Aggregate dividends and consumption smoothing

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A B S T R A C T

We show that net equity payouts from the corporate sector play a crucial role in helping individuals manage their consumption path across the business cycle. In particular, we show that, as investors' desire to smooth consumption increases, optimal aggregate dividends become both more volatile and more counter-cyclical to help counterbalance pro-cyclical labor income. These findings are robust to whether or not agency conflicts exist in the economy.

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1. Introduction

There is a disconnection between microeconomic and macroeconomic models of optimal dividend policy. In the corporate finance literature, equity payout behavior at the individual firm level is either considered irrelevant (Miller & Modigliani, 1961) or depends on a range of company-specific issues including, *inter alia*, taxation, signaling and agency conflicts.[1] By contrast, in dynamic stochastic general equilibrium (DSGE) models, when the consumption requirement of the representative investor is modeled alongside the optimization problem of the corporate sector, an optimal aggregate dividend policy is frequently found to exist.

In many settings, standard DSGE models predict that equity payout behavior at the portfolio level should be highly counter-cyclical; see,

for example, the discussions in Liu and Miao (2015), Hirshleifer, Li, and Yu (2015) and Huang-Meier, Freeman, and Mazouz (2015). This is because, when economic times are good, companies have excellent investment opportunities and therefore wish to retain cash for new projects. Simultaneously, individuals have little requirement for additional revenue as their labor income is highly pro-cyclical. The low demand from households for income from financial assets, and the high demand for new investment from corporations, leads to predicted low dividend payments in economic booms.

This theoretical prediction, though, clearly conflicts with observed financial market behavior. Jermann and Quadrini (2012) report a correlation of +41% between gross equity payouts and GDP while Huang-Meier et al. (2015) report a correlation of +50% between real aggregate dividends changes and real GDP growth. Even net dividends, which comprise of gross dividends minus new equity issue and share repurchases, are not highly counter-cyclical in the manner that is predicted by most DSGE models.[2]

To overcome this anomaly, a number of papers force the pro-cyclicality of equity payouts onto their economies by modeling dividends as a levered claim to consumption; see, for example, Bansal and Yaron (2004), Ju and Miao (2012) and Liu and Miao (2015). But this

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[1] Dividend policy work in the corporate finance literature has incorporated different corporate accounting and finance issues, such as taxation (Brennan, 1970; Harris, Hubbard, & Kemsley, 2001; Miller & Scholes, 1978; Poterba & Summers, 1985), dividend clientele effects (Pettit, 1977), agency conflicts (Easterbrook, 1984; Jensen, 1986; Jensen & Meckling, 1976; La Porta, Lopez-de Silanes, Shleifer, & Vishny, 2000), asymmetric information and signaling (Benartzi, Michaely, & Thaler, 1997; DeAngelo, DeAngelo, & Skinner, 1996; Dong, Robinson, & Veld, 2005; Fuller & Goldstein, 2011; Miller & Rock, 1985), and the bird-in-the-hand fallacy (Bhattacharya, 1979). For reviews of firm-level payout policy, see, for example, Allen and Michaely (2003), Brav, Graham, Harvey, and Michaely (2005), and Ben-David (2010).

[2] For instance, Covas and Den Haan (2011) find the correlation between net dividend payments and GDP to be in the range of −33% and +54% depending on the firm size. In this paper, we report a correlation of −20% between net aggregate equity payouts and GDP.

does little to explain the underlying reason for this relationship. Both Hirshleifer et al. (2015) and Huang-Meier et al. (2015), by contrast, make dividends more pro-cyclical endogenously by incorporating capital adjustment costs into their economic models. This makes firms less willing to retain capital in good times, thus releasing more money for distribution amongst shareholders. Huang-Meier et al. (2015), following Carceles-Poveda (2005, 2009), also endogenize pro-cyclical dividends through a model with agency conflicts, where managers' own reward function makes them averse to volatility in dividend payments. Other approaches have also been suggested. Liu and Miao (2015) argue that incorporating leverage allows firms to raise capital in strong conditions through debt, reducing the need to cut dividends at such times. Hirshleifer et al. (2015) note that the combined effect of extrapolation bias, capital adjustment costs, and recursive preference incorporated into the modeled economy may potentially help to reconcile consumption and dividend behavior.

These explanations, though, all focus on the production side of the economy, with little consideration given as to how investor preferences might affect the relationship between the business cycle and the payout policy of firms. Since the predicted strong counter-cyclicality of dividend payments in standard DSGE models emerges as much from the low marginal utility of consumption in strong economic conditions as it does from better investment opportunities for the corporate sector, this is an important gap in the literature that we attempt to fill here. Our study, therefore, follows closely in the spirit of Marsh and Merton's (1987, p. 4–5) observation that: 'In a purely demand-driven model for dividends, the demand for dividends is not firm-specific because investors only care about the dividend-capital gain mix at the aggregate level… Thus equilibrium aggregate dividends may be determinate, but which firms service this demand and the quantity that each chooses to supply may not.'

