Reporting Frequency Choice and Capital Market Consequences of Voluntary and Mandatory Increases in Interim Reporting†

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ABSTRACT: We study factors influencing reporting frequency choice and the capital market consequences of voluntary and mandatory increases in interim reporting frequency. Analyzing 28,824 firm-year observations of reporting frequency for 1950–73, we find that firms with higher information asymmetries and agency costs, better performance, and longer operating cycles are more likely to issue voluntary interim financial reports. We then compare the effects of switching from semiannual to quarterly reporting on the earnings timeliness and stock return volatility of two subsamples: firms voluntarily increasing reporting frequency (voluntary increasers) and firms forced to do so (mandatory increasers). Voluntary increasers had dramatically more timely earnings and lower stock return volatility after increasing reporting frequency. In contrast, mandatory increasers experienced a much less pronounced increase in earnings timeliness and no change in return volatility. We conclude that a firm’s reporting frequency choice is a rational response to firm-specific characteristics, and that firms forced to report more frequently are less likely to benefit from the change than are voluntary increasers.

JEL Classification: D82; G38; M41; L14

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Introduction

In this paper, we examine the factors influencing firms’ choice of reporting frequency and the economic consequences of increases in reporting frequency on the information environment of the firm and its investors. By studying the choice of financial reporting frequency, we seek broadly to answer two questions. First, which factors cause firms to report more frequently than regulation requires? Second, how, if at all, do changes in reporting frequency—voluntary and mandatory—affect the speed at which accounting information is impounded into price and the volatility of stock returns?

To examine these questions, we collect a sample of 28,824 firm-year observations of reporting frequency over the period 1950–73, representing the entire population of CRSP firms in non-regulated industries during the period. Additionally, from this sample we identify 184 firms that permanently changed from semiannual to quarterly reporting: 99 did so voluntarily (voluntary increasers) and 85 did so in response to SEC regulation (mandatory increasers).

Subject to meeting minimum reporting frequency standards prescribed by regulators, firms may report as often as they wish. Under the current reporting regime, this reporting discretion typically manifests itself through relatively informal voluntary disclosures such as management forecasts, press releases, conference calls, or Internet communications. Less common today are firms that voluntarily issue public financial reports—balance sheets and
income statements, for example—more often than required. But such has not always been the case. Before the SEC mandated semiannual, and then quarterly, financial reporting, many firms voluntarily issued interim financial reports more frequently than required. Other firms, however, increased their frequency of financial reporting only at the behest of regulators. Central to our analysis are two prominent regulatory changes requiring exchange-listed firms to report financial data more frequently: the switch in 1955 from annual to semiannual reporting and the switch in 1970 from semiannual to quarterly reporting.

Our motivation for investigating why firms issued interim reports more frequently than required is to improve our understanding of the factors influencing voluntary disclosure. To this end, we investigate the following factors suggested by theory (and prior evidence) to influence disclosure decisions: (i) information asymmetries between the firm and prospective investors; (ii) agency conflicts between firm management and shareholders; (iii) costs of disclosure; (iv) the informativeness of shorter measurement intervals; (v) firm performance; and (vi) the regulatory environment. We then take the analysis one step further and examine the economic effects of increased disclosure. By doing so, we hope to improve our understanding of the extent to which voluntary disclosure is successful in mitigating agency and information problems.

An additional motivation relates to recommendations to require more frequent interim reporting and the assumed effects of such regulation (IASC 1996). Understanding how firms choose their reporting frequency and how capital markets react to forced changes in reporting frequency can assist in evaluating proposed changes to the present interim reporting policy. Of particular interest in this regard are the differential effects of voluntary and mandatory increases in reporting frequency.

Mandating more frequent disclosures is not necessarily effective in reducing agency and information problems due to the potential effect on voluntary disclosures. Gigler and Hemmer (1998) argue that requiring more frequent interim reports raises the overall costs of disclosure and leads to less frequent voluntary disclosure. Assuming that voluntary disclosures are more
precise signals of firm value as compared to mandatory reports, such a regime shift could cause investors to receive less timely information about the firm’s future prospects.

In our first test we model excess reporting frequency as a function of proxies for the hypothesized determinants of disclosure policy. We find that firms with higher information asymmetry and agency costs disclose more frequently, as do firms with lower proprietary costs and better prior-year accounting performance. Weaker results indicate that firms in less competitive industries report more frequently than expected. Contrary to our expectations, however, we find evidence that firms with long operating cycles are more inclined to issue interim financial reports.

We then examine how reporting frequency affects the speed at which year-end accounting information is impounded into price during that year (timeliness). Consistent with predictions, we find that annual earnings information is reflected in price more quickly for firms reporting on a quarterly basis than those reporting semiannually. We also find that firms reporting at the mandated minimum frequency have more timely earnings than other firms that were voluntarily reporting at the same frequency in an earlier time period. This finding of more timely earnings for mandatory reporters suggests that firms whose ‘optimal’ reporting frequency is below the mandated frequency could be adversely reducing their voluntary disclosures as argued by Gigler and Hemmer (1998).

We also examine timeliness for our 99 voluntary increasers and 85 mandatory increasers to test whether increasing reporting frequency affects timeliness. We find that in the two years leading up to the increase in reporting frequency, voluntary increasers’ annual earnings were less timely than mandatory increasers’. In the two years after the increase, the voluntary increasers’ timeliness was dramatically higher than it was before the increase in reporting frequency, while the timeliness for mandatory increasers displayed much more limited improvements. These findings lead us question the benefits of mandating more frequent disclosures, albeit tentatively. Because our sample of voluntary (mandatory) frequency
increasers occur from 1952 to 1966 (1967 to 1972), the results could be influenced by intertemporal variation in timeliness unrelated to reporting discretion.

In our final set of tests we examine another measure of capital market effects, the volatility of the firm’s stock return, to test whether the frequency of reporting affects volatility. To control for overall market volatility, we scale individual firms’ return volatility by market volatility. Comparing stock return volatility under different reporting frequencies, we do not find any statistical differences across reporting frequencies. However we do find limited evidence that voluntary increases in reporting frequency are associated with declines in stock return volatility.

Overall we interpret our findings as evidence that firms appear to rationally choose optimal reporting frequencies, and they appear to adjust these frequencies to overcome information asymmetries and agency costs. Our evidence indicates that imposing more frequent reporting requirements increases the timeliness of annual earnings, but that it likely reduces other value-relevant disclosures made by firms. Thus, it is unclear that capital markets would be well served by requiring more frequent disclosures, since that would likely impose suboptimal reporting requirements on many firms.

One important caveat to our findings is the endogenous nature of the disclosure decision and how this is likely to affect our findings of determinants of disclosure policy (see Core, 2001). Managers’ choice of the optimal level of disclosure is complex, involving the endogenous determination of disclosure policy, managerial incentives, and firm governance structure to maximize firm value. For simplicity, our current model of reporting frequency treats some of these factors as exogenous.

The paper proceeds as follows. In the next section, we provide a historical overview of the regulation of financial reporting frequency. Section 3 reviews select relevant literature. Section 4 develops our hypotheses regarding the determinants of financial reporting frequency and the relation between reporting frequency and the decision-usefulness of financial reports. We describe our sample selection and data sources in section 5. Section 6 reports results of our
model of reporting choice, and section 7 reports results for the capital market effects of increased disclosure. The paper concludes with a summary of results.

2 The regulation of financial reporting frequency

Before the Securities Act of 1933 and Securities Exchange Act of 1934 (Securities Acts), financial reporting was governed primarily by stock exchanges. The New York Stock Exchange (NYSE), in particular, actively encouraged interim reporting of financial information to investors as early as the mid-1920s; the American Stock Exchange and regional exchanges were more concerned about the burden that mandating frequent reporting might place on their listed firms and did not take similar steps until the early 1960s (Taylor 1963, 15–23).

With passage of the Securities Acts, the Securities and Exchange Commission (SEC) began to take an active role in regulating reporting frequency. In 1934, it mandated that all exchange-listed firms report annually, and followed up in 1955 by requiring semiannual reporting. Finally, in 1970, the SEC enacted regulation mandating that firms report quarterly.

2.1 The early years: Stock exchanges regulate reporting frequency

The New York Stock Exchange

The first rules governing exchange-traded securities came about after the establishment of the NYSE in 1817 and focused on eliminating fictitious trades. Not until the 1860s did the NYSE request financial information from companies with listed securities (Shultz 1936, 7–8). At this time, the NYSE’s mechanism to get firms to report accounting information was through companies’ original requests to list their securities on the exchange. After the original listing, firms were not obligated to report and few chose to do so voluntarily. During the last three decades of the nineteenth century, the NYSE sought to raise the standard of listing

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1 Leftwich et al. (1981) also provide a detailed discussion of the history of interim reporting regulation.
2 In 1939, the NYSE published an article entitled “Exchange Encourages Interim Financial Reports” in the New York Stock Exchange Bulletin, vol. X, no. 8 (August 1939). This article reports on the progress that the NYSE had made in getting firms to report quarterly, including the efforts it undertook during the 1920s.
requirements, but made financial reporting mandatory only in a few special cases. It did not take strong steps to require financial reporting because most listings on the stock exchange were railroad companies and financial institutions governed by the Interstate Commerce Commission and states, respectively. During these years, the NYSE periodically attempted to persuade companies to report financial information, but it was mostly unsuccessful until the turn of the twentieth century.

Starting around 1900, NYSE listing agreements began to require many firms to report earnings and balance sheet information annually, and this became the norm by 1910. Agreements for semiannual reporting followed within the next ten years (e.g., Cluett, Peabody Company, 1914). Smaller companies and industrials desiring to list were apt to agree to conditions that the older, more established railroads and other large corporations might have been reluctant to make. Companies whose listing preceded the advent of stricter reporting requirements were encouraged, but not required, to issue annual reports. General Motors, for example, modified its listing agreement in November 1916 to include a semiannual “consolidated income statement and balance sheet.”

Beginning in 1923, the NYSE required all newly listed companies to publish quarterly financial statements and began to pressure already-listed companies to publish quarterly. In 1926, the NYSE approached all companies that had not already agreed to quarterly reporting, asking them to amend their listing agreements to include this reporting frequency requirement (NYSE, 1939, 1). These efforts to get all listed companies to report quarterly were reasonably successful. While in 1926 only 25 percent of the 957 NYSE-listed companies were under agreements to publish statements quarterly (8 percent semiannually), by the next year 37 percent had agreed to publish quarterly (15 percent semiannually) (NYSE 1939). In October 1931, the NYSE again wrote to all companies to request quarterly reporting, and by the end of

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3 The earliest agreement to publish financial information appears to be a listing agreement made by the Kansas City (Mo.) Gas Company on September 24, 1897 in which it promised to publish net profits at least twice a year.
the year, 63 percent of the listed companies were reporting quarterly and 17 percent were reporting semiannually (NYSE 1939).

By the mid-1950s, the NYSE’s push to get its companies to report quarterly must have been considered successful, since by then 89.5% of the active domestic companies on the NYSE were publishing earnings estimates quarterly. Moreover, this percentage increased to 95% by November 1962 (Taylor 1963, 11–12). Overall, the NYSE was a driving force in getting its listed firms to report financial statement information more frequently.

**The American Stock Exchange and regional exchanges**

Unlike the NYSE, neither the American Stock Exchange (AMEX) nor the regional exchanges were strong proponents of interim reporting. In fact, the AMEX and regional exchanges were uniformly opposed to mandating more frequent reporting and repeatedly opposed SEC proposals for interim reporting. For example, in 1955, in response to an SEC proposal requiring companies to report semiannually, the president of the AMEX, Edward McCormick, sent a letter to the SEC firmly opposing the interim reporting requirement. Their opposition appeared to be motivated by a concern that some firms, finding the regulations too burdensome, might choose to delist and be traded over the counter.

Some non-NYSE stock exchanges later softened their stance and adopted requirements that newly listed corporations report on a quarterly basis. For example, AMEX made quarterly reporting a requirement of newly listed firms starting in 1962. At this time, the AMEX sent a letter to all listed companies with the new requirements, asking them to report quarterly if they did not already do so. Although some companies did then begin to report quarterly, many others did not.

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4 Letter dated March 7, 1955 to the SEC from G. Keith Funston, President of the NYSE (Taylor 1963, 10).
2.2 The Securities and Exchange Commission

Although the Securities and Exchange Act of 1934 specifically allows the SEC to mandate both annual and quarterly financial statements for exchange-listed corporations, the SEC initially mandated only annual reports. In addition to annual reports, during the years 1934 to 1945, the SEC required firms to issue an 8-K whenever certain special events occurred. The SEC requirements pertained only to firms with securities listed on national exchanges.

