Feltham - Ohlson Framework: The Implication of Corporate Tax

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Abstract

In this paper, I provide an empirical work in order to test the tax-adjusted market valuation (residual income) model. Feltham-Ohlson's (1995) residual income model can be extended by adding corporate tax: firm market value is a function of the bottom line after-tax accounting data, e.g., book value and after-tax earnings. Under this tax-adjusted framework, certain issues are examined: the information from the firm's operating activities is not enough to measure the firm's market value; financial activities also affect firm market value. In particular, abnormal financial earnings are not equal to zero, due to the tax deduction on interest expenses. An empirical analysis, using the financial reporting data of Canadian firms for the years 1994-1999, demonstrates that the current book value of financial assets and operating assets, abnormal operating earnings, and abnormal financial earnings are all relevant to firm market value. The sensitivity tests, which define the corporate tax rates in different ways, do not change the results. The sensitivity test, which uses the financial analysts' forecasts, does not change the results, either. Furthermore, the empirical analysis shows that abnormal financial earnings enhance firm share price more when the firm has lower non-tax costs, i.e., firm business risk (financial distress) and bankruptcy costs. It supports the previous research on capital structure to the extent that debt financing benefits a firm more when non-tax costs are lower.

Key words: abnormal financial earnings, abnormal operating earnings, business risk, and bankruptcy cost.

1. Introduction

Ohlson (1995) derives a residual income framework relating firm market value to accounting data such as book value, earnings, and cash flows, using clean surplus accounting. Since then, there has been a great deal of accounting literature seeking to empirically test the framework (Francis et al 2000, Bartholdy et al 2000, Liu and Ohlson 2000, Myers 2000, Dechow et al 1999, Frankel and Lee 1998, Penman and Sougiannis 1998, 1997, Penman 1996, Biddle et al 1997, Bernard 1995, and so on). Some empirical results generally support Ohlson's framework (Dechow et al 1999). Some find Ohlson's residual income model is superior to other models such as the cash flow model and the discounted dividend model (Francis et al 2000, Penman and Sougiannis 1998). Others doubt the conclusions (Lundholm and O'Keefe 2001, Biddle et al 1997)

Feltham and Ohlson (1995) extend Ohlson's work (1995) by dividing the firm's activities into financial activities and operating activities, and analyse how firm market value is related to its accounting data concerning both financial and operating activities. The analysis demonstrates that the market value can be expressed as the current book value and the present value of the expected future abnormal operating earnings. They argue that financial assets are marked to market and do not gener-

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ate abnormal earnings. Their argument is consistent with M-M theory, i.e., without tax, financial structure is irrelevant. Therefore, the expected future information about the performance from operation, together with the current accounting data, is enough to determine firm market value. Under this argument, several empirical works ignore the information from the future financial activities and regress firm share price on book value and abnormal operating earnings (Lundholm and O'Keefe 2001, Francis et al 2000, Penman and Sougiannis 1998,1997, Amir et al 1997).

I extend the Feltham-Ohlson model (F-O model) by adding corporate taxation, and show that firm market value is a function of the bottom line after-tax accounting data, i.e., book value and after-tax earnings. In particular, I show that under corporate tax, financial assets generate non-zero abnormal financial earnings, which enhance firm market value. Abnormal financial earnings result from the tax deduction on interest expenses. The information from the operation, together with the information from the financial activities, such as borrowing, is used to measure share price.

An empirical test is designed to test the value-relevant information from the financial activities. The test shows that abnormal financial earnings enhance firm market value. Furthermore, the test shows that abnormal financial earnings enhance firm market value more when non-tax costs such as business risk and bankruptcy costs are lower. It supports the previous research on capital structure to the extent that debt financing benefits a firm more when non-tax costs are lower.

The paper is organized as follows. The relevant literature on relating firm market value to accounting data is reviewed in section two. In section three, I analyse firm market valuation under corporate tax, and provide the tax-adjusted market valuation model. In section four, an empirical test is designed using the database of the "Canadian Financial Post Card" and "Gale Group Electronic Database" to test the tax-adjusted market valuation model. Finally, the conclusion is provided in section five.

2. Feltham-Ohlson model relating firm market value to accounting data

Ohlson (1995) develops a residual income model relating firm market value to the current and future accounting data. The model is based on the clean surplus relation and the assumption that dividends reduce current book value but leave current earnings unchanged. The model shows that firm market value is a function of current book value and the net present value of the expected future abnormal earnings (residual earnings).

Feltham and Ohlson (1995) extend Ohlson's work (1995) by dividing firm activities into financial and operating activities. They analyse how firm market value is related to its financial and operating information. Their study shows that firm market value can be expressed as the current book value plus the firm's present value of the expected future abnormal operating earnings. Therefore, only the data from the operating system is relevant to the future value such as the future cash flow and the future abnormal earnings. In other words, together with the current accounting data, the information about the future operating performance is enough to measure firm market value. Financial activities such as debt financing yield zero net present value. It is consistent with the M-M theory to the extent that without tax, financial activities such as debt financing are irrelevant.

When adding corporate tax, M-M (1963) argues that debt financing is superior to equity financing because interest is tax deductible. A great deal of finance, economics, and accounting papers find corporate tax affects debt financing decisions (Graham 2000, 1996, Shum 1996, Trezevant 1996, 1992, Rajan and Zingales 1995, Givoly et al 1992, Dhaliwal et al 1992, MacKie-Mason 1990, Bradley et al 1984, Ferri and Jones 1979, to name a few). The research on debt financing generally finds that (Graham 2001) corporations have a tax advantage with debt financing. This tax advantage may be partially offset by the non-tax costs that arise from issuing debt, such as the costs related to business risk or financial distress, the bankruptcy costs, the agency costs, and the under-investment costs. Graham (2001) argues that more work needs to be done to measure the market value of the tax benefits of debt for a broad cross-section of firms.

