* (individual alphas in event time). *p*-values are in parentheses.

Variables	CAR	BHAR	alpha ET
CAR	1.00		
BHAR	0.83 (< 0.0001)	1.00	
alpha ET	0.78 (< 0.0001)	0.65 (< 0.0001)	1.00

Table 8B

Summary statistics on independent variables. *UND* = degree of underpricing of the IPO measured as 100%* [(first closing market price-offering price) / offering price]; *FINANCE*= a dummy variable with the value 1 assigned to *FINANCE* if the IPO is in the financial sector, otherwise *FINANCE* is coded zero; *GROWTH*= a dummy variable with the value 1 assigned to *GROWTH* if the IPO is in the growth (telecommunications, media, health care and technology) sectors, otherwise *GROWTH* is coded zero; *HOT* = a dummy variable with the value 1 assigned to *HOT* if the IPO is issued during hot periods defined as 1993, 1994, 1996, 1997, and 1999, otherwise HOT is coded zero; *LTEGF* = analysts' long-term forecast of earnings growth obtained from *I/B/E/S* (in %).

Variable	Mean	Standard deviation	Min	Max
Underpricing	7.22%	0.16	-21.66%	86.66%
Analysts' long-term forecast of earnings growth	14.01%	6.32	5.67%	62.30%
Finance	13 (9.21%)	N.A.	N.A.	N.A.
Growth sectors	47 (33.33%)	N.A.	N.A.	N.A.
Hot IPOs	88 (62.41%)	N.A.	N.A.	N.A.

*For *FINANCE*, *GROWTH* and *HOT*, only the number of observations and their corresponding percentages (in parentheses) are presented.

Table 9

Ordinary least square (*OLS*) and Weighted least square (*WLS*) regressions of IPO long-run performances. The sample consists of 141 initial public offerings issued by firms listed on the Toronto Stock Exchange during the period of March 1986 through December 2000. We use the mean monthly excess return on the calendar-time portfolio (alphas of Fama-French three-factor model) as the dependent variable in ordinary least square (OLS) regression and weighted least square (WLS) regression, where the weights (w) equal the standardized weights used for the value-weighting schema. The regression model is:

$$\text{alpha}_i = \gamma_0 + \gamma_1.\text{UND}_i + \gamma_2.\text{FINANCE}_i + \gamma_3.\text{GROWTH}_i + \gamma_4.\text{HOT}_i + \gamma_5.\text{LTEGF}_i + e_i ,$$

where *UND* = the degree of underpricing of the IPO; is measured as 100%* [(first closing market price-offering price) / offering price]; *FINANCE*= a dummy variable with the value 1 assigned to *FINANCE* if the IPO is in the financial sector, otherwise *FINANCE* is coded zero; *GROWTH*= a dummy variable with the value 1 assigned to *GROWTH* if the IPO is in the growth (telecommunications, media, health care and technology) sectors, otherwise *GROWTH* is coded zero; *HOT* = a dummy variable with the value 1 assigned to *HOT* if the IPO is issued during hot periods defined as 1993, 1994, 1996, 1997, and 1999, otherwise *HOT* is coded zero; *LTEGF* = analysts' long-term forecast of earnings growth obtained from *I/B/E/S*. *T*-values are reported in parentheses.
*significant at 1%. **significant at 5% and ***significant at 10%.

Variable	*OLS*	*WLS*
Intercept	-0.0044	-0.0185*
	(-0.40)	(-5.55)
1 / w	0.000003**	0.00001
	(2.25)	(1.06)
FINANCE	-0.010	0.0149*
	(-1.10)	(2.72)
GROWTH	0.0010	0.0043***
	(0.16)	(1.66)
UNDERPRICING	-0.0168	0.0309*
	(-0.98)	(5.62)
HOT	-0.0036	-0.0015
	(-0.62)	(-0.41)
LTEGF	0.0005	0.0008*
	(0.61)	(2.69)
Adjusted R^2	1.93%	49.15%

Figure 1: Event-Time Cumulative Average Returns.

