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Time Stamp Errors and the Stock Price Reaction to Analyst Recommendation and Forecast Revisions*

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Abstract

This paper investigates the problem of time stamp errors in the IBES database, the most important data provider of analyst recommendations and forecasts currently. We compare IBES to alternative data sources and show that IBES announcement dates of both recommendations and forecasts are systematically delayed. As a consequence, announcement returns in IBES are significantly underestimated while the pre-announcement effect, which often includes the effective announcement date, is overestimated. We also show that time stamp errors in IBES differ significantly in the cross-section, driving some of the cross-sectional differences in announcement returns. Finally, we discuss how existing research is affected by time stamp errors.

JEL Classification: G14, G24, G29

Keywords: time stamp errors, IBES database, analyst recommendations, analyst forecasts, stock price reaction, pre-announcement effect

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1 Introduction

Today, IBES (Institutional Brokers' Estimate System) is the most important data provider of sell-side analyst recommendations and forecasts both for academic and non-academic use.[1] Until 2012, the other major database providing recommendations and forecasts was First Call. However, in February 2012, Thomson Reuters, the owner of both IBES and First Call, shut down First Call and recommended IBES as a substitute.[2] Thus, future research will have to rely almost exclusively on IBES data when dealing with analyst recommendations and forecasts.[3]

In this paper, we investigate the precision of announcement dates of both analyst recommendations and forecasts in the IBES database. We show that recommendation and forecast announcement dates provided by the IBES database are systematically delayed compared to First Call and other data sources. We demonstrate that these time stamp errors in IBES lead to significantly underestimated announcement returns and a significantly overstated pre-announcement effect, since the latter often includes the effective announcement date. We document that time stamp errors vary across firm, broker, and analyst characteristics, driving some of the cross-sectional differences in announcement returns to analyst recommendation changes and forecast revisions. In summary, our analysis shows that IBES is an imperfect substitute for First Call and that today's most important database for analyst recommendations and forecasts is flawed. To the best of our knowl-

[1] IBES provides analyst recommendations and forecasts on approximately 70,000 firms in over 90 countries.

[2] In January 2011, WRDS (Wharton Research Data Services) announced on its website: "Thomson Reuters has informed us that they will be discontinuing the First Call database this calendar year. At that point, it must be removed from WRDS. [...] IBES, also from Thomson Reuters, may be used as a substitute." In December 2011: "Thomson Reuters' First Call [...] will no longer be offered beginning February 29, 2012. Thomson Reuters' IBES estimates will be the new [...] content set moving forward."

[3] From 2011 to 2013, 11 studies investigating the announcement effect on either analyst recommendations or forecasts were published in top finance and accounting journals (Accounting Review, Journal of Accounting and Economics, Journal of Accounting Research, Journal of Finance, Journal of Financial Economics, Review of Financial Studies). All studies except one rely on the IBES database. Appendix A provides an overview of these studies.

edge, our study is the first to extensively investigate the problem of time stamp errors in the entire IBES database for both recommendations and forecasts.

To investigate the precision of IBES time stamps, we first attempt to identify the same analyst recommendations in the First Call and Thomson One (previously Investext) databases. We then compare the IBES announcement dates with announcement dates provided by these alternative data sources. First Call provided data on the U.S. (and Canada) only, while Thomson One contains analyst reports on firms worldwide. First Call was and Thomson One still is used by brokerage firms to distribute their research reports electronically to their institutional clients. Hence, First Call and Thomson One are expected to comprise exact publication dates of analyst recommendations (Green, 2006).[4] The major disadvantage of the Thomson One database is that analyst reports have to be hand-collected and stock recommendations are not provided in a standardized form. Moreover, Thomson One only contains written reports, but not all recommendations are distributed as written reports.

Using U.S. data and covering the time period 1994-2001, we find IBES announcement dates of analyst recommendations to be delayed by about 0.6 trading days on average compared to the announcement dates provided by First Call. After 2002, the time lag between IBES announcement dates and First Call announcement dates disappears in daily data. However, when analyzing recommendations on stocks listed in four other major capital markets (Britain, France, Germany, and Japan), the problem of time stamp errors in daily data still persists after 2002.[5] In the international sample covering these four countries, we report average time lags between IBES and Thomson One announcement dates ranging from 0.5 trading days (Britain) to 0.7 trading days (Germany) over the

[4]We also cross-check First Call and Thomson One dates against dates provided by newswires (LexisNexis) and confirm the accuracy of First Call/Thomson One time stamps.

[5]We focus on large capital markets to ensure that there is a sufficiently large number of analyst recommendations.

entire sample period from 1994 to 2010.

We use event study analysis to quantify the impact of delayed announcement dates in IBES on cumulative abnormal returns (CARs) around announcement dates. Since IBES announcement dates of recommendations are systematically delayed, the pre-announcement period often includes the effective announcement day. We therefore expect the pre-announcement effect to be overestimated and the announcement effect to be underestimated. In the U.S. sample from 1994 to 2001, the average 2-day announcement return beginning on the announcement date is about 15% (0.5 percentage points) higher for recommendation upgrades and about 20% (1.1 percentage points) lower for recommendation downgrades when using First Call time stamps rather than IBES time stamps. Consistently, the average 2-day pre-announcement CAR is overstated by 40% (0.4 percentage points) for upgrades and by 35% (0.9 percentage points) for downgrades when using IBES data. Over the entire investigation period from 1994 to 2010, the impact of time stamp errors on event window returns is less pronounced but still economically and statistically significant. In the international sample, time stamp errors have a substantially stronger effect on announcement and pre-announcement returns. The average 2-day announcement CAR increases by up to 50% for upgrades and decreases by up to 70% for downgrades when switching from IBES announcement dates to Thomson One announcement dates.

We rerun our analysis for one-year-ahead annual earnings forecasts. In the U.S. sample and the time period 1990-2001, the average time lag between the IBES announcement date and the First Call announcement date is 1.1 trading days. Time stamp errors again disappear after 2002. In the pre-2002 period, the average CAR[0,+1] increases by about 40% (0.3 percentage points) for upward revisions and decreases by over 50% (0.7 percentage points) for downward revisions when using First Call time stamps rather than IBES time stamps. Thus, for analyst forecasts, the effect of imprecise announcement dates on announcement returns is even larger than for analyst recommendations.

We also investigate whether time stamp errors differ across firm, broker, and analyst characteristics often analyzed in the literature. If time stamp errors vary significantly in the cross-section, cross-sectional differences in CARs around the announcement of analyst recommendations and analyst forecasts might be at least partly due to these cross-sectional differences in erroneous dates rather than due to differences in the characteristics themselves. We find that time stamps are significantly more precise for large companies, for recommendations and forecasts of large brokerage firms, and for recommendations and forecasts of more experienced and star analysts. We then show that, for instance, analyst experience has no effect on announcement returns to analyst recommendations when using IBES data. However, when we switch to First Call, analyst experience is negatively correlated with announcement CARs. Another example is firm size, which is not significantly related to announcement returns of forecast revisions when using IBES data but is significantly negatively related to the announcement returns of analyst forecasts when using First Call data. Hence, cross-sectional differences in announcement returns may partly be driven by cross-sectional differences in time stamp errors.

Finally, we discuss how existing research is affected by time stamp errors in IBES. Jegadeesh and Kim (2006) investigate the value of analyst recommendations across the G7 countries using IBES data for the time period from November 1993 to July 2002, a period which we show to be strongly affected by the time stamp error problem. They document that announcement returns are largest for recommendation revisions of U.S. analysts and close to zero for countries such as Germany. They conclude that the most likely explanation for the superior performance of U.S. analysts is that they are more skilled at identifying mispriced stocks than analysts in other countries. However, replicating their study with more precise First Call and Thomson One data, we find that roughly three quarters of the difference between U.S. announcement returns and non-U.S. announcement returns disappear. In another study, Irvine et al. (2007) analyze the pre-announcement effect

on analyst recommendations using IBES data from March 1996 to December 1997 and from March 2000 to December 2000. Both periods are affected by the time stamp error problem. The authors report significant announcement returns ahead of the publication of analyst recommendations and argue that their results are consistent with investors' receiving upfront tips from brokerage firms. However, switching from IBES to First Call data renders previously significant abnormal pre-announcement returns insignificant. In fact, only the pre-announcement effect on the day prior to the publication (t = -1) remains statistically significantly different from zero. While IBES time stamp errors do not reverse the results of the aforementioned studies altogether, our analysis demonstrates that time stamp errors have a significant impact on the magnitude of the reported findings.

The reliability of IBES data has been questioned in previous research. Most prominently, Ljungqvist et al. (2009) document that IBES recommendations were altered between downloads of the database from 2000 to 2007. In response to their study, Thomson Reuters fixed the alterations of recommendations in IBES in 2007.[6] The issue of imprecise time stamps in IBES has also been raised in previous research. While we find that after 2002 there is no significant difference in daily data between IBES and First Call announcement dates, Bradley et al. (2014) investigate the intraday price reaction to recommendations using a small sample of 305 recommendations covering the time period from 2002 to 2007 and show that IBES time stamps are still delayed by about 2.4 hours on average when compared to time stamps provided by newswire sources (Dow Jones News Retrieval, Reuters, and LexisNexis). Even though intraday stock prices are readily available nowadays, the majority of recent studies of analysts' recommendations and forecasts still rely on daily

[6]Our results are based on a download of the IBES database in September 2011. Thus, the problem discussed by Ljungqvist et al. (2009) should not be an issue for our study. To test whether Thomson Reuters altered the IBES database after the closing of First Call in February 2012, we again downloaded the IBES database in March 2013. We do not observe any changes to the IBES database, which would reduce the time stamp error problem, after the shutdown of First Call.

data.[7]

Our findings highlight the importance of controlling for time stamp errors when working with IBES data. We suggest three approaches to mitigate the time stamp error problem in empirical research on analyst recommendations and forecasts. First, alternative data sources such as First Call or Thomson One can be used or IBES data can be matched to such alternative databases to replace IBES announcement dates with precise First Call/Thomson One dates.[8] Second, when using U.S. data, focusing on the post-2002 period is another way to overcome the time stamp error problem in daily data. However, as shown by Bradley et al. (2014), this is not sufficient when working with intraday data. It is also not sufficient for non-U.S. data as the time stamp error problem persists beyond 2002 for most other countries. Third, we show that extending the event window around the announcement date to make sure that the effective announcement date is captured resolves the time stamp error problem when analyzing analyst recommendations. However, we also show that broadening event windows is not sufficient to effectively reduce the time stamp error problem when dealing with analyst forecasts.