This paper contributes to current research on firm market valuation in four ways. First, this study extends the F-O framework by adding corporate tax, and shows that financial activities contribute to firm market value due to the tax deduction on interest expenses (i.e., abnormal financial earnings). Under corporate tax, using future performance merely from operation without future performance from the financial activities may not be an appropriate approach. Second, compared to previous market valuation studies which utilize the total abnormal earnings (in this paper, this is equal to abnormal financial earnings and abnormal operating earnings), this study shows that separating abnormal financial earnings from abnormal operating earnings provides value-relevant information. Third, this study shows that the contribution of debt financing to firm market value depends on non-tax costs such as business risk and bankruptcy costs. It supports the previous research that debt financing benefits a firm more when the non-tax costs are lower. Finally, this study uses the Canadian database. In Canada, an integration tax system is applied to the dividends payout. That is, shareholders receive a credit for taxes paid at the corporate level, which partially or fully offsets the double taxation of equity income and reduces the tax advantage of debt financing. Hence using data from Canadian firms when testing the effect of debt financing on a firm's value, provides a conservative confirmation of the tax-adjusted framework. In the next section, I develop the tax-adjusted firm market valuation model.

3. Tax-adjusted market valuation framework

The F- O model combines the dividend discount model and clean surplus accounting, and shows that firm market value is a function of the book value and the present value of the expected future abnormal earnings (i.e., residue income). That is

$$P_t = bv_t + \sum_{j=1}^{\infty} R_F^{-j} E_t [x_{t+j}^a] \quad (1)$$

Where $x_t^a = x_t - (R_F - 1)bv_{t-1}$, is the abnormal earnings (i.e., residue income).

bv_t = firm book value, date t

x_t = earnings (before tax) for period (t-1,t)

P_t = firm market value, date t.

R_F = one plus the risk-free interest rate r

The market valuation model can be extended to add corporate tax directly, i.e., both book value and earnings are expressed net of corporate tax. Under corporate tax, I define abnormal earnings as after-tax abnormal earnings, i.e., $x_t^a = (1-t)x_t - (R_F - 1)bv_{t-1}$, where t is the corporate tax rate. Function (1) becomes the tax-adjusted market valuation model.

From the firm's operating system, some observations deserve notice. Similarly, I define abnormal operating earnings as $ox_t^a = (1-t)ox_t - (R_F - 1)oa_{t-1}$,. Where oa_t is the operating asset.

I divide the firm's activities into operating activities and financial activities. Using the definition for abnormal operating earnings, the tax-adjusted market valuation model can be expressed as

$$P_t = fa_t + oa_t + \sum_{j=1}^{\infty} R_F^{-j} E_t[ox_{t+j}^a] + \sum_{j=1}^{\infty} R_F^{-j} E_t[-ti_{t+j}] \quad (2)$$

where fa_t is the financial asset (borrowing if negative). Firm book value is the sum of the operating asset and the financial asset.

Besides the operating performance ox_{t+j}^a, the interest shield $-i_{t+j}$, determined by the firm's financial activities, affects the market value. Under corporate tax, the abnormal earnings for the financial activities can be defined as $fx_t^a = (1-t)i_i - (R_F - 1)fa_{t-1}$. Using the interest relation $i_i = (R_F - 1)fa_{t-1}$, abnormal financial earnings is $fx_t^a = -ti_t$, the tax deduction on interest expenses. Abnormal financial earnings will be equal to zero if there is no corporate tax. Hence, the tax-adjusted framework can also be expressed as

$$P_t = fa_t + oa_t + \sum_{j=1}^{\infty} R_F^{-j} E_t[ox_{t+j}^a] + \sum_{j=1}^{\infty} R_F^{-j} E_t[fx_{t+j}^a] \quad (3)$$

Under corporate tax, financial activities are relevant to the extent that abnormal financial earnings (i.e., tax deduction on interest expenses) enhance firm market value.

In the next section, an empirical work is designed to test the effect of abnormal financial earnings on firm market value.

4. Empirical test

4.1. Regression model

The tax-adjusted framework (3) suggests I could regress the firm's share prices on their current book value (including both the current operating asset value and the current financial asset value) and the abnormal earnings (including both the abnormal operating earnings and the abnormal financial earnings).

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \varepsilon_t \quad (4)$$

Feltham-Ohlson's (1995) linear information model shows that the coefficient on current abnormal operating earnings depends on the persistence of abnormal operating earnings over time. No persistence implies the coefficient is zero, whereas full persistence implies a coefficient equal to one over the risk-free interest rate.

The coefficient on current financial earnings also depends on the persistence of abnormal financial earnings over time. In addition, the co-efficient on abnormal financial earnings may depend on non-tax costs from borrowing, and the persistence of non-tax costs over time. If abnormal financial earnings follow a dynamic process different from abnormal operating earnings, I expect that the co-efficient on abnormal financial earnings differs from that on abnormal operating earnings.

In the case of unbiased accounting, the sum of the coefficients on both the financial asset and the operating asset are equal to one. However, conservative accounting implies that a sum of the coefficients is larger than one. If accounting for the financial asset differs from accounting for the operating asset, I expect that the co-efficient on the financial asset differs from that on the operating asset. The prediction regarding the magnitude of coefficient estimates is beyond the scope of this paper.

