The Disappearing Aggregate Ratchet Effect

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This study investigates the effect of SEC Rule 10b-18 on long-run aggregate payout ratios and the information content hypothesis. Prior to 1984, long-run aggregate positive payout ratios are mean reverting and signal higher future earnings growth. The subsequent significant rise in repurchase activity in 1984 eliminates the pre-1984 mean reversion and information content of aggregate payout ratios. After 1984, payout ratios are not mean reverting and do not signal aggregate future earnings growth. Therefore, it appears that the expansion of firm choice regarding the form of payout has resulted in a disappearing or significantly weaker ratchet effect.

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1. Introduction

In the past, dividends have been the most important and key form of payout to investors. In fact, Lintner (1956) found that companies target or strive for a long-run payout ratio of its earnings, which has often been characterized as a "ratchet effect." The ratchet effect refers to the mean reversion of the current payout ratio to a long run payout ratio and is a result of the co-integration of dividends and earnings. Wann and Long (2009) find that aggregate payout ratios are mean reverting for up to eight quarters when using Federal Reserve Flow of Funds data from 1952Q1 to 2004Q3. However, in a landmark survey among contemporary financial executives, Brav, Graham, Harvey, and Michaely (2006) report evidence of a weakened link between dividends and earnings. These executives favor repurchases over dividends due to their flexibility and the ability to improve earnings per share through their use. In addition, little evidence for signaling motivations is found among executives, as they feel that investors are indifferent between repurchases and dividends.

Currently, the amount and quantity of share repurchases has grown to comprise a substantial portion of total corporate payout. This rise in repurchase activity was triggered by the adoption of SEC Rule 10b-18 in 1982. SEC Rule 10b-18 was approved during a deregulation movement, and established guidelines to allow firms to repurchase shares without breaching Sections 9(a)(2) or 10(b) of the Securities Exchange Act (SEA) of 1934. These sections of the SEA of 1934 had previously blocked firms from using repurchases to protect against potential share price manipulations. As a result, a case can be made that the rise in repurchases served as an alternative to dividends, which is corroborated by findings of the recent decrease

in the number of firms that pay dividends (Fama and French, 2001; Grullon and Michaely, 2002). Thus, the substantial rise in repurchase activity that is observed beginning in 1984, after the adoption of SEC Rule10b-18, may have altered the ratchet effect. Based on these observations, this study hypothesizes that the previously documented evidence of the ratchet effect in the traditional terms of dividends and earnings may not exist post-1984. Further, this may impact how payout ratios signal growth in future earnings and cash flows.

Therefore, this study proposes to examine the effect of increased repurchase activity on the aggregate ratchet effect pre- and post-1984 using macroeconomic data provided by the Federal Reserve Statistical Releases. Interesting new evidence is provided that shows a disappearing ratchet effect with respect to growth in both future earnings and cash flow from operations. This finding may be related to the rapid growth of repurchase activity that has ensued since the implementation of SEC Rule 10b-18 in 1982.

This research study makes several empirical contributions. First, prior literature is extended by investigating the role that the aggregate rise in repurchase activity has had on the existence of Lintner's ratchet effect using both aggregate earnings and aggregate operating cash flows. For example, tests are conducted for the mean reversion of the aggregate payout ratio by splitting the sample into pre- and post-1984 time periods. Aggregate payout ratios are mean reverting pre-1984, but not post-1984. This finding suggests that the ratchet effect is significantly weaker or has disappeared. Second, macroeconomic data supplied by the Federal Reserve is utilized to test the strength of the signaling relationship between payout ratio changes and future earnings and operating cash flow growth by distinguishing between pre- and post-1984 periods. Deviations in payout ratios signal higher future earnings and cash flow growth pre-1984, but not post-1984. These two empirical contributions provide new evidence to support the hypothesis that after the adoption of SEC Rule 10b-18 the ratchet effect is significantly weaker or has disappeared post-1984.

2. Literature Review

2.1 Ratchet Effect

Lintner (1956) found that firms try to maintain stable dividends and that earnings were key in a firm's decisions regarding changes in dividends. Firms are naturally against decreasing dividends, and will only increase dividends if higher earnings are forecasted (Lintner, 1956). Lintner's ratchet effect suggests that firms modify dividends to fit a long-run target payout ratio asymmetrically by increasing dividends gradually and averting dividend cuts. This implies that a lower-than-target payout ratio is followed by a rise in dividends, while earnings remain unchanged. Likewise, a higher-than-target payout ratio is followed by a rise in earnings, while dividends remain unchanged.

Prior literature has found support for Lintner's long-run target payout ratio (Arnot and Asness, 2003, Shirvani and Wilbratte, 1997, Wann and Jones, 2014, Wann

and Long, 2009, Wann, Long, and Brockman, 2016). Shirvani and Wilbratte (1997) document support for Lintner's ratchet effect at the firm level. They show that firms adjust dividends upward when dividend levels are below target but they constrain dividends when earnings increase. More recently, Wann and Long (2009) show that aggregate payout ratios are mean reverting for up to eight quarters, which supplies evidence for a macro level ratchet effect. They also find that payout ratio deviations from the target signal aggregate future earnings growth for horizons of up to four years and that excess aggregate liquidity plays an important role.

Wann and Jones (2014) further investigate the ratchet effect at the firm level. They find that lower-than-target payout ratios are related to higher future dividend growth and stable earnings growth. Conversely, higher-than-target payout ratios are related to higher future earnings growth and stable dividends. Therefore, not only is there a ratchet effect at the macroeconomic level, but also at the firm level. However, these studies did not account for the effects of SEC Rule 10b-18.

