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Accounting Valuation and Cost of Capital Dynamics: Theoretical and Empirical Macroeconomic Aspects. Discussion of Callen

Accounting valuation theory—the formal representation of firms' value in terms of financial statement amounts—has been scarce since the beginnings of accounting research. The modelling by both Feltham and Ohlson (especially Feltham and Ohlson, 1995, 1996; Ohlson, 1995, 1999) and the series of works by Callen *et al*. as summarized in Callen (2016) is a key exception in capital markets research in accounting, which has mostly been empirical. Callen (2016) reviews key advancements in the modelling of accounting valuation over the past three decades.

As an empirical researcher, I find great value in theoretical work that provides predictions and thought frameworks for my empirical work. Whereas currently there is some disconnect between theoretical and empirical research in accounting, there are new opportunities to strengthen the links between theory and empirical work, as I detail below. Given the scarcity of accounting valuation theory and the major implications of the Feltham-Ohlson-Callen *et al.* modelling for empirical and theoretical researchers, this modelling collectively provides an extraordinary insight into accounting research.

BACKGROUND

The Feltham-Ohlson-Callen *et al.* modelling begins with a parsimonious set of three assumptions: (1) a valuation assumption that the value of equity is equal to the present value of expected future dividends; (2) the clean surplus relation; and (3) a linear information dynamics. These assumptions can be formalized as follows:

$$P_t = \sum_{\tau=1}^{\infty} R_f E_t(d_{t+\tau}) \tag{1}$$

$$y_t = y_{t-1} + x_t - d_t \tag{2}$$

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$$\begin{aligned} x^a_{t+1} &= \omega x^a_t + v_t + \varepsilon_{1,t+1} \\ v_{t+1} &= \gamma v_t + \varepsilon_{2,t+1}, \end{aligned} \tag{3}$$

where:

P_t is the ex-dividend equity price as of time t;
$x^a_{t+\tau}$ is abnormal earnings over period $t+\tau$;
$x^a_{t+\tau} \equiv x_{t+\tau} - (R_f - 1) y_{t+\tau-1}$;
R_f is one plus the risk-free rate of return;
x, y, d, and υ respectively refer to earnings, book value of equity, dividend payment, and information about future abnormal earnings not in current abnormal earnings;
ω and γ are known parameters between zero and one; and
error terms have mean zero and are uncorrelated with other variables in the model.

Under these assumptions, Ohlson (1995) derives equations that represent a firm's value and return, and have several implications. However, there are major aspects missing from the original Ohlson work. Consider the cost of equity capital, for example, which has been a major focus of research in accounting and its neighbouring fields over the past decades (see, e.g., Diamond and Verrecchia, 1991; Minton and Schrand, 1999; Kothari, 2001; Easton, 2004; Easton and Monahan, 2005; Lara *et al.,* 2011; Barth *et al.,* 2013). The cost of equity capital, that is, the discount rate or the rate of return that a firm's equity capital is expected to earn in an alternative investment with risk equivalent to the firm's risk profile, is a major valuation fundamental of firms' equity. Given that Ohlson (1995) assumes risk neutrality, it is incorrect to measure cost of equity capital in an Ohlson (1995) framework other than by the risk-free rate (see Callen, 2016 for more information about this point and the link between theoretical and empirical analyses of the cost of capital).

Indeed, follow-up works on accounting valuation theory (e.g., Ang and Liu, 2001; Callen *et al.,* 2005, 2006; Callen and Segal, 2005, 2010; Callen, 2016) provide an important advancement to the original work of Feltham and Ohlson. These works address several major issues regarding risk aversion, imperfect information dynamics, term structure of costs of capital, dynamics and empirical considerations, and variance decomposition modelling in accounting.

MACRO-ACCOUNTING ASPECTS

I propose extensions to accounting theoretical modelling, with major implications for valuation and empirical research, by relating to a new and growing research area called Macro-Accounting. This new research area focuses on addressing real-life world problems using the value added that accounting can bring to various macro-level topics that are at the forefront of the academic and professional discussions. Examples are inflation, inequality, the housing market, recessions, GDP, business cycles, the banking system, and national accounting.