In 1945, the SEC took steps to have companies report their financial information more frequently than annually (see timeline in Appendix and Figure 1). The move toward more frequent reporting stemmed from the SEC’s concern that firms whose sales were dominated by war contracts would have large reductions in business and that investors might be caught off-guard. In July 1945, the SEC adopted a rule requiring firms with war business in excess of 25% of sales in the prior year to file a quarterly report (8-K) containing total sales, sales made pursuant to war contracts, and unfilled orders. In 1946, the SEC adopted a rule requiring all firms to report revenues on a quarterly basis, with exceptions for certain industries. Although the SEC preferred that firms report income along with the sales information, it ultimately acquiesced to criticisms that quarterly income information would be unreliable and potentially misleading due to the seasonal nature of some businesses.

In the early 1950s, the SEC wavered on requiring quarterly reporting. It first proposed quarterly reporting of income information, then abandoned the proposal, and later rescinded even its quarterly sales reporting requirements before finally mandating semiannual reporting of income. Proposed in January 1955 and adopted in June of that year, the switch to semiannual reporting required firms to provide semiannual reports within 45 days of the end of the first half of the fiscal year. Firms were required to report sales, net income (before and after taxes), and all extraordinary and special items.

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The SEC did not reconsider quarterly reporting until the end of the 1960s when the Wheat Commission proposed quarterly reporting. As a result, in September 1969, the SEC proposed that companies be required to file quarterly reports on a new Form 10-Q, a proposal finally adopted in October 1970.\textsuperscript{11} Thereafter, firms had to report detailed profit and loss information, earnings per share, and information on the issuer’s capitalization and shareholders’ equity. The rule went into effect so that firms had to report quarterly information for quarters ending after December 31, 1970, although a few select industries such as life insurance companies and public utilities were exempt from the requirement.

3 Related research

Related research on reporting frequency has investigated factors associated with changes in reporting frequency from both empirical and theoretic perspectives.\textsuperscript{12} We provide a brief discussion of these studies below and, as appropriate, provide additional detail on these and other studies as we develop our hypotheses.

Leftwich, Watts, and Zimmerman (1981) (hereafter, LWZ) is the first study of which we are aware to explore the relation between agency costs and voluntary disclosure in the context of interim reporting. In particular, they assess whether the variation in reporting frequency can be explained by factors associated with agency costs and monitoring demand (i.e., growth opportunities and the use of external capital). LWZ attribute their lack of consistent findings to low-powered tests and measurement errors in the dependent and explanatory variables. Bradbury (1992) examines the association between interim reporting frequency in New Zealand and earnings volatility, unexpected earnings, and firm size, but finds no relation between reporting frequency and either earnings volatility or size. Botosan and Harris (2000) examine firms’ decisions to report segment data more frequently than annually during the period 1987–


\textsuperscript{12} There has been considerable research on the usefulness to investors of interim financial reports. IASC (1996) provides a detailed survey of this literature.
94. Their results suggest that firms with low trading volume, firms with high information asymmetry, and growth firms are more likely to have initiated more frequent segment reporting. A common characteristic of these studies is that they focus solely on voluntary changes in reporting frequency.

Another empirical study focusing on interim reporting frequency is McNichols and Manegold (1983), which examines the stock price behavior of 34 AMEX firms that reported annually in 1961 or 1962 and later switched to quarterly reporting. Using short-window, event-study methodology, they predict and find that annual reports have greater information content in an annual-report-only reporting environment, where higher announcement-date return variance corresponds to more information content. Although McNichols and Manegold’s comparison of return volatility under annual and quarterly reporting regimes shares some similarities with our analysis of changes in volatility following mandatory and voluntary increases in interim reporting frequency, ultimately the research questions they address and research designs they use diverge considerably from our paper because of their focus on short-window periods.

Finally, Gigler and Hemmer (1998) develop an analytic model to explain the relation among the frequency of mandatory financial disclosures, the amount of information voluntarily disclosed by privately informed managers, and the resulting informational efficiency of stock prices. A key proposition is that an increase in the frequency of mandatory reporting may actually reduce the timeliness of capital market information because it leads to less frequent voluntary disclosure. The voluntary reports are presumed to be more precise indicators of firm value. Our tests comparing changes in the timeliness of earnings after voluntary and

\[13\text{ Given that regulation requiring semiannual reporting of most exchange-listed firms had been in force since mid-1955, it is unclear why the authors focus on firms reporting annually. Such firms could be in an industry exempt from the semiannual reporting requirements (e.g., financial services, utilities, or seasonal agriculture). Also curious is that the study treats the increases in reporting frequency—some occurring as early as 1963 and nearly 60% occurring in 1964—as mandatory.}\]
mandatory increases in reporting frequency provide some evidence on the empirical validity of their predictions.

4 Hypothesis development

We develop hypotheses on factors influencing managers’ choice of interim reporting frequency and on the capital market consequences of increasing reporting frequency. Consistent with prior research, we expect the reporting frequency decision to be influenced by the following factors: (i) information asymmetries between the firm and prospective investors; (ii) agency conflicts between firm management and shareholders; (iii) costs of disclosure (i.e., proprietary costs); (iv) the length of the firms’ operating cycle; (v) financial performance; and (vi) the regulatory environment. Regarding the effects on the capital market of more frequent interim reporting, we focus on changes in the speed with which accounting information is reflected in price (i.e., earnings timeliness) and shifts in the volatility of firms’ returns. Furthermore, we examine how these effects differ based on whether the firms voluntarily increased their reporting frequency compared to mandatory changes.

4.1 Determinants of financial reporting frequency

Because voluntary interim reporting is a type of voluntary disclosure, we motivate our hypotheses using extant theory and evidence on the factors influencing voluntary disclosure. There has been extensive research on the determinants of disclosure policy, in general, and managers’ incentives to disclose information about the firm, in particular (see Verrecchia (2001), Dye (2001), Healy and Palepu (2001), and Core (2001) for detailed reviews and discussions of this literature). Research focusing specifically on managers’ choice of reporting frequency has been less prevalent, however (see “Related research”).

Firms trade-off the benefits of more frequent disclosure with the associated costs. Potential benefits of more frequent reporting are a lower cost of capital, reduced agency costs, and lower litigation risk. Accompanying these cost reductions are higher costs of report
production and dissemination, proprietary costs, and lower-powered incentives. We develop hypotheses below that reflect these trade-offs.

*Information asymmetry.* Theory suggests that increased disclosure reduces information asymmetry and lowers the cost of capital (Glosten and Milgrom, 1985; Diamond and Verrecchia, 1991). Moreover, as highlighted by Leuz and Verrecchia (2000), an ex-ante commitment to increased disclosure, because it is independent of the information content of the disclosure, should provide even greater cost-of-capital reductions than irregularly occurring voluntary disclosures. The implementation of a more frequent interim reporting policy, albeit not irreversible, is an example of such a commitment. Empirical evidence, too, has been largely supportive of the theory ascribing an inverse relation between disclosure levels and information asymmetry (e.g., Lang and Lundholm, 1993; Botosan, 1997; Leuz and Verrecchia, 2000). Thus, we expect firms for which information problems are most severe to report more frequently in an attempt to mitigate asymmetries and attract additional, lower-cost, capital.

We use a proxy for the firm’s investment opportunity set—the ratio of the book value of assets to firm value, or assets in place—to surrogate for information asymmetry (see, for example, Smith and Watts, 1992, and McLaughlin et al., 1998). We also note that larger firms will generally have richer information environments, which suggests that, based on information asymmetry alone, firm size should be negatively related to interim reporting frequency. Given, however, that size proxies for numerous other constructs (e.g., agency costs and proprietary costs), the predicted negative relation between size (as proxied by the logarithm of the market value of equity) and interim reporting frequency is tenuous. We therefore view firm size more as a control variable and make no prediction regarding its relation to reporting frequency. We predict that firms with greater information asymmetry—i.e., those for which a larger proportion of firm value derives from future investment opportunities—benefit more from frequent financial reporting. Hence, we expect reporting frequency to be negatively related to the ratio of the book value of total assets to firm value.
Agency costs. Agency costs create a demand for monitoring, and financial reporting is one means of reducing these agency problems (Jensen and Meckling, 1976). Based on this proposition, LWZ use agency theory to motivate their explanation of cross-sectional and intertemporal variation in firms’ interim reporting frequencies. Following LWZ, we expect firm reporting frequency to vary as a function of assets-in-place and capital structure, which serve as proxies for agency costs and the benefits of monitoring.

Firms with greater assets-in-place have lower agency costs because it is more difficult for managers to misappropriate well-defined assets in place than to extract value from uncertain growth opportunities. Since they have lower agency costs, they can lower their reliance on disclosures to overcome those costs. Here, we use the assets-in-place variable as a proxy for agency costs, whereas above we use it as a proxy for information asymmetry. The predicted relation is the same in both cases; namely that reporting frequency is negatively related to the ratio of the book value of total assets to firm value.

Capital structure, too, influences, and is influenced by, agency costs. Firms with a greater percentage of outside investors—usually larger firms—tend to have higher agency costs, suggesting firm size as a crude proxy for the percentage of the firm held by outsiders. However, as discussed above, since firm size is a noisy proxy for so many underlying constructs, we include it only as a catch-all control variable. Firms with more debt financing also have higher agency costs and a greater demand for monitoring. If financial report publication complements the use of other debt-provider monitoring, we expect firms with more financial leverage to report more frequently. However, certain forms of debt (e.g., bank debt) may rely on substitute, rather than complementary, monitoring mechanisms. Because we do not control for variation in monitoring demand resulting from different forms of debt, the predicted relation between our leverage variable, debt to firm value, and reporting frequency is indeterminate.

Finally, we control for other forms of monitoring using an exchange-listing variable. We define this variable as an indicator variable that takes the value one if a firm lists its shares on the American Stock Exchange, and zero if on the New York Stock Exchange. Given the
historically less stringent interim reporting requirements of the AMEX, we expect AMEX firms to publish interim reports less frequently than NYSE firms and thus predict a negative relation between reporting frequency and our exchange-listing dummy variable.

Proprietary and other disclosure costs. Disclosing information, voluntarily or due to regulation, can be costly for firms. An important source of these disclosure costs is the competitive harm that results when firms provide proprietary information to competitors and potential market entrants. The magnitude of such costs varies by industry and tends to be higher for focused firms and for firms in concentrated industries. More concentrated industries are generally less competitive and thus more likely to protect economic rents from prospective industry entrants by reporting less often (Harris, 1998). This suggests a negative relation between our proxy for competition, the four-firm concentration ratio, and reporting frequency. In addition, firms have an incentive to conform to industry disclosure practices, and therefore we expect a positive relation between a firm’s frequency of reporting and average reporting frequency in its industry.

Informativeness of more frequent reports. Frequent disclosures are more valuable for some firms than others. As a firm’s operating cycle increases, errors in accrual estimation grow (Dechow and Dichev, 2001). Shortening the reporting interval exacerbates these estimation errors and results in noisier financial reports. Therefore, we expect firms with longer operating cycles to be less inclined to issue interim reports more frequently than required.14

Firm performance. As discussed in Lang and Lundholm (1993), recent theory and empirical evidence on voluntary disclosure offer no clear-cut predictions on the relation between firm performance and levels of voluntary disclosure. Most researchers agree, however, that the two are related. Assuming better-performing firms are more likely to exceed disclosure cost thresholds, there should be a positive relation between firm performance and interim reporting

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14 Similarly, the incentives of firms to report more frequently are likely to vary as a function of the seasonality of the firm’s business, although the precise relation is unclear.
frequency. However, poorly performing firms would report more frequently if doing so reduced litigation costs or improved access to outside capital. We proxy for firm performance using lagged return on assets, but we make no prediction regarding the sign of the relation between reporting frequency and lagged ROA.

Regulation. Of course, regulation itself is necessary to induce some companies to report more frequently. As a result, all else equal, we expect firms to report more frequently as the implementation of frequency-increasing regulation approaches. Although our tests control for such intertemporal variation, we do not formally test this hypothesis.

