The Asymmetric Response of Dividends to Earnings News*

JIN SEO CHO

School of Economics, Yonsei University, Seodaemun-gu, Seoul 03722, Korea
jinseocho@yonsei.ac.kr

MATTHEW GREENWOOD-NIMMO

Faculty of Business and Economics, University of Melbourne, Carlton, VIC 3053, Australia
Melbourne Centre for Data Science, University of Melbourne, Parkville, VIC 3010, Australia
Centre for Applied Macroeconomic Analysis, Australian National University, Canberra, ACT 2600, Australia
Codera Analytics, Johannesburg, GP 2193, South Africa
matthew.greenwood@unimelb.edu.au

YONGCHEOL SHIN

Department of Economics and Related Studies, University of York, Heslington, York, YO10 5DD, U.K.
yongcheol.shin@york.ac.uk

December 28, 2022

Abstract

We provide new evidence of sign-asymmetry in dividend payout policy in the postwar period in the U.S. Using a nonlinear autoregressive distributed lag model, we show that managers: (i) smooth the time-path of dividends relative to earnings; (ii) target a higher long-run payout ratio when earnings increase than when they decrease; and (iii) cut dividends faster than they raise dividends. Our findings are consistent with existing research on the implications of agency problems and signalling effects for payout policy.

Key Words: Payout policy; dividend-smoothing; sign-asymmetry; two-step estimation.

JEL Classifications: C22; C58; G35.

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*We are grateful to In Choi, Tae-Hwan Kim and Michael Thornton for constructive comments. Cho acknowledges financial support from the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2019S1A5A2A01035568). Greenwood-Nimmo and Shin acknowledge partial financial support from the ESRC (Grant Reference: ES/T01573X/1). The views expressed herein are those of the authors and should not be reported as the views of Codera Analytics. The usual disclaimer applies.

Disclosure statement: The authors declare no conflicts of interest.

1 Introduction

Among dividend-paying firms, the common practice is to adjust the dividend gradually in response to earnings news. In Lintner's famous 1956 study, interviews with managers from twenty-eight companies reveal a reluctance to announce dividend changes that may subsequently be reversed. Lintner concludes that firms only adjust their dividends in response to non-transitory earnings changes, with the goal of achieving a desired long-run target payout ratio. A substantial body of empirical work supports this view (e.g., Fama and Babiak, 1968; Marsh and Merton, 1987; Garrett and Priestley, 2000; Andres, Betzer, Goergen, and Renneboog, 2009). In a more recent survey, Brav, Graham, Harvey, and Michaely (2005) find that managers strive to avoid cutting dividends, which indicates that payout policy may exhibit sign asymmetry. In this paper, we provide empirical evidence that aggregate payout policy in the U.S. is asymmetric in the short-run and the long-run.

Brav et al. (2005) find that 93.8% of managers agree that executives strive to avoid reducing dividends, while 89.6% agree that executives smooth the dividend stream. 77.9% of managers agree that executives are reluctant to announce dividend changes that will subsequently be reversed and 88.1% perceive negative consequences to cutting dividends. Such is the reluctance to cut dividends that many managers report that they would first consider liquidating assets, reducing the workforce or deferring profitable investments. The importance that managers attach to dividends supports DeAngelo and DeAngelo's (2006) view that dividends matter to investors, contrary to the irrelevance theorem of Miller and Modigliani (1961).

We derive a generalized version of Lintner's (1956) partial adjustment model that accommodates sign asymmetry in both the long-run equilibrium relationship and in the short-run dynamics. Our specification takes the form of a nonlinear autoregressive distributed lag (NARDL) model. The NARDL model proposed by Shin, Yu, and Greenwood-Nimmo (2014) is a single-equation error correction model that allows for sign asymmetry using partial sum decompositions of the independent variables. It has been widely adopted for the study of asymmetric phenomena, particularly models of asymmetric pass-through and price adjustment (see the references in Cho, Greenwood-Nimmo, and Shin, in press). The ability of the NARDL model to accommodate different patterns of asymmetry in the short- and the long-run makes it a powerful tool for the study of behavioral phenomena, such as loss-aversion or irrational exuberance.