The remainder of the paper is organized as follows. Section 2 discusses the data and samples used in the study. Section 3 compares announcement dates of analyst recommendations in IBES with First Call and Thomson One announcement dates. The impact of time stamp errors on announcement and pre-announcement returns to analyst recom-

[7] Among the 11 studies published in top finance and accounting journals from 2011 to 2013 that are summarized in Appendix A there is no study investigating intraday price reactions to analyst recommendation or forecast revisions.

[8] There are significant drawbacks attached to both of these approaches. First Call was shut down in 2012. Hence, data ends in June 2011 and there will be no further updates. Moreover, while IBES covers stocks worldwide, First Call only covers the U.S. and Canada. In contrast, Thomson One covers stocks worldwide and is constantly updated. However, analyst reports have to be hand-collected and stock recommendations are not provided in standardized form. Also Thomson One codes written reports, but not all analyst recommendations are distributed as written reports, resulting in necessarily incomplete coverage. Finally, when matching IBES data to First Call/Thomson One and replacing IBES announcement dates by the precise announcement dates from First Call/Thomson One, sample size will be substantially reduced due to differences in data coverage and matching problems.

mendations is then analyzed by using standard event study methodology. The section proceeds by replicating the analysis for analyst forecasts. This section then investigates whether time stamp errors in IBES differ significantly across firms, brokers, and analysts and quantifies the impact of these cross-sectional differences in time stamp errors on cross-sectional differences in announcement returns. The last part of Section 3 discusses how time stamp errors affect existing research. Section 4 concludes.

2 Data and samples

In order to compare analyst recommendations reported by IBES, First Call, and Thomson One (previously Investext), we retrieve data on five developed countries which rank among the largest capital markets worldwide: the U.S., Britain, France, Germany, and Japan.[9] We focus on large capital markets to be able to assemble samples containing a sufficiently large number of recommendations. While IBES and Thomson One cover all sample countries, First Call data is only available for analyst recommendations on U.S. (and Canadian) firms. Hence, in our U.S. sample, we compare IBES recommendations with First Call recommendations and in the British, French, German, and Japanese samples, we compare IBES recommendations with Thomson One recommendations.[10] As analyst reports have to be hand-collected from Thomson One, we concentrate on analyst reports of stocks contained in the major stock indices in our British, French, German, and Japanese samples.[11] These stocks are typically covered by a large number of analysts and consequently a large

[9] As of 2010, the U.S. (#1), Britain (#4), France (#6), Germany (#10), and Japan (#3) are among the 10 largest capital markets globally (World Bank, 2015). The other five countries that belong to the top 10 are China (#2), Canada (#5), India (#7), Brazil (#8), and Australia (#9).

[10] In unreported tests, we rerun our analysis for a Canadian sample using IBES and First Call recommendations. Results are similar to the results obtained with the U.S. sample.

[11] For Britain, we collect reports on stocks that are included in the FTSE 100 index at least once between January 1994 and December 2010. For France, we focus on stocks in the CAC 40 index, for Germany, we concentrate on stock in the DAX index, and for Japan, we collect reports on stocks in the Topix 150 index.

number of reports is available.

The advantage of First Call over IBES is that First Call is expected to provide the precise date of publication of an analyst recommendation as it was used by brokerage firms to distribute their research reports electronically to their institutional clients. After the compliance department of a brokerage firm approved an analyst report, the report was typically sent immediately to First Call for distribution (Green, 2006).[12] Thomson One is also used to distribute analyst reports to institutional clients. However, Thomson One relies on the coding of the written reports. Not all analyst recommendations are distributed as written reports, so some recommendations might not be available in Thomson One. Moreover, written reports are often dated sometime after the actual publication of the analyst recommendations (Womack, 1996). Thus, the announcement date contained in Thomson One might be delayed as well. Hence, delays of IBES versus Thomson One recommendations uncovered in this study can be considered conservative estimates of the effective IBES time lags.

IBES started reporting recommendations in 1993, First Call has reported recommendations since 1986, and Thomson One started to collect analyst reports in the mid-1980s. First Call was discontinued in February 2012 with data coverage ending in June 2011. Since observations in the databases are sparse in the beginning, we restrict our sample of analyst recommendations to the time period from January 1, 1994 to December 31, 2010.

To construct our U.S. sample, we match recommendations in IBES and First Call based on the stock's CUSIP, a standardized broker name, the stock recommendation, and the date of the recommendation, allowing for a 10-day window on both sides of the IBES announcement date. Thus, we drop observations with missing CUSIPs, missing broker names, missing recommendations, or missing announcement dates. In our non-U.S.

[12]Analyst recommendations in First Call are designated as either real-time or batch. The latter are recommendations coming from a weekly batch file. We eliminate analyst recommendations coming from such batch files.

samples, we cannot use the stock recommendation as a matching characteristic as it is not provided in standardized form in Thomson One. Hence, in our British, French, German, and Japanese samples, we match recommendations in IBES and Thomson One based on the stock's CUSIP, a standardized broker name, and the announcement date, also allowing for a 10-day window before and after the IBES announcement date. As in the U.S. sample, we eliminate recommendations if one of the matching characteristics is missing. When there are multiple matches, the closest date observation is chosen. In case of ties, we choose the earlier date. Ljungqvist et al. (2007) use a similar matching procedure to combine IBES and First Call. They match recommendations based on broker, CUSIP, and date, allowing for a two-week window on either side of the IBES announcement date.

When investigating the impact of time stamp errors on the stock price reaction to analyst recommendations, we focus on recommendation upgrades and downgrades. Rating changes tend to be more informative than levels (Boni and Womack, 2006). We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current recommendation with its previous recommendation. IBES provides an analyst code that enables us to identify recommendation revisions of the same analyst. Thus, we eliminate recommendations for which the analyst code in IBES is missing. Unfortunately, there is no analyst identifier available in First Call. Thus, in First Call, the current and the previous recommendation might be issued by different analysts. As Thomson One does not report any information on the specific recommendations contained in analyst reports in standardized form, we identify upgrades and downgrades by screening the subtitles of analyst reports.[13] Finally, we allocate recommendations published outside of trading hours, that is, after 4:00 pm, to the

[13]The company name is typically provided in the title of the analyst report while the subtitle summarizes the specific content of the recommendation. We define a recommendation as an upgrade (e.g., "Rating upgrade – Sale of IT solutions and services: A decisive step in the portfolio streamlining process") or downgrade (e.g., "Downgrading to Hold after strong performance") if the subtitle makes an unambiguous statement about the rating change.

next trading day to correctly capture the announcement effect (Green, 2006).

Table 1 provides a survey of the remaining recommendations in the standalone IBES samples, the standalone First Call sample, the standalone Thomson One samples, and the merged samples. In our U.S. sample, we are left with 494,807 recommendations in the IBES sample, of which 105,095 recommendations are identified as upgrades and 129,396 as downgrades. In First Call, there are 656,489 recommendations, of which 142,007 are upgrades, and 180,188 are downgrades. 201,697 (40.8%) of the original IBES recommendations can be matched to First Call (which amounts to 30.7% of the First Call sample). Ljungqvist et al. (2007) use a similar approach to match these two databases and are able to identify 46.8% of their IBES recommendations in First Call, a number that is reasonably close to ours. In the merged sample, upgrades and downgrades are defined as in the standalone First Call sample. There are 51,869 upgrades and 65,332 downgrades. The standalone IBES samples for the other countries contain between 18,560 (France) and 30,250 (Japan) recommendations and are thus substantially smaller than the IBES sample for the U.S. While IBES includes more analyst recommendations on U.S. stocks than on stocks listed in any other country, the relative sample imbalance is fostered by our restriction to non-U.S. stocks contained in the respective country's blue chip index.[14] In each IBES sample, about one quarter of all recommendations can be classified as upgrades and another quarter as downgrades. The Thomson One samples include between 42,989 (Germany) and 74,878 (Britain) observations. There are relatively fewer upgrades and downgrades in the Thomson One samples as we have to identify recommendation revisions based on the subtitles of the analyst reports. In the merged samples, there are between 3,850 (Germany) and 5,090 (Britain) recommendations. Thus, between 15.4% (Japan) and 25.8% (Britain) of original IBES recommendations can be matched to Thomson One, which is equivalent to

[14]The British IBES sample covering all stocks contains 130,089 recommendations, the unrestricted French sample includes 72,360 recommendations, the entire German sample contains 62,759 recommendations, and the complete Japanese sample consists of 90,980 recommendations.

about 6.8% (Britain and France) and 9.0% (Germany and Japan) of the original Thomson One recommendations, respectively. Jung et al. (2012) also match IBES recommendations to Thomson One (Investext) and can identify about 15.5% of IBES recommendations in Thomson One (Investext), which is reasonably close to our figures. In the merged non-U.S. samples, we use the information about recommendation revisions from both the standalone IBES samples and the standalone Thomson One samples to identify upgrades and downgrades. Thereby, we classify about 30% of recommendations as upgrades and another 30% as downgrades.

To compile our U.S. sample, we obtain stock return data from CRSP (Center for Research in Security Prices). For all other countries, we use return data on individual stocks and indices from Thomson Financial Datastream. Following Ivkovic and Jegadeesh (2004), Jegadeesh and Kim (2006), Jung et al. (2012), and many others, we use market-adjusted returns to calculate cumulative abnormal returns (CARs). Market-adjusted returns are defined as the difference between raw returns and market returns of the respective country. For the U.S., we use the CRSP value-weighted index as proxy for the market. For all other countries, we use the respective country's MSCI index. We use CARs over the 2-day (3-day) window beginning on the announcement date of the analyst recommendation to capture the announcement effect of analyst recommendations. The pre-announcement effect is measured by means of CARs over the 2-day pre-announcement window beginning two days prior to the announcement date of the recommendation.[15]

[15]In unreported robustness tests, we calculate abnormal returns in our U.S. sample as the difference between raw returns and returns predicted by a market model. We estimate the market model over the time period from t = -282 to t = -31 and use the CRSP value-weighted index as proxy for the market. The results remain virtually unchanged.