Regression model (4) can be viewed as a linear transformation of equation (3). As F-O shows, transforming a multi-period equation into a linear specification requires the rather strict assumption that current financial earnings and operating earnings can adequately proxy for the stream of future financial earnings and operating earnings. Because the growth and persistence of future earnings varies across firms, these proxies introduce measurement error into the regression. In addition, regression model (4) is tested using cross-sectional data, which may result in biased estimates (Amir et al 1997). This is because the valuation coefficients on abnormal earnings depend on the firm's cost of capital (I use risk-free interest rate), which may be different across firms.

To address these problems, I modify regression model (4) in the following ways. First, I add to the model lagged abnormal earnings and the next year's realized abnormal earnings[1]. Including these variables may capture cross-sectional variation in earnings persistence. Dechow et al (1999) find that the first order autoregression process on abnormal earnings appears to provide reasonable empirical approximation. Second, I allow the coefficients on current abnormal earnings to vary by industry. This will allow me to control for systematic differences in cost of capital and abnormal earnings persistence across industries. Third, to control for intertemporal differences, I allow the coefficients on the current abnormal earnings to vary by years. I also estimate regression model (4) separately for each year. Fourth, I separate shares into three portfolios according to their price/book ratios, and allow the coefficients on the current abnormal earnings to vary across portfolios. I estimate regression model (4) for each portfolio.

Consequently, I test the following four regression models:

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \alpha_5 fx_{t-1}^a + \alpha_6 ox_{t-1}^a + \alpha_7 fx_{t+1}^a + \alpha_8 ox_{t+1}^a + \varepsilon_t \quad (5)$$

$$P_t = \beta_o + \beta_1 fa_t + \beta_2 oa_t + \sum_{i=1}^{5} \beta_{3it} I_i fx_t^a + \sum_{i=1}^{5} \beta_{4it} I_i ox_t^a + \beta_5 fx_{t-1}^a \tag{6}$$
$$+\beta_6 ox_{t-1}^a + \beta_7 fx_{t+1}^a + \beta_8 ox_{t+1}^a + v_t$$

where I_i is an industry indicator variable that is equal to one if the observation belongs to industry i. I classify firms into 5 industries according to their SIC. Table one shows the distribution of firms in each industry.

Table 1.
The distribution of firms across industries

Industry	SIC	# of firms
Mining	1000-1499	72
Manufacturing	2000-3999	110
Transportation, communications and utilities	4000-4999	43
Wholesale and retail sale	5000-5999	35
Other (agriculture, forest and fisheries,construction, and services)	0100-0999, 1500-1799, 7000-8999	24
Total		284

$$P_t = \lambda_0 + \lambda_1 fa_t + \lambda_2 oa_t + \sum_{i=1}^{6} \lambda_{3it} Y_i fx_t^a + \sum_{i=1}^{6} \lambda_{4it} Y_i ox_t^a + u_t \tag{7}$$

where Y_i is a year indicator variable that is equal to one if the observation belongs to year i. I have six-year data from 1994 to 1999.

$$P_t = \gamma_0 + \gamma_1 fa_t + \gamma_2 oa_t + \sum_{i=1}^{3} \gamma_{3it} F_i fx_t^a + \sum_{i=1}^{3} \gamma_{4it} F_i ox_t^a + \gamma_5 fx_{t-1}^a$$
$$+\gamma_6 ox_{t-1}^a + \gamma_7 fx_{t+1}^a + \gamma_8 ox_{t+1}^a + \omega_t \tag{8}$$

where F_i is a portfolio indicator variable that is equal to one if the observation belongs to portfolio i. I classify the shares into three portfolios according to their price/book ratios.

In all four models, I test if the coefficient on abnormal financial earnings is significantly positive.

4.2. Data collection and variable measurement

The data is obtained from the "Canadian Financial Post Card" database. The firms I use for the tests should meet the following conditions: (1) public companies with their share prices listed on the Toronto Security Exchange market (TSE) at the fiscal year end of the years 1995-1998. (2) accounting statements available for the years 1994 -1999 on the "Canadian Financial Post Card" database. (3) not in the banking, real estate, insurance, and financial institutions (SIC 6000-6799). There are 1136 firm years (284 firms 4 years).

The first condition is necessary to obtain the share prices. The second condition is necessary to compute the current abnormal earnings, the lagged abnormal earnings and the one-year forward abnormal earnings. The third condition eliminates firms in certain industries because they follow different tax rules.

The variables for the test are measured as follows.

The dependant variable is the firm's common share price listed on the TSE at the fiscal year end.

Financial asset per share is calculated as cash and cash equivalents, plus short-term investments, minus long-term debt, current portion of long-term debt, and preferred share, all deflated by the number of common shares outstanding at the fiscal year end.

Operating asset per share is measured as the shareholder's equity net of preferred shares, minus the financial asset, plus net deferred tax liability (the test results are not sensitive to this addition), all divided by the number of common shares outstanding at the fiscal year end.

The definitions for financial asset per share and operating asset per share are consistent with Amir et al (1997).

The after-tax financial earnings are measured as the interest income and other non-operating income, minus the interest expenses, times 1 minus the tax rate. Abnormal after-tax financial earnings per share in year t are calculated as the after-tax financial earnings in year t, minus risk-free interest rate times the financial asset in year t-1, all divided by the number of common shares outstanding at the fiscal year end.