NARDL models are typically estimated in a single step by ordinary least squares (OLS). This approach is straightforward but, while the estimator is consistent, its asymptotic distribution is difficult to obtain due to an asymptotic singular matrix problem. Cho, Greenwood-Nimmo, and Shin (2021) propose a consistent two-step estimation procedure where the parameters of the long-run relationship are estimated first using the fully-modified OLS estimator of Phillips and Hansen (1990) before the dynamic parameters are estimated by OLS. This two-step procedure is analytically tractable—Cho et al. establish that the long-run parameter estimator is asymptotically mixed-normal, while the dynamic parameter estimator follows a normal distribution asymptotically. Fitting our model to quarterly data on real dividends and real earnings for the S&P 500 index over the period 1946Q1 to 2022Q2 yields similar results from both estimation strategies, which supports Cho et al.'s finding that they are asymptotically equivalent.

Our results reveal that deviations from equilibrium are corrected at a rate of approximately 4% per quarter, in keeping with the empirical evidence of gradual adjustment surveyed above. We find that the long-run target payout ratio is approximately 1.5 times larger for positive than negative earnings news, at 30% compared to 19%.[1] However, the direction of asymmetry is reversed in the short-run, where dividends are cut following negative earnings news faster than they are increased following positive earnings news.

Our findings can be related to managerial behavior. Managers may target a high payout ratio given positive earnings news for at least two reasons: (i) to benefit from positive signalling effects associated with dividend increases in an environment of asymmetric information (e.g. Ofer and Siegel, 1987); and (ii) to remove excess cashflow that would otherwise exacerbate agency problems by shielding managers from the external monitoring required to raise external capital from investors (e.g. Jensen, 1986). However, managers choose to adjust to the target gradually to limit the risk of overshooting and subsequently reversing their dividend announcements, which they are loathe to do (Lintner, 1956). On the other hand, Brav et al.'s survey reveals that managers seek savings elsewhere before cutting dividends in the event of adverse earnings news. These non-dividend savings may explain why the aggregate target payout ratio is smaller for negative than positive earnings news. When a dividend cut is unavoidable, our results suggest that managers prefer to do it fast, to minimize the number of cuts required to reach the target. Consequently, the dividend is adjusted more rapidly in response to negative news than positive news.

This paper proceeds as follows. In Section 2, we derive our model of asymmetric payout policy. In Section 3, we present and interpret our estimation results. We conclude in Section 4.

[1] These estimates are obtained from the two-step procedure.

2 A Model of Asymmetric Payout Policy

Lintner (1956) proposes the following partial adjustment model of payout policy:

$$\Delta y_t = \gamma_* - \rho_* \left(y_t^* - y_{t-1}\right) + \epsilon_t,$$

where y_t and y_t^* denote the current and target level of dividends, $|\rho_*|$ measures the speed with which the dividend is adjusted toward the target and ϵ_t is the error term. The existence of an equilibrium relation between the dividend target and current earnings (x_t) is well-established (e.g. Cho, Kim, and Shin, 2015). This long-run relationship can be written as $y_t^* = \beta_* x_t$, where β_* is the target payout ratio. Substituting this into (2) yields:

$$\Delta y_t = \gamma_* + \rho_* y_{t-1} + \theta_* x_t + \epsilon_t, \tag{1}$$

where $\theta_* = -\rho_* \beta_*$.