Since its inception about 100 years ago, accounting research has overwhelmingly ignored how firms are affected by or inform the macro economy. Until the late 1960s accounting was thought of as a stewardship measurement system without focusing on its informative content. Over the past five decades, there has been an explosion of research in accounting, finance, and economics that adopts an informational perspective to accounting numbers, for example, how firm-level accounting information relates to firm-level stock returns or firm-level bankruptcy predictions. This explosion was termed 'The Accounting Revolution' (e.g., Beaver, 1997). To date, however, little has been known about the links between accounting and the macro economy, leaving many questions open, with the potential to advance the accounting field and generate an explosion of research in this area.

Recently, there has been a growing academic and professional interest along three Macro-Accounting dimensions:

(a) Macro-to-Micro, for example, how inflation informs accounting results, stock valuation, and cash flows' prediction of individual firms (Konchitchki, 2011, 2013; Curtis *et al.,* 2015), how incorporating macro information improves forecasting of firm fundamentals (Konchitchki, 2011; Li *et al.,* 2014), and how a firm's sensitivity to downward macroeconomic conditions affects its stock valuation (Konchitchki *et al.,* 2015);
(b) Micro-to-Macro, for example, how contextual accounting analysis of firms located within a geographic region helps understand regional housing market fluctuations (Konchitchki, 2015), and how accounting results of individual firms help predict GDP growth (Konchitchki and Patatoukas, 2014a,b);
(c) other Macro-Accounting, for example, how a wisdom-of-crowd technique for aggregating information across firms or experts provides incremental ability to value firms and predicts their accounting performance (DeFond *et al.,* 2013).

For more detailed information about this research front, see, for example, Kothari *et al.* (2006), Ball *et al.* (2009), Hirshleifer *et al.* (2009), Shivakumar (2007, 2010), Cready and Gurun (2010), Konchitchki (2011, 2013, 2015), Kothari and Lester (2012), Konchitchki and Patatoukas (2014a,b), Li *et al.* (2014), Curtis *et al.* (2015), and Konchitchki *et al.* (2015).

Recognizing the linkages between accounting and the macroeconomy provides two insights for theoretical and empirical research on accounting valuation and cost of equity capital. First, the corporate sector is a component of GDP that is likely to be correlated with other components of GDP (e.g., Fischer and Merton, 1984; Konchitchki and Patatoukas, 2014a), which introduces a natural theoretical mechanism of how firms' behaviour can explain, affect, and predict macroeconomic activity. Firms are also affected by the macroeconomy, which opens the door to several extensions in accounting research, such as valuation models that incorporate macro effects, for example, how an individual firm's sensitivity to macro fluctuations relates to cost of capital, disclosure practices, inventory policy, and accounting manipulation.

To demonstrate how the interaction between firms and the macroeconomy can be used in accounting valuation, consider, for instance, the link to firms' equity cost of capital. Specifically, firms' equity values relate to the state of the overall economy through cost of equity capital effects, where the cross-sectional variation in valuation is driven by varying sensitivities of firms' fundamental performance to downside macroeconomic states. In this case, the downside risk of accounting fundamentals (earnings), that is, the expectation for future downward operating performance, contains distinct information about firm risk and varies with cost of capital in the cross section of firms. Firms with high expectations to earnings downside patterns can be those that are likely to be more sensitive to downward macroeconomic states. This stems from the fact that firms in aggregation comprise corporate profits, measured by the US Bureau of Economic Analysis as an aggregate measure of firms' profitability.

Thus, employing the observation above, that corporate profits are a component of GDP and are likely to be correlated with other GDP components, a firm's expected earnings downward pattern captured by earnings downside risk is linked to an expected downward macroeconomic trend through its role in corporate profits, a driver of economic activity. Indeed, Konchitchki *et al.* (2015) find empirical supporting evidence that establishes a link between earnings downside risk and sensitivities to downward states of real GDP growth. Constructed from fundamental accounting data, a firm's downward patterns in earnings can therefore relate to aggregate downside macro states. Such a connection introduces the notion of risk into a firm-specific measure of earnings downside patterns, which translates to cost of equity capital implications. Accordingly, that study posits and finds supportive evidence that earnings downside risk explains cross-sectional variation in cost of equity capital (which will be higher for high earnings downside risk firms relative to low earnings downside risk firms).