The after-tax operating earnings is measured as net income before discontinued operation (the test results are held if using net income after discontinued operation) and before extraordinary items, minus the after-tax financial earnings. Abnormal operating earnings per share in year t are calculated as the after-tax operating earnings in year t, minus the risk-free interest rate, times the operating asset in year t-1, all divided by the number of common shares outstanding at the fiscal year end.

The risk-free interest rate is measured as the one-year T-bill rate, or 10% for all firms. Penman and Sougiannis (1998) measure the risk-free interest rate in three different ways: the 3-year T-bond plus equity risk premium of 6%, 3-year T-bond rate plus risk premium with betas estimated by CAMP for each firm, or 10% for all firms. They find little difference in the results of each calculation. Hence, in the study, I use 10% as the proxy of the risk interest rate (the results using the interest rate for a one-year T-bond as the proxy, which are not shown in the paper, do not change qualitatively).

The definition of the effective corporate tax rate is important since abnormal financial earnings and abnormal operating earnings all depend on this definition. Following Kern and Morris(1992) and Porcano (1986), I define a firm's effective tax rate as its current tax paid divided by pre-tax income, if pre-tax income is positive. If the firm incurs pre-tax loss, dividing the current tax by pre-tax loss is meaningless. Hence, I set the tax rate equal to 1 if the current tax paid is positive, and 0 if the current tax paid is zero or negative (this 0-1 measure may inflate the corporate tax effects). This definition has several problems. Wilkie and Limberg (1993) argue that using current tax paid as the numerator ignores deferred taxes across firms and within firms over time. Use of pre-tax income as the denominator may not be perfect because pre-tax income is different from taxable income. In addition, this definition of the effective corporate tax rate may ignore implicit tax. Omer et al (1991) argue that different effective tax rate measures cause notable shifts in estimated effective tax rates, and researchers should evaluate the robustness of their results across alternative effective tax rate measures. Hence, under sensitivity tests, I define the effective corporate tax rate in four different ways, and test the robustness of my result.

4.3. Regression Results

The primary results are presented in table 3 to table 6.

Table 2 presents the descriptive statistics of the dependent/independent variables. It presents the mean, median, maximum, minimum, 1st quantile, 3rd quantile value, and the standard deviation of the dependent/independent variables.

Table 3 presents the results from regressing equation (5). It is shown that, for the pooled data, the co-efficient on the current abnormal financial earnings is positive and significant, which suggests that performance from the financial activities is relevant to firm market value[2]. Abnormal financial earnings enhance share price due to the tax deduction on interest expenses. The results on annual data of 1996 and 1998 also show positive and significant coefficients on abnormal financial earnings. However, the results from the annual tests of 1995 and 1997 are not significant. The coefficients on the financial asset, the operating asset, and the current abnormal operating earnings are all positive and significant, which is consistent with the F-O model. The co-efficient on the operating asset is not different from that on the financial asset, which suggests that investors may account for both assets in a similar way. The co-efficient on abnormal financial earnings is lower than that on abnormal operating earnings, which suggests that the investors may evaluate the performance from operation more than from that of financial activities. It also suggests that the future earnings from the financial activities may have different persistence than the future operating earnings. In addition, it implies that the tax advantage from the financial activities may be partially offset by the non-tax costs from debt financing (the non-tax issue is explored in section 4.5). The lagged abnormal financial earnings and the next year's abnormal financial earnings are not significant. On the other hand, the lagged abnormal operating earnings and the next year's abnormal operating earnings are positive and significant. Hence, the persistence of future operating earnings is different from that of future financial earnings. Separating abnormal financial earnings from abnormal operating earnings provides value-relevant information.

Table 4 presents the result from regressing equation (6) when I classify firms into 5 industries according to their two-digit SIC. The abnormal earnings (including abnormal financial earnings and abnormal operating earnings) are multiplied by the industry dummy variable. The model allows the persistence of abnormal earnings to

Table 2.
Descriptive statistics of the dependent/independent variables

The sample contains 284 firms listed in the Canadian Financial Post Card at the fiscal year end from 1994-1999. Financial asset is measured as cash and cash equivalent plus short-term investment, minus short-term debt, long term debt and preferred shares. Operating Asset is defined as the shareholder's equity net of financial asset, plus net deferred tax liability. Abnormal financial earnings are defined as after-tax financial income, minus the preceding year's financial asset multiplied by the risk free interest rate. After-tax financial income is defined as interest income and other non-operating income, net of interest expense, all multiplied by one minus the effective corporate tax rate. The effective corporate tax rate is defined as current tax paid divided by pre-tax income, if pre-tax income is positive. When pre-tax income is negative, the effective tax rate is equal to 1 if current tax paid is positive, and 0 if the current tax paid is not positive. Risk free interest rate is equal to 10%. Abnormal operating earnings are defined as after-tax income net of after-tax financial income, minus the preceding year's operating asset multiplied by the risk free interest rate. To control size effect, all the variables are deflated by the number of common shares outstanding at the fiscal year end. There are 1136 (384firms*4 years) observations. I delete the observations with negative book values, and I have 1119 observations. Table 2 entries include the mean, median, 1st quartile, 3th quartile, standard deviation, minimum, and maximum value of the dependent and independent variables.