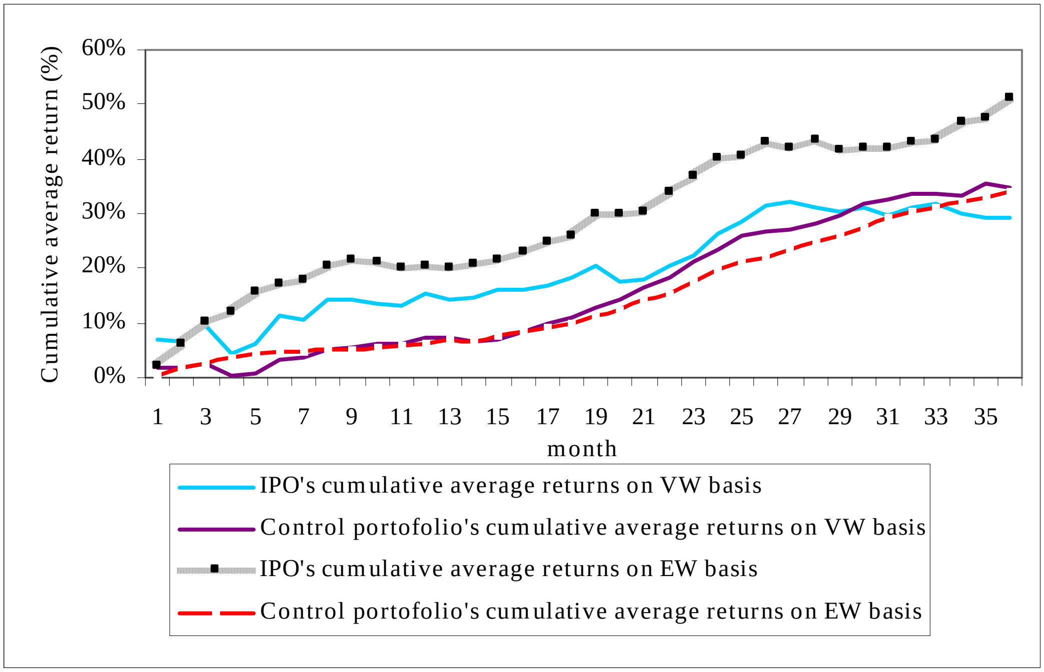
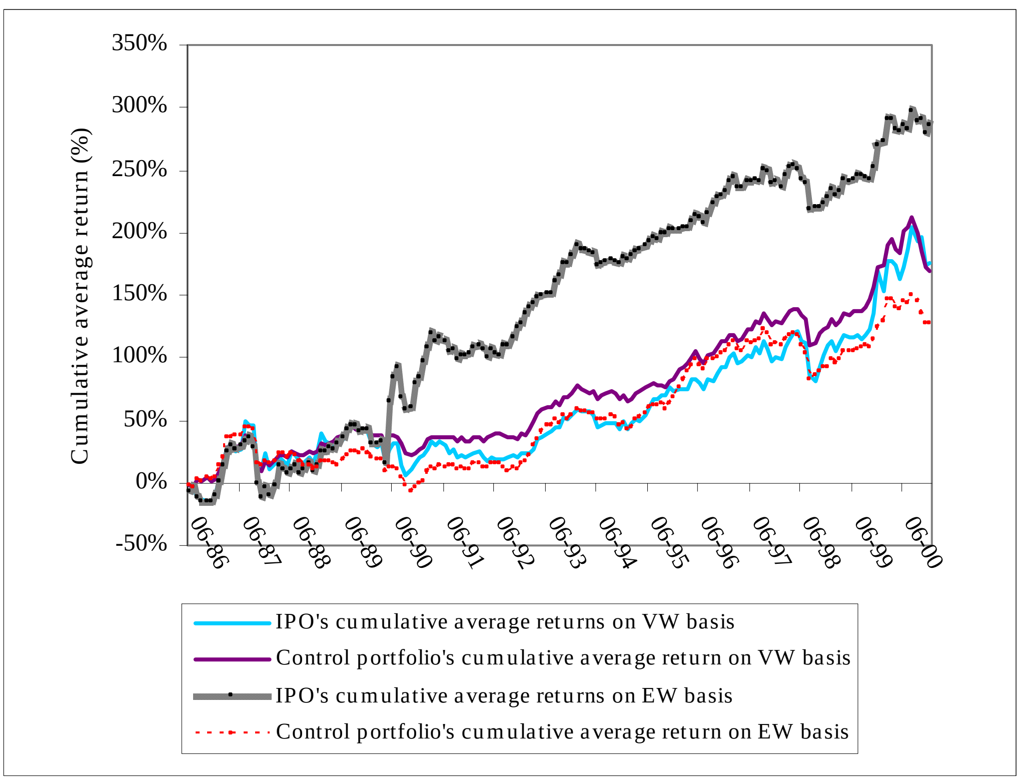


Figure 2: Calendar-time cumulative average returns.



NOTES

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[1] For example, Loughran and Ritter (1985) test the window of opportunity hypothesis to explain the IPO long-run performance. Carter et al. (1998) examine the relation between the aftermarket IPO performance and the underwriter reputation, while Brav and Gompers (1997) analyze venture-backed IPOs. Krigman, Shaw and Womack (1999) focus on the relation between the flipping ratio and the post-IPO returns. Rajan and Servaes (1997) consider data on analysts following and forecast accuracy to explain the long-run performance of IPOs.

[2] Actually, the book equity is the one available in June of each year (see Fama and French, 1992), while the market equity is revised each month.