The idea of linking a firm's cost of equity capital with the macroeconomy is consistent with how firms operate and can be powerful for explaining valuation dynamics. In particular, the extant Macro-Accounting research highlights the role that the macroeconomy can play in accounting valuation modelling of the cost of equity capital. A promising approach to incorporate the macroeconomy in valuation modelling would be similar to the approach used in prior research that extends the early Feltham-Ohlson framework and enriches the linear information dynamics. Examples are how prior studies employ the incorporation of conservative accounting (Zhang, 2000), the decomposition of earnings into permanent and transitory parts (Ohlson, 1999), the theory of depreciation (Feltham and Ohlson, 1996), and the additional conditioning variables such as cash flows and accruals (Barth *et al.,* 1999).

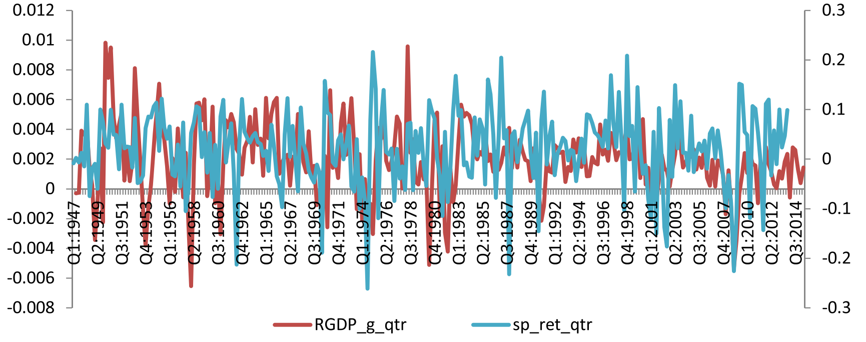
The second insight that emerges from recognizing the linkages between accounting and the macroeconomy pertains to how marginal rate of substitution in consumption across periods is proxied in valuation modelling and empirical research. In particular, research linking accounting fundamentals, valuation, and overall macroeconomic activity motivates cost of equity capital modelling that is a linear function of accounting variables and other information. A starting point in such modelling is to define a marginal rate of substitution in consumption across periods. Similar to the high interest initiated by the early work of Feltham and Ohlson, modelling cost of equity capital using accounting information and its relation to the macroeconomy can improve cost of equity capital estimates, which are of high value for researchers and practitioners.

In addition, using a fundamental-based model that builds on overall economic activity can shed light on the weak performance of the CAPM in terms of measuring cost of equity capital using the CAPM beta and explaining why the stock market is not priced as a risk factor in a two-step Fama and MacBeth (1973) procedure. More specifically, consumption can be driven by overall economic activity or by wealth effects of the stock market. That is, stock price changes can affect consumer spending along two major routes. One is that an increase in stock prices can cause an increase in

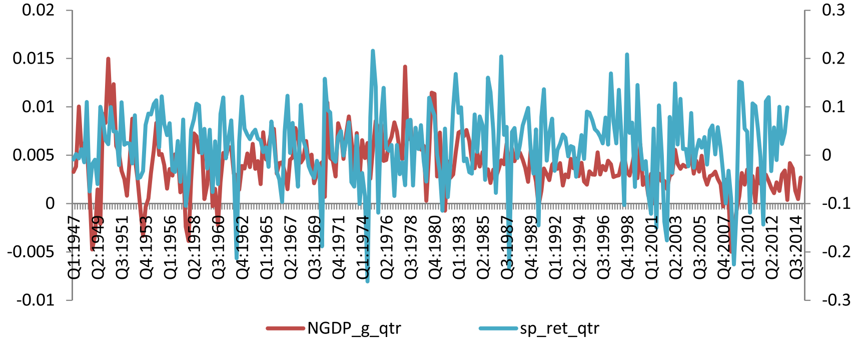
FIGURE 1

DOES THE STOCK MARKET FULLY CAPTURE MACROECONOMIC ACTIVITY? QUARTERLY GDP GROWTH AND CONTEMPORANEOUS QUARTER RETURN ON THE STOCK MARKET PORTFOLIO