As a linear model, (1) implies that dividend policy is symmetric with respect to the sign of earnings news. Consequently, it cannot capture the asymmetric preferences documented by Lintner (1956) and Brav et al. (2005), whereby managers strive to avoid cutting dividends (see also Cho et al., 2015). To allow for sign-asymmetry, we first decompose real earnings as $x_t = x_0 + x_t^+ + x_t^-$, where x_0 is an initial constant value that can be set to zero w.l.o.g., $x_t^+ := \sum_{j=1}^{t} \left(\Delta x_j \mathbb{1}_{\{\Delta x_j \geq 0\}}\right)$ and $x_t^- := \sum_{j=1}^{t} \left(\Delta x_j \mathbb{1}_{\{\Delta x_j < 0\}}\right)$, with $\mathbb{1}_{\{\cdot\}}$ denoting the Heaviside function equal to one if the condition in braces is satisfied and zero otherwise. Next, we generalize the equilibrium relation as follows: $y_t^* = \beta_*^+ x_t^+ + \beta_*^- x_t^-$, where β_*^+ and β_*^- capture the target payout ratios with respect to positive and negative earnings news. We then rewrite (1) as follows:

$$\Delta y_t = \gamma_* + \rho_* y_{t-1} + \theta_*^+ x_t^+ + \theta_*^- x_t^- + \epsilon_t, \tag{2}$$

where $\theta_*^+ = -\rho_* \beta_*^+$ and $\theta_*^- = -\rho_* \beta_*^-$. This represents an asymmetric cointegrating relationship if both y_t and x_t are difference stationary series. To account for serial correlation in ϵ_t, we may include lags of Δy_t, Δx_t^+, and Δx_t^-, as follows:

$$\Delta y_t = \gamma_* + \rho_* (y_{t-1} - \beta_*^+ x_{t-1}^+ - \beta_*^- x_{t-1}^-) + \sum_{j=1}^{p-1} \varphi_{j*} \Delta y_{t-j} + \sum_{j=0}^{q-1} \left(\pi_{j*}^+ \Delta x_{t-j}^+ + \pi_{j*}^- \Delta x_{t-j}^-\right) + \varepsilon_t, \tag{3}$$

where a sufficiently rich lag structure will ensure that ε_t is serially uncorrelated. This is a NARDL(p, q) process (Shin et al., 2014).

One-step estimation of the NARDL model by OLS as in Shin et al. (2014) is consistent, although the asymptotic distribution of the estimator is challenging to derive due to an asymptotic singular matrix issue. Cho et al. (2021) propose a two-step estimation procedure that circumvents this issue. In the first step, the asymmetric cointegration parameters, β_*^+ and β_*^-, are estimated by applying the fully-modified (FM) OLS estimator of Phillips and Hansen (1990) to the regression of y_t on (x_t^+, x_t^-).[2] In the second step, the short-run dynamic parameters in (3) are estimated by replacing $y_{t-1} - \beta_*^+ x_{t-1}^+ - \beta_*^- x_{t-1}^-$ by $y_{t-1} - \hat{\beta}^+ x_{t-1}^+ - \hat{\beta}^- x_{t-1}^-$, where $\hat{\beta}^+$ and $\hat{\beta}^-$ are the FM-OLS parameter estimates. Cho et al. (2021) establish that the FM-OLS estimator of the long-run parameters is T-consistent and follows a mixed normal distribution asymptotically, while the OLS estimator of the short-run parameters is $\sqrt{T}$-consistent and follows a normal distribution asymptotically. Hence, inference on the long- and short-run parameters can proceed via the standard Wald testing principle. Consequently, throughout the empirical analysis below, we report asymptotic standard errors for the two-step model but we rely on a residual bootstrap to conduct inference on the single-step model.

3 Post-war Dividend Smoothing in the U.S.

We analyze post-war dividend payout policy in the U.S. using a quarterly dataset of real earnings and real dividends for the S&P 500 index over the period 1946Q1–2022Q2 constructed from the *Irrational Exuberance* dataset maintained by Robert Shiller.[3] Our sample starts after World War II due to a well-documented change in payout policy at this time (e.g. Chen, Da, and Priestley, 2012, who find that dividends adjust to earnings news four times slower in the post-war than the pre-war period).

