Impact Of Information Technology On The Accuracy Of Analyst Forecasts

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Abstract

We investigate the effect of information technology on analyst's forecast accuracy. Our analysis suggests that analyst forecast accuracy has increased with the growth in information technology. We capture the growth in information technology with seven proxy variables; the total sales of information technology related firms, number of computers sold, number of websites, number of hosts, number of registered domains, number of bytes, and packets of information transferred. The results are consistent with our hypothesis that the increase in information technology has decreased the errors in analyst forecasts. Thus, our paper provides evidence of a positive impact of information technology on the overall information environment. These findings are important for investors who use analyst forecasts to value the firm and make investments decisions, and for overall efficiency of capital markets.

1. Introduction

The information technology revolution during the last decade has changed information availability and the expectations of capital markets. The advent of the World Wide Web and Web browsing technologies in mid nineties accelerated the intensity of this change. Information technology has transformed the way firms generate, communicate, and disseminate information, and the way analysts and investors search and receive information. This has had a profound impact on both the institutional and informational structure of capital markets (Guldimann, 2000).

In this paper we examine the impact of information technology on the accuracy of financial analyst forecasts of earnings. We posit that after controlling for factors related to analyst forecast accuracy, we will find that information technology has increased the precision of analyst forecasts. We use seven different technology variables to proxy for the impact of information technology (IT). The results support our hypothesis that the precision of analyst forecasts is positively related to growth of IT. These findings are consistent with a decrease in information generation, dissemination and acquisition costs; a decrease that may be attributed to the information technology revolution, e.g., the Internet.

The remainder of the paper is organized as follows. Section 2 develops the hypothesis. Section 3 describes the research design and section 4 discusses the sample selection procedure and sample profile. Section 5 presents the empirical tests and results. Section 6 summarizes the findings and discusses the conclusions.

2. Theory and Hypothesis

Advances in information and communication technologies have caused the cost of information search, production, and dissemination to decline dramatically over the last decade. One of the major trends in information technology that is affecting the information availability in the capital markets is the cost of storing, processing, and transmitting information. This cost has dropped at an average rate of 25-35 percent per year for the last three decades (Guldimann 2000) due to innovation in microprocessor technology, increase in telecommunication capacity, and the World Wide Web. The availability of information on the Web has increased many-fold in the last five years, thus further reducing the cost of information acquisition and availability.

Readers with comments or questions are encouraged to contact the authors via email.

While one can trace the existence of Internet to ARPANET in 1969, as a commercial tool it took off with the development of the World Wide Web in 1991. The number of web sites exploded with the development of Mosaic (predecessor of Netscape) from 600 in 1993 to over 8 million in 1999.[1] Today, even very small companies can set up web sites at low costs to provide information to interested parties, such as financial analysts. News wires and investment related sites could be searched from home or office twenty-four hours a day to find information about companies. An interesting issue is the influence of the cost reduction on the ability of the analysts to produce and disseminate more accurate information about firm's earnings and for the investors to search and use this information.

Though the decrease in cost will increase the private information acquisition by information intermediaries such as analysts, it is unclear how that increased information acquisition affects the quality of their earnings forecasts? Clearly the ability of analysts to predict the firm's earnings depends on their ability to acquire and process relevant information that is likely to affect firm's earnings. Analysts rely on information at several levels such as macro-economic factors, industry trends, and firm specific variables to better predict firm's earnings. Analysts also use strategic performance variables related to firms (Dempsey et. al. 1997) to better predict their future earnings.

Increases in the timeliness of the firm specific information available to analysts can significantly improve the accuracy of their forecast. Use of systems such as enterprise resources planning (ERP), supply chain management soft ware, and customer relationship management (CRM) software provide firms with real-time data of their business transactions and provide a wealth of information that can be mined to understand significant trends in business. For example, after installing an ERP system, Motorola cut down their quarterly book closing time from a month to less than three days. Now, Motorola announces its quarterly earnings within the first week of the end of the quarter. Thus, not only the cost of acquisition, processing and dissemination of information has declined, the timeliness of information available is also improved. Thus our hypothesis posits that information technology has improved the forecast accuracy of analysts.

H_A: The accuracy of analyst forecasts is positively related to the advancement of information technology.