Using firm-level data, Wann, Long, and Brockman (2016) find a structural breakpoint in the payout ratio around 1982. To account for the effects of SEC Rule 10b-18, Wann, Long, and Brockman (2016) analyze whether the ratchet effect still exists post-1982 using firm-level data. They find that the ratchet effect disappears after 1982 when conducting variance ratio tests. Then using Fama-MacBeth (1973) regression analysis, they regress future changes in earnings and dividends against target payout ratio deviations for both pre- and post-1982 periods. They find that only during the pre-1982 period is the target payout ratio maintained by allowing earnings to grow and dividends to fall relative to a current higher than target payout ratio. This result falls in line with the mean reversion of payout ratios, as is expected with a ratchet effect. However, the lack of significance in the post-1982 regressions provides additional evidence that the ratchet effect has recently weakened. The results of Wann, Long, and Brockman (2016) using firm-level data are furthered confirmed in the present study using aggregate macro-level data.

2.2 The Rise of Repurchase Activity

Prior to 1984, repurchases were a small portion of the market (Bagwell and Shoven, 1989; Fama and French; 2000). However, since the adoption of Rule 10b-18, a substantial rise in repurchase activity started occurring around 1984 (Grullon and Michaely, 2002; Weston and Siu, 2003). By January of 2000, Grullon and Ikenberry (2000) found that about half of S&P 500 firms had authorized repurchase programs. In order to prevent abuse of the new SEC Rule 10b-18, the SEC stated that fraud charges would be brought upon firms that repurchase securities in full knowledge of important inside information. Cook, Krigman, and Leach (2003) argued that the new rule did not require full disclosure to the public to truly be an effective regulation. They studied the level of compliance by firms and found that, in general, compliance was high.

Although aggregate dividends increased from 1971 to 2010, the surge in aggregate repurchases after Rule 10b-18 resulted in repurchases exceeding dividends by 1998

(Zhuang, 2015). For firms listed on the NYSE for at least 10 years, Zhuang (2015) reported that for the period 1997 to 2010 versus 1983 to 1996, roughly 13% more firms bought back shares at least once every two years. However, in the past 15 years, he also finds that the evidence for "market timing" as a primary motive for share repurchases has diminished after SEC Rule 10b-18.

Some of the prior literature proposes that repurchases are not viewed as a substitute for dividends (Allen, Bernardo, and Welch, 2000; John and Williams, 1985). Brav, Graham, Harvey, and Michaely (2006) surveyed CEOs and found that the payment of dividends is considered an investment decision, while share repurchases are only utilized with residual cash flow after key investments are made. CEOs also cited the advantage of the flexibility of repurchases as compared to dividend commitments. Dittmar and Dittmar (2004) find that both dividends and repurchases are used to distribute the permanent component of earnings. But, they find that only repurchases are used to distribute the temporary components of earnings.

In contrast to the above literature, the results of other studies reveal that repurchases are used as substitutes for dividends. Skinner and Soltes (2011) show that repurchases replace dividends. Further, they find that repurchases are increasingly related to earnings and are becoming the primary form of payout (Skinner and Soltes, 2011). Boudoukh, Michaely, Richardson, and Roberts (2007) also find that dividends are declining in an analysis of relative proportions of payout in the forms of dividends, repurchases and stock sales. The prior strong positive correlation between the dividend yield and the payout ratio vanished after the mid-1980s. Therefore, dividends cannot be used as the sole source to describe payouts. This result also implies that asset-pricing tests which disregard repurchases will lead to erroneous results. In support, Boudoukh, et al (2007) illustrate how time-series models that exclude repurchases from payout yields result in weaker stock return predictability. These results imply that repurchases are now considered an alternative to dividends. Further, Liu and Mehran (2016) suggest that repurchases can be used to help accomplish their target dividends per share goals, where firms that barely achieve their dividend targets are more likely to repurchase more shares.

In summary, prior literature which examines the ratchet effect ignores the potential effect of SEC Rule 10b-18. Firms are now more likely to target net payouts by utilizing share repurchases over dividends, indicating that a substitution effect may exist. Therefore, this study hypothesizes that the ratchet effect should be less prominent or disappear post-1984.

3. Data

The sample data for this study is comprised of quarterly income statement and balance sheet data from Table F.102 in the Federal Reserve's Flows of Funds Release for Nonfinancial Corporate Business. The macroeconomic data covers the period from 1951 Q4 to 2015 Q4 and stems from tax files, as opposed to financial statements. All dollar values are converted into constant 2015 Q4 dollars using the CPI provided

by the Bureau of Labor Statistics. A complete set of definitions of the variables are provided in Table 1.

Table 1: Variable Descriptions

Dividend Yield:	Dividends divided by the market value of equity
Net Dividend Yield:	Dividends plus repurchases minus equity issues, all divided by the market value of equity
Earnings:	Profits before tax
Payout Ratio:	Dividends divided by profits before tax
Target Payout Ratio:	The prior 16-quarter rolling average payout ratio
Target Adjusted Payout Ratio:	Measures the percentage actual payout is above or below target payout, Target Adjusted Payout = $\ln(\text{Payout}_t/\text{Target Payout})*100$
$\Delta\ln(\text{Earnings}_{t+q})$:	Measures the percentage change in earnings. This equals the $\ln(\text{Earnings}_{t+q}/\text{Earnings}_t)$ where q is equal to the number of quarters in the future.
Cash Flow from Operations (CFO):	Profits before tax minus profit tax accruals and dividends, plus capital consumption allowance, foreign earnings retained abroad, inventory valuation adjustment, and net capital transfers (for aggregate nonfarm nonfinancial corporations)
CFO Payout Ratio:	Dividends divided by cash flow from operations
Target CFO Payout Ratio:	The prior 16-quarter rolling average dividends/CFO ratio
Target Adjusted CFO Payout Ratio:	Measures the percentage actual payout is above or below target payout, Target Adjusted CFO Payout = $\ln(\text{CFO Payout}_t/\text{Target CFO Payout})*100$
$\Delta\ln(\text{CFO}_{t+q})$:	Measures the percentage change in operating cash flow. This equals $\ln(\text{CFO}_{t+q}/\text{CFO}_t)$ where q is equal to the number of quarters in the future.