In Table 1, we report descriptive statistics for the level and first difference of real earnings and real dividends.[4] Real earnings growth is an order of magnitude more volatile than real dividend growth and exhibits considerably greater kurtosis, indicating a higher probability of extreme earnings realizations than extreme dividend realizations. This is consistent with executives smoothing the time path of dividends relative to earnings. This tendency is evident in Figure 1, particularly during the global financial crisis and the COVID-19 pandemic.

[2] In fact, one estimates the long-run relationship between y_t and (x_t^+, x_t) to avoid the asymptotic singular matrix problem. A simple transformation is then used to recover the estimated long-run relationship between y_t and (x_t^+, x_t^-).

[3] Shiller's dataset is available from http://www.econ.yale.edu/~shiller/data/ie_data.xls.

[4] Unit root tests reveal that both y_t and x_t are first difference stationary. Results are available on request.

— Insert Table 1 and Figure 1 Here —

Prior to estimation, we take the natural logarithm of both real dividends and real earnings. We select the lag order of the NARDL model by minimization of the Bayes Information Criterion (BIC) over all combinations of models with $p, q = \{1, 2, \ldots, 12\}$. For both the one-step and two-step estimation procedures, a NARDL(10,2) specification is selected. In Table 2, we report the long-run coefficients obtained from both estimation strategies. To facilitate comparisons, we transform the estimated parameters in both cases to obtain estimates of β_*^+ and β_*^-. The point estimates obtained from the two estimators are similar, reflecting the fact that both are consistent for the long-run population parameters. Nevertheless, an important difference between the two estimation strategies can be seen in the standard errors, which are much smaller in the two-step case, indicating considerably greater precision in estimation.

— Insert Table 2 Here —

To provide formal statistical evidence on the existence of a long-run relationship, we test the statistical significance of the error correction parameter. In the single-step NARDL literature, it is typical to jointly test the statistical significance of the lagged levels terms following Pesaran, Shin, and Smith (2001). Alternatively, one can simply test the significance of the error correction parameter using a one-sided t-test, following Banerjee, Dolado, and Mestre (1998). This approach is applicable in both the one- and two-step models.[5] In the one-step case, the test statistic follows a non-standard distribution tabulated by Pesaran et al. (2001), while normal inference is applicable in the two-step case. The t-test statistics take values of -4.901 and -5.037 in the one- and two-step cases, respectively. In both cases, the test statistic exceeds the relevant 1% critical value, indicating a rejection of the null hypothesis of no long-run relationship at all standard significance levels.[6] A Wald test of the equality of β_*^+ and β_*^- returns a bootstrap p-value of 0.000 in the one-step case and an asymptotic p-value of 0.000 in the two-step case. A comparison of the long-run coefficients associated with positive and negative earnings news reveals that dividends respond more strongly to earnings increases than to earnings decreases in long-run equilibrium.

The dynamic parameter estimates are reported in Table 3. The speed of error correction in the two models is relatively similar. The OLS estimates imply that disequilibrium errors are corrected at a rate of 4.3% per quarter,

[5]By contrast, the F-test of Pesaran et al. (2001) is a joint test on the error correction parameter and the lagged levels of the explanatory variables, the latter of which do not enter the second of the two-step NARDL estimation equations.

[6]This critical value is obtained from Table CII(iii) in Pesaran et al. (2001) for the one-step case.

while the corresponding value based on the two-step approach is 4.1%. The remaining dynamic parameter estimates in the ECM equation are similar across both estimation methods.

— Insert Table 3 Here —

For both models, we test the null hypothesis of additive short-run symmetry, $H_0 : \sum_{j=0}^{q-1} \pi_{j*}^{+} = \sum_{j=0}^{q-1} \pi_{j*}^{-}$, against the alternative, $H_1 : \sum_{j=0}^{q-1} \pi_{j*}^{+} \neq \sum_{j=0}^{q-1} \pi_{j*}^{-}$. In both cases, the null is rejected at all standard levels of significance, with p-values of 0.000 and 0.003 in the one- and two-step cases, respectively. In both cases, the evidence indicates that dividends adjust more promptly to negative than positive earnings news. This effect can be seen clearly in Figure 2, where we plot the cumulative dynamic multiplier effects on real dividends associated with a one-unit positive or negative change in real earnings for both the one-step and two-step estimators. In both cases, we report 90% bootstrap confidence intervals for the dynamic multipliers, as well as their linear combination, which quantifies the extent of asymmetry at each horizon. The multiplier plots are similar in both cases, although the narrower bootstrap intervals for the two-step model indicate greater estimation precision.

