Empirical Evidence on Equity Valuation of Thai Firms

Somchai Supattarakul and Anya Khanthavit

Abstract—This study aims at providing empirical evidence on a comparison of two equity valuation models: (1) the dividend discount model (DDM) and (2) the residual income model (RIM), in estimating equity values of Thai firms during 1995-2004. Results suggest that DDM and RIM underestimate equity values of Thai firms and that RIM outperforms DDM in predicting cross-sectional stock prices. Results on regression of cross-sectional stock prices on the decomposed DDM and RIM equity values indicate that book value of equity provides the greatest incremental explanatory power, relative to other components in DDM and RIM terminal values, suggesting that book value distortions resulting from accounting procedures and choices are less severe than forecast and measurement errors in discount rates and growth rates.

We also document that the incremental explanatory power of book value of equity during 1998-2004, representing the information environment under Thai Accounting Standards reformed after the 1997 economic crisis to conform to International Accounting Standards, is significantly greater than that during 1995-1996, representing the information environment under the pre-reformed Thai Accounting Standards. This implies that the book value distortions are less severe under the 1997 Reformed Thai Accounting Standards than the pre-reformed Thai Accounting Standards.

Keywords—Dividend Discount Model, Equity Valuation Model, Residual Income Model, Thai Stock Market

I. INTRODUCTION

FINANCIAL analysts and investors typically use the dividend discount model (DDM) in valuing a firm's equity value. An alternative valuation model is the residual income model (RIM) re-introduced by [6]. RIM puts an emphasis on accounting numbers (i.e., book value and earnings). Even though both models are theoretically equivalent, empirical evidence says otherwise. Reference [2] and [7] compare equity values of U.S. companies estimated by DDM and RIM. Their results suggest that RIM, over a range of conditions, outperforms DDM in predicting US companies' stock prices. Moreover, [2] suggest that the superiority of RIM over DDM can be explained by the fact that book values distortions resulting from accounting procedures and accounting choices of U.S. companies are less severe than forecast and measurement errors in discount rates and growth rates. Accounting data of Thai firms are prepared in conformity with the Thai Accounting Standards (Thai GAAP) which is not identical to the U.S. Accounting Standards (US GAAP).

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Whether RIM will outperform DDM in explaining stock prices of Thai firms is therefore an empirical question. This study aims at providing empirical evidence on relative performance of RIM and DDM in explaining contemporaneous stock prices of Thai firms.

This study compares equity values of Thai firms estimated by DDM and RIM during 1995-2004. In order to examine whether RIM generates more accurate equity values than does DDM, we first calculate the bias index (BIAS$^{\text{DDM}}$ and BIAS$^{\text{RIM}}$) defined as a difference between estimated equity value and stock price, scaled by the stock price and the accuracy index (ACC$^{\text{DDM}}$ and ACC$^{\text{RIM}}$) defined as the absolute value of a difference between estimated equity value and stock price, deflated by the stock price.

We find that medians of BIAS$^{\text{DDM}}$ over a specific range of conditions are significantly less than zero, suggesting that DDM equity values are downwardly biased, relative to contemporaneous stock prices. We also document that medians of BIAS$^{\text{RIM}}$ over a specific range of conditions generally are significantly less than zero and less negative than medians of BIAS$^{\text{DDM}}$. This suggests that both DDM and RIM underestimate cross-sectional stock prices, but RIM equity values are less biased than DDM equity values. Our empirical evidence also shows that DDM and RIM equity values with a component of the corresponding terminal values are less biased than those without the terminal values. The effect of DDM terminal values in reducing the bias, however, is more pronounced than is the effect of RIM terminal values.

Empirical evidence on the accuracy index of DDM equity values (ACC$^{\text{DDM}}$) and RIM equity values (ACC$^{\text{RIM}}$) shows that as forecast horizons increase, DDM equity values are more accurate in predicting the stock prices, suggesting that forecast horizons positively affect performance of DDM in estimating equity values while forecast horizons have no effect on RIM performance. Furthermore, consistent with [7], we find that DDM equity values with a component of DDM terminal values are more accurate than those without a component of DDM terminal values while RIM terminal values have no effect on the accuracy of RIM equity values.

More importantly, our empirical results reveal that RIM equity values are more accurate in predicting contemporaneous stock prices than are DDM equity values. In other words, RIM outperforms DDM in predicting cross-sectional stock prices of Thai firms, consistent with empirical evidence on U.S. companies in [2] and [7].

Alternatively, in order to evaluate the relative explainability of DDM and RIM equity values on cross-sectional stock prices, we regress cross-sectional stock prices on either DDM or RIM equity values and compare the resulting adjusted R^2. Our empirical evidence indicates that adjusted R^2 of both

DDM and RIM equity values increases as forecast horizons increase but the adjusted R^2 of the model with the corresponding terminal value is similar to that of the model without the terminal value. This suggests that forecast horizons improve the explainability of DDM and RIM equity values on cross-sectional stock prices, but DDM and RIM terminal values seem to have no effect on the explainability of DDM and RIM equity values. More importantly, a comparison of adjusted R^2 of DDM and RIM equity values reveals inconclusive evidence on the relative performance of DDM and RIM in explaining contemporaneous stock prices. Specifically, for a one-year forecast horizon, DDM outperforms RIM; for a two-year forecast horizon, RIM outperforms DDM; for a three-year forecast horizon, DDM and RIM perform equally well.

Additionally, in order to further evaluate the relative performance of DDM and RIM in explaining cross-sectional stock prices and to further examine whether for Thai firms, book value distortions in book values resulting from accounting procedures and accounting choices are less severe than forecast and measurement errors in discount rates and growth rates used to estimated future dividends and earnings as for the US firms, we regress cross-sectional stock prices on decomposed DDM and RIM equity values. Specifically, DDM equity values are decomposed into two components: (i) the sum of the present values of future dividends over a specified finite forecast horizon and (ii) the present value of DDM terminal value whereas RIM equity values are decomposed into three components: (i) book value of equity, (ii) the sum of the present values of future residual income or abnormal earnings over a specified finite forecast horizon, and (iii) the present value of RIM terminal value.