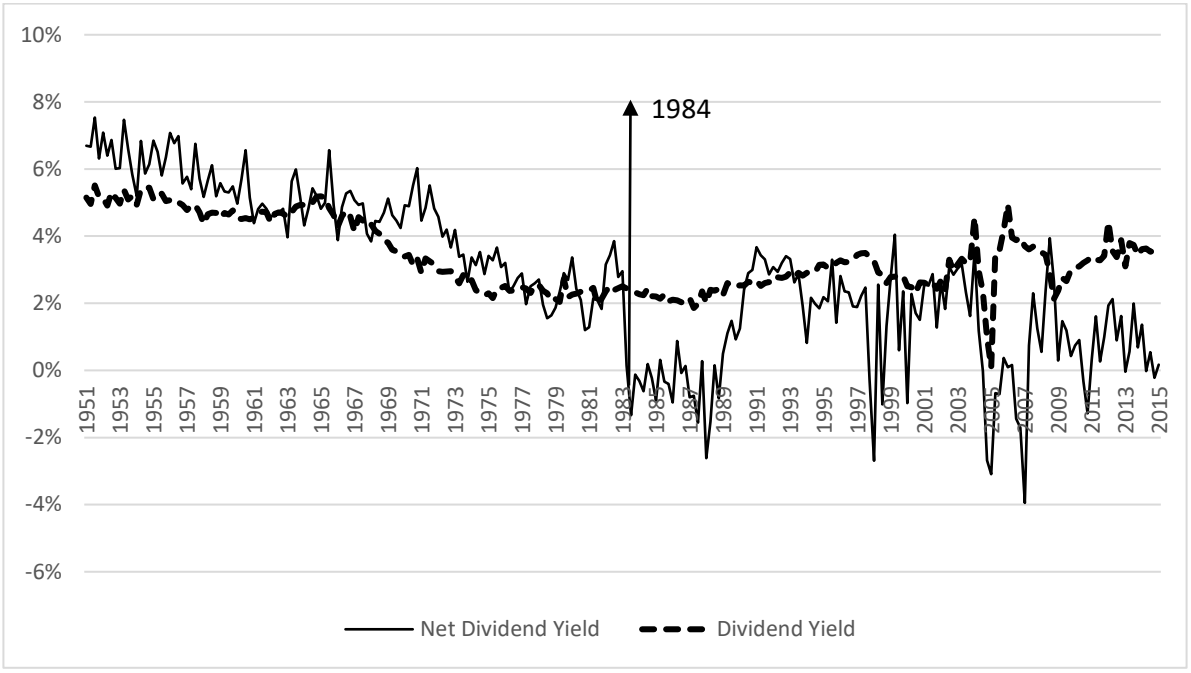
In order to identify unknown structural breakpoints in time series data, a Bai and Perron's (1998) test is conducted. Unfortunately, the pair consisting of the payout ratio and repurchase ratio cannot be used to identify structural breakpoints as in Wann, Long, and Brockman (2016). This is because repurchases are not shown as a separate line item in Table F.102 as provided by the Federal Reserve. Instead, "repurchases minus equity issues" is the only data item given. Therefore, the net dividend yield as compared to the dividend yield is used to illustrate and capture the change in repurchase activity. The net dividend yield ratio is equal to dividends plus repurchases minus equity issues divided by the market value of equity. The dividend yield is equal to dividends divided by the market value of equity.

3.1 Plots of the Dividend Yield and the Net Dividend Yield

In the past, dividends were the primary form of distributing earnings. However, around 1984, share repurchases became an important payout tool (Grullon and Michaely, 2002). Unfortunately, the Federal Reserve's Flows of Funds Release data does not contain share repurchases as a separate series. Instead, this data set only contains net issuance which is new equity issues minus equity retirements. Therefore, to illustrate the impact of the rise in share repurchases, the dividend yield and net dividend yield are reported.

Figure I shows the dividend yield versus the net dividend yield starting from the fourth quarter of 1954 and ending in the fourth quarter of 2015. The net dividend yield is defined as dividends plus repurchases minus equity issues, all divided by the market value of equity. One can see that Figure I reveals considerable instability in the net dividend yield, especially post-1984.

Figure I: Plots of the Dividend Yield and Net Dividend Yield



Notes: Dividends, repurchases minus equity issues, and market value of equity are obtained from the Table F.102 in the Federal Reserve's Flows of Funds Release for Nonfinancial Corporate Business. The dividend yield is equal to dividends divided by the market value of equity. Likewise, the net dividend yield ratio is equal to dividends plus repurchases minus equity issues divided by the market value of equity. Bai and Perron's (1998) test confirms a structural breakpoint for the payout ratio and repurchase ratio in 1984.