— Insert Figure 2 Here —

Figure 2 draws attention to an interesting phenomenon. In the short-run, managers respond more strongly to negative earnings news than to positive earnings news, but this pattern reverses in the long-run. This switching pattern suggests that different considerations drive payout policy with respect to positive and negative earnings news. First, consider the case of a positive earnings realization that can support an increased dividend. In this situation, managers may target a high long-run payout ratio to convey a positive signal to investors in an environment of asymmetric information (Pettit, 1972). A high payout ratio also has the benefit of mitigating the agency problems associated with excess cash flows. As Jensen (1986) notes, excess cash flows may allow investments to be internally funded, reducing the exposure of managers to the external monitoring necessary to raise capital from the market. However, given their uncertainty over whether the earnings change is permanent or transitory, managers have an incentive to adjust the dividend gradually, as shown by Lintner (1956) and a large body of subsequent work. The adjustment path that they choose must be sufficiently rapid to satisfy investor expectations but not so rapid as to be unsustainable if the earnings news proves transitory. In light of Brav et al.'s (2005) evidence that managers believe the reversal of announced dividend increases to be perceived very negatively by investors, they may err on the side of caution and raise the dividend slowly.

Now, consider a negative earnings realization. Brav et al. (2005) shows that managers will strive to make savings elsewhere before they consider cutting the dividend. However, in some cases, a cut will be unavoidable. In this situation, managers have an incentive to maximize non-dividend savings in order to minimize the required cut in dividends, given the adverse signalling effect of dividend reductions. This results in a lower long-run target payout ratio when earnings news is negative than when it is positive. Managers may adjust to this target payout ratio quickly for one of several reasons. On the one hand, they may have no choice given the fall in earnings. Alternatively, they may elect to cut the dividend rapidly in order to reach the target long-run payout ratio as quickly as possible, thereby minimizing the number of cuts required to do so—in simple terms, they may perceive a benefit to getting it over with quickly.

The switch from negative asymmetry in the short-run to positive asymmetry in the long-run has not been demonstrated previously. It offers a compelling insight into variations in managerial preferences over different timescales and provides strong motivation for the study of asymmetry in share buybacks, which have become an increasingly important element of payout policy in recent years.

4 Concluding Remarks

In this paper, we show that a generalization of Lintner's (1956) partial adjustment model that allows for asymmetry with respect to the sign of earnings news can be written as a NARDL model. Using aggregate U.S. data over the period 1946Q1–2022Q2, we show that managers: (i) smooth the time-path of dividends relative to earnings; (ii) target a higher long-run payout ratio when earnings increase than when they decrease; and (iii) cut dividends faster than they raise dividends. We show that our findings are consistent with managers seeking to leverage the signalling effects of dividend increases to communicate private information with investors and also with the use of dividend increases to mitigate agency problems associated with excess cash flows. Our results also indicate that managers prefer to get dividend cuts out of the way quickly to minimize the number of cuts required to reach the long-run target payout ratio.

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	Real Earnings		Real Dividends	
	Level	Difference	Level	Difference
Mean	61.594	0.582	27.686	0.174
Median	47.736	0.444	24.456	0.141
Maximum	210.141	52.694	68.545	2.439
Minimum	9.549	-41.229	9.735	-2.817
Standard Deviation	37.095	6.409	12.903	0.620
Skewness	1.458	1.325	1.648	-0.509
Excess Kurtosis	1.816	24.916	2.182	4.040

Table 1: COMMON SAMPLE DESCRIPTIVE STATISTICS. Descriptive statistics are computed over 305 quarters from 1946Q2–2022Q2. Both real earnings and real dividends are measured in U.S. Dollars at January 2022 prices. We convert from the original monthly sampling frequency used by Shiller to quarterly frequency by taking end-of-period values.