We find that RIM's adjusted R^2 is higher than DDM's adjusted R^2 for both two-year and three-year forecast horizons, suggesting that RIM outperforms DDM in explaining cross-sectional stock prices, consistent with Francis, Olsson, and Oswald [2000]. We also document that DDM terminal value provides greater incremental explanatory power than does the sum of the present values of future dividends, consistent with our results on the accuracy of DDM equity values in predicting cross-sectional stock prices. Our empirical evidence on the incremental explanatory power for models with decomposed RIM equity values indicates that book value of equity provides the highest incremental explanatory power over the other two components in decomposed RIM equity values and both components in decomposed DDM equity values. In other words, book value of equity explains a significant portion of the variation in cross-sectional stock prices. Overall, our empirical evidence implies that book value distortions resulting from accounting procedures and choices are less severe than forecast and measurement errors in discount rates and growth rates.

In addition, Thai Accounting Standards have been reformed to conform to International Accounting Standards (IAS) after the 1997 economic crisis because the society perceived that the former Thai Accounting Standards did not generate high quality of accounting numbers. Thus, this provides a unique

setting to examine the relative distortions in accounting numbers generated from the former and current Thai Accounting Standards. We compare the relative explainability of book value for sub-sample firms prior to 1997 (i.e., a sample period of 1995-1996) and book value of sub-sample firms after 1997 (i.e., a sample period of 1998-2004) to contemporaneous stock prices.

Our empirical results on the incremental explanatory power of each component in decomposed DDM and RIM equity values for sub-sample firms during 1995-1996 and 1998-2004 are consistent with those for full-sample firms discussed earlier. More importantly, the incremental explanatory power of book value of equity for sub-sample firms during 1998-2004, representing information environment under the current Thai Accounting Standards reformed after the 1997 economic crisis, is significantly greater than that for sub-sample firms during 1995-1996, representing information environment under the former Thai Accounting Standards. This implies that the book value distortions are less severe under the current Thai Accounting Standards which is inconformity with International Accounting Standards than under the former Thai Accounting Standards.

The remainder of the paper is organized as follows. Section 2 reviews two valuation models: DDM and RIM. Section 3 discusses DDM and RIM model specifications. Section 4 describes our sample and data collection. Section 5 reports empirical results.

II. Two Equity Valuation Models

A. Review Stage

In this study, we consider two equity valuation models: the dividend discount model (DDM) and the residual income model (RIM). Both DDM and RIM define an equity value as the sum of the present values of expected future payoffs to shareholders. However, they differ in terms of their defined payoffs.

DDM equity value equals the sum of the present values of all expected future dividends. The following equation depicts the definition. Firm subscripts and expectation operators are suppressed for ease of notation.

$$V_S^{DDM} = \sum_{t=1}^{\infty} \frac{DIV_{S+t}}{(1+r_e)^t} \qquad (1)$$

where:

V_S^{DDM} = intrinsic value of equity at valuation date S,

DIV_{S+t} = expected dividends for year $S+t$, and

r_e = cost of equity capital.

RIM is developed based on the DDM concept with an additional accounting assumption typically called the *clean surplus* relation. The following equation depicts the clean surplus relation.

$$BV_t = BV_{t-1} + NI_t - DIV_t \qquad (2)$$

where:

BV_t = equity capital invested or book value at time t,

NI_t = net income or earnings for year t, and

DIV_t = dividends for year t.

Equation (2) can be rewritten as follows:

$$DIV_t = BV_{t-1} - BV_t + NI_t \qquad (3)$$

RIM also defines residual income or abnormal earnings as net income minus charges of equity capital invested. The following equation depicts the definition.

$$AE_t = NI_t - (BV_{t-1} \times r_e) \qquad (4)$$

where:

AE_t = residual income or abnormal earnings for year t.

Equation (3) can we rewritten as follows:

$$NI_t = AE_t + (BV_{t-1} \times r_e) \qquad ` \qquad (5)$$

Substitute NI from equation (5) in equation (3) gives the following equation:

$$DIV_t = BV_{t-1} - BV_t + AE_t + (BV_{t-1} \times r_e)$$
$$= AE_t + (1 + r_e)BV_{t-1} - BV_t \qquad (6)$$

Substitute DIV from equation (6) in equation (1) gives RIM equity value (V_S^{RIM}) as follows:

$$V_S^{RIM} = \sum_{t=1}^{\infty} \frac{AE_{S+t} + (1+r_e)BV_{S+t-1} - BV_t}{(1+r_e)^t}$$
$$= \left(\frac{AE_{S+1}}{(1+r_e)} + BV_S - \frac{BV_{S+1}}{(1+r_e)} \right) + \left(\frac{AE_{S+2}}{(1+r_e)^2} + \frac{BV_{S+1}}{(1+r_e)} - \frac{BV_{S+2}}{(1+r_e)^2} \right) + \ldots$$
$$= BV_S + \frac{AE_{S+1}}{(1+r_e)} + \frac{AE_{S+2}}{(1+r_e)^2} + \ldots$$
$$= BV_S + \sum_{t=1}^{\infty} \frac{AE_{S+t}}{(1+r_e)^t} \qquad (7)$$

Therefore, RIM equity value equals a combination of equity capital invested (or book value of equity) and the sum of all expected future residual income or abnormal earnings where residual income equals net income minus charges of equity capital invested at the beginning of the period. Above set of equations shows that RIM is an algebraic transformation of DDM. In other words, RIM is theoretically equivalent to DDM.