Table 2(a): Descriptive Statistics for Earnings

Variable	Data	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
Dividend Yield	**Full Sample**	3.26%	2.46%	3.02%	3.96%	0.98%	240
	Pre-1984	3.67%	2.46%	3.84%	4.70%	1.11%	112
	Post-1984	2.90%	2.46%	2.85%	3.31%	0.66%	128
Net Dividend	**Full Sample**	2.59%	1.05%	2.64%	4.46%	2.22%	240
Yield	**Pre-1984**	4.29%	3.18%	4.60%	5.29%	1.42%	112
	Post-1984	1.10%	-0.02%	1.25%	2.39%	1.64%	128
Earnings	**Full Sample**	649,579	436,999	544,749	727,302	306,233	241
($million)	**Pre-1984**	492,540	388,615	478,916	576,943	125,685	112
	Post-1984	785,924	491,099	693,448	1,094,028	349,032	129
Payout Ratio	**Full Sample**	34.80%	23.52%	32.38%	43.84%	15.18%	241
	Pre-1984	22.93%	19.76%	23.22%	25.15%	4.34%	112
	Post-1984	45.11%	38.14%	42.51%	50.37%	13.62%	129
Target Payout	**Full Sample**	34.12%	23.47%	32.12%	43.57%	13.05%	242
Ratio	**Pre-1984**	22.23%	20.36%	23.26%	24.17%	2.46%	112
	Post-1984	44.38%	38.98%	42.77%	47.33%	9.23%	129
ln(Payout/Target Payout)	**Full Sample**	-0.26%	-8.37%	0.08%	14.06%	35.44%	241
	Pre-1984	2.02%	-6.67%	-0.18%	8.28%	16.43%	112
	Post-1984	-2.24%	-12.06%	0.62%	17.72%	45.96%	129
Payout - Target Payout	**Full Sample**	0.71%	-2.31%	0.02%	4.28%	10.55%	241
	Pre-1984	0.70%	-1.44%	-0.04%	1.95%	3.98%	112
	Post-1984	0.72%	-5.26%	0.27%	7.77%	13.96%	129
Δln(Earnings$_{t+4}$)	**Full Sample**	2.24%	-8.91%	3.02%	12.77%	19.20%	237
	Pre-1984	1.05%	-10.56%	2.85%	11.41%	16.77%	112
	Post-1984	3.31%	-8.79%	3.05%	16.73%	21.15%	125

Notes: N is the number of non-missing observations for each variable in the sample. All dollar values are converted into constant 2015 Q4 dollars using the CPI provided by the Bureau of Labor Statistics.

In Table 2(a) descriptive statistics for the dividend yield, net dividend yield, and variables related to the payout ratio and earnings are reported. Stated variables are inflation adjusted to constant 2015Q4 dollars. Pre-1984 average dividend yields (3.67%) and net dividend yields (4.29%) are higher compared to their post-1984 respective yields of 2.90% and 1.10%. However, as evident from Figure I and Table 2(a) there is an increase in the volatility of net dividend yields in the post-1984 time period, which may be due to the rise in repurchase activity.

Table 2(a) also shows average and median earnings increase after 1984. Average (median) earnings are $492,540 ($478,916) million before 1984 and $785,924 ($693,448) million after 1984. Comparable to findings in previous literature, both average and median dividend payout ratios are significantly higher post-1984 (Wann, Long, and Brockman, 2016). Pre-1984, average (median) payout ratios are 22.93% (23.22%) versus 45.11% (42.51%) post-1984. Further, both average and median target dividend payout ratios are much higher post-1984. Pre-1984, average (median) target payout ratios are 22.23% (23.26%) versus 44.38% (42.77%) post-1984. This is consistent with Floyd, Li, and Skinner (2015) who also report an overall increase not only in dividend payouts, but also in repurchases over time.

Also, the differences between average payout minus target payout are similar at 0.70% pre-1984 and 0.72% post-1984. However, the standard deviation is much wider post-1984 (13.96%) than pre-1984 (3.98%). The higher difference in variance after 1984 may be related to a greater reliance upon repurchases as a more flexible substitute for dividends.

For illustration purposes, Table 2(a) shows the one-year growth rate in earnings which is the change in earnings across four quarters, i.e., $\Delta\ln(\text{Earnings}_{t+4})$. The average one-year growth rate in earnings is 2.24% for the full sample; 1.05% for the pre-1984 period, and 3.31% for post-1984. The $\Delta\ln(\text{Earnings}_{t+q})$ represents the total return in earnings over the period measured, and is calculated by taking the natural log of earnings in period t+q divided by earnings in period t, where q = 4, 8, 12, 16, or 20 quarters. This is the dependent variable used in the regression analysis seen later in Tables 4 and 6, where earnings growth is measured from one-year (four quarters) to five-years (twenty quarters).

In Table 2(b), the descriptive statistics for variables related to cash flows from operations (CFO) and CFO target payout ratios are reported. CFOs are used in this study as an alternative measure of profitability. Average and median CFOs increase significantly post-1984. The inflation-adjusted average (median) cash flows are $568,209 ($552,960) million before 1984 and $1,321,356 ($1,270,401) million after 1984. In Table 2(b), the CFO payout ratio is equal to dividends divided by cash flow from operations. Unlike payouts of earnings, the average and median CFO payout ratios are relatively similar during the pre-1984 and post-1984. Post-1984 average (median) CFO payout ratios of 24.96% (24.81%) are only slightly higher than the pre-1984 average (median) CFO payout ratios at 20.38% (21.95%). Statistics for the target CFO

payout ratios are also similar. Both average and median target CFO payout ratios are slightly higher for post-1984 at 24.07% (25.27%) versus the pre-1984 average (median) ratios at 21.13% (22.72%).