3 Empirical analysis

In our main analysis, we first compare IBES time stamps of analyst recommendations with First Call and Thomson One time stamps (Section 3.1). We then quantify the impact of time stamp errors on announcement and pre-announcement returns (Section 3.2). We go on to replicate the analysis for analyst forecasts (Section 3.3). Next, we investigate whether time stamp errors differ across firm, broker, and analyst characteristics and analyze the effect of cross-sectional differences in time stamp errors on cross-sectional differences in announcement returns (Section 3.4). The section concludes with a discussion on how existing research is affected by time stamp errors (Section 3.5).

3.1 Time stamp errors of analyst recommendations

To investigate the precision of time stamps in IBES, we use the merged samples and compare IBES time stamps with First Call/Thomson One time stamps. Specifically, we calculate for each matched recommendation the time lag in trading days between the announcement date in IBES and the announcement date in First Call/Thomson One.

Panel A of Table 2 reports the results. Looking at the U.S. data reported in the first three columns, we find the average time lag between the IBES announcement date and the First Call announcement date to be positive and statistically significant for the years 1995 to 2002, indicating that IBES dates are significantly delayed compared to First Call. The average time lag is larger than one trading day in years 1995, 1996, and 1997 and then decreases almost monotonically to 0.2 trading days in 2002. In 2003, the time lag turns negative and even significantly so (-0.1 trading days). It then remains economically close to zero until 2010 although it is often statistically significant. Consistently, the number of positive time lags is large until 2002, accounting for between 12.4% (2002) and 47.5% (1994) of all recommendations on U.S. stocks, and then drops virtually to zero in 2003.

From 1994 to 2001, the average time lag amounts to 0.6 trading days in our U.S. sample which compares to only 0.1 trading days over the entire sample period. In the British sample, the average time lag between the IBES announcement date and the Thomson One announcement date is not statistically different from zero for years 1994 to 1998. This is mainly because we are able to match only relatively few recommendations at the beginning of the sample period. In 1999, the time lag turns statistically significant (0.5 trading days). It then increases monotonically over the following years and peaks at 1.2 trading days in 2002. From 2002 onwards, the time lag decreases almost steadily and is economically and statistically no longer different from zero in 2010. The average time lag over the 1994 to 2001 (entire) time period amounts to 0.7 (0.5) trading days. In our French sample, the average time lag is larger than two trading days at the beginning of the investigation period (1994, 1995, and 1997). It fluctuates between 0.5 and 0.8 trading days between 1999 and 2003. From 2003 onwards, it decreases almost monotonically from 0.8 trading days to 0.1 trading days in 2008 and 2010, respectively, and is no longer statistically different from zero as of 2008. Over the 1994 to 2001 (entire) period, the average time lag for French recommendations is 0.8 (0.5) trading days. In the German sample, the average time lag is positive but not statistically significant throughout the first three sample years.[16] From 1998 to 2004, the time lag fluctuates at about one trading day. In 2005, the time lag drops to 0.2 trading days and turns statistically insignificant. However, this substantial decrease is followed by an increase to 0.5 trading days in 2006 (t-statistic of 2.79). In contrast to previous samples, the time lag remains positive and statistically significant at the end of the investigation period in 2010. The average time lag in the German sample amounts to 0.9 (0.7) trading days between 1995 and 2001 (2010). Finally, the pattern in the Japanese sample resembles the pattern in the U.S. sample. The average time lag is positive and statistically significant for years 1994 to 2002. In 2003, there is a sharp decline in the

[16]Note that no recommendation can be matched between IBES and Thomson One in the first sample year, resulting in the German sample starting in 1995 instead of 1994.

average time lag, which is no longer significantly different from zero from 2003 to 2005. There is a small rebound in years 2006 to 2008. However, in 2009 and 2010, the average time lag is again close to zero and either not significant (2009) or only weakly significant (2010). The results in Panel A of Table 2 are graphically illustrated in Panel A of Figure 1. Overall, we find that while time stamp errors disappear in the U.S. sample in 2003, and to some extent also in the Japanese sample, they only vanish gradually in the British and French samples after 2002/2003. Time lags of German stock recommendations remain positive and statistically significant until the end of our investigation period.

We treat First Call and Thomson One as our 'gold standard' for the reasons outlined above. However, to further validate the accuracy of First Call/Thomson One time stamps, we cross-check them against dates provided by news sources using LexisNexis. We draw three random samples of 100 recommendations each: one for the U.S. and the time period from 1994 to 2001, one for the U.S. and the time period from 2003 to 2010, and one for Germany and the time period from 1994 to 2010.[17] We retain the earliest reported time stamp in LexisNexis. In the U.S. sample covering the period 1994-2001, only 2% of First Call dates are delayed compared to dates provided by news sources. In the later U.S. sample, covering 2003-2010, only 4% of First Call dates follow news source dates. In the German sample, we could not identify any delayed time stamps in Thomson One when compared to dates provided by news sources. As an additional test to verify the quality of First Call and Thomson One time stamps, we compare First Call time stamps with time stamps of recommendations on U.S. firms from Thomson One. As analyst reports have to be hand-collected from Thomson One, we randomly select 1,000 quarters of firms in the S&P 1500 index in the time period from January 1994 to December 2010. This procedure results in a Thomson One sample containing 7,321 analyst recommendations. We are able

[17]For the U.S. sample and the time period from 2003 to 2010, we focus on newswires, while for the 1994-2001 U.S. sample and for the German sample, we also take into account newspaper articles because of the limited availability of newswire sources.

to match 484 recommendations to First Call using the same matching procedure as for the other Thomson One samples. In the merged sample, the average time lag between the First Call announcement date and the Thomson One announcement date amounts to -0.008 trading days and is not statistically different from zero (t-statistic of -0.07). In conclusion, when investigating daily data, First Call and Thomson One indeed seem to provide accurate time stamps.[18]

One reason for the convergence of IBES and First Call after 2002 might be that Thomson Reuters (previously Thomson) acquired full ownership of IBES in September 2000 and purchased 48% of First Call's shares in June 2001, also resulting in a 100% ownership stake.[19] Thus, an alignment of the two databases seems to have taken place after full ownership of both databases was acquired, leading to more precise announcement dates in IBES. Ljungqvist et al. (2009) confirm that a reconciliation of the IBES and First Call databases took place in 2003.[20] As First Call only covered the U.S. (and Canada), the merger of the two databases had less of an effect on recommendations on firms from other countries. Therefore, time stamp errors disappear only gradually in our non-U.S. samples.

[18]In an intraday setting, Bradley et al. (2014) cross-check IBES time stamps of recommendations against newswire time stamps for the period from 2002 to 2007. They only consider daytime recommendations where the reported time stamp is between 9:30 am and 4:00 pm. 56.4% of IBES time stamps are delayed compared to newswires. However, even if the time provided by IBES is inaccurate, the date could still be correct. Our sample of 100 randomly selected recommendations for the period from 2003 to 2010 only contains 15 daytime recommendations. Newswire sources do not provide the time for one recommendation. For nine recommendations (64.3%), the time provided by First Call is delayed compared to newswire sources. However, First Call dates equal newswire dates for all but one recommendation. Hence, even if First Call might not provide the precise time of a recommendation announcement, First Call announcement dates are almost always correct.

[19]Thomson Reuters completed the acquisition of Primark, a publicly listed company that owned IBES, in September 2000 (see, e.g., "The Thomson Corporation Completes Equity Tender Offer for Primark", Business Wire, September 13, 2000). Thomson Reuters founded First Call in 1984, but only owned 52% of the shares. In June 2001, Thomson purchased the remaining 48% of shares from its eight brokerage partners, Credit Suisse, Salomon Smith Barney, Morgan Stanley, Deutsche Bank, Merrill Lynch, UBS, Lehman Brothers, and Prudential (see, e.g., "Thomson Financial Acquires Full Ownership of First Call", Business Wire, June 21, 2001).

[20]WRDS says the following on its website: "In 2000, IBES was integrated with Thomson Reuters/First Call [...]." This statement might be misleading. Even though Thomson Reuters acquired IBES in 2000, our findings indicate that the integration of the two databases only took place in 2002/2003.

To shed some light on why announcement dates in IBES are systematically delayed when compared to other data sources, we investigate the delay between the date on which an analyst makes a stock recommendation according to IBES – the announcement date – and the date on which this recommendation is recorded by IBES – the activation date.[21] Specifically, we calculate the time lag in trading days between the activation date and the announcement date in IBES. In the U.S. sample, we eliminate 25 observations with negative time lags between the IBES activation date and the IBES announcement date. The inclusion of a recommendation in the database prior to its actual publication is not reasonable. There are no observations with negative time lags in the non-U.S. samples. Moreover, in the U.S. sample, we eliminate 742 recommendations with time lags of more than 30 trading days, and in the non-U.S. samples, we delete between 15 (Japan) and 30 observations (Germany) for the same reason.[22]

Panel B of Table 2 reports the results. In the U.S. sample, there is hardly any systematic difference between the recommendation announcement date reported in IBES and IBES's activation date until 2001. In 2002, the time lag jumps from a value close to zero to 0.7 trading days. The year 2002 appears to be a transition year in which IBES started to store two different dates. However, there is still a significantly positive time lag between announcement dates in IBES and First Call in 2002. Thereafter, the time lag between IBES announcement and activation dates fluctuates between zero and one trading day. Consistently, the percentage of positive time lags jumps from about 3% in 2001 to over 20% in 2002. The pattern of time stamps within IBES in the other countries' samples is similar but lagged by one year versus the U.S. The major jump in the average time lag and the fraction of positive time lags takes place in 2003 rather than in 2002. Panel B

[21] The precise wording of Thomson Reuters for the IBES announcement date is as follows: "Date that the forecast/actual was reported." The precise definition for the IBES activation date is as follows: "Date that the forecast/actual was recorded by Thomson Reuters." (Thomson Reuters, 2010, p. 57).