Panel A: GDP growth in real terms



Panel B: GDP growth in nominal terms



The figure plots time-series of quarterly growth in GDP and contemporaneous stock market return. GDP growth is quarter-over-quarter, that is, the quarterly change relative to the prior quarter. Stock market return is on the Standard & Poor's Composite Index. Stock market returns are obtained from the CRSP Stock File Index—Monthly Index Built on Market Capitalization (CRSP: MSI) available from Wharton Research Data Services (WRDS). The return variable is SPRTRN, defined as (SPINDX(t)/SPINDX(t–1)) – 1, where SPINDX is the level of the Standard & Poor's 500 Composite Index (prior to March 1957, 90-stock index) at the end of the trading month. GDP data in real and nominal terms are obtained from the Federal Reserve Bank of St. Louis, Federal Reserve Economic Data (FRED) database, over the available period from Q1:1947 through Q2:2015.

TABLE 1

CONTEMPORANEOUS OVERLAP BETWEEN MEASURES FOR EQUITY MARKET RETURNS AND MEASURES FOR MACROECONOMIC ACTIVITY

	vwretd_qtr	*vwretx_qtr*	*sp_ret_qtr*	*NGDP_g_qtr*	*RGDP_g_qtr*	*Vwretd_ann*	*vwretx_ann*	*sp_ret_ann*	*NGDP_g_ann*	*RGDP_g_ann*
vwretd_qtr	1.000	0.999	0.989	0.049	0.107	0.444	0.436	0.431	−0.082	−0.056
	0.000	*<.0001*	*<.0001*	*0.422*	*0.080*	*<.0001*	*<.0001*	*<.0001*	*0.182*	*0.365*
vwretx_qtr	0.998	1.000	0.989	0.042	0.109	0.445	0.441	0.436	−0.095	−0.059
	<.0001	*0.000*	*<.0001*	*0.492*	*0.076*	*<.0001*	*<.0001*	*<.0001*	*0.125*	*0.343*
sp_ret_qtr	0.984	0.985	1.000	0.045	0.120	0.456	0.452	0.459	−0.095	−0.045
	<.0001	*<.0001*	*0.000*	*0.468*	*0.049*	*<.0001*	*<.0001*	*<.0001*	*0.123*	*0.468*
NGDP_g_qtr	−0.025	−0.036	−0.041	1.000	0.824	0.313	0.295	0.282	0.683	0.544
	0.684	*0.555*	*0.507*	*0.000*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
RGDP_g_qtr	0.075	0.074	0.089	0.794	1.000	0.420	0.415	0.414	0.388	0.605
	0.222	*0.227*	*0.147*	*<.0001*	*0.000*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*
vwretd_ann	0.400	0.401	0.414	0.255	0.373	1.000	0.996	0.984	0.160	0.296
	<.0001	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*0.000*	*<.0001*	*<.0001*	*0.009*	*<.0001*
vwretx_ann	0.385	0.390	0.404	0.239	0.376	0.994	1.000	0.988	0.136	0.292
	<.0001	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*<.0001*	*0.000*	*<.0001*	*0.027*	*<.0001*
sp_ret_ann	0.383	0.388	0.414	0.225	0.378	0.981	0.986	1.000	0.127	0.307
	<.0001	*<.0001*	*<.0001*	*0.000*	*<.0001*	*<.0001*	*<.0001*	*0.000*	*0.039*	*<.0001*
NGDP_g_ann	−0.112	−0.126	−0.136	0.682	0.388	0.103	0.078	0.066	1.000	0.737
	0.071	*0.040*	*0.027*	*<.0001*	*<.0001*	*0.094*	*0.206*	*0.285*	*0.000*	*<.0001*
RGDP_g_ann	−0.084	−0.091	−0.079	0.523	0.581	0.225	0.222	0.240	0.705	1.000
	0.175	*0.142*	*0.202*	*<.0001*	*<.0001*	*0.000*	*0.000*	*<.0001*	*<.0001*	*0.000*