Table 2 (b): Descriptive Statistics for Operating Cash Flows (CFO)

Variable	Data	Mean	25th Quartile	Median	75th Quartile	Standard Deviation	N
CFO ($ million)	**Full Sample**	971,346	556,779	905,276	1,283,148	469,799	241
	Pre-1984	568,209	405,409	552,960	736,179	184,057	112
	Post-1984	1,321,356	980,457	1,270,401	1,582,742	344,655	129
CFO Payout Ratio	**Full Sample**	22.83%	17.77%	23.50%	25.59%	5.74%	241
	Pre-1984	20.38%	16.69%	21.95%	23.52%	3.81%	112
	Post-1984	24.96%	22.66%	24.81%	27.89%	6.28%	129
Target CFO Payout Ratio	**Full Sample**	22.73%	18.26%	23.69%	25.94%	4.37%	242
	Pre-1984	21.13%	16.66%	22.72%	23.73%	3.71%	112
	Post-1984	24.07%	21.22%	25.27%	26.65%	4.43%	129
ln(CFO Payout/Target CFO Payout)	**Full Sample**	-1.42%	-5.75%	-0.19%	5.98%	27.91%	241
	Pre-1984	-3.79%	-8.74%	-2.63%	1.92%	8.52%	112
	Post-1984	0.64%	-3.68%	3.37%	12.22%	37.26%	129
CFO Payout - Target CFO Payout	**Full Sample**	0.13%	-1.31%	-0.05%	1.43%	4.11%	241
	Pre-1984	-0.75%	-1.84%	-0.55%	0.35%	1.63%	112
	Post-1984	0.90%	-0.77%	0.78%	3.11%	5.29%	129
$\Delta ln(CFO_{t+4})$	**Full Sample**	3.07%	-1.88%	3.52%	7.82%	7.56%	237
	Pre-1984	4.10%	-1.06%	5.36%	10.22%	8.68%	112
	Post-1984	2.14%	-2.28%	2.17%	6.60%	6.28%	125

N is the number of non-missing observations for each variable in the sample. All dollar values are converted into constant 2015 Q4 dollars using the CPI provided by the Bureau of Labor Statistics.

The target adjusted CFO payout is the natural log of the CFO payout divided by the target CFO payout, and represents the percentage the payout ratio is above or below the target payout ratio in Table 2(b). This variable is used to capture how

deviations from target explain changes in future cash flows. The average and median natural log of CFO payout divided by target CFO payout for the full sample are -1.42% and -0.19%, respectively.

For illustration purposes, the one-year growth rate in cash flow from operations is also provided in Table 2(b) as $\Delta\ln(CFO_{t+4})$. The average one-year growth rate in cash flow from operations is 3.07% for the full sample. This is the dependent variable used in the regression analysis results seen later in Tables 5 and 7. The CFO growth rate, $\Delta\ln(CFO_{t+q})$, represents the total return over the *q* period measured. The $\Delta\ln(CFO_{t+q})$ is calculated by taking the natural log of CFO in period t+q divided by CFO in period t, where q = 4, 8, 12, 16, or 20 quarters.

3. Methodology

3.1 Variance Ratio Tests

The results of the Lo and MacKinlay's (1988) variance ratio test are presented in Table 3, and are used to establish whether deviations of aggregate payout ratio from the target payout ratio revert to a long-run mean. Mean-reverting deviations in the payout ratio should return to zero.

Table 3 reports the variance ratios for aggregate payout ratio deviations for the full sample period, the pre-1984 period, and the post-1984 period. The results indicate that aggregate payout ratio deviations from target are autocorrelated negatively using both earnings and cash flows from operations as denominators in the payout ratio. The negative autocorrelation implies that current payout and CFO payout ratios are revised to achieve a target long-run aggregate payout and aggregate CFO payout ratio. For example, when the current payout ratio rises above the target payout ratio, downward adjustments are implemented. Likewise, when the current payout ratio falls below the target payout ratio, upward adjustments are employed. This process is referred to as mean reversion. If target aggregate payout ratios do not follow a random walk and are not continuously stabilized, then temporary deviations from the target aggregate payout ratio can communicate information about growth in future earnings and cash flow from operations.

Table 3 reveals that the aggregate full sample payout ratios for earnings and CFO payout ratios are weakly mean reverting for up to eight and sixteen quarters, respectively. However, during the pre-1984 time period, CFO payout ratios are strongly mean-reverting for up to twenty quarters or five years at p-values ranging from 0.01 to 0.05. Further, during the pre-1984 time period, earnings payout ratios are mean-reverting up to sixteen quarters or four years at p-values ranging from 0.05 to 0.10. Therefore, these findings support the ratchet effect in the pre-1984 period before the substantial rise in repurchase activity. In contrast, aggregate payout ratios are not mean reverting during the post-1984 sample, implying a weakening or disappearing ratchet effect post-1984.

Table 3: Variance Ratio Tests

	Number nq of base observations	Number q of base observations aggregated to form variance ratio				
		4	8	12	16	20
Full Sample						
Dividends/Earnings						
Variance Ratio	257	0.78	0.41	0.46	0.39	0.3
Test Statistic		(-0.84)	(-1.53)*	(-1.18)	(-1.16)	(-1.20)
Dividends/CFO						
Variance Ratio	257	0.67	0.31	0.25	0.17	0.16
Test Statistic		(-1.16)	(-1.47)*	(-1.31)*	(-1.31)*	(-1.20)
Pre-1984 Sample						
Dividends/Earnings						
Variance Ratio	128	0.58	0.50	0.42	0.38	0.35
Test Statistic		(-1.79)**	(-1.48)*	(-1.41)*	(-1.32)*	(-1.26)
Dividends/CFO						
Variance Ratio	128	0.47	0.30	0.24	0.17	0.18
Test Statistic		(-2.62)***	(-2.45)***	(-2.17)**	(-2.08)**	(-1.86)**
Post-1984 Sample						
Dividends/Earnings						
Variance Ratio	129	0.81	0.44	0.50	0.44	0.34
Test Statistic		(-0.67)	(-1.35)*	(-1.01)	(-0.99)	(-1.05)
Dividends/CFO						
Variance Ratio	129	0.71	0.34	0.27	0.18	0.16
Test Statistic		(-0.92)	(-1.26)	(-1.15)	(-1.16)	(-1.11)

Notes: Dividends, earnings, and cash flows from operations (CFO) are stated in constant 2015 Q4 dollars and are as defined in Table 1. *n* denotes the total number of quarterly observations over the period 1951Q4 to 2015Q4 in the variance ratio test. ***, **, * denotes significance at the 1%, 5%, and 10% levels using a one-tailed z-score, respectively.