III. Model Specification

From equation (1), DDM is implemented as follows:

$$V_S^{DDM} = \sum_{t=1}^{T} \frac{DIV_{S+t}}{(1+r_e)^t} + \frac{DIV_{S+T}(1+g_{DIV})}{(1+r_e)^T(r_e - g_{DIV})}$$
$$= \sum_{t=1}^{T} \frac{DIV_{S+t}}{(1+r_e)^t} + \frac{TV_{S+T}^{DDM}}{(1+r_e)^T} \qquad (8)$$

where TV_{S+T}^{DDM} is DDM terminal value under certain assumptions of growth rates of future dividends (g_{DIV}) and forecast horizons (T). From equation (8), it can be concluded that an accuracy of V_S^{DDM} depends primarily on measurement errors in discount rates (i.e., cost of equity capital, r_e) and forecast errors in future dividends which depends heavily on growth rates.

From equation (7), RIM is implemented as follows:

$$V_S^{RIM} = BV_S + \sum_{t=1}^{T} \frac{AE_{S+t}}{(1+r_e)^t} + \frac{AE_{S+T}(1+g_{AE})}{(1+r_e)^T(r_e - g_{AE})}$$
$$= BV_S + \sum_{t=1}^{T} \frac{AE_{S+t}}{(1+r_e)^t} + \frac{TV_{S+T}^{RIM}}{(1+r_e)^T} \qquad (9)$$

where TV_{S+T}^{RIM} is RIM terminal value under certain assumptions of growth rates of future abnormal earnings (g_{RIM}) and forecast horizons (T).

As discussed in Section 2, RIM is an algebraic transformation of DDM; thus, RIM is theoretically equivalent to DDM. As a result, V_S^{RIM} is subject to the same theoretical limitations as V_S^{DDM}, mentioned earlier. Specifically, both DDM and RIM face measurement errors in discount rates and forecast errors in growth rates. Measurement errors in discount rates and forecast errors in growth rates, however, should have a smaller effect on an accuracy of V_S^{RIM} than they do on an accuracy of V_S^{DDM} since V_S^{RIM} is also based partly on the amount of current equity capital invested or current book value of equity, which is not subject to the forecast and measurement errors. The fact that book value of equity is one component in V_S^{RIM} causes an accuracy of V_S^{RIM} to depend upon a degree of distortions in book value of equation resulting from accounting procedures and accounting choices while the book value distortions have no effect on an accuracy of V_S^{DDM}.

[2] uses analyst forecast data of future dividends and earnings to proxy for future dividends (DIV) and earnings (NI) in both DDM and RIM while [7] uses realizations (ex post data) instead of analyst forecast data. References [1], [3], [4], and [5] also use analysts' forecasts of future earnings and dividends as a basis for estimating future book value of equity and abnormal earnings in RIM. Consistent with prior studies, this study uses analysts' forecasts of future dividends as a proxy for future dividends (DIV) in DDM and uses analysts' forecasts of both future dividends and earnings as a basis for estimating future book value of equity (BV) and future residual income or abnormal earnings in RIM. Specifically, future book value is calculated using the clean surplus relation stated in equation (2) as $BV_t = BV_{t-1} + NI_t - DIV_t$, and future abnormal earnings (AE) are calculated using equation (4) as $AE_t = NI_t - (BV_{t-1} \times r_e)$.

Subject to data availability of analysts' forecasts of future dividends and earnings, we use four different forecast horizons (T) for both DDM and RIM: one-year, two-year, three-year, and four-year forecast horizons. Three different growth rates are arbitrarily chosen for both future dividends and abnormal earnings (g_{DIV} and g_{RIM}): 0 percent, 3 percent, and 5 percent and three different levels of cost of equity capital (r_e) are arbitrarily employed: 10 percent, 12 percent, and 15 percent.

IV. SAMPLE AND DATA COLLECTION

Thai firms included in our sample must have (1) actual annual earnings per share (EPS), (2) year-end book value per share (BPS), (3) annual dividend per share (DPS), and (4) year-end stock price (PRICE), available on Thomson Datastream database, and (5) analysts' forecasts of future earnings and (6) analysts' forecasts of future dividends, available on I/B/E/S database. Subject to data availability of analysts' forecasts of future earnings and dividends on I/B/E/S database, our sample period is limited to 1995 to 2004.

V. EMPIRICAL TESTS AND RESULTS

A. Bias and Accuracy of DDM and RIM Equity Values

In order to examine which model between DDM and RIM generates more accurate value, relative to stock price, the bias index and accuracy index are calculated as follows:

Bias Index of DDM Equity Values

$$BIAS^{DDM} = \frac{V_S^{DDM} - P_s}{P_S} \qquad (10)$$

Bias Index of RIM Equity Values

$$BIAS^{RIM} = \frac{V_S^{RIM} - P_s}{P_S} \qquad (11)$$

Accuracy Index of DDM Equity Values

$$ACC^{DDM} = \frac{\left| V_S^{DDM} - P_S \right|}{P_S} \qquad (12)$$

Accuracy Index of RIM Equity Values

$$ACC^{RIM} = \frac{\left| V_S^{RIM} - P_S \right|}{P_S} \qquad (13)$$

$BIAS^{DDM}$ and $BIAS^{RIM}$ are the bias index of DDM and RIM, respectively, ACC^{DDM} and ACC^{RIM} are the accuracy index of DDM and RIM, respectively, and P_S is the stock price at the valuation date S. A comparison of $BIAS^{DDM}$ and $BIAS^{RIM}$ provides empirical evidence on a relative bias of DDM and RIM equity values, relative to cross-sectional stock prices; a comparison of ACC^{DDM} and ACC^{RIM} provides empirical evidence on a relative accuracy of DDM and RIM equity values, relative to cross-sectional stock prices.