3. Research Design

3.1. Measure of Analyst Forecast Accuracy

We focus on the impact of information technology on the private information acquisition and processing by financial analysts, an important group of information intermediaries between firms and investors. Financial analysts track firms and provide buy and sell recommendations to their clients based on their research analysis. It is common knowledge that the stock prices move based on analysts' recommendations market (Malkiel and Cragg 1980; Givoly and Lakonishok 1984). Analysts also gather, analyze, and interpret information about firms' future prospects and forecast the future earnings of the firms based on publicly available and privately acquired information (Dempsey et. al. 1997).

Analyst forecasts are available in I/B/E/S, First Call, and Zack's databases.[2] Almost all financial sites on the web provide some information about analysts' forecasts. In addition, there are numerous academic articles that have shown that consensus analyst forecast is a good measure of market expectation of firm's earnings (Malkiel and Cragg 1980; Givoly and Lakonishok 1984). This is also apparent from the fact that investors mostly rewards firms that have positive earning surprises and punish the ones that have negative earning surprises (Givoly and Lakonishok 1984). The importance of forecast accuracy is further multiplied by the technological improvements at service providers (such as, I/B/E/S, First Call, and Zack's). With the development of information technology, these firms now offer cheaper and more timely forecast data to investors through Internet based platforms (Gleason and Lee 2000). As a result, more and more investors are now using analyst forecasts to make their decisions. Increase in forecast accuracy reduces investment risks for the investors and allows for more precise valuation of firms.

[1] Source: ***http://www.mit.edu/people/mkgray/net/web-growth-summary.html***

[2] In this study, we obtain analysts forecasts from I/B/E/S database.

Consistent with existing literature (discussed above), we define analyst forecast error as:

$$|FE| = \left| \frac{Actual\ EPS - Forecasted\ EPS}{Actual\ EPS} \right|$$

This variable is bounded in the range [0,1]. We then define *ACCURACY = 1*-|*FE*| as a measure of analyst forecast accuracy.

3.2. Measures of Information Technology Level

We use the following seven proxies to capture the growth in information technology. *ITSALES* is the inflation-adjusted total annual sales in billions of dollars for the information technology sector. This includes firms in the two-digit SIC codes 48 (communication), three-digit SIC codes 357 (computer and office equipment), and 737 (computer hardware and software related services). *COMP* is the number of computers sold (in millions) during the year per the *MA334R-1* and *MA35R-1* reports obtained from the U.S. Department of Commerce, Economics and Statistics Administration (U.S. Census Bureau). *SITES* is the number of web sites and *HOSTS* is the number of hosts in millions. *DOMAINS* is the number of registered domains. *BYTES* (*PACKETS*) is the number of bytes (packets) of information transferred per month (in trillions). The growth in these variables proxy for the growth of information technology related and hence, the increase in processing power and reduction in search and communication costs. The above variables and those used in later tests are defined in table 1.

Table 1
Variable Definitions

Variable	Definition
ACCURACY	Measure of analyst forecast accuracy = 1 - |*FE*|; bounded between 0 and 1
ARSQ	Adjusted R-squares in regressions of *MV* on net income during the quarter (both variables deflated by book value of the firm at the end of the quarter)
BYTES	Number of bytes transferred per month (in trillions) – includes FTP, WWW, and GOPHER
COMP	Number of computers sold (in millions) during the year per the *MA334R-1* and *MA35R-1* reports obtained from the U.S. Department of Commerce, Economics and Statistics Administration (U.S. Census Bureau)
DISP	Dispersion of analysts' forecasts; measured by the standard deviation of the forecasts
DOMAINS	Number of registered domains
|*FE*|	Absolute value of analysts' forecast error; bounded between 0 and 1
HOSTS	Number of hosts (in millions)
INST	Proportion of the firm's outstanding stock held by institutional investors at the beginning of the fiscal year per *COMPACT DISCLOSURE*
ITSALES	Inflation-adjusted total annual sales (in $ billion) for the information technology sector defined as comprising firms in the two-digit SIC codes 48 (communications), three-digit SIC codes 357 (computer and office equipment), and 737 (computer hardware and software related services)
L	When prefixed to a variable, implies its natural logarithm
MV	Firm's inflation-adjusted market value on day +1 relative to quarterly earnings announcement date (in $ billion)
PACKETS	Number of packets transferred per month (in trillions) – includes FTP, WWW, and GOPHER
NUM	Number of analysts following the firm
SITES	Number of web sites
TECHNO	Measure of information technology, proxied by *LITSALES*, *LCOMP*, *LSITES*, *LHOSTS*, *LDOMAINS*, *LBYTES*, and *LPACKETS*
TIME	Variable with value of 1 for quarter 1 of 1989 running up to 44 for quarter 4 for 1999