4.2 Capital market consequences of increasing interim reporting frequency

Implicit in the debate over the reporting frequency of interim financial statements is the question of whether mandating more frequent reporting improves investors’ (and other financial statement users’) ability to make decisions. In exploring whether the frequency of interim reporting affects decision-usefulness, we first consider the effects of changes in reporting frequency on two important aspects of the information environment: (1) voluntary disclosures made by firms, and (2) competing (i.e., non-firm) information sources. Based on this discussion, we then make predictions based on how reporting frequency affects the speed at which accounting information is impounded into price (timeliness), a construct of longstanding interest to accounting researchers (e.g., Ball and Brown, 1968; Foster et al., 1984; Alford et al., 1993; Ball et al., 2000). We similarly examine whether stock market volatility differs based on various reporting regimes (Ohlson, 1979; Yee, 2001).

4.3 Effects of reporting-frequency regulation on alternative information sources

In addition to the direct effects on price formation, altering the frequency of mandatory financial reports can indirectly affect price formation through its impact on voluntary disclosure. In particular, Gigler and Hemmer (1998, 2001) predict that requiring more frequent interim reporting will reduce voluntary disclosure because it raises the costs of disclosure. The
additional costs associated with more stringent reporting requirements include costs of production and dissemination, legal costs, proprietary costs, and lower-powered incentives. The net effect of these additional costs is to make voluntary disclosure less economically valuable and thus more infrequent.

Independent of the higher costs of mandatory disclosure, requiring more frequent interim reports also mitigates information asymmetries between managers and investors and therefore directly reduces the value of voluntary disclosures for firms. For example, the voluntary disclosure of an earnings forecast can be used to revise expectations when management believes investors have significantly over- or underestimated the firm’s future prospects. By providing investors with more frequent earnings signals, interim reporting better aligns investor expectations with those of management and thus reduces the need to issue expectation-correcting forecasts.

Requiring more frequent reporting can also alter the incentives of competing information sources (e.g., financial analysts) to seek out and analyze information. Because more frequent financial reporting reduces the gap between the market’s expectation of earnings and the expectation conditional on full information, it will likely decrease the returns to analyst forecasting. On the other hand, additional mandated disclosures will likely reduce the costs for analysts to produce and analyze information. The net effect on the incentives of financial analysts and other competing information is uncertain.¹⁵

### 4.4 Earnings timeliness

The usefulness of accounting earnings has been well-established in prior literature. As far back as Ball and Brown (1968), researchers have successfully demonstrated that if accounting information is known in advance, it can be used to separate firms based on stock market performance. One measure of earnings usefulness is earnings timeliness, which measures how

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¹⁵Francis et al. (2000) find that over 1986–95 the information in analyst reports serves as a complement to, not a substitute for, information in earnings announcements.
quickly earnings information is impounded into price. Although the earnings report may not be
disclosed until the end of the reporting period, earnings information affects price well before a
final earnings number is disclosed through voluntary management forecasts and analyst
research (Beaver et al., 1980). We first investigate whether timeliness differs across reporting
frequencies and then whether it changes after voluntary or mandatory increases in reporting
frequency.

### 4.4.1 Earnings timeliness across different reporting frequencies

Although it may seem self-evident that more frequent interim reporting would allow more
accurate and timely predictions of annual earnings, researchers in the late 1960s debated this
question. Green and Segall (1967) began the debate by claiming that since interim reports are
not designed to help predict annual earnings per share, it is not clear that they would provide
that benefit. Using historical information and first quarter earnings for a sample of 50 firms,
Green and Segall (1967) find that prediction models of 1964 EPS based only on annual earnings
perform similar to models that also use first quarter earnings. They conclude, albeit tentatively,
that “first-quarter reports, as presently prepared, are of little help in forecasting annual EPS.”
Brown and Niederhoffer (1968) refute Green and Segall (1967) using a much more
comprehensive database of 519 Compustat firms. They find that including first quarter earnings
in prediction models improves forecasts of annual earnings, and that the predictions improve
with each subsequent release of quarterly reports.

Based on the evidence in Brown and Niederhoffer (1968), we believe that issuance of
interim reports will allow market participants to predict annual earnings earlier in the year, and
therefore we expect annual earnings information to be impounded into price more quickly (e.g.,
timely) under interim reporting regimes. Formally, we predict that annual earnings is more
timely under a quarterly reporting regime than under either annual or semiannual reporting.

While we believe that a switch from annual to semiannual reporting or a similar switch
to quarterly reporting may improve timeliness, these benefits are likely to diminish as the
earnings measurement interval declines. Accounting results from shorter reporting periods are less reliable than longer periods and are also less representative of the year as a whole.

While the previous hypothesis predicts that timeliness varies, in general, based on reporting frequency, this effect might further depend on whether the firm is reporting in excess of the required frequency. Gigler and Hemmer (1998) argue that imposing additional mandatory reporting requirements will cause firms to reduce other disclosures that are more precise indicators of firm value. Therefore, under more frequent mandatory reporting, accounting information is expected to consume a higher percentage of the information available to investors. Based on this discussion, for a given level of reporting frequency (semiannual or quarterly), we expect that firms reporting at the mandatory minimum will have timelier earnings as compared to those voluntarily reporting at the same frequency.

4.4.2 Timeliness surrounding voluntary and mandatory increases in reporting frequency
We observe some firms voluntarily increasing their reporting frequency. Perhaps firms undertake this increase to reduce information asymmetries or to reduce monitoring costs. In fact, any of the motivations discussed in section 4.1 (determinants of disclosure choice) are potential reasons for a voluntary increase in reporting frequency. As mentioned in the previous section, since annual earnings is an aggregation of interim-period earnings, frequent reporting assists in estimating annual earnings and therefore should result in more timely annual earnings. The anticipated improvement in forecast accuracy and the potential reduction in information asymmetries lead to the prediction that the timeliness of annual earnings will increase following a voluntary switch from semiannual to quarterly reporting.

Predicting the effects of a mandated frequency increase on earnings timeliness is not as straightforward as it is in the case of a voluntary increase. At first glance, a mandated increase in frequency appears to have a similarly beneficial impact on the timeliness of earnings, again due to aggregation. If, however, mandating more frequent reporting reduces voluntary disclosures (Gigler and Hemmer, 1998), frequency-increasing regulation could potentially
reduce timeliness if the mandatory reports are less timely than the voluntary reports that they replace. That said, the Gigler and Hemmer (1998) argument refers to overall disclosures and not just earnings disclosures. Since the earnings information, in particular, will be disclosed at least as frequently as before, we still expect to find an increase in timeliness following a mandated disclosure increase, albeit the impact is expected to be less than a voluntary increase.

4.5 Return volatility

We also examine whether stock market volatility differs with reporting frequency. Yee (2001) models interim reporting using a multi-period Kyle framework. He argues that more frequent reporting will reduce volatility because it distributes surprise news over more interim reports. This higher reporting frequency will therefore reduce reporting-day price movements. This leads to our prediction that return variability will vary inversely with reporting frequency.

We next consider volatility surrounding voluntary and mandatory increases in interim reporting frequency. As discussed previously, one reason for increased voluntary disclosure is to reduce information asymmetries and investor uncertainty. Assuming the voluntary increase will have the desired effect, we predict that return variability will decline after a voluntary increase in interim reporting frequency from semiannual to quarterly.

Firms required to increase reporting frequency do not necessarily have the same type of concerns about information asymmetries or investor uncertainty as voluntary increasers. Since a mandated increase in reporting may induce firms to eliminate more precise disclosures (Gigler and Hemmer, 1998), we do not expect return volatility to decrease following a mandatory increase in reporting frequency. In fact, volatility might actually increase.

5 Sample and data

5.1 Sample selection and data sources

To collect our sample, we first compiled the names and perm numbers of all NYSE and AMEX firms on the monthly CRSP tapes in any year from 1950 through 1973. We exclude certain
regulated industries (two-digit SIC codes) whose disclosure rules are potentially different from the SEC’s: utilities (49); financial services, insurance, and real estate firms (60–67); and railroads and other transportation companies (40–41). We also exclude firms whose primary SIC code begins with 9. The total number of firms included on CRSP from 1950 to 1973 is 4,164, of which 462 are firms in excluded industries. This leaves us with as many as 3,702 sample firms for which to collect reporting frequency data.

As our source of how frequently each company published financial statements in each year, we use the semi-weekly news publication Moody’s Industrial News Reports. Moody’s binds these reports annually, and we use the index from this annual edition as our primary source of reporting frequency.16 Our final sample includes 28,824 firm-year observations, which include all firm-years for which both the frequency of reporting and CRSP data (returns for 12-month period prior to firm’s year-end) are available.

Table 1 contains the frequency of financial reports issued during the year by individual firms over the period 1950–73. We pool firms over 3-year periods and report the mean frequency by industry. We also separately report NYSE from AMEX firms, since the reporting requirements of the two stock exchanges differed. Our observations for AMEX firms begin in the 1962–64 period because CRSP did not start reporting AMEX data until July 1962.

A few patterns are apparent from Table 1. First, even in the early 1950s, the majority of the firms report quarterly. As early as 1950–52, NYSE firms are reporting an average of 3.62 times per year. Second, average reporting frequency increases monotonically over time, which is at least partially due to the frequency-increasing regulation imposed by the SEC both in 1955 and 1970. By 1971–73, reporting frequency for NYSE firms had grown to an average of 3.94 times per year. Third, NYSE firms report more frequently than AMEX firms, on average, consistent with the NYSE’s stronger historical emphasis on frequent reporting.

16 In some cases, we supplemented the use of the index by looking at actual news reports. For example, on rare occasions, Moody’s lists only a semiannual earnings report in the index. Recognizing that the firm would have also filed an annual report, we reviewed the actual news reports and found the annual report Moody’s had mistakenly excluded from the index.
Finally, firms in industries exhibiting seasonal sales patterns appear to report less frequently than others. For example, in the 1950–52 period, firms involved in either wholesale or retail trade (SIC 50–59) report an average of 3.06 times per year, whereas heavy manufacturing firms reported 3.80 times per year. The differences in reporting frequencies are even more pronounced when firms are partitioned based on 2-digit SIC codes (non-tabulated). For example, in the 1950–52 period, the 90 NYSE firms classified under SIC code 53, general merchandise stores, reported only 2.54 times per year. This is consistent with quarterly sales data being less informative for such stores, as most sales occur in the last quarter of the year.

5.2 Sample of frequency-increasing firms: Mandatory versus voluntary increasers

Among the goals of this paper is to improve our understanding of why firms change their frequency of reporting and the capital market effects of such a change. As discussed previously, we expect firms to alter reporting frequencies to reduce the cost of capital and agency costs. In some cases, firms will voluntarily alter their reporting frequency, while in other cases they may be required to change due to new regulations.

It is instructive to consider the options that firms have in regard to changing their reporting frequency (see figure 2). Initially, firms can be classified as either switchers or non-switchers. If we observe that a firm altered its reporting frequency, one possibility is that there was a mandatory increase in reporting frequency imposed by a regulatory body (mandatory increasers). Alternatively, the firm might have chosen to voluntarily increase (voluntary increasers) or decrease (voluntary decreasers) its reporting frequency. Finally, the firm might choose an action that requires it to disclosure more frequently, such as moving from an exchange requiring less frequent reporting (e.g., AMEX) to one requiring more (e.g., NYSE).

For our purposes, we require a sample of firms that permanently increased their reporting frequency. To restrict our sample to such firms, we include the following screens. First, we exclude firms having no CRSP data for the four-year period surrounding the switch (from two years prior to the switch through one year after the switch). Next, we require that the
change in reporting frequency be for at least one year. This excludes, for example, firms that had been reporting quarterly, reported semiannually for one year, and then resumed quarterly reporting. We also exclude firms that had previously established a pattern of reporting at the higher frequency. So our basic requirement is that a firm reports two years in a row at the lower frequency followed by two years at the higher frequency. We also require accounting earnings for the same four-year period, which we either obtain from Compustat or hand-collect. We identify 184 firms with a sustained increase in reporting frequency from semiannual to quarterly.

Table 2 reports the distribution of the switching firms over the fiscal-year end of their event-year. The first year of the new (higher) reporting frequency is classified as the switch year. The SEC mandated quarterly reporting starting in 1970, and we classify firms that switched prior to 1967 as voluntary switchers, and all others as mandatory switchers. We include firms that switched in the years leading up to the 1970 change because SEC discussions and proposals about the change had already taken place. We also include a few firms who changed after 1970 because the SEC gave firms in some industries extra time to comply. Of the total of 184 switching firms, we identify 99 of the switchers as voluntary and 85 as mandatory.