Panel A of table 1 presents medians of $BIAS^{DDM}$ and $BIAS^{RIM}$, the bias index or signed prediction errors while panel B of table 1 shows medians of ACC^{DDM} and ACC^{RIM}, the accuracy index or absolute prediction errors. $BIAS^{DDM}$, $BIAS^{RIM}$, ACC^{DDM} and ACC^{RIM} are calculated over a range of conditions: three levels of cost of equity capital (10%, 12%, and 15%), three different growth rates (1%, 3%, and 5%), four forecast horizons (one year to four years), and equity values with and without a component of terminal value.

We arbitrarily choose to report results on three pairs of cost of equity capital (r_e) and growth rates (g): (10%, 1%), (12%, 3%) and (15%, 5%). For DDM under the assumed cost of equity capital of 10% and the assumed growth rate of 1%, and four forecast horizons (T) of one to four years, medians of $BIAS^{DDM}$ for DDM equity values without terminal value (with terminal value) range from -0.9746 to -0.8923 (from -0.6901 to -0.5554). All medians are significantly less than zero. For the same forecast horizon, median of $BIAS^{DDM}$ for DDM equity values with terminal value is significantly less negative than median of $BIAS^{DDM}$ for DDM equity values without terminal value, as expected. This suggests that DDM equity values are downwardly biased, relative to contemporaneous stock prices and the downward bias is reduced when DDM terminal values are taken into account in estimating DDM equity values. Evidence on the other two pairs of cost of equity capital and growth rates is qualitatively identical.

For RIM under the assumed cost of equity capital of 10% and the assumed growth rate of 1%, and four forecast horizons (T) of one to four years, medians of $BIAS^{RIM}$ for RIM equity values without terminal value (with terminal value) range from -0.2724 to -0.1701 (from 0.0222 to 0.1465). For the same forecast horizon, median of $BIAS^{RIM}$ for RIM equity values with terminal value is significantly greater than median of $BIAS^{RIM}$ for RIM equity values without terminal value, as predicted. Empirical results on the other two pairs of cost of equity capital and growth rates are consistent with discussed results. This suggests that in general RIM equity values are downwardly biased, relative to cross-sectional stock prices and the downward bias is reduced when RIM terminal values are included, consistent with results on DDM equity values. Overall, DDM and RIM implementing as discussed in this paper generally underestimate equity values, relatively to contemporaneous stock prices.

A comparison of the accuracy index of DDM and RIM (ACC^{DDM} and ACC^{RIM}) helps address how accurate DDM and RIM estimate contemporaneous stock prices. Since our empirical results for all three pairs of cost of equity capital and growth rates are qualitatively identical, we discuss in this paper only results for the first pair: cost of equity capital of 10% and growth rate of 1%. Medians of ACC^{DDM} for DDM equity values without terminal value (with terminal value) range from 0.8251 to 0.9455 (from 0.4023 to 0.4653). Results show that as forecast horizons increase, DDM equity values are more accurate in predicting the stock prices, suggesting that forecast horizons affect performance of DDM in estimating equity values. This is consistent with empirical evidence of US firms in [7]. Moreover, for the same forecast horizon, medians of ACC^{DDM} for DDM equity values with terminal value is significantly less than that without terminal value, suggesting that DDM equity values are more accurate when DDM terminal values are included in the estimation of equity value. Specifically, median of ACC^{DDM} is doubled when DDM terminal value is taken into account. This indicates that DDM terminal value is an important

componentof DDM equity values. This is consistent with results on US firms documented by [7].

For RIM, medians of ACC^{RIM} for RIM equity values without terminal value (with terminal value) range from 0.2485 to 0.2709 (from 0.2113 to 0.2547). Medians of ACC^{RIM} under eight reported conditions are not significantly different. Our results indicate that forecast horizons and RIM terminal values do not have a significant effect on performance of RIM in estimating equity value. This is consistent with empirical evidence on US firms documented in [7]. More importantly, medians of ACC^{RIM} are significantly lower than medians of ACC^{DDM} in all reported conditions, suggesting that RIM equity values are more accurate than are DDM equity values, relative to cross-sectional stock prices. In other words, RIM outperforms DDM in predicting contemporaneous stock prices of Thai firms. This is consistent with empirical evidence on US companies reported in [2] and [7]. In addition, median of ACC^{RIM} for book value of equity (BV) is 0.2931, which is lower than that of DDM equity values. This suggests that book value of equity also outperforms DDM in predicting cross-sectional stock

prices of Thai firms.

B. The Explainability of DDM and RIM Equity Values

In order to examine relative performance of DDM and RIM equity values in explaining cross-sectional stock prices, the following regression models are estimated.

Stock Prices and DDM Equity Values

$$P_S = \alpha^{DDM} + \beta^{DDM} V_S^{DDM} + \varepsilon^{DDM} \qquad (14)$$

Stock Prices and RIM Equity Values

$$P_S = \alpha^{RIM} + \beta^{RIM} V_S^{RIM} + \varepsilon^{RIM} \qquad (15)$$

A comparison of adjusted R^2s of these models provides evidence on the relative explainability of DDM and RIM equity values on cross-sectional stock prices. Table 2 reports estimated slope coefficients, β^{DDM} and β^{RIM}, standard errors, adjusted R^2, and number of observations (*n*) for the DDM and RIM regression models over a range of conditions: three levels of cost of equity capital (10%, 12%, and 15%), three different growth rates (1%, 3%, and 5%), three forecast horizons (one year to three years), and models with equity values with and without terminal values.