	Single-step		Two-step	
	Estimate	S.E.	Estimate	S.E.
Intercept	–	–	2.081	0.242
β_*^+	0.285	0.092	0.298	0.060
β_*^-	0.159	0.113	0.191	0.072

Table 2: LONG-RUN PARAMETER ESTIMATES. This table reports long-run parameter estimates obtained from the single-step and two-step estimation procedures. The long-run parameter estimates are obtained from the single-step estimation results as $\hat{\beta}_T^+ = -\hat{\theta}_T^+/\hat{\rho}_T$ and $\hat{\beta}_T^- = -\hat{\theta}_T^-/\hat{\rho}_T$. For the single-step model, bootstrap standard errors obtained from 5,000 replications of a simple non-parametric residual bootstrap are reported. Asymptotic standard errors are reported for the FM-OLS parameter estimates in the two-step model. Note that the intercept of the cointegrating equation is not identified in the single-step estimation procedure.

	One-step		Two-step	
	Estimate	S.E.	Estimate	S.E.
Intercept	0.115	0.023	0.004	0.001
y_{t-1}	-0.043	0.009	–	–
x^+_{t-1}	0.012	0.005	–	–
x^-_{t-1}	0.007	0.006	–	–
ECM_{t-1}	–	–	-0.041	0.008
Δy_{t-1}	0.295	0.055	0.296	0.055
Δy_{t-2}	0.036	0.057	0.065	0.058
Δy_{t-3}	0.075	0.056	0.082	0.057
Δy_{t-4}	0.184	0.055	0.159	0.057
Δy_{t-5}	-0.070	0.054	-0.053	0.057
Δy_{t-6}	0.151	0.054	0.115	0.055
Δy_{t-7}	0.032	0.054	0.042	0.054
Δy_{t-8}	-0.126	0.053	-0.134	0.054
Δy_{t-9}	-0.035	0.049	-0.006	0.051
Δx^+_t	-0.023	0.014	-0.019	0.012
Δx^+_{t-1}	0.002	0.013	0.004	0.012
Δx^-_t	-0.019	0.014	-0.020	0.013
Δx^-_{t-1}	0.065	0.017	0.063	0.014
Adjusted R^2	0.460		0.451	
$\mathcal{X}^2_{\text{S.Corr.}}$	–		0.601	
$\mathcal{X}^2_{\text{Hetero.}}$	–		0.000	

Table 3: DYNAMIC PARAMETER ESTIMATES. This table reports parameter estimates for the NARDL(10,2) model in error correction form, estimated by OLS and using the two-step procedure. For the single-step model, bootstrap standard errors obtained from 5,000 replications of a simple non-parametric residual bootstrap are reported. Asymptotic standard errors are reported for the OLS parameter estimates in the two-step model. $\mathcal{X}^2_{\text{S.Corr.}}$ denotes the Ljung-Box test for serial correlation up to order 12. $\mathcal{X}^2_{\text{Hetero.}}$ denotes the Breusch–Pagan–Godfrey Lagrange multiplier test for residual heteroskedasticity. The values reported for these two tests are asymptotic p-values.