Within our model, the representative household derives income for consumption from three sources; salary, changes in the level of lending provided to firms alongside the associated interest payments made on existing corporate debt, and cash payouts to equity. To capture the desire of the household to smooth consumption over time, we concentrate on internal habit formation utility functions. As has been widely documented elsewhere (e.g., Constantinides, 1990), we find that, as the habit motive strengthens, the optimal consumption path becomes less volatile. More importantly, our study documents that this effect is not driven equally by all three components of income. For example, if we incorporate agency conflicts into our model, investors' income from debt is (approximately) uncorrelated with output for all levels of habit formation. Changes in lending practice, therefore, are not used by investors as a mechanism to aid in consumption smoothing. Furthermore, in a world with no agency conflicts, labor income becomes both more pro-cyclical and more volatile as the habit motive rises; a result that is counterintuitive.

By contrast, we demonstrate that dividend payments at the portfolio level play a vital role in helping individuals to manage their consumption paths across the business cycle, with optimal aggregate equity payout behavior being highly sensitive to the strength of investors' desire to smooth consumption over time. This result holds both in the presence and absence of agency conflicts. This is our central contribution.

The paper proceeds as follows. In Section 2, we present our baseline theoretical model, which excludes agency conflicts. We describe the optimization problems of the representative household and the firms within the economy. We also describe how bankruptcy can occur within our framework and the impact this has on the corporate borrowing rate. After deriving the equilibrium and describing both the market clearing conditions and our choice of parameter values, we present our main results. These clearly show the sensitivity of optimal aggregate dividend policy to investor preferences, and illustrate the way in which aggregate equity payouts play a vital role in helping investors to smooth consumption. In Section 3, we turn to a model where managers maximize their own utility function rather than that of their shareholders. Our central findings are largely unchanged from the baseline model. Section 4

compares the implications of our models with the observed behavior of the US economy. This supports our theoretical results that the cyclical variations in dividend behavior, consumption behavior and labor income are correlated. Section 5 provides some concluding comments.

2. The value-maximizing model (VM)

In this section we describe our main DSGE model, which is an extension of earlier seminal work by Kydland and Prescott (1982), Hansen (1985), and others. Our paper lies within the stream of theoretical studies that explicitly incorporate equity payouts for the representative firm. While this has been a feature in a number of previous studies, this is either often not the central focus of their work (for example, Alessandrini, 2003; Baxter, Jermann, & King, 1998), or the point of interest differs significantly from the purpose of this study (for example, Covas & Den Haan, 2011; Jermann & Quadrini, 2012; Levy & Hennessy, 2007).

The most closely related previous studies to this are those by Carceles-Poveda (2009), Liu and Miao (2015), Hirshleifer et al. (2015), and Huang-Meier et al. (2015). Carceles-Poveda (2009) considers risk-averse firms in the DSGE model and shows that this feature contributes to the explanation of the behavior of stock returns and macroeconomic aggregates in incomplete markets. Liu and Miao (2015) study the effect of the investor's generalized disappointment aversion preferences on equity returns when the production economy is set to include leverage with a pro-cyclical dividend process. Hirshleifer et al. (2015) explain stylized facts about business cycles by using a DSGE model with recursive preferences when considering that individuals are likely to overextrapolate future performance from past performance of a small sample. Huang-Meier et al. (2015) focus on the pro-cyclical behavior of gross dividend payouts when low elasticity of investment is endogenized. The authors find that the role of agency conflicts in the real business cycle models is important as it explains pro-cyclical dividend payout behavior better than the presence of capital adjustment costs.

2.1. The economic environment

We assume that there are a large number of firms that all experience the same technology shocks as well as idiosyncratic capital shocks, one representative household and one representative bank. Equilibrium is reached when each is simultaneously able to maximize its individual objective function subject to budget and market clearing constraints.

2.1.1. The household's problem

The representative household's preferences are captured by a time-inseparable utility function that includes consumption and leisure:

$$\sum_{h=0}^{\infty} \beta^h u\left(c_{t+h}, \ c_{t+h-1}, \ 1-l_{t+h}^s\right) \tag{1}$$

where β is the subjective discount factor, $u(\cdot)$ is the period utility function for consumption and leisure, c_{t+h} is the level of consumption at time $t+h$, l^s is the number of hours worked in the labor market and the total number of hours available is normalized to one. The s superscript here refers to the fact that this is the supply of labor, which is to be distinguished from the firm's demand for labor, l^d. This results in $1 - l^s_{t+h}$ being available for leisure at time $t+h$. That the utility function for time $t+h$ includes consumption at time $t+h-1$ reflects internal habit formation. While this preference characteristic has featured in a number of previous DSGE models (see, for example, Boldrin, Christiano, & Fisher, 2001; Carroll, Overland, & Weil, 2000; Constantinides, 1990; Gershun, 2010; Otrok, Ravikumar, & Whiteman, 2002; Seckin, 2001), these earlier studies do not consider optimal aggregate dividend policy, which is our focus here.

In order to maximize its expected lifetime utility, at t the household can choose the current level of consumption and the amount of labor that it agrees to supply to the corporate sector. In addition, there are