TABLE 1
The Bias and Accuracy Index of the DDM and RIM Equity Values

Panel A: Bias or Signed Prediction Errors

Model	r_e	g	BV	Without Terminal Value				With Terminal Value			
				T=1	T=2	T=3	T=4	T=1	T=2	T=3	T=4
DDM	10.00%	1.00%		-0.9746	-0.9464	-0.9154	-0.8923	-0.6901	-0.6407	-0.5680	-0.5554
				1482	1414	945	290	1482	1414	945	290
RIM	10.00%	1.00%	-0.1223	-0.1701	-0.1975	-0.2618	-0.2724	0.0662	0.0222	0.0819	0.1465
			2741	1452	1300	923	315	1259	1201	918	320
DDM	12.00%	3.00%		-0.9751	-0.9477	-0.9184	-0.8985	-0.6901	-0.6471	-0.5826	-0.5775
				1482	1414	945	290	1482	1414	945	290
RIM	12.00%	3.00%	-0.1223	-0.1849	-0.2252	-0.2989	-0.3220	-0.0183	-0.0958	-0.0362	-0.0089
			2741	1452	1300	923	315	1163	1120	875	310
DDM	15.00%	5.00%		-0.9757	-0.9500	-0.9227	-0.9060	-0.7211	-0.6877	-0.6388	-0.6405
				1482	1414	945	290	1482	1414	945	290
RIM	15.00%	5.00%	-0.1223	-0.2062	-0.2641	-0.3499	-0.3870	-0.2204	-0.2872	-0.2493	-0.2560
			2741	1452	1300	924	315	1096	1052	845	301

Panel B: Accuracy or Absolute Prediction Errors

Model	r_e	g	BV	Without Terminal Value				With Terminal Value			
				T=1	T=2	T=3	T=4	T=1	T=2	T=3	T=4
DDM	10.00%	1.00%		0.9455	0.8908	0.8291	0.8251	0.4653	0.4381	0.4105	0.4023
				1482	1414	945	290	1482	1414	945	290
RIM	10.00%	1.00%	0.2931	0.2659	0.2690	0.2709	0.2485	0.2547	0.2461	0.2392	0.2113
			2741	1452	1300	923	315	1259	1201	918	320
DDM	12.00%	3.00%		0.9465	0.8937	0.8354	0.8321	0.4653	0.4418	0.4280	0.4169
				1482	1414	945	290	1482	1414	945	290
RIM	12.00%	3.00%	0.2931	0.2665	0.2665	0.2806	0.2397	0.2479	0.2452	0.2461	0.1950
			2741	1452	1300	923	315	1163	1120	875	310
DDM	15.00%	5.00%		0.9479	0.8978	0.8419	0.8437	0.5000	0.4807	0.4710	0.4590
				1482	1414	945	290	1482	1414	945	290
RIM	15.00%	5.00%	0.2931	0.2622	0.2678	0.2828	0.2756	0.2809	0.2997	0.2950	0.2430
			2741	1452	1300	924	315	1096	1052	845	301

performance of DDM equity value in estimating

TABLE 2
The Relative Explainability of the DDM and RIM Equity Values

Model	r_e	g		BV	Without Terminal Value			With Terminal Value		
					T=1	T=2	T=3	T=1	T=2	T=3
DDM	10.00%	1.00%	b		0.3278 ***	0.1723 ***	0.1366 ***	0.0268 ***	0.0259 ***	0.0468 ***
			SE		0.0064	0.0026	0.0014	0.0005	0.0003	0.0005
			Adj R^2		0.6394	0.7588	0.9136	0.6394	0.8031	0.9149
			n		1482	1414	945	1482	1414	945
RIM	10.00%	1.00%	b	3.3199 ***	0.2303 ***	0.1588 ***	0.0976 ***	0.0170 ***	0.0134 ***	0.0163 ***
			SE	0.0861	0.0082	0.0018	0.0010	0.0009	0.0002	0.0002
			Adj R^2	0.3518	0.3501	0.8549	0.9191	0.3338	0.8599	0.9134
			n	2741	1452	1300	923	1259	1201	918
DDM	12.00%	3.00%	b		0.3338 ***	0.1770 ***	0.1410 ***	0.0268 ***	0.0264 ***	0.0484 ***
			SE		0.0065	0.0027	0.0014	0.0005	0.0003	0.0005
			Adj R^2		0.6394	0.7581	0.9136	0.6394	0.8031	0.9149
			n		1482	1414	945	1482	1414	945
RIM	12.00%	3.00%	b	3.3199 ***	0.2345 ***	0.1633 ***	0.1014 ***	0.0169 ***	0.0135 ***	0.0163 ***
			SE	0.0861	0.0084	0.0019	0.0010	0.0009	0.0002	0.0002
			Adj R^2	0.3518	0.3501	0.8551	0.9190	0.3322	0.8598	0.9022
			n	2741	1452	1300	923	1163	1120	875
DDM	15.00%	5.00%	b		0.3427 ***	0.1841 ***	0.1476 ***	0.0298 ***	0.0299 ***	0.0547 ***
			SE		0.0067	0.0028	0.0015	0.0006	0.0004	0.0005
			Adj R^2		0.6394	0.7572	0.9136	0.6394	0.8026	0.9149
			n		1482	1414	945	1482	1414	945
RIM	15.00%	5.00%	b	3.3199 ***	0.2408 ***	0.1702 ***	0.1071 ***	0.0186 ***	0.0152 ***	0.0182 ***
			SE	0.0861	0.0086	0.0019	0.0010	0.0010	0.0002	0.0002
			Adj R^2	0.3518	0.3501	0.8554	0.9188	0.3323	0.8587	0.8888
			n	2741	1452	1300	924	1096	1052	845

Since our results for all three pairs of cost of equity capital and growth rates are qualitatively identical, we discuss in this paper only results for the first pair: cost of equity capital of 10% and growth rate of 1%. β^{DDM} and β^{RIM} under all conditions are significantly positive. A comparison of adjusted R^2 of DDM models without terminal value indicates that adjusted R^2 increases as forecast horizons increase. Specifically, adjusted R^2 increases from 63.94% in the one-year forecast horizon (T=1) to 75.88% in the two-year forecast horizon and 91.36% in the three-year forecast horizon. Results for DDM models with terminal value are consistent with the previously discussed results. That is, adjusted R^2 increases from 63.94% in the one-year forecast horizon (T=1) to 80.31% in the two-year forecast horizon and 91.49% in the three-year forecast horizon. This suggests that the explainability of DDM equity values on cross-sectional stock prices is increasing with forecast horizons, consistent with our empirical results on the accuracy of DDM equity values in predicting stock prices discussed earlier. Moreover, for the same forecast horizon, adjusted R^2 of DDM models with terminal value is similar to that without terminal value. This suggests that DDM terminal value has no significant effect on the explainability of DDM equity values on cross-sectional stock prices while our results on the accuracy of DDM equity values indicate that DDM terminal value improves

contemporaneous stock prices.