Variable	Mean	Std Dev	Median	Min	Max	1-Qrt	3-Qrt
P_t	17.7611	21.3399	12.4000	0.0850	204.95	5.7500	24.2250
fa_t	-5.2657	11.3131	-1.7070	-85.9866	18.0967	-6.8605	0.0943
oa_t	15.3430	19.0163	10.0734	-0.1121	106.2555	3.4333	21.6521
fx_t^a	0.2937	1.7021	0.0247	-11.2209	39.6255	-0.0833	0.3135
ox_t^a	-0.3621	2.1206	-0.0996	-41.0821	10.8861	-0.6410	0.3031
fx_{t-1}^a	0.2459	0.9921	0.0280	-5.2600	12.5849	-0.0761	0.3085
ox_{t-1}^a	-0.2021	1.4655	-0.0623	-18.7142	10.8861	-0.5106	0.3103
fx_{t+1}^a	0.2404	2.6900	0.0441	-64.6918	39.6255	-0.0805	0.3494
ox_{t+1}^a	-0.5660	3.1414	-0.1522	-69.8180	10.4936	-0.8298	0.2606

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a:abnormal financial earnings in year t+1.

Table 3.
Result of regression model (5)

The regression model (model 5) is

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \alpha_5 fx_{t-1}^a + \alpha_6 ox_{t-1}^a + \alpha_7 fx_{t+1}^a + \alpha_8 ox_{t+1}^a + \varepsilon_t$$

Year	Int.	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	Adj. R^2
Pooled	5.2866	1.3414	1.3182	2.4151	2.8829	0.7678	2.1893	-0.1370	0.5772	0.5897
	10.0344	20.2386	31.7412	7.5662	10.2259	1.7214	6.9264	-0.9527	4.5553	
1995	3.8732	1.7337	1.3370	-0.5256	1.3340	4.7813	-0.0041	4.0090	3.8376	0.6008
t-stat	4.4951	12.7561	17.1359	-0.5044	1.6584	3.5003	-0.0052	4.3687	5.7183	
1996	4.2087	1.6588	1.5237	5.6220	5.6893	-2.7236	0.864	-0.4922	0.2746	0.6814
t-stat	4.5938	13.2713	20.1596	5.5465	7.3603	-2.5870	1.2690	-0.9778	0.6547	
1997	5.5495	1.5801	1.5126	0.0142	0.8781	6.2505	6.3416	1.0724	1.3408	0.6696
t-stat	5.0167	11.9473	17.6960	0.0226	1.5868	5.4255	7.7173	2.5697	3.2655	
1998	6.4343	1.0204	1.1676	2.9302	3.1758	0.1965	2.0350	-0.6727	0.8320	0.5725
t-stat	5.7412	7.5802	14.1422	5.2852	5.9566	0.3088	3.7512	-1.8382	2.5829	

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 4
Result of regression model(6) with industry classification

The regression model (model 6) is

$$P_t = \beta_o + \beta f a_t + \beta_2 oa_t + \sum_{i=1}^{5} \beta_{3it} I fx_t^a + \sum_{i=1}^{5} \beta_{4it} I_i ox_t^a + \beta_5 fx_{t-1}^a + \beta_6 ox_{t-1}^a + \beta_7 fx_{t+1}^a + \beta_8 ox_{t+1}^a + v_t$$

Year	Int.	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	Adj. R^2	F-stat
Pooled	5.2133	1.3642	1.3249	2.2558	2.5797	0.6101	1.8540	-0.1446	0.5759	0.5948	0.3618
t-stat	9.8037	19.7904	31.5973	3.0263	4.0155	1.3623	5.6530	-1.0068	4.5325		
1995	4.0235	1.8092	1.3280	-0.7778	1.0392	5.0300	-0.3439	3.6890	3.5616	0.5966	0.2722
t-stat	4.5792	11.5534	16.0449	-0.2645	0.9636	3.5558	-0.4173	3.8386	4.8796		
1996	3.6658	1.7414	1.5564	9.5377	8.1954	-2.8161	0.9530	-0.1776	0.4428	0.6938	1.2812
t-stat	4.0028	12.7538	20.0000	2.9205	4.0243	-2.6528	1.3837	-0.3478	1.0347		
1997	5.2723	1.6809	1.5569	0.6900	0.8269	5.6662	5.7502	1.0934	1.4397	0.6742	1.4414
t-stat	4.6249	11.7944	17.6800	0.1509	0.7854	4.8045	6.7805	2.5425	3.3269		
1998	6.2054	1.2097	1.2285	4.1879	3.3118	0.2303	1.8384	-1.1354	1.2375	0.5981	2.4612
t-stat	5.9990	8.4461	14.8140	2.4782	2.5092	0.3599	3.3651	-2.9360	3.6569		

In this table, I report average coefficients and average t-statistics across industries. I also report the F-value of a test for a specific co-efficient is equal across industries.

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 5 Result of regression model (7) with year classification

The regression model (model 7) is

$$P_t = \lambda_0 + \lambda_1 fa_t + \lambda_2 oa_t + \sum_{i=1}^{6} \lambda_{3it} Y_i fx_t^a + \sum_{i=1}^{6} \lambda_{4it} Y_i ox_t^a + u_t$$

Variables	co-efficient	stad. Err	t-stat	Adj. R^2	F-stat
Intercept	5.1756	0.4713	10.9825	0.5014	17.1439
financial asset	1.4055	0.0586	24.0039		
operating asset	1.3114	0.0374	35.0855		
94 abnormal financial earnings	0.7213	1.3934	0.5177		
95 abnormal financial earnings	0.2160	1.2305	0.1755		
96 abnormal financial earnings	6.2353	1.0792	5.7776		
97 abnormal financial earnings	1.5015	0.6132	2.4485		
98 abnormal financial earnings	3.9250	0.5096	7.7018		
99 abnormal financial earnings	-0.6687	0.2735	-2.4449		
average abnormal financial earnings	1.9884	0.8416	2.3627		
94 abnormal operating earnings	3.9794	0.7586	5.2455		
95 abnormal operating earnings	3.5092	0.7043	4.9826		
96 abnormal operating earnings	6.8864	0.7261	9.4836		
97 abnormal operating earnings	3.2987	0.4668	7.0664		
98 abnormal operating earnings	4.2478	0.4485	9.4708		
99 abnormal operating earnings	1.3158	0.2443	5.3857		
average abnormal operating earnings	3.8729	0.5581	6.9391		

I report the F-value of a test for a specific co-efficient is equal across years.