The table reports Pearson and Spearman correlations above and below the diagonal, respectively, of quarterly and annual measures of stock market returns with contemporaneous measures of GDP growth. The equity return variables *vwretd*, *vwretx*, and *sp_ret* respectively refer to stock market value-weighted return including distributions, value-weighted return excluding distributions, and the return on the Standard & Poor's Composite Index, where qtr (ann) in the variable name denotes quarterly (annual) return. *NGDP_g_qtr* (*RGDP_g_qtr*) is quarter-over-quarter (i.e., quarterly change relative to the prior quarter) growth in nominal (real) GDP. *NGDP_g_ann* and *RGDP_g_ann* are the annual counterparts to *NGDP_g_qtr* and *RGDP_g_qtr*. Stock market returns were obtained from the CRSP Stock File Index—Monthly Index Built on Market Capitalization (CRSP: MSI) available from Wharton Research Data Services (WRDS). The return variables are denoted in CRSP as VWRETD, VWREX, and SPRTRN, where VWRETD (VWRETX) contains the monthly returns, including (excluding) all distributions, on a value-weighted market portfolio and excluding American Depository Receipts; and SPRTRN is defined as (SPINDX(t)/SPINDX(*t*–1)) – 1 with SPINDX indicating the level of the Standard & Poor's 500 Composite Index (prior to March 1957, 90-stock index) at the end of the trading month. GDP data in real and nominal terms were obtained from the Federal Reserve Bank of St. Louis, Federal Reserve Economic Data (FRED) database, over the available period from Q1:1947 through Q2:2015.

consumption because of a wealth effect. The second is that stock prices can increase as an anticipation of improved economic activity.

In fact, stock returns are a leading indicator of GDP growth, which proxies for economic activity in the US (e.g., Konchitchki and Patatoukas, 2014a). This suggests that changes in stock prices are not a source of subsequent changes in consumer spending but just an indication for future changes in consumption. There is indeed little empirical overlap between stock price changes and changes in overall economic activity. I demonstrate this point in Figure 1 and Table 1, which show contemporaneous overlaps between measures for stock market returns and measures for macroeconomic activity, where Figure 1 focuses on quarterly analysis and Table 1 reports results on both quarterly and annual levels. As can be seen in Figure 1 and Table 1, the stock market return does not move in lockstep with overall economic activity as proxied by GDP growth (in both nominal and real terms; also see Dimson *et al.,* 2005). In addition to this evidence, prior research finds little to no wealth effects of stock prices on consumer spending (e.g., Ludvigson and Steindel, 1999). Together, the results and prior research are consistent with the fact that stock market returns are forward-looking and already incorporate current growth in GDP expectations. Because costs of capital are a function of risk, I expect stock market returns to be more related to shocks to expected GDP growth than to contemporaneous GDP growth. At this stage, however, theoretical and empirical research in this regard is scarce but needed.

In light of the above, using economic activity (rather than the stock market return as is often done in the literature) to proxy for consumption and building on recent research linking macroeconomic activity to valuation (e.g., Konchitchki *et al.,* 2015) will provide an important contribution to accounting research by improving valuation modelling and the estimation of cost of equity capital. Clearly, GDP growth (and especially shocks to GDP growth) and firms' expected returns are likely to be related. Other macroeconomic factors such as (shocks to) the money supply are expected to be relevant as well.

In fact, Callen (2016, equation (10)) provides a first step toward the incorporation of the macroeconomy into theoretical models of valuation. I note, however, that producing CAPM-type models by assuming that shocks to the discount factor are driven by shocks to the stock market portfolio (Callen, 2016, p. 9) is inconsistent with the arguments above about proxying for consumption based on stock prices. For discount factor shocks to be driven by stock market shocks, these two measures should be highly correlated. But, as shown in Table 1 and Figure 1, GDP growth and stock market portfolio returns have low correlations and consumption is better proxied by macroeconomic activity. Further, as described in Konchitchki *et al.* (2015), in many cases stock returns fail to capture changes in valuation fundamentals.

CONCLUSION

The accounting valuation theory modelled by Feltham-Ohlson and the series of works by Callen *et al.* are key exceptions in capital markets research in accounting, which has mostly been empirical. Given the scarcity of accounting valuation theory and the major implications of the Feltham-Ohlson-Callen *et al*. modelling for empirical and theoretical researchers, this modelling collectively provides an extraordinary contribution to accounting research.

While there is a relatively strong disconnect between theoretical and empirical research in accounting, this study suggests extensions to theoretical valuation modelling that builds on recent research in Macro-Accounting, with major empirical implications. Such modelling will contribute to researchers and practitioners interested in firm valuation and better estimation of the cost of equity capital.

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