[22] IBES reports time lags between the activation date and the announcement date of over 800 trading days.

of Figure 1 displays these results graphically. Hence, until 2001/2002, IBES did not store the original announcement date of analyst recommendations but only the activation date, leading to the reported time stamp errors. Following the reconciliation of the IBES and First Call databases in 2002/2003, IBES started to store separate dates for the announcement and the activation of analyst recommendations. Subsequently, time lags decrease, either immediately or gradually over time.

3.2 The impact of time stamp errors on the stock price reaction to analyst recommendation revisions

To quantify the impact of time stamp errors in IBES on event window returns, we use the merged samples and compare CARs around IBES announcement dates with CARs around First Call and Thomson One announcement dates. An expected consequence of time stamp errors is that the announcement effect is underestimated. By contrast, pre-announcement returns are overstated because they often include the actual announcement day.

Panel A of Table 3 reports the average 2-day pre-announcement CAR as well as the average 2-day and 3-day announcement CARs of recommendation upgrades. In the U.S. sample, the average 2-day (3-day) announcement CAR is 3.4% (3.6%) when using IBES time stamps and increases by about 0.1 percentage points when switching to First Call time stamps. The average pre-announcement CAR decreases by about the same amount, from 0.4% using IBES to 0.3% using First Call. While the effect of time stamp errors on announcement returns is economically small, pre-announcement returns drop by about 25% when switching to First Call, which is economically sizable. All return differences are statistically significant at the 5% level. When restricting our analysis to the time period from 1994 to 2001, which is strongly affected by time stamp errors, 2-day (3-day) announcement returns for upgrades are 3.4% (3.6%) with IBES time stamps and 3.9% (4.2%) with

First Call time stamps. Thus, the announcement effect increases by about 15% (0.5 to 0.6 percentage points) when switching from IBES to First Call. Consistently, the pre-announcement effect is overstated by almost 40% (0.4 percentage points) when using IBES announcement dates. For the other countries, we only report results for the entire time period from 1994 to 2010. Findings are similar to those reported on the U.S. in the sense that announcement returns are underestimated in IBES by about 0.2 to 0.5 percentage points and pre-announcement effects are overestimated by about the same amount. However, the return differences between IBES and Thomson One time stamps are economically much more meaningful as average announcement returns are substantially smaller in the international samples versus the U.S. sample. Jegadeesh and Kim (2006) also document announcement returns to be largest for U.S. analysts compared to their counterparts in other countries and attribute this to the superior skills of U.S. analysts at identifying mispriced stocks.[23] In our non-U.S. samples, the average CAR[0,+1] and CAR[0,+2] increase by 20% (Britain and Japan) and 50% (France and Germany), respectively, when switching from IBES to Thomson One time stamps and only the return differences in the British sample are statistically insignificant. Panel A of Figure 2 illustrates graphically the 2-day announcement returns of recommendation upgrades in IBES and First Call for different time lags ranging from one to 10 trading days. When time stamps in IBES are precise, that is, when there is no time lag between IBES announcement dates and First Call announcement dates, announcement returns in First Call and IBES are the same. However, as IBES time stamps become delayed, announcement returns based on IBES time stamps are substantially reduced while First Call announcement returns remain on a similar level across all time lag groups.

Panel B of Table 3 presents the results for recommendation downgrades. In the U.S.

[23]In Section 3.5, we show that the announcement return difference between U.S. and non-U.S. recommendations can partly be explained by differences in time stamp errors.

sample spanning the entire investigation period, the average 2-day (3-day) announcement CAR is -4.4% (-4.5%) with IBES time stamps and decreases by about 0.3 percentage points when switching to First Call. The pre-announcement effect is reduced by about 0.2 percentage points to -0.5% when using First Call rather than IBES announcement dates. When focusing on the period from 1994 to 2001, time stamp error effects are again much more pronounced. Announcement returns decrease by about 20% (1.1 percentage points) when moving from IBES to First Call. In the British, French, German, and Japanese samples, announcement returns to recommendation downgrades decrease by between roughly 10% (Japan) and 70% (France) when using Thomson One time stamps rather than IBES time stamps. Results for downgrades in the U.S. sample are illustrated graphically in Panel B of Figure 2. Overall, as expected, we document announcement effects to become stronger and pre-announcement returns to become weaker when switching from IBES to First Call/Thomson One announcement dates. Hence, time stamp errors provide an additional explanation for the pre-announcement effect of analyst recommendations documented in previous research (e.g., Jegadeesh and Kim, 2006; Irvine et al., 2007; Loh, 2010).[24]

To corroborate our international findings, which are stronger than those found in the U.S. sample, we use an alternative and proprietary source of Swiss analyst stock recommendations and match these recommendations to the analyst recommendations for Swiss stocks included in IBES. We use recommendations on Swiss stocks as provided by Burkhalter Asset Management (BAM), a small and independent asset management company lo-

[24]Prior literature already provides several explanations for the pre-announcement effect of analyst stock recommendations. For example, certain investors may receive tips from brokerage firms prior to the publication of the analyst recommendations (Irvine et al., 2007; Christophe et al., 2010; Anderson and Martinez, 2014). An alternative explanation is that analysts typically issue their stock recommendations after corporate news and thereby simply 'piggy-back' on public information (Altinkiliç and Hansen, 2009). A third explanation, also referred to as the 'prediction hypothesis', is that the judgment of investors coincides with the judgment of analysts. Hence, investors buy stocks that they predict will do well and sell stocks that they predict will perform poorly. Analysts independently decide to upgrade or downgrade shares of strongly or weakly performing firms, respectively (Christophe et al., 2010).

cated in Bern, Switzerland. BAM offers as one of its services a newsletter which includes, among other things, updates on stock recommendations. BAM distributes this newsletter electronically several times per day. Hence, updates on analyst recommendations do not immediately reach BAM clients. However, they typically reach them with only a few hours delay after their original publication. The BAM announcement date of a recommendation is the date the newsletter was sent out. We collect stock recommendations on Swiss stocks as provided by BAM for the period from January 1, 2002 to December 31, 2006. To match our IBES recommendations to the recommendations in the BAM database, we apply the same matching algorithm as applied before to match IBES and First Call. The Swiss IBES sample includes 6,904 observations, the BAM sample includes 8,098 recommendations, and the merged sample consists of 2,127 observations. Hence, 30.8% of Swiss IBES recommendations can be matched to the BAM sample and 26.3% of BAM recommendations can be matched to IBES. Panel A of Table A1 in Appendix B reports the average time lag between the IBES announcement date and the BAM announcement date by calendar year. It is positive and statistically significant for all years. However, the time lag decreases from 2.3 and 1.5 trading days in 2002 and 2003, respectively, to 1.0 trading days in 2004, and to 0.2 and 0.3 trading days in 2005 and 2006, respectively. As in the German sample, time lags are substantially reduced after 2004 but do not fully disappear. Panel B of Table A1 shows the average pre-announcement and announcement returns to recommendation revisions for the Swiss sample. We find the effect of time stamp errors on the announcement and pre-announcement returns to be even stronger than in the other non-U.S. samples. Thus, these tests confirm the findings for non-U.S. countries using yet another database.

3.3 Analyst forecasts

In this section, we rerun the analysis from previous sections for analyst forecasts. We follow previous research and concentrate on one-year-ahead annual earnings per share (e.g., Clement and Tse, 2003; Gleason and Lee, 2003). In this section, we focus on the U.S. sample and the comparison of IBES and First Call time stamps, as Thomson One only distributes written reports and analysts often revise their forecasts without issuing new written reports. IBES started reporting forecasts in 1976 and First Call has reported forecasts since 1989, so we focus on the time period from January 1, 1990 to December 31, 2010. The matching procedure to combine IBES and First Call forecasts is similar to the matching procedure for recommendations. Observations are matched based on the CUSIP, a standardized broker name, the one-year-ahead annual earnings forecast, and the announcement date of the forecasts. When investigating the impact of time stamp errors on the stock price reaction to forecasts we focus on announcements of upward and downward revisions of forecasted one-year-ahead annual earnings per share. We define an analyst forecast as an upward (downward) revision if the current forecast exceeds (falls short of) the previous forecast.

In the standalone IBES sample, there are 2,555,386 one-year-ahead annual earnings forecasts, of which 1,062,890 are upward revisions and 1,257,786 are downward revisions. In First Call, there are 1,784,607 forecasts in total, 769,002 upward revisions, and 870,860 downward revisions. Of IBES forecasts, 888,423 (34.8%) can be matched to First Call (which is equivalent to 49.8% of First Call forecasts). The matched sample contains 385,253 upward revisions and 449,252 downward revisions.

Panel A of Table 4 reports average time lags between forecast announcement dates in IBES and First Call by calendar year. The average time lag is between two and five trading days from 1990 to 1994. In these five years, 60% to 90% of all forecasts have a

positive time lag. The time lag remains positive and significant until 2002 but decreases from 1.5 trading days on average in 1995 to 0.1 trading days in 2002. The percentage of positive time lags also decreases from over 50% in 1995 to about 10% in 2002. As of 2003, the time lag is virtually zero. Over the time period from 1990 to 2001, the average time lag amounts to 1.1 trading days and over the entire investigation period, the time lag is 0.2 trading days on average. Results are graphically illustrated in Figure 3. In unreported tests, we also investigate the time lag between the IBES activation date and the IBES announcement date of forecasts. We find patterns similar to those reported in Panel B of Table 2 and Panel B of Figure 1 for recommendations. After the reconciliation of the two databases in 2002/2003, when IBES started to permanently store two different dates, time stamp errors disappear.