4. Sample Selection And Profile

Sample selection is discussed in table 2. A firm must satisfy the following criteria to be included in the sample:

1. data for the firm is available for at least one quarter during the period 1989-99 on quarterly COMPUSTAT; (i.e., item numbers 8, 44, 54, and earning announcement dates)
2. the firm has fiscal year-end of December 31st
3. the firm is available on CRSP
4. the firm is available on I/B/E/S
5. the firm is available on COMPACT DISCLOSURE

We confine the sample to December 31 year-end firms to align the observations cross-sectionally. This allows us to control for time-dependent variables in our tests. Criteria 1 and 2 yield 82,174 firm-quarter observations (3,890 independent firms). We lose 1,612 firm-quarter observations and 157 firms due to missing PERM numbers. A total of 5,731 firm-quarter observation and 121 firms are lost due to missing CRSP data. The sample is reduced by another 44,062 firm-quarter observations and 1,852 firms due to non-availability of I/B/E/S forecast data. Finally, we get a sample of 29,179, firm-quarter observation and 1,624 firms after accounting for missing data on COMPACT-DISCLOSURE. Table 2 depicts the sample selection process.

Table 2
Sample Selection Procedure

	Firm-Quarter Observations	Number of Firms
➢ Firms with December year-end available on quarterly COMPUSTAT for at least one quarter during 1989-99*	82,174	3,890
➢ Less, firms with missing PERM numbers	(1,612)	(157)
➢ Less missing observations on CRSP	(5,731)	(121)
➢ Less missing observations on I/B/E/S**	(44,062)	(1,852)
➢ Less missing observations on *COMPACT-DISCLOSURE****	(1,590)	(136)
➢ Final Sample	29,179	1,624

* with non-missing data on quarterly COMPUSTAT item nos. 8, 44, 54, and earnings announcement dates
** mean earnings-per-share forecasts, actual earnings-per-share, dispersion of forecasts, and number of analysts making forecasts not available
*** data on institutional holdings not available

Table 3 shows the sampling percentages relative to the COMPUSTAT population for various industries. Thomas' (1989) classification scheme (shown at the bottom of the table) is used for defining industries. The sample as a percentage of the COMPUSTAT population by industry ranges from 25.05% to 44% (overall, 35.51%). Thus, our sample is representative of the population of firms.

The sample distribution is presented in table 4. Mean (median) market value (*MV)* for the sample is $3.8850 ($0.5060) billion. The mean value of *ACCURACY* is 0.7798 and median is 0.9091. On average, more than 5 analysts (*NUM*) were following a firm. The dispersion of analyst forecasts (*DISP*) has a mean of .0277 and a median value of 0.010. The mean institutional shareholding (*INST*) is 44.28%. *ARSQ* is the adjusted R-square of the regression of *MV* on net income during the quarter (both variables deflated by book value of the firm at the end of the quarter). This variable captures the changes in the explanatory power of earnings for firm value. Mean *ARSQ* is 3.8978%.

Table 3
Sampling Percentage Across Industries

Industry Groups	Sample Observations	COMPUSTAT Observations	Sampling Percentage
Basic Industries	2,440	5,545	44.00%
Capital Goods	6,922	18,714	36.99%
Construction	923	2,677	34.48%
Consumer Goods	9,918	25,673	38.63%
Energy	1,402	3,754	37.35%
Finance	4,827	19,269	25.05%
Transportation	1,756	3,982	44.10%
Utilities	991	2,560	38.71%
Total	29,179	82,174	35.51%

The classification into industry groups is based on Thomas (1989). Each group contains the following four-digit SIC codes:

Industry Group	SIC Codes
1. Basic Industries	1000-1299, 1400-1499, 2600-2699, 2800-2829, 2870-2899, and 3300-3399
2. Capital Goods	3400-3419, 3440-3599, 3670-3699, 3800-3849, 5080-5089, 5100-5129, and 7300-7399
3. Construction	1500-1599, 2400-2499, 3220-3299, 3430-3439, and 5160-5219
4. Consumer Goods	0000-0999, 2000-2399, 2500-2599, 2700-2799, 2830-2869, 3000-3219, 3420-3429, 3600-3669, 3700-3719, 3850-3879, 3880-3999, 4830-4899, 5000-5079, 5090-5099, 5130-5159, 5220-5999, 7000-7299, and 7400-9999
5. Energy	1300-1399 and 2900-2999
6. Finance	6000-6999
7. Transportation	3720-3799 and 4000-4799
8. Utilities	4800-4829 and 4900-4999

Table 4
Sample Characteristics

Variables	Availability Period	No. of Observations	Unit of Measure	Mean	Standard Deviation	Median
MV	1989-99	29,179	$ Billion	3.8850	13.1632	0.5060
ACCURACY	1989-99	29,179	Number	0.7798	0.2987	0.9091
NUM	1989-99	29,179	Number	5.9658	5.3554	4.0000
DISP	1989-99	29,179	$ per Share	0.0277	0.0888	0.010
ARSQ	1989-99	29,179	Percentage	3.3472	3.8978	1.8300
INST	1989-99	29,179	Percentage	0.4428	0.2263	0.4578
ITSALES	1989-99	29,179	$ Billion	1.2619	0.3315	1.2405
COMP	1989-99	29,179	Million	17.9759	5.7256	19.9388
SITES [a]	1993-96	11,455	Million	0.1368	0.1993	0.02350
HOSTS [b]	1992-95	8,708	Million	4.4465	2.5831	3.9000
DOMAINS [c]	1992-95	8,708	Thousand	82.2136	67.8360	56.0000
BYTES [d]	1992-95	6,372	Trillion	13.4329	5.7768	14.0000
PACKETS [e]	1992-95	6,372	Trillion	13.5352	5.0246	14.5000

See Table 1 for variable definitions.

Notes:

(a) Source: *http://www.mit.edu/people/mkgray/net/web-growth-summary.html*

(b) Source: *http://www.mit.edu/people/mkgray/net/internet-growth-raw-data.html*

(c) Source: *http://www.mit.edu/people/mkgray/net/internet-growth-raw-data.html*

(d) Source: *http://www.cc.gatech.edu/gvu/stats/NSF/Bytes.GIF*
(includes FTP, WWW, and GOPHER)

(e) Source: *http://www.cc.gatech.edu/gvu/stats/NSF/Both.GIF*
(includes FTP, WWW, and GOPHER)

5. Empirical Tests And Results

5.1. Correlation Analysis

Table 5 provides the correlations between *ACCURACY* and variables affecting the information environment surrounding the firm. Since larger firms have a richer predisclosure information environment (Atiase 1980, 1985), we expect a positive correlation between *LMV* and *ACCURACY*. The larger the analyst following, the greater is the predisclosure information. This suggests a positive association between *ACCURACY* and *NUM*. The greater the disagreement between analysts, the lower the quality of predisclosure information. This suggests a negative association between *ACCURACY* and *DISP*. We expect a negative association between *ARSQ* and *ACCURACY*, since earnings will have greater explanatory power if predisclosure information is less (Kim and Verrecchia 1991). More sophisticated investors are likely to have access to more predisclosure information (El-Gazzar 1998; Bartov et al. 2000), possibly due to their greater resources and enhanced computational and analytical skills. Such investors, given their resources and technological skills, would demand more accurate (and, therefore, more costly analyst forecasts). This would suggest a positive association between *INST* and *ACCURACY*. The correlation of *ACCURACY* with the information technology variables (in logarithmic form) is predicted to be positive. As shown in table 5, Pearson and Spearman Coefficients are in the expected directions and significant for all the variables.

Table 5
Correlation Analysis
(*p* values in parentheses)

Variables	Expected Sign	Pearson	Spearman
		Correlation of *ACCURACY* with	
LMV	+	0.2791	0.2635
		(0.0001)	(0.0001)
NUM	+	0.1758	0.2052
		(0.0001)	(0.0001)
DISP	–	-0.1096	-0.1538
		(0.0001)	(0.0001)
ARSQ	–	-0.0659	-0.0659
		(0.0001)	(0.0001)
INST	+	0.1496	0.1416
		(0.0001)	(0.0001)
LITSALES	+	0.0590	0.0616
		(0.0001)	(0.0001)
LCOMP	+	0.0697	0.0599
		(0.0001)	(0.0001)
LSITES	+	0.0151	0.0324
		(0.1065)	(0.0005)
LHOSTS	+	0.0380	0.0323
		(0.0004)	(0.0026)
LDOMAINS	+	0.0338	0.0323
		(0.0016)	(0.0026)
LBYTES	+	0.0379	0.0180
		(0.0025)	(0.1504)
LPACKETS	+	0.0382	0.0183
		(0.0023)	(0.1446)

See Table 1 for variable definitions.