[3] Other studies use either an annual rebalancing method, no rebalancing, or a control firm approach, whereby a matching firm is chosen on the basis of size and book-to-market characteristics. Our choice of monthly rebalancing is based on the fact that it takes into account changes in the original size and book-to-market ratio of our sample firm following the offering. However, this methodology remains susceptible to measurement, new listing, skewness biases described by Barber and Lyon (1997), and to momentum bias described by Rau and Vermalen (1998). According to them, this last bias decreases if we decrease the frequency which we rebalance. However, each method offers advantages and disadvantages, and as noted by Brav et al. (2000, p. 6), "no clear winner has emerged as the universally optimal methodology in terms of statistical properties."

[4] $w^*_{i,s} = 1/N_s$ if the portfolio return is equally-weighted and $w^*_{i,s} = w_{i,s} / \sum_{i=1}^{N_s} w_{i,s}$ if the portfolio return is value-weighted; to the event-time weight $w_{i,s}$ corresponds a calendar-time weight $w_{i,t} = ME_{i,t} / \sum_{i=1}^{M_t} ME_{i,t}$ (the relative market capitalisation where M_t stands for the number of firms during the calendar-time month t).

[5] This approach was adopted by Loughran and Ritter (1995), Brav, Geczy and Gompers (2000) and Jegadeesh (2000) to measure the average abnormal long-run performance of US issuers. The Canadian study by Ikenberry, Lakonishok and Vermaelen (2000) also uses calendar-time formed portfolios of issuing firms.

[6] All data comes from *Compustat*, and the market return is a value-weighted return computed within the sample. We have constructed *SMB* and *HML* in keeping with Fama and French (1993). Stocks are ranked in July based on their sizes and book-to-market ratios. The stocks are subsequently sorted into two size groups and three book-to-market groups based on Fama and French breakpoints: the stocks above the 50 percent size breakpoint are designated *B* (for big) and the remaining 50 percent are designated *S* (for small); the stocks above the 70 percent book-to-market breakpoint are designated *H* (for high), the middle 40 percent are designated *M* and the firms below the 30 percent book-to-market breakpoint are designated *L* (for low). Six value-weighted portfolios, *S/L, S/M, S/H, B/L, B/M* and *B/H* are formed at the intersection of size and book-to-market groups. $SMB = ((S/L - B/L) + (S/M - B/M) + (S/H - B/H))/3$ and $HML = ((S/H - S/L) + (B/H - B/L))/2$.

[7] Unit offerings are excluded because we were not able to separate the values of the components of offerings (usually common stock with warrants).

[8] The information on the average gross proceeds is not available in Jog (1997).

[9] We also consider macroeconomic factors as suggested by Eckbo, Masulis and Norli (2000). However, following Berkowitz and Qiu (2001), we only add two term structure factors to the *FF-TFPM* (the default factor and the term to maturity factor) to explain the variation in Canadian equity returns over time, but we didn't notice any significant change in the performance result. The intercept in the *EW* portfolio is positive (0.645%) and not significant (*t*-statistic=0.33, a 23.22% return for 36 months). When the IPOs are value-weighted, the intercept is negative (-0.158%) and not significant (*t*-statistic= -0.1, a -5.68% return for 36 months).

[10] When returns are measured in calendar time, each month is weighted equally; in event time, each IPO is weighted equally.

[11] We do not claim that these variables are the principal sources of long-run underperformance. Other papers suggest different explanations and propose various variables. Ritter and Welch (2002), in their noteworthy review of IPO activity, highlight the principal sources of long-run underperformance.

[12] In this paper, we prefer using long-term earnings growth projections rather than earnings forecasts, which are usually not made beyond a period of two years. Further, analysts are frequently evaluated on the accuracy of their recommendations and annual earnings forecasts, but not on their long-term growth forecasts. Thus, reputation effects are less likely to affect analysts when they issue excessively optimistic long-term earnings growth forecasts. Finally, Dechow et al. (1999, p. 3) note that "*long-term growth is a number that is followed and used by the investment community*."

[13] Breusch-Pagan test (*p*-value = 0.00005) and White test (*p*-value = 0.0156).

[14] Clarkson et al. (1992) examine the role played by direct disclosure in the valuation of IPOs in Canada, and find that forecasters have "good news" to reveal about the future earnings prospects, more so than non-forecasters.

[15] McNichols and O'Brien (1996) show that analysts disproportionately tend to follow successful firms and to stop following unsuccessful firms.

[16] Loughran and Ritter (1995) argue that issuers take advantage of swings in investor sentiment related to optimism about the growth prospects of IPOs, in order to time their issues. Behaviouralists claim that if managers can time the market, IPOs should cluster during hot issuance periods and long-run returns should be particularly poor.