Part of our sample consists of firms that delayed increasing their reporting frequency reporting until required by regulators. Because this sample selection is nonrandom, one major concern is that factors associated with the probability of being selected into the sample may also influence the relation between stock returns and accounting information. For example, if our nonrandom sample of firms has lower information asymmetry than other firms, we may detect little change in the timeliness of their accounting information if we fail to consider this selection bias. More generally, we expect cross-sectional variation in information asymmetry and the demand for monitoring to affect firms’ propensity to disclose voluntarily, as well as the relation between accounting information and price.

As a first step in addressing selection bias, we present evidence on the characteristics that we expect to influence firms’ reporting frequency choice. The greater the differences along
these dimensions between firms reporting at the minimum required frequency and those reporting more often, the greater caution we must exercise in interpreting our results.

5.3 Descriptive statistics for entire sample

Table 3 reports descriptive statistics for sample firms partitioned into two periods: 1950–55 (annual reporting required) and 1956–70 (semiannual reporting required). To be included in the subsequent analysis, a firm must have total assets greater than $100,000 for both the current and prior year, and must also have CRSP monthly return data for the entire 12-month period of each year. Since we collect data for the overwhelming majority of firms on CRSP, the data in this table is essentially the entire population of firms listed on both CRSP and COMPUSTAT during the period 1950–70. The table includes statistics on disclosure frequency, firm size, and other variables used in our model of determinants of disclosure policy.

Our dependent variable is excess reporting frequency, defined as reporting frequency in excess of the mandated minimum frequency. For 1950–55, the excess reporting frequency is the actual reporting frequency less 1, while in the 1956–70 period, it is the actual frequency less 2. The mean excess reporting frequency in the 1950–55 period is 2.68, which decreases to 1.82 in the 1956–70 period. Table 3 also reports statistics for three measures of firm size: total assets, market value of equity, and book value of equity.

Table 3 also contains descriptive statistics for the five factors our model predicts will affect disclosure frequencies. The first factor is information asymmetries. One proxy for information asymmetry is the following measure of stock market liquidity, share turnover: the aggregate annual volume of shares traded in the individual stock as a percentage of the average total shares outstanding. The mean (median) liquidity is 18% (11%) for 1950–55, increasing to 32% (20%) for 1956–70. The increase in liquidity could be due to changes in the overall liquidity of the U.S. stock market. Information asymmetries are also expected to vary positively with

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17 Monthly volume data is available on CRSP only beginning in 1963. For the years prior to 1963, we hand-collect the annual volume data using the Bank’s Price and Quotation Record.
growth options. Our proxy for growth options, ASSETS_IN_PLACE, is the book value of assets (Compustat item #6) divided by total firm value, where total firm value is the book value of liabilities (item #18) plus the market value of equity. Firms with higher assets in place have lower growth options. The mean (median) assets in place is 1.01 (1.01) for the early period and 0.80 (0.79) for the later period. To the extent that this variable is a good proxy, firms in the more recent period exhibit a greater degree of information asymmetry (significant at the 0.001 level).

A second factor explored is whether agency costs (and monitoring) affect disclosure policy. Firms with higher levels of debt have greater agency costs, while firms with more assets in place have lower agency costs. We define LEVERAGE as the book value of debt (Compustat item #181) divided by total firm value. From Table 3, this measure of leverage appears similar for our earlier and later period firms. The mean (median) leverage is 0.36 (0.34) for the early period and 0.33 (0.31) for the later period. We present descriptive statistics for an alternative measure of assets in place, net property plant and equipment (item # 8) divided by total firm value. Because the alternative measure is highly correlated with ASSETS_IN_PLACE (defined above), we include only ASSETS_IN_PLACE in our reporting choice model.

The propensity for firms to disclose is also affected by proprietary costs. Industries with higher concentration of firms tend to be more profitable, and we expect firms in these industries to be less likely to disclose to avoid giving away proprietary information.\textsuperscript{18} We use two measures of market structure commonly used in the industrial organization literature: the four-firm concentration ratio (CR\textsubscript{4}), the sum of the market shares of the four largest firms in the industry, and the Herfindahl-Hirschmann Index (HHI), the sum of the squared market shares of each firm in the industry. Using $S$ to denote total sales for firms in a given Compustat two-digit SIC code, $s_\text{i}$ to represent the sales of the $i$th largest firm in the industry, and $n$ to be the number of firms in the industry, we define CR\textsubscript{4} and HHI as follows:

\textsuperscript{18} An opposing argument that firms in concentrated industries are more likely to have sustainable advantages (e.g., monopoly power), and are therefore more willing to disclose because they are less likely to be hurt by proprietary information.
\[ CR4 = \sum_{i=1}^{S} \times S \quad \text{and} \quad HHI = \sum_{i=1}^{S} \left( \frac{S_i}{S} \right)^2. \]

Both measures of industry concentration are greater in the earlier period than in the later period. The mean (median) \( HHI \) is 0.16 (0.12) in the earlier period and 0.10 (0.06) in the later period. For both measures, we compute sales for each industry by aggregating across all firms in the same two-digit SIC code on Compustat. Since Compustat is less comprehensive in the earlier period, our measures of industry concentration might be overstated during that time.

A firm’s propensity to disclose interim reports also depends on the value of more frequent disclosure. For example, frequent disclosures are arguably less valuable for firms with longer operating cycles, where operating cycle it is defined as follows:

\[
\text{Days in Operating Cycle} = \text{Days in Accounts Receivable} + \text{Days in Inventory}, \quad \text{where}
\]

\[
\text{Days in Accounts Receivable (AR)} = 365 \left( AR_t + AR_{t-1} \right)/2SALES_t, \quad \text{and}
\]

\[
\text{Days in Inventory} = 365 \left( Inventory_t + Inventory_{t-1} \right)/2COGS.
\]

Compustat item numbers for accounts receivable, sales, and inventory are 2, 12, and 3, respectively. In our tests, we use operating cycle as a fraction of the year. For early-period firms, the mean (median) of this variable is 0.28 (0.24), while it is 0.32 (0.30) in the later period.

Finally we include the following measures of firm profitability in the analysis: return on assets, return on equity, prior 12-month raw stock return, and prior 12-month market-adjusted return. Table 3 shows that the early-period firms tend to be more profitable across these measures. This higher level of profitability might be due to back-filling of data by Compustat.

6 The choice of reporting frequency

In modeling reporting frequency choice, we attempt to measure firms’ propensity to report more frequently than required, or, more generally, firms’ propensity to make voluntary disclosures. As developed in section 4, we expect this unobservable variable to depend on factors influencing the benefits and costs of disclosure; hence,

\[
\text{Voluntary Reporting} = f\left(\text{Information Asymmetry, Agency Costs, Proprietary Costs, Informativeness of Shorter Measurement Intervals, Performance}\right).
\]
We proxy for the latent dependent variable in two different ways. Our first measure is \textit{EXCESS\_FREQUENCY}_1 (\textit{EF1}), the firm’s actual reporting frequency less its SEC-required reporting frequency. So, if firm \textit{i} reports \textit{k} times in a given year \textit{t},

\[ EF1_{it} = \begin{cases} k - 1, & t = 1951 - 55, \\ k - 2, & t = 1956 - 70, \\ \end{cases} \]

which is an ordinal variable ranging from \(-1\) to \(3\) for the sample.\(^{19}\)

By construction, \textit{EF1} assumes that a firm’s tendency to report more frequently is a linear function of the number of times it reports and the minimum reporting requirement; the variable thus establishes a precise ordering of firms’ preferences for voluntary reporting. Based on this metric, for example, a firm that reports quarterly in 1955 and 1956 is assumed to be less forthcoming with voluntary disclosures in 1956 than it was in 1955. Because our estimation procedure (see below) assumes ordinality of the dependent variable, if \textit{EF1} ranks underlying preferences incorrectly, regression coefficient estimates could be biased.

Given the potential bias in using \textit{EF1}, we also test our hypotheses using an indicator variable equal to one if a firm reports more frequently than required. This mitigates possible bias but reduces efficiency since \textit{EF2} discards information contained in \textit{EF1} (Long, 1997, 148–49). We define the binary choice variable in terms of \textit{EF1} as follows:

\[ EF2_{it} = \begin{cases} 1 \text{ if } EF1 > 0, \\ 0 \text{ otherwise.} \end{cases} \]

To estimate our model of reporting choice using \textit{EF1} as the dependent variable, we run twenty annual, cross-sectional ordered logit regressions and use the Fama-MacBeth (1973) procedure to estimate coefficients and test statistics for the full twenty-year period. Each coefficient estimate is the average of the annual regression slopes for 1951–70, and the estimated

\(^{19}\) During the period 1956–70, we identify 166 firms that issued no interim reports; that is, they issued only one financial report during the year, the annual report. Because the SEC required semiannual reporting during this period, \textit{EXCESS\_FREQUENCY} is \(-1\) for these firms.
The coefficient’s \( z \)-statistic is the average slope divided by its time-series standard error for the twenty-year period. The \( EF2 \)-model we estimate using Chamberlain’s (1980) conditional (fixed effects) logit procedure (see Greene, 1997, 899–901).

The results of estimating each regression specification are included in Table 4. Although the coefficient estimates and related \( z \)-statistics are generally higher for the Fama-MacBeth ordered logit regressions than for the conditional logit regression, the signs of the coefficient estimates are identical and the resulting inferences are largely the same. Thus, even if bias affects the \( EF1 \) results, the effect is immaterial.

As predicted, our proxy for firm growth options, \textsc{assets\_in\_place}, is negatively related to a firm’s likelihood of reporting more frequently than required (with significance at the 0.01 level or better). This is consistent with there being a greater demand for reporting when information problems are severe and agency costs are high. More frequent reporting thus serves to either mitigate information asymmetries between the firm and prospective investors, to ameliorate agency problems through improved monitoring of the firm’s managers, or both.

In addition, consistent with both the NYSE having more stringent reporting requirements than the AMEX and the evidence in LWZ, the role of exchange listing in determining reporting frequency is significant. Of course, reporting frequency and exchange are endogenously determined: firms choose where to list conditional on the exchange’s expected reporting requirements and the firm’s reporting frequency choice. As LWZ point out, firms that choose to list on the NYSE may value the monitoring benefits of more frequent reporting.

Industry reporting practices, as reflected in the mean annual reporting frequency of an industry’s constituent firms, also have a highly significant influence on an individual firm’s choice of reporting frequency; that is, if other firms in a given firm’s two-digit SIC code report more frequently than required, that firm is likely to conform to industry reporting practices.

Our results on the relation between firm performance and reporting frequency are supportive of theory that better-performing firms disclose at higher levels, perhaps because they are more likely to exceed disclosure cost thresholds. The estimated coefficient on \textsc{roa} is
significantly positive at the 0.10 level. Results using lagged market performance instead of lagged accounting performance yield similar results.

We find no evidence that firms in concentrated industries or firms with longer operating cycles report less frequently. On the contrary, our evidence suggests that firms with longer operating cycles are much more likely to report at voluntarily high frequencies (0.01 level of significance). This is inconsistent with the hypothesis that more frequent reporting and the accompanying shorter measurement periods result in noisier, less informative financial reports for such firms. We also find weak evidence that firms in concentrated industries, as measured by the four-firm concentration ratio, report more frequently, perhaps because these firms have sustainable competitive advantages making proprietary costs low. Finally, the estimated coefficients on our proxies for firm size and financial leverage, neither of which has an unambiguously predicted relation to reporting frequency, are insignificantly different from zero. These results, as are those discussed above, are exceptionally robust to changes in empirical proxies and regression specifications.

To summarize, the evidence on reporting choice confirms the hypotheses that firms with more asymmetrically informed investors, higher agency costs, and better performance tend to report more frequently, as do NYSE firms and industries whose firms have high mean reporting frequencies. Puzzlingly, our results contradict the hypothesis that firms with long operating cycles benefit less from frequent interim reporting. Firms in concentrated, presumably less competitive, industries also report more frequently than expected.

7 Capital market consequences of increasing interim reporting frequency

Over the period 1950–73, firms in the United States reported financial results at frequencies varying from annual to quarterly. We investigate whether reporting at different frequencies affects either the speed at which accounting information is impounded into price (timeliness) or

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20 Replacing the four-firm concentration ratio with the Herfindahl-Hirschmann index in the regressions does not affect inferences.
the volatility of returns. Our tests compare the timeliness of accounting earnings and volatility of returns across reporting frequencies, as well as before and after increases in frequency.

We first partition all firms into annual, semiannual, and quarterly reporting frequencies, and examine timeliness and volatility across these reporting regimes. We expect more frequent reporting to result in more timely earnings. Predictions for volatility, however, are less clear due to the endogenous nature of the reporting frequency decision. We also partition the sample into firms voluntarily reporting above the minimum required frequency and firms reporting at the SEC minimum. We then compare the earnings timeliness and volatility of these two groups.