5.2. Portfolio Analysis

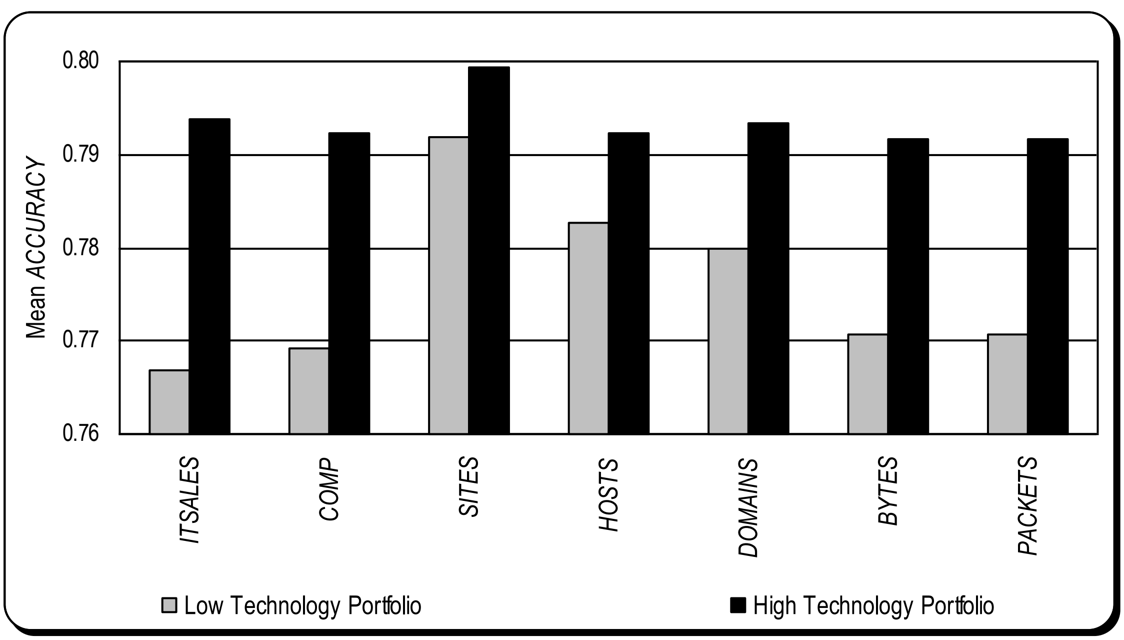
In the portfolio analysis, we partition the sample based on the median values of the seven technology variables. Our hypothesis predicts that mean *ACCURACY* for low technology portfolio should be lower than the mean for high technology portfolio. Table 6 shows that *t*-tests for equal portfolio means reject the null hypothesis that portfolios have equal mean *ACCURACY*. For four of our proxies, *ITSALES*, *COMPS*, *BYTES* and *PACKETS* the null is rejected at 1% level in a one-sided test. For *DOMAIN*, the null is rejected at 5% and for *SITES* and *HOSTS* it is rejected at 10% level. The dichotomy between the two portfolios for each technology variable is also depicted graphically in figure 1.

Table 6
Portfolio Analysis

Partitioning Variable	Mean *ACCURACY*		*t* statistics (H_0: Equal Portfolio Means)
	Portfolio of Obs. > Median	Portfolio of Obs. ≤ Median	
ITSALES	0.7939	0.7668	***7.7554
COMP	0.7923	0.7693	***6.5765
SITES	0.7994	0.7918	*1.4366
HOSTS	0.7924	0.7827	*1.5676
DOMAINS	0.7934	0.7799	**2.1744
BYTES	0.7916	0.7706	***2.8560
PACKETS	0.7916	0.7706	***2.8560

See Table 1 for variable definitions
* implies significance at 10% level (one-sided)
** implies significance at 5% level (one-sided)
*** implies significance at 1% level (one-sided)

Figure 1
Plot Of Analyst Forecast Accuracy Versus Technology



See table 1 for variable definitions. Low (High) Technology Portfolio consists of observations ≤ (>) median value of the corresponding technology variable. Differences between mean *ACCURACY* for the two portfolios are significant for all variables.