Based upon the common significance found for mean reversion at sixteen quarters across the pre-1984 subsample and the full sample, the 16-quarter rolling average payout ratio is used as the long-run target payout ratio. The target payout ratio is then used to calculate the extent actual payout deviates from the target payout in the regression analysis.

3.2 Regression Analysis

The relationship between changes in dividends and future earnings growth is examined using Maximum Likelihood estimation over the sample period of 1951 Q4 to 2015 Q4. Estimates are corrected for autocorrelated errors. The future time horizons range from four to twenty quarters, or one to five years.

Previous surveys of business executives indicate that dividends are only increased when permanent earnings growth rates are maintainable. However, these survey implications do not always line up with empirical studies that test whether dividend changes signal future earnings growth. Exceptions to this statement can be found in Wann and Long, (2009) which uses aggregate data and other studies that use firm-level data (Wann and Jones, 2014, Wann, Long, and Brockman, 2016). This study uses aggregate macro-level data to further examine this issue.

One focus of the study is to examine if the payout ratio is mean reverting both before and after the substantial rise in repurchase activity in 1984. However, another important focus is to examine if there are differences in the signaling power of aggregate payout ratio changes based upon the time periods of pre-1984 and post-1984. Payout ratios are simply dividends divided by earnings before tax or by operating cash flows. The long-run target payout ratio is a rolling average of the previous 16-quarter payout ratios. Finally, the target adjusted payout ratio is defined as the percentage that actual payout is above or below the long-run target earnings payout ratio or target CFO payout ratio.

Equation (1) evaluates how well changes in target-adjusted payout ratios forecast future changes in earnings. If β_1 is significantly positive ($\beta_1>0$), then payouts above (below) the target ratio signal higher (lower) future earnings. Equation (1) is as follows:

$$\Delta\ln(\text{Earnings}_{t+q}) = \alpha_1 + \beta_1\ln(\text{Payout}_t/\text{Target Payout}) + \varepsilon \quad (1)$$

Equation (2) examines how changes in target-adjusted CFO payout ratios predict future changes in operating cash flows. If β_2 is significantly positive ($\beta_2>0$), then this is evidence that above (below) target-adjusted CFO payouts signal higher (lower) future cash flows. Equation (2) is as follows:

$$\Delta\ln(\text{CFO}_{t+q}) = \alpha_2 + \beta_2\ln(\text{CFO Payout}_t/\text{Target CFO Payout}) + \varepsilon \quad (2)$$

In equations (3) and (4) below, an interactive variable is created to summarize the effects of changes in payout ratios that occur pre- and post-1984. Since payout ratios are not mean reverting post-1984, the study examines whether the time period studied makes a difference in predicting changes in earnings or cash flows. Equations (3) and (4) are as follows:

$$\Delta\ln(\text{Earnings}_{t+q}) = \alpha_3 + \beta_3\ln(\text{Payout}_t/\text{Target Payout})*\text{PRE} + \lambda_3\ln(\text{Payout}_t/\text{Target Payout})*\text{POST} + \varepsilon \quad (3)$$

$$\Delta\ln(\text{CFO}_{t+q}) = \alpha_4 + \beta_4\ln(\text{CFO Payout}_t/\text{Target CFO Payout})*\text{PRE} + \lambda_4\ln(\text{CFO Payout}_t/\text{Target CFO Payout})*\text{POST} + \varepsilon \quad (4)$$

In equations (3) and (4) the interactive variables are: PRE=1 (POST=0) if the date occurs before 1984; and PRE=0 (POST=1) if the date is after 1984. If β_3 is significantly positive ($\beta_3>0$), then payout deviations above (below) the target payout ratio signal higher (lower) future earnings during the pre-1984 time period. A significantly positive λ_3 ($\lambda_3>0$), implies that payout ratios above (below) target predicts higher (lower) future earnings during the post-1984 period. Equation (4) has similar interpretations except the dependent and independent variables are based on cash flows from operations rather than earnings.

4. Results

Table 4 presents Equation (1) results, and shows the relationship between changes in target adjusted payout ratios and future earnings over a time horizon of four to twenty quarters. The results in Table 4 show that increases in payout ratios above target imply significantly higher future earnings growth over all time periods (p=0.01).

Table 4: Future Growth in Earnings and Payout Deviations from Target

Dependent Variable	α_1	β_1
	Intercept	ln(Payout$_t$ / Target Payout)
Δln(Earnings$_{t+4}$)	0.0264	0.1076
t-statistic	1.37	3.00**
N = 236		
R²= 72.04		
Δln(Earnings$_{t+8}$)	0.0509	0.2005
t-statistic	1.56	4.68***
N = 232		
R²=83.49		
Δln(Earnings$_{t+12}$)	0.0743	0.0991
t-statistic	1.85*	2.68***
N = 227		
R²=89.12		
Δln(Earnings$_{t+16}$)	0.0880	0.1476
t-statistic	1.98**	4.63***
N = 224		
R²= 92.63		
Δln(Earnings$_{t+20}$)	0.1365	0.1319
t-statistic	2.26**	3.54***
N = 220		
R²= 92.53		

Notes: Δln(Earnings$_{t+q}$) is the total percentage change in profits over *q* quarters, where *q* equals 4, 8, 12, 16, or 20. *t*-statistics are shown in parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. *N* is the number of observations used in the regression.