Next, we examine the sample of firms that increased their frequency of reporting and test for changes in timeliness and volatility surrounding the switch. Our tests compare the timeliness of accounting earnings and volatility in the two years before the switch to the two years after the increase in reporting frequency. In comparing these properties before and after the change, our sample acts as its own control, mitigating effects that might differ across firms. To implement this design, we require firms to have price and return data for the four years surrounding the increase in reporting frequency (years t–3 to t+1), as well as five years of financial accounting information. Since firms must be successful enough to survive for the entire period, this requirement introduces some survivor bias. In what we believe are the most compelling comparisons in the paper, we compare the capital market effects of firms that voluntarily increased their frequency to those that were required to switch.

7.1 Tests of timeliness

To measure how quickly earnings information is impounded into price, we use a methodology similar to that used by Alford et al. (1993), which is based on Ball and Brown (1968). We first construct hedge portfolios assuming that, as of the beginning of the year, we had perfect foresight of year-end (annual) earnings. To create these ‘perfect foresight of earnings’ portfolios, we rank firms based on the change in primary earnings per share (before

Where necessary, we hand-collect the financial accounting information.
extraordinary items) divided by beginning of year stock price per share, \((EPS_t-EPSt-1)/P_{t-1}\), and form a hedge portfolio comprising a long position in the top forty percent of firms and a short position in the bottom forty percent. We also form ‘perfect foresight of returns’ hedge portfolios by ranking the sample on annual stock returns and similarly going long in the top forty percent and short in the bottom forty percent.

To test for timeliness, we examine how quickly the returns to the earnings-based hedge portfolio \((EHPRett)\) are earned over a fifteen-month window ending three months after year-end. We present our results graphically in figures 3 and 4 and report the area under these graphs and the results of statistical comparisons. To construct the graphs in figures 3 and 4, we compute the return to \(EHPRett\) earned as of the end of each month \(t (t=1,15)\) as a percentage of the fifteen-month return to the returns-based hedge portfolio. The larger the area under each of these graphs, the more timely the earnings information is reflected in returns.

7.1.1 Timeliness of annual earnings across different reporting frequencies

We compare the timeliness of earnings across annual, semiannual and quarterly reporting frequencies. Partitioning firms based on reporting frequency gives us a sample of 272 firms reporting annually, 1,180 firms reporting semiannually, and 17,334 reporting quarterly, over the entire 1950–73 period. We construct separate hedge portfolios for each frequency of reporting. Since market conditions vary from year to year, we rank firms separately in each year for each reporting frequency. We retain all firms in the top and bottom 40% of earnings changes and returns to use for our portfolios. For each reporting frequency (semiannual and quarterly), we pool these observations across years and create one large hedge portfolio for each frequency that goes long in all firm-year observations classified in the top 40%, and short the bottom 40%.

Figure 3, Panel A, reports the timeliness graphs for semiannual and quarterly firms.\(^{22}\) The shaded region represents timeliness for semiannual reporters and the dashed line on top

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22 We have omitted the timeliness plots for firms reporting annually to economize on space. The plots and related inferences are similar to those for semiannual reporters.
relates to quarterly reporters. The shape of these graphs suggests that, on average, annual earnings information is impounded into price quicker for firms reporting quarterly than for firms reporting semiannually. The area under the graph for the semiannual reporters is 2.21, while the area for the quarterly reporters is 2.95.

Figure 3, Panel B, reports the timeliness graphs for semiannual reporters and quarterly reporters, comparing firms reporting at the mandatory minimum to those voluntarily reporting at a higher frequency. For the semiannual reporters, the graph of the firms reporting at the mandated minimum is similar to the graph for firms voluntarily reporting at that frequency. For the quarterly reporters, the timeliness of the graph for the mandatory reports is uniformly higher than that of the voluntary reporters. This latter finding is consistent with Gigler and Hemmer (1998), who argue that mandating more frequent reporting may induce firms to reduce other voluntary reports and induce the market to place more weight on earnings.

Overall, the graphs in figure 3 suggest that, on average, the timeliness of earnings for firms reporting on a quarterly basis is higher than that of firms reporting semiannually. This finding cannot be interpreted as a reason to require firms to report more frequently, however. One possible cause of the increased timeliness is that when the SEC mandates more frequent reporting, firms reduce other voluntary disclosures, thereby allowing accounting information to represent a larger percentage of the total information available to investors.

7.1.2 Timeliness of annual earnings for firms that increased frequency: Voluntary versus mandatory increasers

We also test timeliness using the sample of firms that increase their frequency of reporting. We identify 99 firms that increase their frequency of reporting from semiannual to quarterly during 1950–66 (voluntary increasers), and 85 firms that do so during 1967–70 (mandatory increasers). Table 5 provides descriptive statistics for these samples both before and after the change in frequency. Voluntary increasers are, on average, larger and more liquid than mandatory increasers, and the former also tend to have fewer assets in place as a percentage of firm value.
In our tests, we compare the timeliness of earnings before the frequency increase to timeliness after the increase and also compare the earnings timeliness of voluntary increasers to that of mandatory increasers. The first graphs in Figure 4, Panel A, are timeliness graphs for firms that voluntarily switched from semiannual to quarterly reporting. The shaded region depicts earnings timeliness for firms reporting on a semiannual basis (i.e., before the increase in frequency), and the dashed line represents timeliness for firms reporting on a quarterly basis (i.e., after the increase in frequency). Timeliness improves drastically after the increase in frequency. Before the increase to quarterly reporting, the area under the timeliness curve is 1.47, while after the increase in frequency the area has risen to 3.03, a difference of 1.56 ($t = 5.48$).

Additionally, the fifteen-month return on the earnings-based hedge portfolio divided by the fifteen-month return to the returns based portfolio is only 23.6% in the pre-frequency increase period, while it rises to 47.3% after the voluntary increase in reporting frequency. Our findings suggest that voluntary increasers’ earnings timeliness increases significantly. The findings do not suggest, however, that all firms would receive similar benefits from increasing reporting frequency, since the decision to report more frequently and the resulting improvements in earnings timeliness are determined by the firm-specific characteristics of a select group of firms.

Figure 4, Panel A, also contains timeliness graphs for firms that increased reporting frequency due to changes in SEC reporting regulations. The shaded region represents the timeliness of such firms before the increase in frequency. Timeliness appears to improve marginally after the increase in frequency. In the period before the increase, the area under the curve is 2.46, while after the frequency increase it rises to 2.92, a difference of 0.46. While not nearly as dramatic as the increase for voluntary increasers, the increase is statistically significant ($t = 3.78$). Additionally, the scaled returns to the hedge portfolio rise from 32.7% to 37.3%.

Finally, Figure 4, Panel B, contains the timeliness plots that directly compare voluntary

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23 This difference is calculated by comparing the fifteen monthly observations on the graphs of pre-frequency-increase timeliness to the fifteen monthly observations on the graphs of post-frequency-increase timeliness.
reporters to mandatory reporters in the pre-frequency increase period and in the post-frequency increase period. In the pre-frequency increase period, the timeliness of the voluntary switchers is significantly lower ($t = 8.03$) than that of the mandatory switchers. The area under the curve for voluntary firms is 1.47, while the area under the curve for mandatory switchers is 2.46. One reason our sample firms might have voluntarily increased reporting frequency is to improve the relatively poor timeliness of their earnings information. The next graph compares the voluntary and mandatory reporters in the post-frequency increase period. After the switch, the timeliness of the voluntary and mandatory reporters—both now reporting quarterly—is similar. The area under the voluntary reporters’ curve is 3.03, while the area under the mandatory reporters’ curve is a statistically indistinguishable 2.92.

Overall, the results suggest that firms choosing to report more frequently have significantly more timely earnings after the switch. For firms whose increase in frequency is imposed by regulation, earnings timeliness is also higher after the reporting frequency increase, but the effect is attenuated, which could be due to mandatory increasers’ already reporting at a ‘near-optimal’ level. Moreover, given the more modest nature of the timeliness improvement, it is unclear whether the benefits of forcing firms to report more frequently exceed the costs.

7.2 Tests of volatility

In our final set of tests, we compare stock return volatility under different reporting frequencies and across increases in frequency. We define stock return volatility as the standard deviation of the fifteen monthly holding-period returns for each firm-year observation, ending three months after fiscal year-end. Macroeconomic factors, as well as other time-period-specific effects, can affect the volatility of market returns and hence an individual firm’s return volatility. To control for overall market volatility, we also scale firm return volatility by market volatility in each year. When this measure is greater than one (less than one), the individual security is more (less) volatile than the overall market portfolio. The overwhelming majority of firms are expected to be more volatile than the market portfolio.
Table 6 reports comparisons of return volatility across various reporting frequencies and switching periods. Panel A reports the raw return volatility and scaled volatility by reporting frequency, as well as by whether the firm is reporting at the minimum required frequency or voluntarily reporting at a higher frequency. For the 272 firm-year observations that are reporting annually, the mean (median) raw return volatility is 0.091 (0.081), and the mean (median) scaled volatility is 2.74 (2.36). Return volatility is nominally higher, on average, for quarterly reporters, whose mean (median) raw volatility is 0.099 (0.088) and whose mean (median) scaled volatility is 2.78 (2.52). The differences are statistically significant for raw return volatility \((t = -2.36, z = -3.01)\); however, the differences are not significant for scaled volatility.

We also partition semiannual reporters and quarterly reporters into those reporting at the minimum frequency required and those voluntarily reporting at a higher frequency. We do not have formal predictions for these comparisons, so this information is descriptive. For both the semiannual and quarterly reporters, the raw return volatility measures are smaller for firms voluntarily reporting at a higher frequency. The mean (median) raw volatility for the semiannual minimum reporters is 0.105 (0.086), while the mean (median) is significantly lower for voluntary semiannual reporters at 0.050 (0.046). A similar, but less dramatic, comparison exists for the quarterly reporters. Scaling by market volatility alters the results for quarterly reporters, however; that is, for quarterly reporters, scaled volatility is higher for voluntary reporters than for mandatory reporters.

Next, we compare return volatility for voluntary increasers, pre- and post-switch, to that of mandatory increasers, mandatory switchers, pre- and post-switch. We predict that return volatility for voluntary increasers will decline after the frequency increase. We have no prediction for the mandatory switchers. Panel B of table 6 reports the volatility of switching firms before and after the switch. For the voluntary increasers, the mean (median) scaled variability is 3.23 (2.74) in the two years before the switch, dropping to 2.98 (2.48) after the switch. Although nominally consistent with predictions, the difference is not statistically
significant. For the mandatory switchers, the mean (median) scaled volatility is 3.93 (3.43) in the years before the switch and a similar 3.90 (3.48) in the years after the switch.

Overall, the evidence that a change in reporting frequency systematically affects return volatility is weak, although the lack of results could be due to low-powered tests.

8 Conclusion
We study fundamental questions about voluntary disclosure incentives and the capital market effects of such disclosures in the context of voluntary and mandatory changes in interim reporting frequency. Based on financial reports issued during 1950–73, we collect 28,824 observations of the frequency with which firms issued financial reports each year. During this time period, not surprisingly, NYSE firms reported more frequently than AMEX firms, reporting frequency increased monotonically over the period, and industries exhibiting seasonal sales patterns (e.g., general merchandise stores) reported less frequently than others.

Using extant research, we model reporting frequency as a function of information asymmetry, agency costs, proprietary costs, informativeness of shorter measurement intervals, and firm performance. We find that firms with higher information asymmetry and agency costs disclose more frequently, as do firms with lower proprietary costs and better prior-year accounting performance. Weaker results indicate that firms in less competitive industries report more frequently than expected. The evidence strongly rejects the hypothesis that firms with longer operating cycles are less likely to report more often than required. Whether this curious result is due to our mismeasuring the operating cycle variable, ill-conceived theory, or some other model misspecification is currently unresolved.

With respect to capital market effects, we find that earnings timeliness is increasing in reporting frequency. In particular, earnings is more timely for firms reporting quarterly than for firms reporting either semiannually or annually. However, conditional on reporting at a given frequency, firms reporting at the SEC mandated minimum have more timely earnings than firms voluntarily reporting at the same frequency. This result is consistent with firms choosing
voluntarily to report at a higher-than-mandated frequency in order to overcome information asymmetries. The result is also consistent with predictions in Gigler and Hemmer (1998) that mandating more frequent reporting causes firms to reduce other valuation-relevant disclosures, thereby increasing the market’s focus on earnings.