5.3. Regression Analysis

Multivariate regression analysis is superior to univariate analysis (Correlation and Portfolio analyses), since it allows for simultaneous controls of all variables that can affect the dependent variable. We run the following regression to test our hypothesis.

$$ACCURACY = \alpha_0 + \alpha_1 LMV + \alpha_2 NUM + \alpha_3 DISP + \alpha_4 ARSQ + \alpha_5 INST + \alpha_6 TECHNO + \epsilon$$

where $\alpha_0 \ldots \alpha_6$ are the regression coefficients to be estimated from the data and ϵ are the estimation errors. *TECHNO* implies the natural logarithm of our seven technology variables: *ITSALES, COMP, SITES, HOSTS, DOMAINS, BYTES,* and *PACKETS.* All the other variables are as defined earlier. The predicted signs of $\alpha_0 \ldots \alpha_5$ are as discussed in the section on "Correlation Analysis." Variables, *LMV, NUM, DISP, ARSQ,* and *INST* are included as control variables. *LMV* controls for any size-related effects on forecast accuracy. *NUM* and *DISP* control for the effects of number of analysts and disagreement among analysts on accuracy. *ARSQ* accounts for changes in the explanatory power of earnings. Finally, *INST* controls for the effects of investor sophistication on analysts' prediction behavior. Since all these effects are different from information technology, we have to control for their effects on *ACCURACY*, before we can test our hypothesis. H_A predicts that as *TECHNO* increases, *ACCURACY* should increase too (that is, $\alpha_6 > 0$). As is evident from Table 7, the coefficients of *LMV, NUM, DISP, ARSQ,* and *INST* are generally in the expected directions. The coefficients of all the information technology related variables (except the number of sites) are significant and positive, thus rejecting the null that information technology has no affect on the accuracy of analyst forecast. These results support the alternate hypothesis.

5.4. Limitations of the Research Design

One limitation of this research is that it does not control for advancement of various types of forecasting methodologies over time. Another aspect that is not controlled for is the increase in forecast accuracy due to learning effects of analysts. In other words, analysts might get better at predicting with experience. Even though it is very difficult to quantify these effects, we try to control them with a "time" variable.[3] TIME is defined as a variable with value of 1 for quarter 1 of 1989 increasing to 44 for quarter 4 for 1999. This variable should capture the effects of omitted effects discussed above. Results for LITSALES and LCOMP are presented in table 8. Results for the other technology variables are not reported since we have observations for only four years for these variables and this caused significant multicollinearity with TIME making the results unreliable. Results in table 8 continue to support our hypothesis that forecast accuracy has improved with information technology. However, to the extent that TIME does not capture the effects mentioned above, our results should be interpreted with caution.

5.5. Regression Diagnostics and Sensitivity Analysis

Belsley, Kuh, and Welsch's (1980) test for multicollinearity is conducted on all the regressions and reported in tables 7 and 8. The highest variance inflation factor (VIF) is 9.8590. Thus, all VIF values are below the critical level of 10. Therefore, multicollinearity does not appear to be a significant problem in any of the regression estimations. White's (1980) test for heteroskedasticity is also conducted. The null of homoskedastic errors is rejected for all the regressions (White's p values are reported in tables 7 and 8). To ascertain the effects of heteroskedasticity on our results, White's homoskedastic p values are calculated for the regressions (results not tabulated). None of the conclusions are altered. Tests for outliers are also conducted on all the regressions using Belsley, Kuh, and Welsch's (1980) procedure. No influential outliers are detected. These diagnostics/sensitivity analyses confirm that our results are robust and reliable.

[3] Researchers in the past, such as Mikhail, Walther, and Willis (1997), have used this variable to control for similar effects.