This evidence supports Lintner's (1956) ratchet effect which suggests that higher payout ratios signal higher future earnings. These aggregate-level results are comparable to firm-level findings of dividend changes that forecast future profitability (Asquith and Mullins, 1983; Chang, Kumar, and Sivaramakrishnan, 2006; Fuller and Blau, 2010; Healy and Palepu, 1988; Michaely, Thaler and Womack, 1995; Nissim and Ziv, 2001; Wann and Jones, 2014; Wann, Long, and Brockman, 2016).

Equation (2) tests the general relationship between variations in target adjusted payout ratios and variations in future operating cash flows over a time horizon of four to twenty quarters. These results are presented in Table 5. Increases in payout ratios significantly predict higher future operating cash flows for eight to twenty quarters (p=0.05 and p=.01). This evidence supports the theory that higher payout ratios signal higher future operating cash flows similar to prior literature (Brooke, Charlton, and Hendershott, 1998).

Table 5: Future Growth in Cash Flows and Payout Deviations from Target

Dependent Variable	α_2	β_2
	Intercept	ln(CFO Payout$_t$ / Target CFO Payout)
$\Delta\ln(CFO_{t+4})$	0.0305	-0.0045
t-statistic	5.09***	-0.50
N = 245		
R^2= *72.04*		
$\Delta\ln(CFO_{t+8})$	0.053	0.0550
t-statistic	1.78*	2.33**
N = 241		
R^2=*91.91*		
$\Delta\ln(CFO_{t+12})$	0.0745	0.1160
t-statistic	2.04**	6.88***
N = 237		
R^2=*89.12*		
$\Delta\ln(CFO_{t+16})$	0.0975	0.0498
t-statistic	1.79*	3.00***
N = 233		
R^2= *92.63*		
$\Delta\ln(CFO_{t+20})$	0.1225	0.0754
t-statistic	3.30***	3.62***
N = 229		
R^2= *92.53*		

Notes: $\Delta\ln(CFO_{t+q})$ is the total percentage change in operating cash flows over *q* quarters, where *q* equals 4, 8, 12, 16, or 20. CFO represents cash flows from operations as defined in Table 1. t-statistics are shown in parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. N is the number of observations used in the regression.

The results for equation (3) are reported in Table 6. Equation (3) consists of interactive variables to capture the effects of differing time periods (pre- versus post-1984), where PRE=1, POST=0 if the period is before 1984; and PRE=0, POST=1 if the period is after 1984. The coefficients for the target adjusted payout ratio during the pre-1984 period are significantly positive for predicting future earnings growth in all periods, four through twenty quarters. This indicates that an increase in the aggregate payout ratio signals higher future earnings growth during the pre-1984 period. In contrast, during the post-1984 period, there is essentially no relationship between variations in the aggregate payout ratio and changes in future earnings growth, except for the 16-quarter period.

Table 6: Pre- and Post-1984 Future Growth in Earnings and Payout Ratio Deviations from Target

	α_3	β_3	λ_3
Dependent Variable	Intercept	$\ln(\text{Payout}_t / \text{Target Payout})$*PRE	$\ln(\text{Payout}_t / \text{Target Payout})$**POST*
$\Delta\ln(\text{Earnings}_{t+4})$	0.0225	0.1877	-0.0131
t-statistic	1.14	2.86**	-0.45
N = 245			
R^2= 77.95			
$\Delta\ln(\text{Earnings}_{t+8})$	0.0424	0.4000	0.0514
t-statistic	1.30	4.77***	1.37
N = 241			
R^2=87.88			
$\Delta\ln(\text{Earnings}_{t+12})$	0.0747	0.3053	-0.0123
t-statistic	2.02**	4.32***	-0.31
N = 237			
R^2= 90.86			
$\Delta\ln(\text{Earnings}_{t+16})$	0.0798	0.3467	0.1206
t-statistic	1.56	4.54***	2.98***
N = 233			
R^2= 92.01			
$\Delta\ln(\text{Earnings}_{t+20})$	0.1426	0.4022	0.0586
t-statistic	1.80*	5.05***	1.30
N = 229			
R^2= 93.60			

Notes: $\Delta\ln(\text{Earnings}_{t+q})$ is total percentage change in profits over *q* quarters, where *q* equals 4, 8, 12, 16, or 20. PRE and POST are dummy variables, where PRE=1 for period before 1984; POST=1 for period after 1984; and 0 otherwise. t-statistics are shown in parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. N is the number of observations used in the regression.

The fact that the significance of the payout ratio is determined by the time period of pre- or post-1984 is an interesting result. This result is strengthened by unreported tests that examine the equality of the coefficients of β_3 and λ_3. These tests reveal

significant differences at p-values of less than 1%. Overall, these findings support the hypothesis that the rise in repurchase activity, following the implementation of Rule 10b-18, may have played a significant role in reducing or eliminating the signaling power of payout ratio deviations in predicting changes in future earnings growth.

The results of equation (4) are presented in Table 7. Equation (4) captures the effects of the future growth of operating cash flows in Equation (2) but for differing time periods (pre- versus post-1984), where dummy variable PRE=1 before 1984, 0 otherwise; and POST=1 after 1984, 0 otherwise. Similar to the findings in Table 6, there is a marked difference between the pre- and post-1984 periods.