Finally, we identify 99 firms who voluntarily increase reporting frequency from semiannual to quarterly and 85 firms who do so in response to requirements imposed by the SEC in 1970. Before increasing reporting frequency, voluntary increasers have significantly less timely earnings than do mandatory increasers. After increasing reporting frequency, voluntary increasers display drastic improvements in timeliness, while mandatory increasers experience more limited improvements. There is some evidence that stock return volatility is lower for voluntary increasers after the frequency switch.

We conclude that reporting frequency choice is a rational response to firm-specific characteristics and that firms forced to report more frequently are less likely to benefit from the change than are voluntary increasers. Our results thus call into question the efficacy of proposals to mandate more frequent reporting. Firms who benefit from more frequent reporting will have already elected to report more often or at a higher quality, whereas the net benefits of such regulation to firms already reporting at optimal levels would likely be vanishingly small, if not negative.
Appendix
Evolution of SEC Requirements for Financial Reporting Frequency

July 1, 1934 The Securities Exchange Act of 1934 requires that every issuer of a security registered on a national exchange file an annual report, the form of which is prescribed by the SEC. The Act suggests that the report contain detailed information about the firms’ assets, liabilities, depreciation methods, and income, including information about non-recurring items. It also specifically allows the SEC to prescribe quarterly reports if it so chooses. The SEC, however, did not require issuers to file any type of quarterly report until 1946.

July 23, 1945 (Sec. Exch. Act Release 3718) SEC requires listed companies to notify the commission of any cancellation of a war contract if the dollar value of the business covered by the terminated portion of the contract is 20% or more of the company's total sales for the previous fiscal year. The SEC also announces that it will require listed companies whose war business amounted to more than 25% of total sales in the prior fiscal year to file quarterly reports on Form 8-K. These reports must be filed within 30 days after the end of the fiscal quarter.

March 28, 1946 (Sec. Exch. Act Release 3803) SEC adopts a proposal requiring issuers to file Form 8-K quarterly, which is to include the dollar amount of sales and gross revenues during the fiscal quarter. Form 8-K must be filed no later than 45 days after the close of each fiscal quarter (insurance companies, investment companies, common carriers and public utility companies are exempt from the quarterly requirements). Concurrently, the SEC rescinds the rule adopted in July 1945. In Release 3803, the SEC also discusses the complaints of investors, bankers, and other objectors and the rationale for requiring quarterly reporting of sales.

March 11, 1949 (Sec. Exch. Act Release 4222) SEC proposes that quarterly reports filed as part of Form 8-K be filed separately as part of a new Form 9-K.


October 10, 1952 (Sec. Exch. Act Release 4755) SEC proposes a revised Form 9-K that would include a quarterly income statement and a related statement of earned surplus.


October 9, 1953 SEC rescinds the limited quarterly reporting requirement on Form 8-K because of “short-term and seasonal business changes and the frequent occurrence of a net earnings trend contrary to the gross trend in a company.” (Sec. Exch. Act Release 4908; Sec. Exch. Act Release 4949; Armstrong address before Am. Soc. Corp. Secretaries, Chicago Chapter, 13 January 1954). For the first time since 1946, there is no interim reporting requirement.

January 27, 1955 (Sec. Exch. Act Release 5129) SEC proposes that companies provide a semiannual report to the commission on a revised Form 9-K. The report would be filed once per year, 45 days after the end of the first half of the fiscal year. The report would contain specific information about sales and gross revenue, net income before and after taxes, extraordinary and special items, and charges and credits to earned surplus. The unaudited report would not contain a formal statement of profit and loss or earned surplus.
**June 23, 1955** (Sec. Exch. Act Release 5189) SEC adopts the January 1955 proposal stipulating that companies file semiannual reports on Form 9-K. The regulation does not apply to banks and bank holding companies, investment companies, insurance companies, public utilities and other common carriers, companies engaged in seasonal production and seasonal sale of a single-crop agriculture commodity, companies in the promotional or development stage, or foreign issuers.

**February 29, 1964** (Sec. Exch. Act Release 7246) SEC requires that all real estate companies file quarterly reports on new Form 7-K.

**September 15, 1969** (Sec. Exch. Act Release 8683) SEC proposes that companies be required to file quarterly reports on new Form 10-Q. The new form supersedes Forms 8-K and 9-K and requires the quarterly reporting of certain events similar to those reported on Form 8-K. Form 10-Q would also require the prompt reporting of significant acquisitions of assets or businesses, including the financial statements of the acquired businesses and summarized financial information for each of the first three fiscal quarters.

**September 15, 1969** (Sec. Exch. Act Release 8684) SEC proposes that real estate companies file a more detailed quarterly report on a new Form 7-Q. Under the proposal, real estate companies would no longer be required to file Forms 7-K or 8-K.

**October 28, 1970** (Sec. Exch. Act Release 9004) SEC announces adoption of Form 10-Q, requiring companies to file quarterly reports within 45 days after the end of each of the first three quarters of the fiscal year. At the same time, the SEC rescinds Form 9-K, which requires companies to file semiannual reports. The content of Form 10-Q is not as originally proposed. In the original 1969 proposal, the SEC contemplated having Form 10-Q replace Form 8-K. However, after further consideration the commission determines not to rescind Form 8-K because Form 8-K requires the reporting of significant events on a timelier basis. The summarized information required by Form 10-Q must be prepared in accordance with GAAP, include profit and loss information in more detail than was required by Form 9-K, include data on earnings per share, and include information regarding the issuer’s capitalization and stockholders’ equity. The new rule does not apply to investment companies, real estate companies, public utilities and other common carriers, life insurance companies, companies in the promotional or development stage, or foreign issuers.

**November 2, 1970** (Sec. Exch. Act Release 9005) SEC adopts a rule requiring real estate companies to file a more detailed quarterly report on Form 7-Q and concurrently eliminates Form 7-K. However, after further consideration, the commission decides to retain Form 8-K because it requires the reporting of significant events on a timelier basis.
References


International Accounting Standards Committee (IASC), 1996. Interim financial reporting: An issues paper prepared by the IASC staff.


Shultz, B., 1936. Stock exchange procedure (New York Stock Exchange Institute, New York City).


Figure 1. A timeline of key dates in the SEC’s regulation of financial reporting frequency.

- 1 Jul 1934: SEC Act of 1934 requires filing of annual reports
- 28 Mar 1946: Quarterly reporting of sales required in Form 8-K
- 9 Oct 1953: Quarterly reporting requirement rescinded
- 27 Jan 1955: Semiannual reporting of sales and income proposed
- 23 Jun 1955: Semiannual reporting adopted (Form 9-K)
- 15 Sep 1969: Quarterly reporting proposed
- 28 Oct 1970: Quarterly reporting adopted (Form 10-Q)
Figure 2. Classification of firms by year-to-year change in interim reporting frequency.
Figure 3, Panel A. Timeliness of annual earnings by reporting frequency. Plots reflect percentage of 15-month cumulative returns-based hedge portfolio return ($R_{HPRet_{15}}$) earned by earnings-based hedge portfolio as of end of each month during 15-month period after beginning of event-year; that is, for each month $i$ ($i = 1,15$), the plotted percentage is $y_i = \frac{EHP_{Ret_i}}{R_{HPRet_{15}}} \times 100$. The earnings-based hedge portfolio comprises a long position in top 40% of firms annually ranked on percentage change in annual earnings scaled by price and a short position in bottom 40%. The returns-based hedge portfolio is formed by annually ranking firms based on 15-month returns and going long in top 40% and short in bottom 40%. Separate hedge portfolios are constructed for semiannual and quarterly reporting frequencies. For each frequency, observations are pooled across all years and one hedge portfolio is created that goes long (short) in all firm-year observations classified in the top (bottom) 40% in their respective year. Area under graph is $\sum_{i=1}^{15} y_i + \frac{y_{15}}{2}$. Test of difference in areas under graphs is $t$-test of difference in means of 15 observations used to plot each graph.
Figure 3, Panel B. Timeliness of annual earnings by reporting frequency and relation to minimum reporting requirement. Plots reflect percentage of 15-month cumulative returns-based hedge portfolio return ($RHPRet_{15}$) earned by earnings-based hedge portfolio as of end of each month during 15-month period after beginning of event-year; that is, for each month $i$ ($i = 1, 15$), the plotted percentage is $y_i = \frac{EHPR_{i} - RHPRet_{15}}{RHPRet_{15}} \times 100$. The earnings-based hedge portfolio comprises long position in top 40% of firms annually ranked on percentage change in annual earnings scaled by price and short position in bottom 40%. The returns-based hedge portfolio is formed by annually ranking firms based on 15-month returns and going long in top 40% and short in bottom 40%. Separate hedge portfolios are constructed for semiannual and quarterly reporting frequencies. For each frequency, observations are pooled across years and a hedge portfolio is created that goes long (short) in firm-year observations classified in the top (bottom) 40% in their respective year. Area under graph is $\sum_{i=1}^{14} y_i + \frac{y_{15}}{2}$. Test of difference in areas under graphs is $t$-test of difference in means of 15 observations used to plot each graph.
Figure 4, Panel A. Annual earnings timeliness: Pre-frequency-increase versus post-frequency-increase for voluntary and mandatory increasers. Plots reflect percentage of 15-month cumulative returns-based hedge portfolio return \((RHPRet_{15})\) earned by earnings-based hedge portfolio as end of each month during 15-month period after beginning of event-year; that is, for each month \(i (i = 1, 15)\), the plotted percentage is \(y_i = \frac{EHPRet_i}{RHPRet_{15}} \times 100\). The earnings-based hedge portfolio comprises long position in top 40% of firms annually ranked on percentage change in annual earnings scaled by price and short position in bottom 40%. Returns-based hedge portfolio is formed by annually ranking firms based on 15-month returns and going long in top 40% and short in bottom 40%. Firms are identified as voluntary or mandatory increasers in reporting frequency if they had a sustained increase in reporting frequency from semiannual to quarterly. Voluntary (mandatory) increases cover the period 1952–66 (1967–72). Firm-year observations in the two years before the frequency change (\(t-2, t-1\)) are pooled and ranked as described above. This is done similarly for the year of the switch and the year after the switch (\(t, t+1\)). Area under graph is \(\sum_{i=1}^{14} y_i + \frac{y_{15}}{2}\). Test of difference in areas under graphs is \(t\)-test of difference in means of 15 observations used to plot each graph.
Figure 4, Panel B. Annual earnings timeliness: Mandatory increasers versus voluntary increasers in pre- frequency-increase and post-frequency-increase periods. Plots reflect percentage of 15-month cumulative returns-based hedge portfolio return ($R_{15}$) earned by earnings-based hedge portfolio as of end of each month during 15-month period after beginning of event-year; that is, for each month $i$ ($i = 1,15$), the plotted percentage is $y_i = \frac{EHPR_{i15}}{R_{15}HPR_{i15}} \times 100$. The earnings-based hedge portfolio comprises long position in top 40% of firms annually ranked on percentage change in annual earnings scaled by price and short position in bottom 40%. Returns-based hedge portfolio is formed by annually ranking firms based on 15-month returns and going long in top 40% and short in bottom 40%. Firms are identified as voluntary or mandatory increasers in reporting frequency if they had a sustained increase in reporting frequency from semiannual to quarterly. Voluntary (mandatory) increases cover the period 1952–66 (1967–72). Firm-year observations in the two years before the frequency change (t–2, t–1) are pooled and ranked as described above. This is done similarly for the year of the switch and the year after the switch (t, t+1). Area under graph is $\sum_{i=1}^{15} y_i + \frac{y_{15}}{2}$. Test of difference in areas under graphs is t-test of difference in means of 15 observations used to plot each graph.
Table 1. Financial reporting frequency by exchange and industry: 1950–73.

Sample includes 28,824 firm-year observations of yearly reporting frequency for the period 1950–73. To be included in the sample, a firm must also have CRSP data for the year. The frequency of reporting was hand-collected from Moody’s Industrial New Reports. We exclude heavily regulated industries from the analysis—utilities (SIC 49); finance, insurance, and real estate (SIC 60–67); railroads and other transportation (SIC 40–41)—as well as firms whose primary SIC code begins with 9. Data for AMEX firms is available starting in July 1962. Table below separates the sample into three-year periods and reports the mean frequency of reporting by industry and by stock exchange. N is the number of firms.