Panel B of Table 4 reports CARs around the announcement date of forecast revisions. Over the time period from 1990 to 2010, the average announcement return to upward forecast revisions using IBES time stamps is 1.4% and increases by about 5% (0.1 percentage points) when switching to First Call time stamps. The announcement effect on downward revisions is about -1.6% in IBES and decreases by about 10% (0.2 percentage points) when switching to First Call data. When restricting our sample to 1990-2001, when the time stamp error problem is prevalent, switching from IBES to First Call increases the announcement effect of upward revisions by up to 40% (0.3 percentage points) and decreases the announcement effect of downward revisions by about 50% (0.6 to 0.7 percentage points). All differences in announcement returns which result from using IBES versus First Call time stamps are statistically significant. The effect of time stamp errors on pre-announcement returns is weaker. Pre-announcement return differences are generally not statistically significant for upward revisions. However, for downward revisions, the pre-announcement effect is overstated by about 5% (0.1 percentage points) over the entire time period and by about 10% (0.2 percentage points) from 1990 to 2001. Hence, while

the impact of time stamp errors on announcement returns to forecast revisions is stronger than to recommendation changes, the effect of time stamp errors on the pre-announcement effect is weaker.

Both IBES and First Call not only report recommendations and forecasts but also actual earnings. IBES started reporting actuals in the early 1980s and First Call in 1989. Earnings announcement dates are also available from Compustat. For completeness, we also analyze time lags between IBES and First Call earnings announcement dates and between Compustat and First Call earnings announcement dates. Results are reported in Table A2 in Appendix B. The pattern of time lags for actuals is slightly different from the pattern for recommendations and forecasts. From 1990 to 1998, IBES and Compustat earnings announcement dates are both delayed by about 1.1 trading days compared to First Call. Average time lags shrink to values close to zero in 1999 and remain economically unimportant until 2010. Results are graphically illustrated in Figure A1 in Appendix B.

3.4 Cross-sectional differences in time stamp errors and their impact on the stock price reaction to analyst recommendation and forecast revisions

In this section, we assess whether time stamp errors in IBES, as measured by the time lag between the IBES and First Call announcement dates, vary across different types of companies, brokerage firms, and analysts. If time stamp errors vary significantly in the cross-section, cross-sectional differences in CARs around the announcement of recommendations and forecasts might be at least partly driven by these cross-sectional differences in time stamp errors rather than by the characteristics themselves. We focus on the U.S. sample and the time period from 1994 to 2001, which is strongly affected by time stamp errors.

We use characteristics found to be significantly related to announcement returns in previous research on the value of analyst stock recommendations and forecasts (e.g., Clement and Tse, 2003; Ertimur et al., 2007; Fang and Yasuda, 2014). We include a company's market capitalization as proxy for firm size. The number of analysts employed by a brokerage firm is a proxy for broker size. A dummy variable that equals one for analysts who have been awarded the All-American Research Team title at least once captures the reputation of analysts.[25] The number of recommendations and forecasts issued by an analyst is a proxy for analysts' attentiveness. Moreover, the number of firms followed by an analyst is considered a proxy for analysts' portfolio complexity and availability of time. We use the number of years in which an analyst supplies recommendations and forecasts on a company as a proxy for the analysts' firm-specific experience. We obtain data on these variables either from Compustat (market capitalization), IBES, or Institutional Investor (All-American Research Team ranking). Appendix C provides detailed descriptions of all these characteristics and lists existing studies that use these variables.

Panel A of Table A3 in Appendix B reports descriptive statistics of firm, broker, and analyst characteristics for our merged sample of recommendations. There are 5,404 firms in this sample. For 310 firms, we lack information on the company's market capitalization. The average (median) company has a market capitalization of USD 2,066 million (USD 335 million). Our sample contains 101 brokerage firms. On average (median) these brokerage firms employ 21 (9) analysts. There are 3,501 distinct analysts in our sample. The All-American Research Team title has been awarded to 15% of them at least once. On average (median) they issue 1.5 (1.4) recommendations per company and year, follow 6.3 (5.7) companies per year, and cover the respective company for 0.8 (0.5) years. Descriptive statistics for the merged sample of forecasts are provided in Panel B of Table A3. They

[25] All-American Research Team rankings from the Institutional Investor magazine are only available for the years 2001 to 2010. Hence, we do not consider analysts who were awarded the title between 1994 and 2000.

are similar to the ones for the recommendation sample. There are 5,539 companies, 105 brokerage firms, and 3,786 analysts in the merged sample of forecasts. Analysts issue on average (median) 3.6 (3.4) forecasts per firm and year, follow 9.6 (8.3) firms per year, and cover the respective companies for 1.4 (1.0) years.

To investigate whether there are cross-sectional differences in time stamp errors, we run OLS regressions of the time lags between the IBES announcement date and the First Call announcement date of recommendations and forecasts on firm, broker, and analyst characteristics. We run separate regressions for recommendation upgrades and recommendation downgrades and for upward forecast revisions and downward forecast revisions.

Panel A of Table 5 presents the results. Columns 1 and 2 (3 and 4) report regression coefficients for the sample of recommendations (forecasts). IBES time stamps tend to be more precise, that is, the time lag between the IBES and First Call announcement dates is smaller for large companies and for recommendations and forecasts issued by large brokerage firms. The star analyst status has no effect on the time lag of recommendations but time lags tend to be smaller for forecasts issued by All-American Research Team analysts. The number of recommendations and forecasts issued by an analyst has no effect on time stamp errors. The results for the number of companies followed by an analyst are mixed. In Column 1, when dealing with recommendations, the coefficient on this variable is negative and statistically significant, while in Columns 3 and 4, when looking at forecasts, coefficients are positive and also statistically significant. Finally, recommendations (but not forecasts) of more experienced analysts are associated with smaller time stamp errors. Results show that time lags between IBES and First Call time stamps are not randomly distributed in the cross-section but differ significantly across firm, broker, and analyst characteristics.

Next, we analyze the impact of cross-sectional differences in time stamp errors on cross-sectional differences in announcement returns. We regress 2-day announcement CARs

around recommendation changes and forecast revisions on firm, broker, and analyst characteristics. We again run separate regressions for recommendation upgrades and recommendation downgrades and for upward revisions and downward revisions of forecasts. We run each regression twice, first using IBES time stamps and then using First Call time stamps. For easier comparison of results between recommendation upgrades and recommendation downgrades and between upward forecast revisions and downward forecast revisions, we reverse the sign of the cumulative market-adjusted announcement returns to recommendation downgrades and downward forecast revisions.

Results are presented in Panel B of Table 5. Findings from the sample of recommendations (forecasts) are reported in Columns 1 to 4 (5 to 8). We focus on characteristics for which we find different results when using IBES versus First Call time stamps. For instance, in Column 3, when looking at recommendation downgrades using IBES time stamps, the coefficient on firm-specific experience is not statistically significant (t-statistic of -1.43). However, in Column 4, when using First Call time stamps, firm-specific experience is significantly negatively related to 2-day announcement returns (t-statistic of -3.14). Hence, when using IBES data, we miss this negative relation between firm-specific experience and announcement returns to analyst recommendation revisions. Results are even more striking when considering analyst forecast revisions. For instance, in Column 5, when relying on IBES time stamps, firm size has no significant effect on announcement CARs of upward forecast revisions (t-statistic of -0.99). However, when switching to First Call time stamps, upward forecast revisions for larger firms generate significantly smaller announcement returns than upward forecast revisions for smaller firms (t-statistic of -2.54). Findings are very similar when looking at downward forecast revisions in Columns 7 and 8. Again, when using IBES data, we would not uncover this negative relation between firm size and announcement returns to forecast revisions. Overall, the results in this section document that cross-sectional differences in time stamp errors can significantly influence

cross-sectional differences in announcement returns to analyst recommendation and forecast revisions.

3.5 How is existing research affected by time stamp errors?

In this section, we discuss how existing research is affected by time stamp errors. To illustrate potential effects on empirical findings resulting from time stamp errors, we replicate two analyses from existing studies, one on the announcement effect of analyst recommendations and one on the pre-announcement effect of recommendations.

Jegadeesh and Kim (2006) analyze the stock price reaction to analyst recommendations across the G7 countries. Their study uses IBES data for the time period from November 1, 1993 to July 31, 2002, a period which we show to be strongly affected by the time stamp error problem. They find announcement returns to be largest for recommendations of U.S. analysts and close to zero for countries like Germany. The authors conclude that the most likely explanation for the superior performance of U.S. analysts is that U.S. analysts are more skilled at identifying mispriced stocks than analysts in other countries.

To investigate whether time stamp errors provide an alternative explanation for differences in announcement effects across countries, we analyze whether (and how) the results of Jegadeesh and Kim (2006) change when we replace the IBES recommendations on U.S. (German) stocks by First Call (Thomson One) recommendations. In the time period from November 1, 1993 to July 31, 2002, which is covered by Jegadeesh and Kim (2006), our U.S. sample includes 48,742 upgrades and 62,266 downgrades. This is comparable to the 50,238 upgrades and 63,444 downgrades reported by Jegadeesh and Kim (2006). Our German sample employed so far only includes recommendations on stocks contained in the blue chip index DAX. To obtain a German sample comparable to that used in Jegadeesh and Kim (2006), we extend our German sample by including recommendations on all Ger-

man stocks. This leads to 5,334 upgrades and 5,829 downgrades, which is again close to the 5,252 upgrades and the 5,713 downgrades in Jegadeesh and Kim's (2006) sample. The U.S. First Call sample consists of 65,671 upgrade and 87,201 downgrades and the German Thomson One sample includes 895 upgrades and 960 downgrades. In the merged IBES-First Call sample for the U.S., the average time lag amounts to 0.5 trading days and in the merged German IBES-Thomson sample, the average time lag is 1.1 trading days.