For RIM performance in explaining cross-sectional stock prices, we find that adjusted R^2 increases as forecast horizons increase but is not affected by RIM terminal value, consistent with results DDM results. Specifically, for RIM models without terminal value, adjusted R^2 increases from 35.01% in the one-year forecast horizon (T=1) to 85.49% in the two-year forecast horizon and 91.91% in the three-year forecast horizon, and for RIM models with terminal value, adjusted R^2 increases from 33.38% in the one-year forecast horizon (T=1) to 85.99% in the two-year forecast horizon and 91.34% in the three-year forecast horizon. Moreover, for the same forecast horizon, adjusted R^2 of RIM models with terminal value is similar to that without terminal value. Note also that the explainability on cross-sectional stock prices of book value of equity (adjusted R^2 of 35.01%) and RIM equity values in the one-year forecast horizon are at a similar level.

A comparison of adjusted R^2 of DDM and RIM models reveals mixed results on the relative explainability of DDM and RIM equity values on cross-sectional stock prices. Specifically, for the one-year forecast horizon, adjusted R^2 of DDM model (63.94%) is greater than those of RIM model (35.01%) and book value of equity (35.18%); for the two-year forecast horizon, adjusted R^2 of DDM model (75.88%) is lower than that of RIM model (85.49%); for the three-year forecast horizon, adjusted R^2 of DDM model (91.36%) and

RIM (91.91%) model are not significantly different. Reference [2] find empirical evidence that for five-year

TABLE 3

Regression of Stock Prices on the Decomposed DDM and RIM Equity Values

Model	r_e	g		Book Value		Sum of PV of DIV or AE		PV of TV	
				T=2	T=3	T=2	T=3	T=2	T=3
DDM	10.00%	1.00%	b			-0.1188 ***	-5.1618 ***	0.0504 ***	2.7568 ***
			SE			0.0139	0.1873	0.0024	0.0974
			Adj R²			0.8171	0.9532		
			Inc R²			0.0096	0.0375	0.0583	0.0395
			n			1414	945		
RIM	10.00%	1.00%	b	1.5063 ***	1.57 ***	-0.0865 ***	2.7049 ***	0.0196 ***	-0.557 ***
			SE	0.0316	0.043	0.0063	0.2925	0.0005	0.0622
			Adj R²			0.9536	0.9697		
			Inc R²	0.0931	0.0476	0.0076	0.0030	0.0525	0.0029
			n			1134	853		
DDM	12.00%	3.00%	b			-0.1209 ***	-5.3028 ***	0.0511 ***	2.8406 ***
			SE			0.0141	0.1924	0.0024	0.1004
			Adj R²			0.8171	0.9532		
			Inc R²			0.0094	0.0375	0.0590	0.0395
			n			1414	945		
RIM	12.00%	3.00%	b	1.5618 ***	1.6334 ***	-0.0904 ***	2.5856 ***	0.0198 ***	-0.529 ***
			SE	0.0323	0.0442	0.0065	0.3065	0.0005	0.0649
			Adj R²			0.9572	0.9706		
			Inc R²	0.0957	0.05	0.0078	0.0026	0.0533	0.0024
			n			1048	807		
DDM	15.00%	5.00%	b			-0.1242	-5.5159	0.0584	3.3301
			SE			0.0145	0.2002	0.0027	0.1177
			Adj R²			0.8171	0.9532		
			Inc R²			0.0094	0.0375	0.0599	0.0395
			n			1414	945		
RIM	15.00%	5.00%	b	1.6038	1.6905	-0.0925 ***	2.6470 ***	0.0222 ***	-0.604 ***
			SE	0.0332	0.0447	0.0067	0.3161	0.0006	0.0746
			Adj R²			0.9594	0.9715		
			Inc R²	0.0968	0.0531	0.0078	0.0026	0.0535	0.0024
			n			978	771		

forecast horizon, adjusted R^2 of DDM model (51%) is lower than that of RIM model (71%), suggesting that RIM outperforms DDM in explaining cross-sectional stock prices while our empirical evidence shows inconclusive evidence on the relative explainability of DDM and RIM equity value on cross-sectional stock prices.

C. The Book Value Distortions and Forecast and Measurement Errors

In order to further examine relative performance of DDM and RIM in explaining cross-sectional stock prices and examine whether book value distortions resulting from accounting procedures and choices are less severe than forecast and measurement errors in discount rates and growth rates, we regress cross-sectional stock prices on decomposed DDM and RIM equity values. DDM equity values with terminal value are decomposed into two components: (1) the sum of the present values of future dividends over specified finite forecast horizons $\left(\sum_{t=1}^{T} \frac{DIV_{S+t}}{(1+r_e)^t}\right)$, and (2) the present

value of the corresponding DDM terminal value $\left(\frac{TV_{S+T}^{DDM}}{(1+r_e)^T}\right)$.