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 6
Result of regressing model (8) for three portfolios

The regression model (model 8) is

$$P_t = \gamma_0 + \gamma_1 fa_t + \gamma_2 oa_t + \sum_{i=1}^{3} \gamma_{3i} F fx_t^a + \sum_{i=1}^{3} \gamma_{4i} F ox_t^a + \gamma_5 fx_{t-1}^a + \gamma_6 ox_{t-1}^a + \gamma_7 fx_{t+1}^a + \gamma_8 ox_{t+1}^a + \omega_t$$

Year	Int.	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	Adj. R^2
Pooled	4.9596	1.3501	1.3023	3.8291	2.6285	0.0242	1.8871	-0.1822	0.5638	0.6445
t-stat	10.0288	21.0724	33.2979	5.3855	6.2857	0.0575	6.2883	-1.3593	4.7570	
high ratio port.	6.9718	2.4792	2.3403	2.3306	0.9855	0.7591	1.9695	0.5982	2.8335	0.7368
t-stat	7.5447	15.0958	21.9000	2.2116	1.5421	0.6433	3.5442	1.0914	5.5384	
median port.	0.2235	1.5822	1.5545	0.5512	0.7565	-0.1300	-0.0753	-0.0733	0.0900	0.9571
t-stat	0.8805	49.3920	83.8458	3.0654	4.6381	-0.5818	-0.3961	-0.9601	1.1837	
low ratio port.	-0.2647	0.9884	0.9954	0.5968	0.7181	-0.7411	0.6942	0.0668	0.0380	0.9132
t-stat	-1.0156	34.2179	55.4868	4.9752	6.1257	-4.2778	4.6649	0.6799	0.4394	

The F-value of a test for a specific co-efficient is equal across portfolio is equal to 38.8004.

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 7
Pearson/Spearman correlation matrix of independent variables

Variables	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	P_t
fa_t		-0.7810	-0.5294	0.3564	-0.5149	0.2843	-0.6713	0.4064	-0.2048
oa_t	-0.8484		0.4622	-0.2602	0.4584	-0.2075	0.5146	-0.3353	0.5888
fx_t^a	-0.3654	0.3324		-0.4373	0.5270	-0.3131	0.4987	-0.3057	0.1522
ox_t^a	0.3739	-0.2877	-0.7146		-0.3016	0.6532	-0.3146	0.6234	0.1673
fx_{t-1}^a	-0.4135	0.4122	0.2420	-0.2571		-0.4068	0.4541	-0.2919	0.1795
ox_{t-1}^a	0.2983	-0.2195	-0.2007	0.4567	-0.4905		-0.2586	0.4547	0.1180
fx_{t+1}^a	-0.2961	0.2413	0.1350	-0.1322	0.1521	-0.0896		-0.4342	0.1494
ox_{t+1}^a	0.3019	-0.2702	-0.1246	0.2707	-0.1222	0.1548	0.1451		0.0514
P_t	-0.1163	0.4547	0.0556	0.2326	0.0713	0.2601	0.0389	0.1053	

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 8.
Result of regression model (5) using financial analysts' forecasts

The regression model (model 5) is

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \alpha_5 fx_{t-1}^a + \alpha_6 ox_{t-1}^a + \alpha_7 fx_{t+1}^a + \alpha_8 ox_{t+1}^a + \varepsilon_t$$

Variables	*Coefficients*	*Std. Err.*	*t-statistics*	*Adj. R^2*
intercept	9.1076	1.1914	7.6442	0.5658
fa_t	1.0655	0.2319	4.5951	
oa_t	1.2232	0.0760	16.0848	
fx_t^a	1.6525	0.4960	3.3316	
ox_t^a	1.8479	0.4820	3.8338	
fx_{t-1}^a	-1.0979	0.7503	-1.4633	
ox_{t-1}^a	0.6322	0.6479	0.9758	
fx_{t+1}^a	-2.9416	3.1251	-0.9413	
ox_{t+1}^a	2.9293	0.7116	4.1166	

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 4 presents the result from regressing equation (6) when I classify firms into 5 industries according to their two-digit SIC. The abnormal earnings (including abnormal financial earnings and abnormal operating earnings) are multiplied by the industry dummy variable. The model allows the persistence of abnormal earnings to differ across. It is shown that the conclusion from model (5) does not change when I allow for differences across industries. The co-efficient on abnormal financial earnings is positive and significant. The F-value, which is not significant, suggests there are no cross-industry differences.