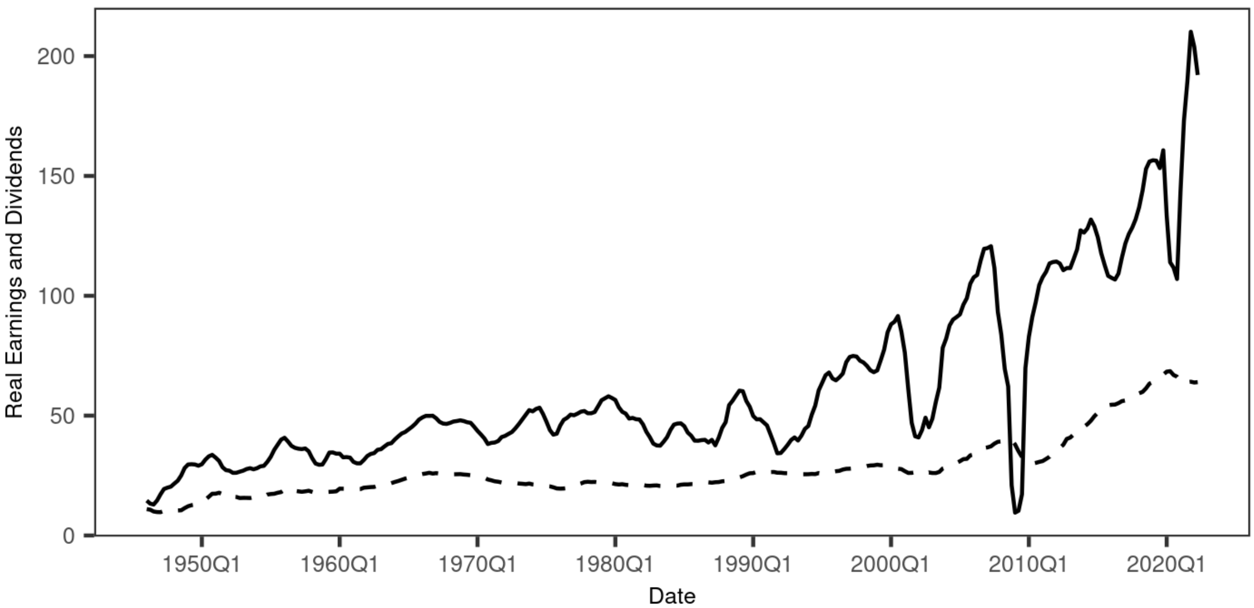
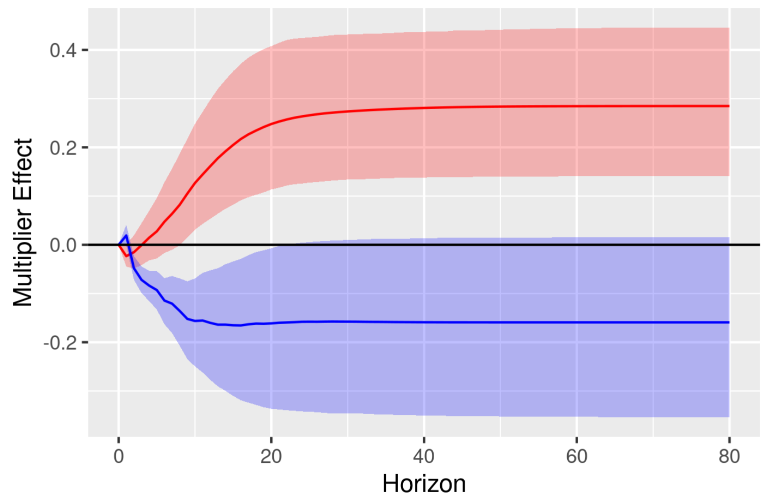
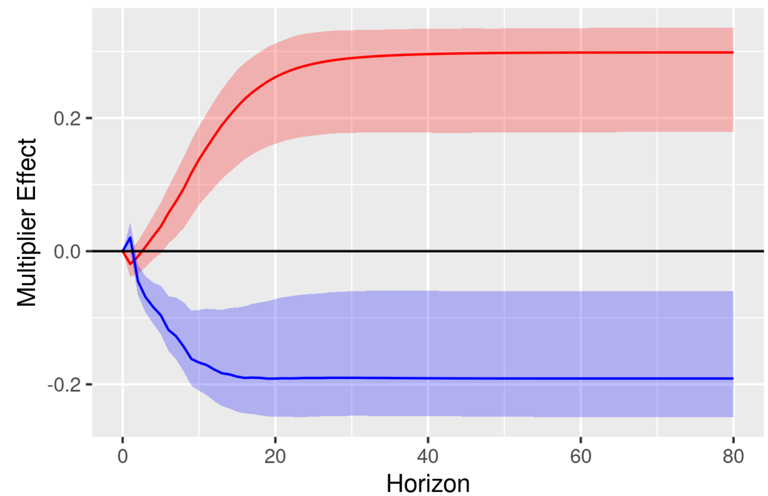