Table 7. Pre- and Post-1984 Future Growth in Cash Flows and Payout Deviations from Target

	α_4	β_4	λ_4
Dependent Variable	Intercept	$\ln(\text{CFO Payout}_t$ /Target CFO Payout)*PRE	$\ln(\text{CFO Payout}_t$ /Target CFO Payout)**POST*
$\Delta\ln(CFO_{t+4})$	0.0328	0.1271	-0.0154
t-statistic	4.57***	3.44***	-2.37**
N = 245			
R^2= 77.95			
$\Delta\ln(CFO_{t+8})$	0.064	0.1537	-0.0029
t-statistic	4.94***	3.20***	-0.44
N = 241			
R^2=87.88			
$\Delta\ln(CFO_{t+12})$	0.0981	0.2141	0.0111
t-statistic	4.64***	4.44***	1.41
N = 237			
R^2= 90.86			
$\Delta\ln(CFO_{t+16})$	0.1263	0.1618	-0.0016
t-statistic	5.26***	3.54***	-0.21
N = 233			
R^2= 92.01			
$\Delta\ln(CFO_{t+20})$	0.1553	0.1784	0.0092
t-statistic	5.42***	3.68***	1.01
N = 229			
R^2= 93.60			

Notes: $\Delta\ln(CFO_{t+q})$ is total percentage change in operating cash flows over *q* quarters, where *q* equals 4, 8, 12, 16, or 20. CFO represents cash flows from operations as defined in Table 1. PRE and POST are dummy variables, where PRE=1 for the time period before 1984, 0 otherwise; and POST=1 if after 1984, 0 otherwise. t-statistics are shown in parentheses. *, **, *** denotes significance at the 10%, 5%, and 1% levels, respectively. N is the number of observations used in the regression.

The β_4 coefficient for the CFO payout ratio during the pre-1984 period is significantly positive from four quarters growth in future operating cash flows to twenty quarters future growth. This implies that an aggregate increase (decrease) in the CFO payout ratio relative to target payout is a signal of higher (lower) growth in future operating cash flow. However, during the post-1984 period, there is no significant relationship between variations in the payout ratio and variations in future aggregate operating cash flow growth, except for the four quarter or one-year period. Thus, CFO payout ratio deviations signal higher or lower future operating cash flow growth, but only before 1984.

Surprisingly, there is a significant negative relationship between aggregate payout ratio variations and aggregate future growth in operating cash flows for up to one year. This implies that increases in payout ratio deviations forecast lower future one-year earnings growth during the post-1984 period. This finding is unexpected and somewhat puzzling. However, this coefficient is small (0.0154) relative to other significant coefficients (i.e., 0.1271 for β_4).

Unreported tests examining the equality of the coefficients of β_4 and λ_4 reveal significant differences at p-values of less than 1%. Therefore, the rise in repurchase activity due to Rule 10b-18 appears to have also diminished or eliminated the signaling power of payout ratio deviations as they relate to growth in future operating cash flows.

5. Robustness

If dividends are flat and earnings are mean reverting, then the payout ratio would be positively correlated with future earnings and operating cash flow growth. For example, a high payout ratio could be the result of a temporary but significant decline in earnings. This example would have the effect of signaling higher future earnings growth when earnings return to normal levels. This study is not affected by this concern. Additional variance ratio tests confirm there is no significant mean reversion by separately testing the time series of dividends, earnings, and cash flows from operations. Additionally, the correlation between the payout ratio and future earnings growth is only -0.15. Finally, the correlation between the CFO payout ratio and future cash flows from operations growth is only -0.30.

6. Conclusions

This study tests the information content hypothesis and provides new evidence concerning the strength of the ratchet effect after the surge in aggregate repurchase activity in 1984 following the adoption of SEC Rule 10b-18 in 1982, a revision of the Securities and Exchange Act of 1934. Specifically, this paper investigates how Rule 10b-18 may have affected the ratchet effect post-1984 in two ways. First, it examines if aggregate payout ratios continue to revert to a long-run target ratio. Second, this study tests for any changes in the signaling power of aggregate payout ratios on future growth in earnings and operating cash flows.

Lo and MacKinlay's (1988) variance ratio test is used to determine if aggregate payout ratios and aggregate CFO payout ratios are mean reverting for the full sample period, the pre-1984 period, and the post-1984 period. A significantly negative autocorrelation implies mean reversion of the payout ratios, and is equivalent to maintaining a long-run target payout ratio. This study shows that aggregate payout ratio deviations are mean reverting specifically during the pre-1984 period, but not during the post-1984 period. This provides evidence for the disappearance of the ratchet effect after the adoption of SEC Rule 10b-18.

This study also offers new insights into prior research by investigating the role that the rise in aggregate repurchase activity has had on the signaling power of aggregate payout ratios as they relate to aggregate earnings and operating cash flow growth. Four regressions are estimated over the sample period of 1951 Q4 to 2015 Q4 using Maximum Likelihood estimation, corrected for autocorrelated errors, based on macroeconomic data provided by the Federal Reserve Statistical Releases. Similar to prior literature, this study shows that before 1984 there is a significantly positive relationship between changes in payout ratios, and changes in earnings and operating cash flows. However, new evidence presented in this paper shows that post-1984 aggregate payout ratios are not mean reverting, and do not signal or predict growth in future earnings or operating cash flows. This suggests that the traditional signaling role of long-run target payout ratios has disappeared or has been significantly reduced since the substantial rise in repurchasing activity in 1984 following the adoption of SEC Rule 10b-18.

Future research could examine whether aggregate payout ratio deviations influence aggregate investments in capital expenditures. A measure of excess liquidity could be utilized to examine any changes that are made in capital expenditures that follow liquidity shocks during the pre- and post-1984 periods. Also, aggregate stock market reactions can be measured based upon the aggregate choice of capital expenditures related to excess liquidity both pre- and post-1984. These research results could help determine whether increased repurchase activity has had a positive or negative impact on capital expenditures, and if this impact is the same both before and after the passage of SEC Rule 10b-18.

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