Table 5 presents the result from regressing equation (7) when I use dummy variable representing years. All abnormal earnings (including abnormal financial earnings and abnormal operating earnings) are multiplied by the dummy variable. The model allows for the different persistence on abnormal earnings across years. It is shown that the co-efficient on the average abnormal financial earnings is positive and significant. The significantly high F-value suggests that there are significant dif-

Table 9.
Results from regressing model 5 for two sub-samples: high business risk
Sub-sample vs. low business risk sub-sample

The regression model (model 5) is

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \alpha_5 fx_{t-1}^a + \alpha_6 ox_{t-1}^a + \alpha_7 fx_{t+1}^a + \alpha_8 ox_{t+1}^a + \varepsilon_t$$

Year	Int.	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	Adj. R^2
low-risk group	5.4899	1.3325	1.2698	3.1734	4.2701	3.6320	3.6527	-0.5998	0.6233	0.5526
t-stat	8.1864	11.0252	18.4232	4.1210	5.6625	4.0468	5.0951	-2.5709	2.8397	
high-risk group	3.8990	1.5542	1.4697	1.3011	1.5804	-0.5653	1.6520	2.6036	2.4762	0.6613
t-stat	4.8255	19.0285	27.4085	3.5041	4.7824	-1.0773	4.4869	6.9109	8.2827	

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

Table 10

Result from regressing model (5) with two sub-samples: sub-sample with high bankruptcy cost vs. sub-sample with low bankruptcy cost

The regression model (model 5) is

$$P_t = \alpha_0 + \alpha_1 fa_t + \alpha_2 oa_t + \alpha_3 fx_t^a + \alpha_4 ox_t^a + \alpha_5 fx_{t-1}^a + \alpha_6 ox_{t-1}^a + \alpha_7 fx_{t+1}^a + \alpha_8 ox_{t+1}^a + \varepsilon_t$$

Year	Int.	fa_t	oa_t	fx_t^a	ox_t^a	fx_{t-1}^a	ox_{t-1}^a	fx_{t+1}^a	ox_{t+1}^a	$Adj.R^2$
low-risk group	6.2876	1.9938	1.9452	1.3014	1.3925	1.1333	2.2350	0.8540	2.6841	0.7188
t-stat	8.7072	17.0932	26.8794	2.1400	2.9841	1.4348	4.84201	1.9370	6.7921	
high-cost group	-0.0848	1.0658	1.1100	0.5684	0.8192	-0.3737	0.4925	-0.0440	0.0794	0.8756
t-stat	-0.2938	35.5723	57.9801	3.8550	5.8030	-1.8791	2.8300	-0.7648	1.5595	

P_t: share price in year t.

fa_t: financial assets in year t.

oa_t:operating assets in year t.

fx_t^a: abnormal financial earnings in year t.

ox_t^a: abnormal operating earnings in year t.

fx_{t-1}^a: abnormal financial earnings in year t-1.

ox_{t-1}^a: abnormal operating earnings in year t-1.

fx_{t+1}^a: abnormal financial earnings in year t+1.

ox_{t+1}^a: abnormal operating earnings in year t+1.

ferences in the persistence of abnormal earnings across years. Hence, the test results from table 4 and table 5 show that the differences in the persistence on abnormal earnings across years are much larger than across industries.

To test the market valuation model further, I follow Penman (1996) and classify the observations into three portfolios according to their price/book ratio: high price/book ratio portfolio, median portfolio, and low price/book ratio portfolio. I test if the firm market valuation relation is different across portfolios. Table 6 presents the result from regressing equation (8) across the three portfolios. It is shown that the abnormal financial earnings are positive and significant across all three portfolios. The financial asset and the operating asset are also positive and significant across all three portfolios. Abnormal operating earnings are positive and significant except the high price/book portfolio. The adjusted R-squared are extremely high (0.7386 for high ratio portfolio, 0.9571 for median portfolio, and 0.9132 for low ratio portfolio). The coefficients on abnormal financial earnings are not different from those on abnormal operating earnings except in the case of the high price/book portfolio. For the high price/book portfolio, the co-efficient on abnormal earnings is much higher than with other groups, which may be explained by the non-tax cost theory to be discussed in section 4.5. The F-value, which is used to test if the coefficients are different across the three portfolios, is extremely high (38.8004). It suggests that the coefficients on the explanatory variables are different across portfolios.

To control for the potential effects of heteroskedastic errors, White's (1980) correction is employed. All regression results do not change qualitatively.

Table 7 presents the correlation matrix of the independent variables. The highest absolute value of the correlation is between the financial asset and the operating asset (-0.8484). Abnormal financial earnings and abnormal operating earnings are also highly correlated (-0.7146). There are several correlations consistent with Amir et al (1997): a high negative correlation between the operating asset and the current/lagged abnormal operating earnings, the operating asset and the financial asset; a high positive correlation between the current abnormal operating earnings and the lagged abnormal operating earnings. I further calculate the condition indices. The maximum value of the condition indices is 6.47, which is much less than 30. It suggests that multi-collinearity is not a serious problem.

In the next section, I design the sensitivity tests.

4.4. Sensitivity tests

Several sensitivity tests are designed in this section.

It is argued that the market takes time to fully reflect the information disclosed by the accounting statements. Hence, I use the share price one month after the fiscal year end as the dependent variable. The results from regressing models (5), (6), (7) and (8) do not change qualitatively.

I measure effective corporate tax rate in four different ways. The effective tax rate measure is a key point in this study because it determines the measurement of abnormal financial earnings and abnormal operating earnings. First, I use the original measure, but set the absolute value of the measure not larger than the top statutory federal rate plus the provincial rate. This is done to mitigate the effects of the tax rate outliers. The regression results do not change qualitatively.

Second, I define the effective corporate tax rate similar to the original measure, except that I use the total tax payment (current tax paid plus deferred taxes) as the numerator, in order to take into account the effect of deferred taxes. The regression results do not change qualitatively.