Panel A: New York Stock Exchange firms

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Mining &amp; Construction</td>
<td>10–17</td>
<td>121</td>
<td>124</td>
<td>123</td>
<td>126</td>
<td>127</td>
<td>139</td>
<td>160</td>
<td>161</td>
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<tr>
<td>Light Manufacturing (Food, Textiles,</td>
<td>20–27</td>
<td>516</td>
<td>530</td>
<td>515</td>
<td>498</td>
<td>526</td>
<td>556</td>
<td>550</td>
<td>586</td>
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<tr>
<td>Furniture, etc..)</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Heavy Manufacturing (Chemicals, Metals,</td>
<td>28–39</td>
<td>1,300</td>
<td>1,361</td>
<td>1,396</td>
<td>1,499</td>
<td>1,597</td>
<td>1,601</td>
<td>1,538</td>
<td>1,579</td>
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<td>Trans. Equipment)</td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>50–59</td>
<td>240</td>
<td>247</td>
<td>240</td>
<td>244</td>
<td>274</td>
<td>292</td>
<td>292</td>
<td>373</td>
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<tr>
<td>Services</td>
<td>70–88</td>
<td>44</td>
<td>51</td>
<td>52</td>
<td>53</td>
<td>51</td>
<td>45</td>
<td>67</td>
<td>111</td>
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<tr>
<td>Other</td>
<td>79</td>
<td>3.73</td>
<td>40</td>
<td>46</td>
<td>50</td>
<td>57</td>
<td>69</td>
<td>68</td>
<td>96</td>
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<tr>
<td><strong>TOTALS (NYSE firms)</strong></td>
<td>2,300</td>
<td>3.62</td>
<td>2,353</td>
<td>2,372</td>
<td>2,470</td>
<td>2,632</td>
<td>2,702</td>
<td>2,710</td>
<td>2,906</td>
</tr>
</tbody>
</table>
### Panel B: American Stock Exchange firms (beginning in 1963)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td></td>
<td>N  Mean</td>
<td>N  Mean</td>
<td>N  Mean</td>
<td>N  Mean</td>
<td></td>
</tr>
<tr>
<td>Mining &amp; Construction</td>
<td>220 3.11</td>
<td>227 3.37</td>
<td>202 3.71</td>
<td>210 3.82</td>
<td></td>
</tr>
<tr>
<td>Light Manufacturing (Food, Textiles, Furniture, etc.)</td>
<td>244 3.23</td>
<td>317 3.51</td>
<td>337 3.66</td>
<td>388 3.77</td>
<td></td>
</tr>
<tr>
<td>Heavy Manufacturing (Chemicals, Metals, Trans. Equipment)</td>
<td>828 3.37</td>
<td>1,045 3.66</td>
<td>1,240 3.82</td>
<td>1,198 3.87</td>
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<tr>
<td>Wholesale &amp; Retail Trade</td>
<td>210 3.18</td>
<td>290 3.54</td>
<td>322 3.81</td>
<td>357 3.89</td>
<td></td>
</tr>
<tr>
<td>Services</td>
<td>84 3.15</td>
<td>113 3.52</td>
<td>159 3.54</td>
<td>180 3.82</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>33 3.09</td>
<td>33 3.52</td>
<td>47 3.81</td>
<td>95 3.57</td>
<td></td>
</tr>
<tr>
<td>TOTALS (AMEX firms)</td>
<td>1,619 3.27</td>
<td>2,025 3.58</td>
<td>2,307 3.77</td>
<td>2,428 3.84</td>
<td>8,379</td>
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<tr>
<td>TOTALS (both NYSE &amp; AMEX)</td>
<td>2,300 3.62</td>
<td>2,353 3.70</td>
<td>2,372 3.76</td>
<td>2,470 3.83</td>
<td>4,251 3.64</td>
</tr>
</tbody>
</table>
Table 2. Distribution of firms that increased frequency of reporting from semiannual to quarterly: 1952–72.
Table contains yearly distribution of 184 firms that increased financial reporting frequency from semiannual to quarterly. To be included in the table, firms must report at the lower frequency for at least two years prior to the increase and at the higher frequency for at least one year after the switch. Firms must also have CRSP return data for this entire four-year period and be listed on either the NYSE or AMEX. For the period 1952–64, the table includes only firms listed on the NYSE; thereafter, both NYSE and AMEX firms are included.

<table>
<thead>
<tr>
<th>Year</th>
<th>Voluntary Increasers</th>
<th>Mandatory Increasers</th>
</tr>
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<tbody>
<tr>
<td>1952</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>1953</td>
<td>5</td>
<td>23</td>
</tr>
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<td>1954</td>
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<td>17</td>
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<td>1955</td>
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<td>16</td>
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<td>1956</td>
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<td>1957</td>
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<td>2</td>
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<td>1965</td>
<td>17</td>
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<td>1966</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>99</td>
<td>85</td>
</tr>
</tbody>
</table>
Table 3. Descriptive Statistics.

Table contains descriptive statistics on reporting frequency, firm size, and other variables used in our model of reporting frequency choice. Individual firm-year observations are included in the analysis if firm reporting frequency is available, firm has total assets greater than $100,000 in years t and t−1, and firm has CRSP return data for each month of the fiscal year. The frequency of disclosures by individual firms is predicted to depend on (1) information asymmetry, (2) agency costs, (3) disclosure costs, (4) informativeness of more frequent disclosures, and (5) firm performance. For comparability, we have partitioned the sample into firms that are required to report annually (1950–55), and firms that are required to report semiannually (1956–70). Variable definitions are below.

<table>
<thead>
<tr>
<th>Annual Reporting Required</th>
<th>Semiannual Reporting Required</th>
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<tbody>
<tr>
<td></td>
<td>(1950–55)</td>
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<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Reporting Frequency</td>
<td>1,639</td>
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<tr>
<td>Excess Reporting Frequency (EF1)</td>
<td>1,639</td>
</tr>
<tr>
<td>Measures of Firm Size</td>
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<tr>
<td>Total Assets</td>
<td>1,639 $242.6</td>
</tr>
<tr>
<td>Market Value of Equity</td>
<td>1,639 244.4</td>
</tr>
<tr>
<td>Book Value of Equity</td>
<td>1,639 154.2</td>
</tr>
<tr>
<td>Information Asymmetry</td>
<td></td>
</tr>
<tr>
<td>Share turnover: Annual volume/Avg. shares o/s</td>
<td>1,209 0.18</td>
</tr>
<tr>
<td>BV of Assets/Firm Value</td>
<td>1,639 1.01</td>
</tr>
<tr>
<td>Agency Costs</td>
<td></td>
</tr>
<tr>
<td>Debt / Firm Value (LEVERAGE)</td>
<td>1,639</td>
</tr>
<tr>
<td>Net PPE/Firm Value</td>
<td>1,639 0.35</td>
</tr>
<tr>
<td>Disclosure or Proprietary Costs</td>
<td>1,639</td>
</tr>
<tr>
<td>Four-firm Concentration Ratio (COMPETITION)</td>
<td>1,639</td>
</tr>
<tr>
<td>Herfindahl-Hirschmann Index</td>
<td>1,639</td>
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<tr>
<td>Informativeness of More Frequent Disclosures</td>
<td></td>
</tr>
<tr>
<td>Days of Operating Cycle</td>
<td>1,639 100.9</td>
</tr>
<tr>
<td>Operating Cycle - Fraction of year</td>
<td>1,639</td>
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<tr>
<td>Measures of Firm Performance</td>
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<tr>
<td>Return on Assets</td>
<td>1,639 7.5%</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>1,639 11.7%</td>
</tr>
<tr>
<td>Prior 12 month raw stock return</td>
<td>1,639</td>
</tr>
<tr>
<td>Prior 12 month market-adjusted return</td>
<td>1,639</td>
</tr>
</tbody>
</table>

Reporting frequencies were hand-collected from Moody’s Industrial New Reports. EXCESS_FREQUENCY is the reporting frequency in excess of the mandated frequency. Total assets is Compustat Item # 6. Market Value of Equity (MVE) = price per share * number of shares outstanding (on CRSP at the end of the year). Book Value of Equity = Total Assets (item #6) - Total Liabilities (item #181). If item #181 is missing, we estimate it by adding data items 5, 9, 35, 38, and 75. If item numbers 35, 38, or 75 are missing, we set them equal to zero. Share turnover (liquidity) is total annual volume from CRSP divided by average shares outstanding for the year. CRSP has volume data beginning in 1963. For observations before 1963, we hand-collected aggregate volume data from the Bank’s Price and Quotation Record. ASSETS_IN_PLACE = Book Value of Assets (item #6) / (Total Liabilities (item #181) + MVE). Leverage = Total Liabilities / Firm Value.

Four-firm Concentration Ratio = \( \sum_{i=1}^{5} \left( \frac{s_i}{S} \right)^{1/2} \) where \( s_i \) represents firm i’s sales (item #12), n is the number of firms in the entire industry, and S is total sales for the entire industry on Compustat based on 2 digit SIC code.

Herfindahl Index = \( \sum_{i=1}^{n} \left( \frac{s_i}{S} \right)^2 \) where \( s_i \) represents firm i’s sales, and \( i=1 \) to 4 for the largest 4 firms in the industry based on sales.

Days of Operating Cycle = Days in Accounts Receivable + Days in Inventory

Days in Accounts Receivable (AR)= 365 * [(ARt + ARt–1)/2] / SALES,

Days in Inventory = 365 * [(Inventoryt + Inventoryt–1)/2] / COGS

Operating Cycle as fraction of year = Days of Operating Cycle/365

Return on Assets = Net Income Before Extraordinary Items (item #18) / Average Total Equity (item #6 - item #181)

Return on Equity = Net Income Before Extraordinary Items (item #18) / Average Total Assets (item #6 - item #181)
Table 4. Determinants of Reporting Frequency.

Summary statistics from regressions of two alternative measures of excess reporting frequency on variables hypothesized to explain firms’ choice of reporting frequency. The independent variables, described in detail at the bottom of the table, proxy for information asymmetry, agency costs, proprietary costs, the informativeness of shorter measurement periods, and firm performance.

Regression specification (1): Dependent variable, \( EXCESS\_FREQUENCY1 \) (EF1), is actual reporting frequency less required reporting frequency, where reporting frequency is number of times per year a firm issues financial reports. EF1 is, therefore, an ordinal categorical variable with values of –1, 0, 1, 2, or 3 in our sample. To estimate this model, we run annual, cross-sectional ordered logit regressions. Each coefficient estimate is the average of annual regression slopes for 1951–70, and the \( z \)-statistic is average slope divided by its time-series standard error for the 20-year period (Fama-MacBeth, 1973).

Regression specification (2): Dependent variable, \( EXCESS\_FREQUENCY2 \) (EF2), is an indicator variable with a value of one if firm reports more frequently than required. Coefficient estimates and related \( z \)-statistics are calculated using Chamberlain’s (1980) conditional logit regression with fixed-year-effects on the entire panel of time-series, cross-sectional data, 1951–70.

<table>
<thead>
<tr>
<th>Explanatory Variable</th>
<th>Underlying Construct</th>
<th>Prediction</th>
<th>( z )-statistic</th>
<th>( z )-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSETS_IN_PLACE</strong></td>
<td>Information asymmetry; agency costs</td>
<td>–</td>
<td>-1.04 * (-7.73)</td>
<td>-0.41 * (-3.41)</td>
</tr>
<tr>
<td><strong>SIZE</strong></td>
<td>Information asymmetry (–); agency costs (–); proprietary costs (+)</td>
<td>?</td>
<td>-0.01 (-0.34)</td>
<td>-0.01 (-0.33)</td>
</tr>
<tr>
<td><strong>LEVERAGE</strong></td>
<td>Agency costs</td>
<td>?</td>
<td>0.50 (1.35)</td>
<td>0.40 (1.62)</td>
</tr>
<tr>
<td><strong>EXCHANGE</strong></td>
<td>Agency costs</td>
<td>–</td>
<td>-1.37 * (-8.80)</td>
<td>-0.54 * (-5.14)</td>
</tr>
<tr>
<td><strong>COMPETITION</strong></td>
<td>Proprietary costs</td>
<td>–</td>
<td>0.35 (1.54)</td>
<td>0.32 * (1.70)</td>
</tr>
<tr>
<td><strong>INDUSTRY_PRACTICE</strong></td>
<td>Proprietary costs</td>
<td>*</td>
<td>3.42 * (18.84)</td>
<td>1.42 * (11.83)</td>
</tr>
<tr>
<td><strong>OPERATING_CYCLE</strong></td>
<td>Informativeness of shorter measurement period</td>
<td>–</td>
<td>1.19 * (5.45)</td>
<td>0.24 (1.55)</td>
</tr>
<tr>
<td><strong>ROA</strong></td>
<td>Firm performance</td>
<td>?</td>
<td>2.68 * (1.84)</td>
<td>0.76 * (1.84)</td>
</tr>
</tbody>
</table>

\( N \) [average of 691 obs. per annual regression for (1)] 13,828 13,828

\( Pseudo \text{ R}^2 \) [annual regression average for (1)] 19.9% 12.3%

\( \text{ASSETS\_IN\_PLACE} \) is ratio of book value of total assets to firm value, where firm value is sum of market value of common equity and book value of liabilities. SIZE is logarithm of market value of common equity. LEVERAGE is ratio of debt to firm value. EXCHANGE is an indicator variable taking the value of one (zero) if common stock of firm is listed on NYSE (AMEX). COMPETITION is four-firm concentration ratio for firm’s two-digit SIC code. INDUSTRY\_PRACTICE is mean reporting frequency of firm’s two-digit SIC code. OPERATING\_CYCLE is length of firm’s operating cycle scaled by 365, where operating cycle is number of days in accounts receivable plus number of days in inventory. ROA is return on assets for previous 12 months.