Table 7
Regression Analysis
$Accuracy = \alpha_0 + \alpha_1 LMV + \alpha_2 NUM + \alpha_3 DISP + \alpha_4 ARSQ + \alpha_5 INST + \alpha_6 TECHNO + error$

Independent Variables	Expected Sign	*TECHNO* Variables (*t* statistics in parentheses)						
		LITSALES	LCOMP	*LSITES*	*LHOSTS*	*LDOMAINS*	*LBYTES*	*LPACKETS*
Intercept		***0.2295 (3.232)	***0.3611 (15.875)	***0.5087 (15.427)	***0.4723 (21.727)	***0.3558 (5.064)	***0.4210 (10.956)	***0.3978 (9.086)
LMV	+	***0.0528 (37.524)	***0.0523 (37.565)	***0.0516 (23.105)	***0.0455 (17.151)	***0.0455 (17.130)	***0.0389 (12.361)	***0.0388 (12.369)
NUM	+	***0.0038 (7.825)	***0.0038 (7.836)	***0.0031 (4.237)	***0.0022 (2.597)	***0.0022 (2.588)	-0.0008 (-0.769)	-0.0008 (-0.779)
DISP	–	***-0.4133 (-21.996)	***-0.4108 (-21.861)	***-0.9720 (-19.002)	***-0.9094 (-16.120)	***-0.9093 (-16.113)	***-1.0000 (-14.450)	***-0.9995 (-14.442)
ARSQ	–	***-0.0041 (-5.958)	***-0.0029 (-4.233)	*-0.0051 (-1.585)	0.0002 (0.093)	-0.0019 (-0.740)	0.0027 (0.954)	0.0030 (1.036)
INST	+	***0.0003 (3.893)	***0.0003 (3.821)	***0.0004 (3.258)	***0.0005 (3.263)	***0.0005 (3.242)	***0.0007 (3.626)	***0.0007 (3.626)
TECHNO	+	***0.0345 (3.566)	***0.0389 (5.567)	0.0010 (0.388)	***0.0252 (3.317)	***0.0142 (2.493)	***0.0396 (3.747)	***0.0478 (3.777)
Obs.		29,179	29,179	11,455	8,708	8,708	6,372	6,372
Adj-R Sqr		10.36%	10.42%	11.28%	9.59%	9.54%	8.98%	8.98%
F Value		563.054	566.451	243.801	154.900	154.017	105.771	105.813
Prob. > *F*		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Highest VIF		2.5866	2.6615	6.4724	2.7428	2.7431	2.7539	2.7541
White's *p* Value		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

See Table 1 for variable definitions.

- implies significance at 10% level (one-sided)

** implies significance at 5% level (one-sided)

*** implies significance at 1% level (one-sided)

Table 8
Regression Analysis With Control For Time

$ACCURACY = \alpha_0 + \alpha_1 LMV + \alpha_2 NUM + \alpha_3 DISP + \alpha_4 ARSQ + \alpha_5 INST + \alpha_6 TIME + \alpha_7 TECHNO + error$

Independent Variables	Expected Sign	*TECHNO* Variables			
		LITSALES		*LCOMP*	
		Estimate	*t* Statistic	Estimate	*t* Statistic
Intercept		-0.1666	-0.743	***0.3104	11.038
LMV	+	***0.0527	37.361	***0.0528	37.536
NUM	+	***0.0037	7.661	***0.0037	7.814
DISP	–	***-0.4143	-22.040	***-0.4103	-21.835
ARSQ	–	***-0.0047	-6.150	***-0.0038	-5.076
INST	+	***0.0003	3.920	***0.0003	3.715
TIME	?	**0.0017	1.862	***0.0014	3.068
TECHNO	+	***0.0968	2.781	***0.0707	5.652
Obs.		29,179		29,179	
Adj-R Sqr		10.37%		10.44%	
F Value		483.154		487.013	
Prob. > *F*		0.0001		0.0001	
Highest VIF		3.2659		9.8590	
White's *p* Value		0.0001		0.0001	

See Table 1 for variable definitions
** implies significance at 5% level (one-sided)
*** implies significance at 1% level (one-sided)

6. Conclusion

This paper investigates the effect of information technology on the accuracy of analyst forecasts. We provide evidence consistent with analyst forecasts becoming more accurate with growth in information technology. We capture the growth in information technology using several variables, such as total sales of information technology related firms, number of computers sold, number of websites, number of hosts, number of registered domains, number of bytes, and packets of information transferred. Our results are consistent with our hypothesis that the increase in the usage of information technology has increased the accuracy of analyst forecasts. Thus, our paper provides evidence of a positive impact of information technology on the overall information environment. Our findings are important to investors who use these forecasts to value the firm and make investment decisions.

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