We use event study analysis to quantify the impact of using alternative data sources on event window returns. Results are reported in Panel A of Table 6. For the U.S. IBES sample, the average CAR[0,+1] (CAR[0,+2]) is 2.1% (2.2%) for upgrades and -3.3% (-3.4%) for downgrades. For the German IBES sample, we find significantly smaller announcement returns of 0.2% (0.2%) for upgrades and -0.4% (-0.5%) for downgrades. The difference in announcement returns between the two countries amounts to 1.9% (2.0%) for upgrades and 2.9% (3.0%) for downgrades. Our results are very similar to those reported in Table 6 of Jegadeesh and Kim (2006). Hence, we confirm that when relying on IBES data the announcement effect of recommendations by U.S. analysts is significantly larger than the announcement effect of recommendations by German analysts. When we use the First Call instead of the IBES sample for U.S. recommendations, the average 2-day (3-day) announcement return increases by 0.1% (0.1%) for upgrades and decreases by 0.5% (0.5%) for downgrades. When using more precise Thomson One data instead of IBES data for German recommendations, we find that the 2-day (3-day) announcement returns increase by 1.4% (1.7%) for upgrades and decrease by -2.1% (-2.3%) for downgrades. Thus, in the analysis of upgrades, the resulting difference in average CAR[0,+1] (CAR[0,+2]) between the U.S. and German samples decreases from 1.9% (2.0%) when using IBES data to 0.6% (0.4%) only when using First Call and Thomson One data with more precise time stamps. Moreover, the difference in 2-day CARs to recommendation upgrades is no longer statistically significant. Hence, we report a reduction in the difference in announcement

returns between U.S. and German recommendation upgrades of over 70%. Similarly, when analyzing downgrades, the difference in average CAR[0,+1] (CAR[0,+2]) between the U.S. and German samples narrows substantially from -2.9% (-3.0%) when using IBES data to -1.3% (-1.1%) when using First Call and Thomson One data, a decrease of about 60%. Thus, the general conclusion of Jegadeesh and Kim (2006) that U.S. analysts provide more value is still valid but the difference in announcement returns between U.S. and German analysts is substantially reduced.

Irvine et al. (2007) analyze the pre-announcement rather than the announcement effect of analyst recommendations. Their paper uses IBES data for the time periods from March 31, 1996 to December 31, 1997 and from March 31, 2000 to December 31, 2000. Both periods are affected by time stamp errors. Irvine et al. (2007) document significant abnormal returns beginning five days ahead of the publication of initial buy and strong buy recommendations. The authors argue that their results are consistent with investors' receiving tips from brokerage firms prior to the publication of recommendations.

To investigate the effect of time stamp errors on the pre-announcement returns reported by Irvine et al. (2007), we first replicate their findings using IBES data and then switch to First Call data.[26] There are 4,850 buy and 4,189 strong buy recommendations in our IBES sample, which is reasonably close to the 4,598 buy and 4,467 strong buy recommendations reported by Irvine et al. (2007).[27] In the First Call sample, we are able to

[26]Irvine et al. (2007) first investigate abnormal returns and abnormal volumes using the CRSP database. In a later part of the study, the authors use a proprietary sample of institutional trades. Due to data availability, we can only replicate the first part of their analysis.

[27]We follow Irvine et al. (2007) and focus on first initiations by an analyst. We require the brokerage firm to appear in IBES at least six months prior to an initiation. We delete initiations when there was an earnings announcement within five days of the recommendation. We delete stocks with a price less than USD 5 on the day prior to the initiation. We eliminate initiations of recommendations on firms that have gone public within six months and when there was another initial recommendation in the 11-day window around the recommendation.

identify 3,275 buy and 3,695 strong buy recommendations.[28] In the matched sample, IBES announcement dates are on average delayed by about 1.0 trading days compared to First Call announcement dates.

Average abnormal returns for a symmetric 21-day window around the announcement date of recommendation initiations are reported in Panel B of Table 6. In the IBES sample, we find significant average abnormal returns on all five trading days ahead of the publication of recommendations except for day t = -4. These results are very similar to those reported in Table 2 in Irvine et al. (2007). However, in the First Call sample, most of the pre-event abnormal returns turn insignificant and only the return on the last day before the event date (t = -1) remains statistically significant, but economically relatively small (0.2%) when compared to the event day return of 1.3%. Hence, time stamp errors provide an additional explanation for the documented abnormal returns preceding the publication of analyst recommendations.

Many existing studies use IBES data and consider 2-day or 3-day announcement returns when investigating the stock price reaction to analyst recommendations and forecast revisions (e.g., Ivkovic and Jegadeesh, 2004; Jegadeesh and Kim, 2006; Clement et al., 2011; Kirk, 2011; Jung et al., 2012). As we show in this paper, this may lead to an underestimation of announcement returns and an overestimation of pre-announcement returns. One approach to mitigate this problem is to broaden event windows around announcement dates to make sure that they include the (erroneous) pre-announcement effect. To illustrate the effect of broader event windows, we rerun our event study analysis from Tables 3 and 4, focusing on U.S. recommendations and forecasts, and extend our event windows to include either one or two days prior to the announcement date. We then compare the announce-

[28] As there is no analyst identifier available in First Call, we cannot identify first initiations by an analyst but only first initiations by a brokerage firm in our First Call sample. However, in Table A4 in Appendix B, we rerun the analysis with a merged sample that uses IBES analyst identifiers to determine first initiations by an analyst also in the First Call sample. Results remain virtually unchanged.

ment returns which result from using alternative event windows and IBES data with the announcement returns obtained when using the more precise First Call time stamps.

Results for recommendation revisions are presented in Panel A of Table 7. When considering recommendation upgrades, the difference in announcement returns reported in Table 3 turns insignificant when we extend the event window by one or two days prior to the event date. When considering recommendation downgrades, the difference resulting from using First Call versus IBES announcement dates turns insignificant when we use the CAR[-2,+2] comprising two pre-announcement days.

Results for analyst forecast revisions are reported in Panel B. When analyzing forecast revisions, broadening the event window to include one or two days prior to the announcement date is not sufficient to make the difference between CARs based on IBES and CARs based on First Call time stamps disappear. Even when using an 11-day CAR comprising five pre-announcement days, CAR[-5,+5], the significant difference between CARs based on IBES and CARs based on First Call time stamps persists. Differences in CARs resulting from using First Call versus IBES announcement dates only turn insignificant (or weakly significant) when including a two-week period prior to the announcement date of forecast revisions in the CAR. In summary, widening event windows seems to be a reasonable robustness test when analyzing analyst recommendations. However, when investigating forecast revisions, broadening event windows in a way that ensures that time stamp errors no longer impact results requires event windows that include at least 10 trading days prior to the event. This does not appear to be a sensible approach to dealing with the time stamp error problem as such long event windows amplify the well-known signal-to-noise problem in event studies.

4 Conclusion

This study investigates the problem of time stamp errors in the IBES database. After the shutdown of First Call in 2012, IBES became the most important data provider of analyst recommendations and forecasts to both the finance industry and the research community. By comparing IBES to First Call and other alternative data sources, we show that IBES did not store the original announcement date of both recommendations and forecasts, resulting in significantly delayed announcement dates. While the time stamp error problem disappears around the year 2002 for some countries, in particular the U.S., it prevails in some non-U.S. datasets, such as Germany. Using event study analysis, we show that imprecise announcement dates lead to a significant underestimation of announcement effects in IBES and a significant overestimation of pre-announcement returns, as they often include the effective announcement date. We also find that time stamp errors in IBES are not randomly distributed in the cross-section but differ significantly across firm, broker, and analyst characteristics. Consequently, cross-sectional differences in announcement returns related to firm, broker, or analyst characteristics may be driven by cross-sectional differences in time stamp errors. Finally, we show that studies using IBES data and investigating a time period strongly affected by time stamp errors, such as Jegadeesh and Kim (2006) or Irvine et al. (2007), significantly underestimate the stock price reaction to analyst recommendation and forecast revisions on the announcement date, while they overestimate the pre-announcement effect.

In summary, our findings highlight the importance of controlling for time stamp errors in IBES data. We suggest three approaches to mitigate the time stamp error problem. First, alternative databases, such as First Call or Thomson One, can be used or IBES data can be augmented by matching it to these data sources and replacing the announcement

dates.[29] Second, when using U.S. data, focusing on the post-2002 period might be another way to overcome the time stamp error problem in daily data. However, as shown by Bradley et al. (2014), this is not sufficient when working with intraday data. It is also not sufficient for non-U.S. data. Third, we show that broadening the event window to include one or two days prior to the announcement date reported in IBES captures the effective announcement date and thus resolves the time stamp error problem when analyzing analyst recommendations. However, broadening event windows does not appear to be sufficient when dealing with analyst forecasts.

[29]While mitigating the time stamp error problem, both of these approaches have significant drawbacks as well. As First Call was shut down in 2012, there will be no further updates. Moreover, First Call only covers the U.S. and Canada. In Thomson One, analyst reports have to be hand-collected and stock recommendations are not provided in standardized form. Moreover, Thomson One relies on the coding of the written reports. As not all analyst recommendations are distributed as written reports, some recommendations included in IBES or First Call will not be available in Thomson One. Finally, matching IBES data to First Call/Thomson One and replacing IBES announcement dates by the precise announcement dates from First Call/Thomson One results in substantially smaller samples due to differences in data coverage and matching problems.

References

Altinkiliç, O., and R. Hansen, 2009, On the information role of stock recommendation revisions, *Journal of Accounting and Economics* 48, 17-36.

Anderson, A., and J.V. Martinez, 2014, Brokerage-firm trading and profits around recommendation revision dates, Working Paper, Swedish House of Finance.

Bradley, D., J. Clarke, S. Lee, and C. Ornthanalai, 2014, Are analysts' recommendations informative? Intraday evidence on the impact of time stamp delays, *Journal of Finance* 69, 645-673.

Boni, L., and K.L. Womack, 2006, Analysts, industries, and price momentum, *Journal of Financial and Quantitative Analysis* 41, 85-109.

Christophe, S.E., M.G. Ferri, and J. Hsieh, 2010, Informed trading before analyst downgrades: Evidence from short sellers, *Journal of Financial Economics* 95, 85-106.

Clement, M.B., and S.Y. Tse, 2003, Do investors respond to analysts' forecast revisions as if forecast accuracy is all that matters?, *Accounting Review* 78, 227-249.