Similarly, RIM equity values with terminal value are decomposed into three components: (1) the corresponding book values of equity (BV_S), (2) the sum of the present values of future residual income or abnormal earnings over specified finite forecast horizons $\left(\sum_{t=1}^{T} \frac{AE_{S+t}}{(1+r_e)^t}\right)$, and (3) the present

value of the corresponding RIM terminal value $\left(\frac{TV_{S+T}^{RIM}}{(1+r_e)^T}\right)$.

Therefore, the following regression models are estimated.

Stock Prices and Decomposed DDM Equity Values:

$$P_S = \alpha^{DDM'} + \beta_1^{DDM'} \sum_{t=1}^{T} \frac{DIV_{S+t}}{(1+r_e)^t} + \beta_2^{DDM'} \frac{TV_{S+T}^{DDM}}{(1+r_e)^T} + \varepsilon^{DDM'} \quad (16)$$

Stock Prices and Decomposed RIM Equity Values:

$$P_S = \alpha^{RIM'} + \beta_1^{RIM'} BV_S + \beta_2^{RIM'} \sum_{t=1}^{T} \frac{AE_{S+t}}{(1+r_e)^t} + \beta_3^{RIM'} \frac{TV_{S+T}^{RIM}}{(1+r_e)^T} + \varepsilon^{RIM'} \quad (17)$$

Table 3 presents estimated slope coefficients for models

with decomposed DDM equity values ($\beta_1^{DDM'}$ and $\beta_2^{DDM'}$) and models with decomposed RIM equity values ($\beta_1^{RIM'}$, $\beta_2^{RIM'}$, and $\beta_3^{RIM'}$), the corresponding standard errors (SE), adjusted R^2, incremental R^2, and number of observations (n).

year forecast horizon while for the two-year horizon, the incremental R^2 of $\left(\sum_{t=1}^{T}\dfrac{DIV_{S+t}}{(1+r_e)^t}\right)$ is similar to that of

TABLE 4
Regression of Stock Prices on the Decomposed DDM and RIM Equity Values

Model	re	g		Book Value		Sum of PV of DIV or AE		PV of TV	
				T=2	T=3	T=2	T=3	T=2	T=3
DDM	10.00%	1.00%	b			-0.1174 ***	-5.3204 ***	0.0499 ***	2.8390 ***
			SE			0.0244	0.4865	0.0042	0.2532
			Adj R²			0.8599	0.9758		
			Inc R²			0.0100	0.0192	0.0615	0.0202
			n			326	151		
RIM	10.00%	1.00%	b	1.7225 ***	1.9872 ***	-0.1112 ***	4.7038 ***	0.0214 ***	-0.9830 ***
			SE	0.0569	0.1004	0.0089	0.8844	0.0008	0.1879
			Adj R²			0.9772	0.9919		
			Inc R²	0.0698	0.0205	0.0119	0.0015	0.0611	0.0014
			n			299	154		
DDM	12.00%	3.00%	b			-0.1196 ***	-5.4659 ***	0.0506 ***	2.9254 ***
			SE			0.0249	0.4998	0.0042	0.2608
			Adj R²			0.8599	0.9758		
			Inc R²			0.0100	0.0192	0.0620	0.0202
			n			326	151		
RIM	12.00%	3.00%	b	1.7869 ***	2.0394 ***	-0.1162 ***	4.7298 ***	0.0216 ***	-0.9839 ***
			SE	0.0562	0.0994	0.0089	0.9300	0.0007	0.1968
			Adj R²			0.9804	0.9920		
			Inc R²	0.0727	0.0227	0.0123	0.0014	0.0621	0.0014
			n			272	148		
DDM	15.00%	5.00%	b			-0.1228 ***	-5.6857 ***	0.0578 ***	3.4296 ***
			SE			0.0255	0.5198	0.0048	0.3057
			Adj R²			0.8599	0.9758		
			Inc R²			0.0100	0.0192	0.0632	0.0202
			n			326	151		
RIM	15.00%	5.00%	b	1.8193 ***	2.1417 ***	-0.1182 ***	4.3343 ***	0.0241 ***	-1.0031 ***
			SE	0.0585	0.0950	0.0094	0.9660	0.0008	0.228
			Adj R²			0.9812	0.9923		
			Inc R²	0.0728	0.0274	0.0120	0.0011	0.0619	0.0010
			n			250	143		

Since our empirical results for all three pairs of cost of equity capital and growth rates are qualitatively identical, we discuss in this paper only results for the first pair: cost of equity capital of 10% and growth rate of 1%. Note that adjusted R^2 of decomposed RIM model is higher than that of decomposed DDM model for both two-year and three-year forecast horizons. This evidence indicates that RIM outperforms DDM in explaining cross-sectional stock prices, consistent with [2].

For decomposed DDM model, the incremental explanatory power measured by the incremental R^2 is higher for $\left(\dfrac{TV_{S+T}^{DDM}}{(1+r_e)^T}\right)$ (5.83%) than for $\left(\sum_{t=1}^{T}\dfrac{DIV_{S+t}}{(1+r_e)^t}\right)$ (0.96%) for three-

$\left(\dfrac{TV_{S+T}^{DDM}}{(1+r_e)^T}\right)$. This suggests that DDM terminal value is an important component of DDM equity values in explaining cross-sectional stock prices, consistent with our results on the accuracy of DDM equity values in predicting contemporaneous stock prices.