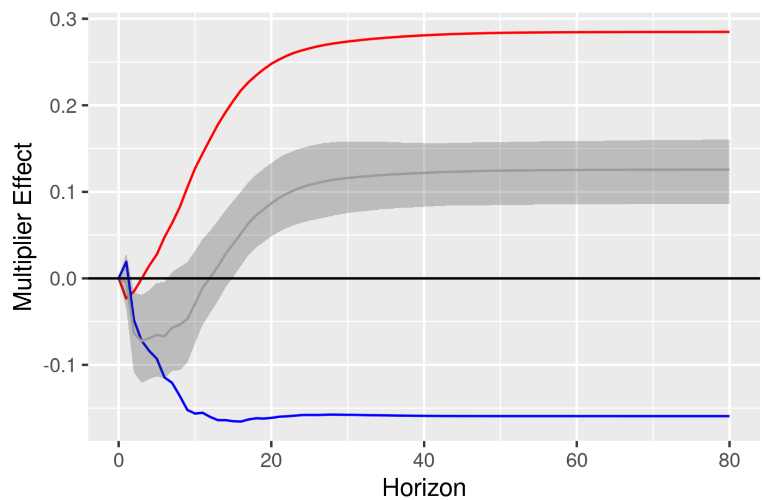
Figure 1: REAL EARNINGS VS. REAL DIVIDENDS. The solid line represents real earnings and the dashed line real dividends. Both series are measured in U.S. Dollars at January 2022 prices. We convert from the original monthly sampling frequency to quarterly frequency by taking the end-of-period value.



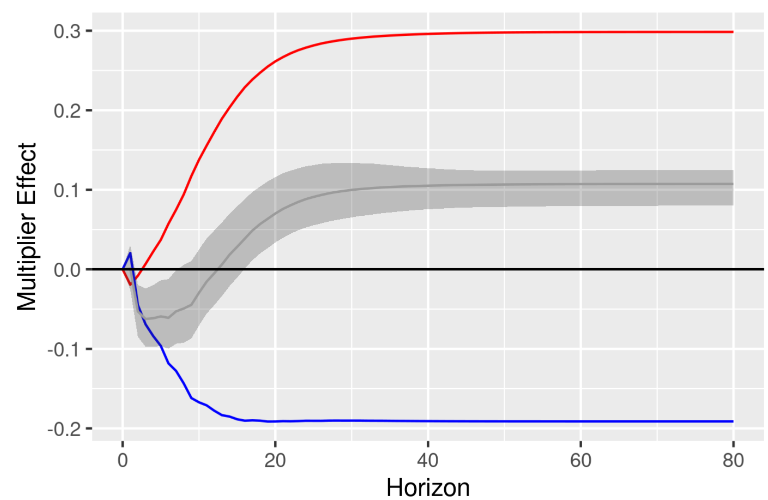
(a) Dynamic Multipliers (single-step)



(b) Dynamic Multipliers (two-step)



(c) Asymmetry (single-step)



(d) Asymmetry (two-step)

Figure 2: CUMULATIVE DYNAMIC MULTIPLIERS. In panels (a) and (b), the cumulative response of the real dividend to a one unit positive (negative) change in real earnings is shown in red (blue), with the accompanying 90% bootstrap interval shaded. In panels (c) and (d), the linear combination of the cumulative dynamic multipliers for positive and negative shocks in gray, accompanied by its 90% bootstrap interval. Bootstrapping is performed using 5,000 replications of a simple non-parametric residual bootstrap procedure.