Clement, M.B., J. Hales, and Y. Xue, 2011, Understanding analysts' use of stock returns and other analysts' revisions when forecasting earnings, *Journal of Accounting and Economics* 51, 279-299.

Ertimur, Y., J. Sunder, and S.V. Sunder, 2007, Measure for measure: The relation between forecast accuracy and recommendation profitability of analysts, *Journal of Accounting Research* 45, 567-606.

Fang, L.H., and A. Yasuda, 2014, Are stars' opinions worth more? The relation between analyst reputation and recommendation values, *Journal of Financial Services Research* 46, 235-269.

Firth, M., C. Lin, P. Liu, and Y. Xuan, 2013, The client is king: Do mutual fund relation-

ships bias analyst recommendations?, *Journal of Accounting Research* 51, 165-200.

Gleason, C.A., and C.M.C. Lee, 2003, Analyst forecast revisions and market price discovery, *Accounting Review* 78, 221-233.

Green, T.C., 2006, The value of client access to analyst recommendations, *Journal of Financial and Quantitative Analysis* 41, 1-24.

Haushalter, D., and M. Lowry, 2011, When do banks listen to their analysts? Evidence from mergers and acquisitions, *Review of Financial Studies* 24, 321-357.

Hilary, G., and C. Hsu, 2013, Analyst forecast consistency, *Journal of Finance* 68, 271-297.

Hilary, G., and R. Shen, 2013, The role of analysts in intra-industry information transfer, *Accounting Review* 88, 1265-1287.

Huber, P.J., 1967. The behavior of maximum likelihood estimates under nonstandard conditions, Proceedings of the Fifth Berkeley Symposium on Mathematical Statistics and Probability 1, 221–233.

Hui, K.W., and P.E. Yeung, 2013, Underreaction to industry-wide earnings and the post-forecast revision drift, *Journal of Accounting Research* 51, 701-737.

Irvine, P., M. Lipson, and A. Puckett, 2007, Tipping, *Review of Financial Studies* 20, 741-768.

Ivkovic, Z., and N. Jegadeesh, 2004, The time and value of forecast and recommendation revisions, *Journal of Financial Economics* 73, 433-463.

Jegadeesh, N., and W. Kim, 2006, Value of analyst recommendations: International evidence, *Journal of Financial Markets* 9, 274-309.

Jung, B., P.B. Shane, and Y.S. Yang, 2012, Do financial analysts' long-term growth forecasts matter? Evidence from stock recommendations and career outcomes, *Journal of Accounting and Economics* 53, 55-76.

Kirk, M., 2011, Research for sale: Determinants and consequences of paid-for analyst

research, *Journal of Financial Economics* 100, 182-200.

Lehavy, R., F. Li, and K. Merkley, 2011, The effect of annual report readability on analyst following and the properties of their earnings forecasts, *Accounting Review* 86, 1087-1115.

Ljungqvist, A., C. Malloy, and F. Marston, 2007, Rewriting history, Working Paper, New York University.

Ljungqvist, A., C. Malloy, and F. Marston, 2009, Rewriting history, *Journal of Finance* 64, 1935-1960.

Loh, R.K., 2010, Investor inattention and the underreaction to stock recommendations, *Financial Management* 39, 1223-1251.

Loh, R.K., and R.M. Stulz, 2011, When are analyst recommendation changes influential?, *Review of Financial Studies* 24, 593-627.

Lui, D., S. Markov, and A. Tamayo, 2012, Equity analysts and the market's assessment of risk, *Journal of Accounting Research* 50, 1287-1317.

Thomson Reuters, 2010, IBES detail history user guide – A guide to the IBES analyst-by-analyst historical earnings estimate database.

White, H., 1982. Maximum likelihood estimation of misspecified models, *Econometrica* 50, 1–26.

Womack, K., 1996, Do brokerage analysts' recommendations have investment value?, *Journal of Finance* 51, 137-16.

World Bank, 2015, Market capitalization of listed companies, http://data.worldbank.org/indicator/CM.MKT.LCAP.CD/countries.

Tables

Table 1: Descriptive statistics

This table presents the distribution of analyst recommendations in the standalone and merged samples for each of the five sample countries. In the U.S. sample, we compare IBES recommendations with recommendations in First Call. In the non-U.S. samples, we compare IBES recommendations with Thomson One recommendations. The total number of recommendations and the number of upgrades and downgrades in each sample are provided and information on the size of the merged samples as compared to the standalone samples is reported. We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. Recommendations in IBES and Thomson One are matched based on the stock's CUSIP, a standardized broker name, and the announcement date of the recommendation, also allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties.

	IBES sample			First Call/Thomson One sample			Merged sample				
	Total	Upgrades	Down-grades	Total	Upgrades	Down-grades	Total	% of IBES sample	% of First Call/ Thomson One sample	Upgrades	Down-grades
U.S.	494,807	105,095	129,396	656,489	142,007	180,188	201,697	40.8%	30.7%	51,869	65,332
Britain	19,755	5,128	5,083	74,878	1,523	1,214	5,090	25.8%	6.8%	1,569	1,443
France	18,560	4,806	4,728	58,775	931	812	4,009	21.6%	6.8%	1,241	1,169
Germany	19,412	5,190	5,241	42,989	1,042	939	3,850	19.8%	9.0%	1,281	1,215
Japan	30,250	7,640	7,683	51,837	1,109	1,076	4,655	15.4%	9.0%	1,342	1,317

Table 2: Time lags between IBES announcement date, First Call/Thomson One announcement date, and IBES activation date for analyst recommendations

This table presents the average time lag between the IBES announcement date and the First Call/Thomson One announcement date (Panel A) and the average time lag between the IBES activation date and the IBES announcement date for analyst recommendations (Panel B). In the U.S. sample, we compare IBES recommendations with recommendations in First Call. In the non-U.S. samples, we compare IBES recommendations with Thomson One recommendations. The announcement date refers to the date on which the analyst originally published the recommendation according to IBES and First Call/Thomson One, respectively. The activation date refers to the date on which the information is entered into the IBES database. The time lag is the difference in trading days between the announcement dates reported in IBES and First Call/Thomson One, respectively (Panel A) and between the IBES activation date and the IBES announcement date (Panel B). The table also reports the number of observations (#) and the number of positive time lags as percentage of all observations (>0). Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. Recommendations in IBES and Thomson One are matched based on the stock's CUSIP, a standardized broker name, and the announcement date of the recommendation, also allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. In Panel B, when comparing IBES activation dates and IBES announcement dates, we eliminate observations with a negative time lag and observations with a time lag that exceeds 30 days. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Time lag between IBES announcement date and First Call/Thomson One announcement date for analyst recommendations

	U.S.			Britain			France			Germany			Japan		
	Mean	#	>0	Mean	#	>0	Mean	#	>0	Mean	#	>0	Mean	#	>0
1994	0.152	1,834	47.5%	0.375	8	37.5%	4.417***	12	75.0%	NA	0	NA	4.600***	25	84.0%
1995	1.202***	2,989	43.1%	-0.143	7	57.1%	2.125*	24	66.7%	1.250	4	50.0%	1.838***	68	73.5%
1996	1.010***	3,795	32.5%	-0.267	15	33.3%	-0.250	24	58.3%	0.743	35	54.3%	1.689***	45	68.9%
1997	1.317***	5,092	43.0%	0.042	24	41.7%	2.118***	34	73.5%	0.469	32	53.1%	2.380***	50	76.0%
1998	0.728***	6,761	37.9%	0.490	51	66.7%	1.979***	47	63.8%	2.317***	41	73.2%	2.193***	88	65.9%
1999	0.347***	8,039	22.4%	0.527*	112	51.8%	0.686	86	61.6%	0.926***	135	50.4%	1.275***	182	72.0%
2000	0.360***	8,042	24.1%	0.801***	181	52.5%	0.494	174	55.7%	0.935***	200	53.5%	1.626***	179	59.2%
2001	0.301***	10,307	20.1%	0.895***	210	60.5%	0.536**	261	53.6%	0.653**	288	56.6%	1.686***	331	71.9%
2002	0.164***	14,605	12.4%	1.223***	278	63.7%	0.670***	330	59.4%	1.660***	341	66.3%	1.127***	386	58.8%
2003	-0.133***	15,299	0.5%	0.722***	360	60.0%	0.830***	348	60.1%	1.087***	450	64.7%	0.050	437	38.0%
2004	-0.032***	15,815	0.1%	0.958***	356	60.4%	0.807***	327	59.0%	0.907***	334	54.5%	0.148	325	33.2%
2005	-0.016***	15,746	0.1%	0.353**	320	51.6%	0.600***	290	52.1%	0.191	278	39.9%	0.081	359	37.0%
2006	-0.002	18,628	0.4%	0.753***	360	56.1%	0.639***	338	56.5%	0.472***	288	48.3%	0.402***	301	31.9%
2007	-0.019***	18,646	0.1%	0.667***	460	50.4%	0.375***	339	48.1%	0.053	243	37.0%	0.403***	347	45.2%
2008	-0.029***	20,962	0.5%	0.373***	635	41.9%	0.113	425	38.4%	0.368***	345	38.3%	0.340***	592	36.8%
2009	-0.023***	18,323	0.0%	0.164*	905	28.6%	0.161	497	28.8%	0.436***	436	33.0%	0.168	519	32.4%
2010	-0.016***	16,814	0.1%	-0.050	808	22.6%	0.106	453	25.2%	0.498***	400	33.0%	0.188*	421	34.9%
94-01	0.600***	46,859	29.8%	0.684***	608	55.3%	0.828***	662	58.0%	0.872***	735	55.2%	1.765***	968	69.5%
Total	0.129***	201,697	8.0%	0.470***	5,090	44.2%	0.503***	4,009	47.6%	0.706***	3,850	48.1%	0.617***	4,655	45.0%

Panel B: Time lag between IBES activation date and IBES announcement date for analyst recommendations