*Significantly different from zero at the 1%, 5%, and 10% levels, respectively.
Table 5. Descriptive statistics for switching firms before and after the switch.
This table contains descriptive statistics for firms that increased their reporting frequency. The descriptive information is provided for firms both before the switch (year t–1) and after the switch (year t+1), and separately for voluntary and mandatory switchers.

<table>
<thead>
<tr>
<th>Measure of Firm Size</th>
<th>Voluntary BEFORE (year t–1)</th>
<th>Voluntary AFTER (year t+1)</th>
<th>Mandatory BEFORE (year t–1)</th>
<th>Mandatory AFTER (year t+1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N Mean Standard Deviation</td>
<td>N Mean Standard Deviation</td>
<td>N Mean Standard Deviation</td>
<td>N Mean Standard Deviation</td>
</tr>
<tr>
<td>Total Assets</td>
<td>99  $ 106.7 $ 30.1 197.5</td>
<td>99  $ 120.7 $ 30.9 208.7</td>
<td>85  $ 67.0 $ 13.9 146.5</td>
<td>85  $ 78.7 $ 21.5 167.3</td>
</tr>
<tr>
<td>Market Value of Equity</td>
<td>99  129.5 22.6 321.9</td>
<td>99  129.4 24.4 283.9</td>
<td>85  66.8 15.0 168.9</td>
<td>85  81.4 19.0 206.6</td>
</tr>
<tr>
<td>Book Value of Equity</td>
<td>99  74.3 26.1 136.5</td>
<td>99  85.5 27.8 156.3</td>
<td>85  40.9 8.3 91.1</td>
<td>85  47.3 10.8 97.0</td>
</tr>
<tr>
<td>Info Asymmetry</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LIQUIDITY: Volume</td>
<td>78  0.23 0.13 0.31</td>
<td>82  0.33 0.13 0.50</td>
<td>81  0.44 0.37 0.45</td>
<td>82  0.51 0.36 0.54</td>
</tr>
<tr>
<td>ASSETS IN PLACE: BV of Assets/Firm Value</td>
<td>99  0.24 0.23 0.22</td>
<td>99  0.24 0.21 0.22</td>
<td>85  0.25 0.18 0.23</td>
<td>85  0.28 0.29 0.22</td>
</tr>
<tr>
<td>Agency Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LEVERAGE: Debt / Firm Value</td>
<td>99  0.60 0.62 0.20</td>
<td>99  0.58 0.58 0.21</td>
<td>85  0.47 0.46 0.18</td>
<td>85  0.45 0.44 0.17</td>
</tr>
<tr>
<td>Disclosure or Proprietary Costs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Four-firm Concentration Ratio</td>
<td>99  0.17 0.14 0.15</td>
<td>99  0.16 0.13 0.14</td>
<td>85  0.10 0.08 0.07</td>
<td>85  0.09 0.07 0.06</td>
</tr>
<tr>
<td>Herfindahl-Hirschmann Index</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informativeness of More Frequent Disclosure</td>
<td>99  64.45 53.68 68.20</td>
<td>99  70.37 63.91 77.14</td>
<td>85  77.39 79.40 83.74</td>
<td>85  75.31 78.21 72.77</td>
</tr>
<tr>
<td>Days of Operating Cycle</td>
<td>99  0.18 0.15 0.19</td>
<td>99  0.19 0.18 0.21</td>
<td>85  0.21 0.22 0.23</td>
<td>85  0.21 0.21 0.20</td>
</tr>
<tr>
<td>Measures of Firm Performance</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on Assets</td>
<td>99  3.9% 4.4% 7.2%</td>
<td>99  4.9% 5.1% 5.0%</td>
<td>85  3.8% 3.6% 6.2%</td>
<td>85  2.0% 3.5% 11.0%</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>99  5.4% 7.2% 12.4%</td>
<td>99  5.7% 7.4% 14.6%</td>
<td>85  9.3% 6.3% 41.7%</td>
<td>85  3.9% 6.9% 27.2%</td>
</tr>
<tr>
<td>Prior 12-month raw stock return</td>
<td>99  22.5% 10.4% 45.9%</td>
<td>99  22.1% 7.3% 52.7%</td>
<td>85  44.9% 16.7% 98.0%</td>
<td>85  20.8% 3.4% 82.3%</td>
</tr>
<tr>
<td>Prior 12-month Market-adjusted return</td>
<td>99  9.6% 1.9% 43.4%</td>
<td>99  10.0% -2.7% 46.5%</td>
<td>85  38.1% 15.3% 89.2%</td>
<td>85  13.2% -5.0% 77.1%</td>
</tr>
<tr>
<td>Measure of Risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return Volatility</td>
<td>99  0.08 0.06 0.05</td>
<td>99  0.09 0.07 0.07</td>
<td>85  0.15 0.13 0.09</td>
<td>85  0.15 0.14 0.07</td>
</tr>
<tr>
<td>Return Volatility scaled by Average Market Return Volatility</td>
<td>99  3.12 2.62 1.95</td>
<td>99  2.93 2.45 1.83</td>
<td>85  4.01 3.57 2.48</td>
<td>85  3.84 3.51 2.13</td>
</tr>
</tbody>
</table>

Total assets is Compustat Item # 6. Market Value of Equity (MVE) = price per share * number of shares outstanding (on CRSP at the end of the year). Book Value of Equity = Total Assets (item #6) - Total Liabilities (item # 181). If item #181 is missing, we estimate it by adding data items 5, 9, 35, 38, and 75. If item numbers 35, 38, or 75 are missing, we set them equal to zero. Liquidity is total annual volume from CRSP divided

\[ \text{Liquidity} = \frac{\sum si}{n} \]

where \( s_i \) represents firm \( i \)'s sales, \( n \) is the number of firms in the entire industry, and \( S \) is total sales for the entire industry on Compustat based on 2 digit SIC code.

\[ \text{Herfindahl Index} = \sum \left( \frac{s_i}{S} \right)^2 \]

where \( s_i \) represents firm \( i \)'s sales, and \( i=1 \) to \( 4 \) for the largest 4 firms in the industry based on sales.

Days of Operating Cycle = Days in Accounts Receivable + Days in Inventory

Days in Accounts Receivable (AR) = 365 * [(ARt + ARt–1)/2] / SALES,

Days in Inventory = 365 * [(Inventoryt – Inventoryt–1)/2] / COGS

Operating Cycle as fraction of year = Days of Operating Cycle/365

Return on Assets = Net Income Before Extraordinary Items (item #18) / Average Total Assets (item #6)

Return on Equity = Net Income Before Extraordinary Items (item #18) / Average Total Equity (item #6 - item #181)

Return variability is the standard deviation of the 15 monthly holding-period returns for each firm-year observation, ending 3 months after fiscal year-end.
Table 6. Volatility compared across reporting frequencies and around switching period

This table reports stock return volatility, the standard deviation of the 15 monthly holding-period returns for each firm-year observation, ending 3 months after fiscal year-end. The purpose of this table is to provide evidence on (i) whether volatility is different across annual, semiannual, and quarterly reporting regimes and (ii) whether either voluntary or mandatory increases in reporting frequency affect volatility. Panel A includes all firms and reports a comparison of firms across reporting frequencies. Panel B includes switching firms and reports a comparison of these firms before the switch to after the switch.

**Panel A: All firms**

<table>
<thead>
<tr>
<th>Reporting Frequency</th>
<th>ALL FIRMS</th>
<th>Firms Reporting at Minimum Required Frequency</th>
<th>Firms Voluntarily Reporting at Higher Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Annual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>272</td>
<td>0.091</td>
<td>0.081</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>272</td>
<td>2.737</td>
<td>2.358</td>
</tr>
<tr>
<td>Semiannual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>1,180</td>
<td>0.097</td>
<td>0.079</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>1,180</td>
<td>2.964</td>
<td>2.507</td>
</tr>
<tr>
<td>Quarterly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>17,334</td>
<td>0.099</td>
<td>0.088</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>17,334</td>
<td>2.777</td>
<td>2.520</td>
</tr>
</tbody>
</table>

### COMPARISONS

<table>
<thead>
<tr>
<th>Reporting Frequency</th>
<th>ALL FIRMS</th>
<th>Firms Reporting at Minimum Required Frequency</th>
<th>Firms Voluntarily Reporting at Higher Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RAW VOLATILITY</td>
<td>SCALED BY MARKET VOLATILITY</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Difference in Means</td>
<td>Medians</td>
<td>t-stat</td>
</tr>
<tr>
<td>(1) Annual vs. Semi-annual</td>
<td>-0.005</td>
<td>0.001</td>
<td>(-1.29)</td>
</tr>
<tr>
<td>(2) Annual vs. Quarterly</td>
<td>-0.007</td>
<td>-0.007</td>
<td>(-2.36)</td>
</tr>
<tr>
<td>(3) Semiannual vs. Quarterly</td>
<td>-0.002</td>
<td>-0.002</td>
<td>(-1.12)</td>
</tr>
<tr>
<td>(4) Semiannual reporting at minimum required frequency vs. voluntarily reporting at higher frequency</td>
<td>0.054</td>
<td>0.041</td>
<td>(19.95)</td>
</tr>
<tr>
<td>(5) Quarterly reporting at minimum required frequency vs. voluntarily reporting at higher frequency</td>
<td>0.019</td>
<td>0.023</td>
<td>(21.68)</td>
</tr>
</tbody>
</table>
Table 6 (cont’d.). Volatility compared across reporting frequencies and around switching period.

Panel B: Switching Firms

<table>
<thead>
<tr>
<th></th>
<th>BEFORE SWITCH (years t-2 and t-1)</th>
<th></th>
<th>AFTER SWITCH (years t and t+1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>Median</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td>All Switchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>368</td>
<td>0.112</td>
<td>0.085</td>
<td>0.078</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>368</td>
<td>3.551</td>
<td>3.039</td>
<td>2.303</td>
</tr>
<tr>
<td>Voluntary Switchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>198</td>
<td>0.083</td>
<td>0.069</td>
<td>0.054</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>198</td>
<td>3.226</td>
<td>2.744</td>
<td>2.212</td>
</tr>
<tr>
<td>Mandatory Switchers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raw Return Volatility</td>
<td>170</td>
<td>0.145</td>
<td>0.130</td>
<td>0.088</td>
</tr>
<tr>
<td>Scaled by Market Volatility</td>
<td>170</td>
<td>3.928</td>
<td>3.432</td>
<td>2.356</td>
</tr>
</tbody>
</table>

COMPARISONS

<table>
<thead>
<tr>
<th></th>
<th>RAW VOLATILITY</th>
<th>SCALED BY MARKET VOLATILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difference in Means (t-stat)</td>
<td>Difference in Medians (Z-stat)</td>
</tr>
<tr>
<td>(1) Voluntary Before vs. Voluntary After</td>
<td>-0.010 (-1.67)</td>
<td>-0.004 (-1.37)</td>
</tr>
<tr>
<td>(2) Mandatory Before vs. Mandatory After</td>
<td>-0.003 (-0.38)</td>
<td>-0.006 (-1.07)</td>
</tr>
<tr>
<td>(3) Voluntary Before vs. Mandatory Before</td>
<td>-0.061 (-7.87)</td>
<td>-0.061 (-8.94)</td>
</tr>
<tr>
<td>(4) Voluntary After vs. Mandatory After</td>
<td>-0.055 (-7.39)</td>
<td>-0.063 (-8.50)</td>
</tr>
</tbody>
</table>