For decomposed RIM model, the incremental R^2 of book value of equity is the highest, relative to those of $\left(\sum_{t=1}^{T}\dfrac{AE_{S+t}}{(1+r_e)^t}\right)$ and $\left(\dfrac{TV_{S+T}^{RIM}}{(1+r_e)^T}\right)$. For example, for the two-year forecast horizon, the incremental R^2 is 9.31% for book value

TABLE 5
Regression of Stock Prices on the Decomposed DDM and RIM Equity Values

Model	r_e	g		Book Value		Sum of PV of DIV or AE		Present Value of TV	
				T=2	T=3	T=2	T=3	T=2	T=3
DDM	10.00%	1.00%	b			4.0025 ***	1.3249 *	0.5154 *	0.9922 ***
			SE			1.5098	0.7117	0.2707	0.1855
			$Adj R^2$			0.4828	0.5139		
			$Inc R^2$			0.0040	0.0024	0.0020	0.0194
			n			909	717		
RIM	10.00%	1.00%	b	0.9329 ***	1.0196 ***	1.5054 ***	0.6374 ***	0.1518 *	0.4302 ***
			SE	0.041	0.0445	0.4161	0.2302	0.0775	0.0717
			$Adj R^2$			0.6347	0.6035		
			$Inc R^2$	0.2715	0.3420	0.0069	0.0050	0.0020	0.0234
			n			697	610		
DDM	12.00%	3.00%	b			4.0753 ***	1.3571 *	0.5304 *	1.0313 ***
			SE			1.5373	0.7306	0.2727	0.1902
			$Adj R^2$			0.4828	0.5139		
			$Inc R^2$			0.0040	0.0024	0.0021	0.0200
			n			909	717		
RIM	12.00%	3.00%	b	0.9886 ***	1.0930 ***	1.6276 ***	0.7662 ***	0.1748 **	0.4873 ***
			SE	0.0413	0.0469	0.4231	0.2362	0.0786	0.0755
			$Adj R^2$			0.6440	0.6077		
			$Inc R^2$	0.3117	0.3674	0.0081	0.0071	0.0027	0.0282
			n			654	579		
DDM	15.00%	5.00%	b			4.1844 ***	1.4054 *	0.6202 *	1.2240 ***
			SE			1.5784	0.7592	0.3094	0.2213
			$Adj R^2$			0.4828	0.5139		
			$Inc R^2$			0.0040	0.0024	0.0022	0.0208
			n			909	717		
RIM	15.00%	5.00%	b	1.1294 ***	1.2923 ***	1.9111 ***	0.9569 ***	0.1595	0.5750
			SE	0.0402	0.0468	0.4780	0.2383	0.0976	0.08762
			$Adj R^2$			0.6444	0.6198		
			$Inc R^2$	0.4552	0.5247	0.0092	0.0111	0.0015	
			n			654	553		

of equity, 0.76% for $\left(\sum_{t=1}^{T}\dfrac{AE_{S+t}}{(1+r_e)^t}\right)$, and 5.25% for $\left(\dfrac{TV_{S+T}^{RIM}}{(1+r_e)^T}\right)$.

This indicates that book value of equity provides the highest incremental explanatory power over the other two components in RIM equity values. In other words, book value of equity explains a significant portion of the variation in contemporaneous stock prices. Additionally, the incremental explanatory power of book value of equity is greater than those of $\left(\sum_{t=1}^{T}\dfrac{DIV_{S+t}}{(1+r_e)^t}\right)$ and $\left(\dfrac{TV_{S+T}^{DDM}}{(1+r_e)^T}\right)$. This is consistent with empirical evidence on US firms documented in [2]. Overall, this suggests that book value distortions resulting from accounting procedures and choices (influencing only RIM equity values) are less severe than forecast and measurement errors in discount rates and growth rates (influencing both DDM and RIM equity values).

In addition, we also regress cross-sectional stock prices on decomposed DDM and RIM equity values for a sample period of 1995-1996, representing the time period prior to the 1997 economic crisis and a sample period of 1998-2004, representing the time period after the 1997 economic crisis. This allows us to evaluate whether the current Thai Accounting Standards reformed as after the 1997 economic crisis to conform to International Accounting Standards generates higher-quality accounting data than does the former Thai Accounting Standards. Tables IV and V present estimated slope coefficients for decomposed DDM equity values ($\beta_1^{DDM'}$ and $\beta_2^{DDM'}$) and decomposed RIM equity values ($\beta_1^{RIM'}$, $\beta_2^{RIM'}$, and $\beta_3^{RIM'}$), the corresponding standard errors (SE), adjusted R^2, incremental R^2, and number of observations (n) for sample periods of 1995-1996 and 1998-2004, respectively.

Results on relative performance of DDM and RIM in explaining cross-sectional stock prices evaluated by adjusted R^2 suggest that RIM outperforms DDM over a range of

conditions and for both sample periods which is consistent with our empirical results discussed earlier and also prior empirical evidence on US firms documented in [2].

Furthermore, results on the incremental explanatory power of each component in decomposed DDM and RIM equity values for the sample periods of 1995-1996 and 1998-2004 are consistent with those for a full sample discussed earlier. That is, DDM terminal value provides greater incremental explanatory power than the sum of the present values of finite future dividends. For RIM model, book value of equity provides the greatest incremental explanatory power and RIM terminal value comes in second and the sum of the present values comes in last. Moreover, book value of equity provides greater incremental explanatory than DDM terminal value. Overall, our results reveal that book value distortions resulting from accounting procedures and choices are less severe than forecast and measurement errors in discount rates and growth rates, consistent with our findings discussed earlier.

More importantly, the incremental explanatory power of book value of equity for the sample period of 1998-2004, representing the information environment under the current Thai Accounting Standards reformed after the 1997 economic crisis, is significantly greater than that for the sample period of 1995-1996, representing the information environment under the former Thai Accounting Standards. Specifically, the incremental R^2 of book value of equity for the sample period of 1998-2004 (1995-1996) is 27.15% (5.69%) and 34.20% (2.05%) for the two-year and three-year forecast horizons, respectively. This implies that book value distortions resulting from accounting procedures and choices are less severe under the current Thai Accounting Standards which is inconformity with International Accounting Standards than are those under the former Thai Accounting Standards. In other words, the current Thai Accounting Standards seem to generate higher-quality accounting numbers than do the former Thai Accounting Standards.

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