Third, I follow Biddle et al (1997) and define the effective tax rate as the top statutory tax rate if net operating earnings are positive, and 0 otherwise. Wilkie and Limberg (1993) argue that using pre-tax income as the denominator may be biased since it is not equal to taxable income. This definition avoids the problem incurred by the difference between taxable income and pre-tax income. The regression results do not change qualitatively.

Fourth, I delete the firm years with negative pre-tax income, since it is problematic to calculate the effective tax rate when a firm has a negative accounting income. The effective tax rate is defined as the current tax paid, divided by pre-tax income. The regression results do not change qualitatively.

Several studies on the Feltham-Ohlson's model use the earnings forecast from the financial analysts as a proxy for the expected future earnings (e.g., Frankel and Lee 1998, Bernard 1995). I follow this method and use the financial analysts' forecasts. I use the Investext Plus from the "Gala Group Electronic Database". The Investext Plus offers the forecasts of the firm's future performance from the experts such as Midland Walwyn, CIBC Wood Gundy Securities Inc. Newcrest Capital Inc, Merrill Lynch, and so on (more than 500 investment banks and 190 trade associations). The forecasts on annually and quarterly financial statements are reported from 1996 to present. From my sample of 284 firms, 146 firms have income statement forecasts for at least one year for the time periods from 1994 to 1999. Table 8 presents the result from regressing equation (5) when I calculate the next year's abnormal earnings using the earnings forecasts. It is shown that the conclusions do not change qualitatively.

In summary, all regression results from section 4.3 are robust under the sensitivity tests. In the next section, I further explore the effect of the non-tax costs on the valuation of abnormal financial earnings.

4.5. Abnormal financial earnings and non-tax costs

Abnormal financial earnings, which are equal to the tax deduction on interest expense, enhance firm market value. However, this tax advantage of debt financing is reduced if non-tax costs are incurred. Business risk (or financial distress) and bankruptcy costs are two major non-tax costs specified by previous studies. Following the previous studies (Graham 2000, Dhaliwai et al 1992, Givoly et al 1992, MacKie-Mason 1990, Bradley et al 1984), I define business risk or financial distress as the standard deviation of operating earnings (results do not change when using the standard deviation of pre-tax income), deflated by firm market value (equal to share price multiplied by the number of shares outstanding). I separate the sample into two groups: the high-business -risk group (business risk is higher than the median business risk) and the low-business-risk group. The hypothesis is that, when regressing share price on abnormal financial earnings, as well as other variables under equation (5), the co-efficient on abnormal financial earnings should be higher for the low-business-risk group than for the high-business-risk group. Table 8 presents the result. Consistent with the hypothesis, the co-efficient on abnormal financial earnings for the low-risk group is 3.1734, which is much higher than that for the high-risk group, which is 1.3011. Hence, I argue that due to the non-tax costs such as business risk or financial distress, the effect of tax savings from debt financing on firm market value is reduced.

Bankruptcy costs are measured as the inverse of Tobin's Q ratio. It also measures the potential loss of growth opportunities in the case of bankruptcy, and presents liquidation (Givoly et al 1992). I calculate the inverse of Tobin's Q ratio as book value per share divided by market share price. I classify the samples into two groups: a high bankruptcy cost group (book to market ratio is greater than the median value) and a low bankruptcy cost group. I regress model (5) for each group: regressing share price on abnormal financial earnings, as well as other variables. The hypothesis is that the co-efficient on abnormal financial earnings is higher for the low-cost group than that for a high-cost group. The Result in table 9 shows that the co-efficient on abnormal financial earnings for a low-risk group (i.e., high price-book ratio) is 1.3014, which is much higher than for that of a high-cost group (i.e., low price-book ratio), which is 0.5684.

In summary, regression results from this section show that non-tax costs affect the valuation of financial activities. The higher the non-tax costs, the less the tax advantage from debt financing will enhance firm market value. The results indirectly confirm my measurement of abnormal financial earnings, i.e., abnormal financial earnings are related to a firm's financial activities.

5. Conclusion

This paper adds corporate tax into Feltham-Ohlson's market valuation (residue income) model. Under the tax-adjusted framework, I show that performance from financial activities such as debt financing is relevant to the extent that abnormal financial earnings (equal to tax deduction on interest expenses) enhance share price. Empirical tests using Canadian firms for the years 1994 to 1999 support the tax-adjusted market valuation model. Furthermore, the empirical results show that the effect of abnormal financial earnings on share price is significant across industries, years, and portfolios. In addition, the regression results are robust under several sensitivity tests, when I measure the effective corporate tax rates in different ways or I use the earnings forecasts from the financial analysts as a proxy for the expected future earnings. Hence, I argue that it may not be an appropriate approach to merely use abnormal operating earnings to test the market valuation model. Abnormal financial earnings contribute to share price through tax savings on interest deduction.

The non-tax cost theory indicates that the tax advantage is reduced if non-tax costs are incurred from debt financing. Business risk (or financial distress) and bankruptcy costs are two major non-tax costs incurred by debt financing. Hence, I expect that abnormal financial earnings will enhance share price less for high non-cost firms than for low non-cost firms. The empirical tests classify the sample into a high non-cost group and a low non-cost group, and regress share price on abnormal financial earnings and other independent variables. The results are consistent with the non-tax cost theory.

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Endnotes

1. Under the sensitivity tests, I calculate the next year's abnormal earnings using the earnings forecast from the financial analysts instead of the neat year's realized earnings. Several studies on Feltham-Ohlson's model also use the earnings forecast (e.g., Frankel and Lee 1998, Bernard 1995)

2. Abnormal financial earnings outliers (2% of the observations) are deleted from the sample. The regression results do not change qualitatively.

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