	U.S.			Britain			France			Germany			Japan		
	Mean	#	>0	Mean	#	>0	Mean	#	>0	Mean	#	>0	Mean	#	>0
1994	0.000	1,834	0.0%	0.000	8	0.0%	0.000	12	0.0%	NA	0	NA	0.000	25	0.0%
1995	0.000	2,989	0.0%	0.000	7	0.0%	0.000	24	0.0%	0.000	4	0.0%	0.000	68	0.0%
1996	0.002*	3,795	0.1%	0.867***	15	40.0%	0.042	24	4.2%	0.000	35	0.0%	0.067*	45	6.7%
1997	0.000	5,091	0.0%	0.333*	24	16.7%	0.000	34	0.0%	0.000	32	0.0%	0.140	50	6.0%
1998	0.000	6,760	0.0%	0.098*	51	7.8%	0.000	47	0.0%	0.000	41	0.0%	0.000	88	0.0%
1999	0.184***	7,917	3.3%	0.009	111	0.9%	0.000	86	0.0%	0.000	135	0.0%	0.000	182	0.0%
2000	0.185***	7,964	3.4%	0.166*	181	2.2%	0.190*	174	2.9%	0.000	200	0.0%	0.000	179	0.0%
2001	0.113***	10,207	3.2%	0.171**	210	1.9%	0.115*	261	2.3%	0.073	288	1.7%	0.000	331	0.0%
2002	0.681***	14,292	23.5%	0.198	273	1.1%	0.690***	329	4.0%	0.666***	332	4.5%	0.194***	386	2.1%
2003	0.477***	15,099	22.6%	1.516***	310	50.6%	1.903***	300	68.3%	1.721***	391	55.2%	0.454***	425	35.3%
2004	0.280***	15,610	18.4%	1.289***	332	52.4%	0.932***	295	47.8%	1.730***	304	55.9%	0.264***	303	25.7%
2005	0.332***	15,566	23.1%	1.258***	298	45.6%	1.140***	271	42.8%	1.337***	264	53.0%	0.133***	338	13.0%
2006	0.411***	18,263	32.3%	1.281***	338	39.3%	0.778***	324	37.7%	0.696***	280	36.4%	0.329***	277	24.9%
2007	0.381***	18,470	25.1%	0.517***	433	31.2%	0.379***	327	27.2%	0.504***	238	28.2%	0.188***	308	18.2%
2008	0.515***	20,693	31.6%	0.482***	598	22.6%	0.392***	401	14.0%	0.448***	339	17.7%	0.607***	514	38.9%
2009	0.789***	17,721	43.9%	0.876***	871	31.7%	0.473***	480	18.8%	0.660***	430	24.2%	0.352***	469	33.9%
2010	0.921***	16,138	54.5%	0.712***	781	37.3%	0.631***	439	33.9%	0.808***	386	35.0%	0.431***	378	28.0%
Total	0.426***	198,409	24.1%	0.761***	4,841	30.2%	0.649***	3,828	25.9%	0.772***	3,699	27.4%	0.273***	4,366	20.1%

Table 3: Stock price reaction to analyst recommendation revisions using IBES time stamps and First Call/Thomson One time stamps

This table presents average cumulative abnormal returns (CARs) around the announcement date of analyst recommendation revisions using IBES time stamps and First Call/Thomson One time stamps, respectively. In the U.S. sample, we compare IBES recommendations with recommendations in First Call. In the non-U.S. samples, we compare IBES recommendations with Thomson One recommendations. CARs are calculated as the difference between cumulative raw returns and cumulative market returns of the respective country. For the U.S., we use the value-weighted CRSP index as the market index and for all other countries, we use the respective country's MSCI index. We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after both the IBES announcement date. Recommendations in IBES and Thomson One are matched based on the stock's CUSIP, a standardized broker name, and the announcement date of the recommendation, also allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Means of the two groups are tested for equality using a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

	IBES time stamps	First Call/ Thomson One time stamps	Difference	t-value	N
Panel A: Upgrades					
U.S.					
CAR[-2,-1] (%)	0.370	0.285	0.085**	2.01	50,074
CAR[0,+1] (%)	3.447	3.547	-0.101**	-2.04	50,074
CAR[0,+2] (%)	3.577	3.688	-0.111**	-2.09	50,070
U.S., 1994-2001					
CAR[-2,-1] (%)	1.104	0.688	0.417***	4.07	11,092
CAR[0,+1] (%)	3.441	3.949	-0.508***	-4.59	11,092
CAR[0,+2] (%)	3.612	4.197	-0.584***	-4.86	11,089
Britain					
CAR[-2,-1] (%)	0.512	0.112	0.400***	2.60	1,567
CAR[0,+1] (%)	0.847	1.057	-0.210	-1.59	1,567
CAR[0,+2] (%)	0.979	1.134	-0.155	-1.00	1,567
France					
CAR[-2,-1] (%)	1.036	0.653	0.383**	2.37	1,241
CAR[0,+1] (%)	0.977	1.435	-0.457***	-3.15	1,241
CAR[0,+2] (%)	1.061	1.508	-0.447***	-2.64	1,241
Germany					
CAR[-2,-1] (%)	0.648	0.554	0.094	0.64	1,281
CAR[0,+1] (%)	0.626	0.869	-0.243*	-1.66	1,281
CAR[0,+2] (%)	0.688	1.015	-0.327**	-1.98	1,281
Japan					
CAR[-2,-1] (%)	0.856	0.515	0.341**	2.46	1,342
CAR[0,+1] (%)	1.728	2.074	-0.345**	-2.25	1,342
CAR[0,+2] (%)	1.896	2.377	-0.481***	-2.71	1,342

Panel B: Downgrades					
U.S.					
CAR[-2,-1] (%)	-0.766	-0.543	-0.223***	-4.32	63,095
CAR[0,+1] (%)	-4.401	-4.676	0.275***	4.43	63,086
CAR[0,+2] (%)	-4.526	-4.802	0.276***	4.27	63,074
U.S., 1994-2001					
CAR[-2,-1] (%)	-2.511	-1.643	-0.868***	-6.86	15,973
CAR[0,+1] (%)	-5.243	-6.367	1.125***	7.90	15,970
CAR[0,+2] (%)	-5.416	-6.550	1.134***	7.73	15,969
Britain					
CAR[-2,-1] (%)	-0.527	-0.193	-0.334*	-1.88	1,438
CAR[0,+1] (%)	-0.744	-0.882	0.138	0.83	1,438
CAR[0,+2] (%)	-0.763	-0.938	0.175	0.91	1,438
France					
CAR[-2,-1] (%)	-0.994	-0.429	-0.564***	-3.31	1,169
CAR[0,+1] (%)	-0.907	-1.523	0.615***	3.63	1,169
CAR[0,+2] (%)	-0.968	-1.496	0.528***	2.76	1,169
Germany					
CAR[-2,-1] (%)	-0.961	-0.704	-0.257	-1.46	1,215
CAR[0,+1] (%)	-0.788	-1.213	0.425**	2.32	1,215
CAR[0,+2] (%)	-0.907	-1.318	0.411**	2.11	1,215
Japan					
CAR[-2,-1] (%)	-0.348	-0.088	-0.260*	-1.73	1,317
CAR[0,+1] (%)	-1.770	-2.013	0.243	1.36	1,317
CAR[0,+2] (%)	-2.006	-2.229	0.223	1.10	1,317

Table 4: Analyst forecasts

This table presents the average time lag between the IBES announcement date and the First Call announcement date for analyst forecasts (Panel A) and the average cumulative abnormal returns (CARs) around the announcement date of analyst forecast revisions using IBES time stamps and First Call time stamps, respectively (Panel B). We focus on forecasts of the one-year-ahead annual earnings per share of U.S. firms. In Panel A, the time lag is the difference in trading days between the announcement dates reported in IBES and First Call, respectively. The number of observations (#) and the number of positive time lags as percentage of all observations (>0) are reported. In Panel B, CARs are calculated as the difference between cumulative raw returns and cumulative returns of the value-weighted CRSP index. We define an analyst forecast as an upward revision or downward revision by comparing the current with its previous forecast. Forecasts in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the forecasted earnings per share, and the announcement date of the forecast, allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Time lag between IBES announcement date and First Call announcement date for analyst forecasts

	Mean	#	>0
1990	4.400***	915	85.1%
1991	4.245***	3,366	87.5%
1992	3.153***	4,889	81.7%
1993	2.717***	6,663	76.8%
1994	2.128***	8,138	65.1%
1995	1.539***	10,259	52.2%
1996	1.356***	13,088	43.7%
1997	1.254***	16,998	43.6%
1998	1.044***	24,426	44.5%
1999	0.668***	25,212	33.4%
2000	0.598***	29,334	27.9%
2001	0.411***	43,720	22.4%
2002	0.147***	50,961	9.6%
2003	-0.005***	55,519	0.3%
2004	-0.001	64,277	0.2%
2005	0.002**	73,264	0.2%
2006	-0.002**	80,082	0.1%
2007	-0.001	89,352	0.1%
2008	-0.005***	102,598	0.0%
2009	-0.002***	96,218	0.0%
2010	-0.002**	89,144	0.0%
90-01	1.079***	187,008	39.5%
Total	0.234***	888,423	8.9%

Panel B: Stock price reaction to analyst forecast revisions using IBES time stamps and First Call time stamps

	IBES time stamps	First Call time stamps	Difference	t-value	N
Upward revisions					
U.S.					
CAR[-2,-1] (%)	1.068	1.071	-0.004	-0.29	378,675
CAR[0,+1] (%)	1.352	1.414	-0.062***	-4.20	378,666
CAR[0,+2] (%)	1.394	1.450	-0.056***	-3.48	378,643
U.S., 1990-2001					
CAR[-2,-1] (%)	1.248	1.287	-0.039	-1.07	67,315
CAR[0,+1] (%)	0.839	1.159	-0.320***	-8.41	67,315
CAR[0,+2] (%)	0.913	1.198	-0.285***	-6.77	67,313
Downward revisions					
U.S.					
CAR[-2,-1] (%)	-1.179	-1.123	-0.055***	-3.88	440,523
CAR[0,+1] (%)	-1.606	-1.766	0.160***	9.93	440,504
CAR[0,+2] (%)	-1.660	-1.825	0.165***	9.39	440,478
U.S., 1990-2001					
CAR[-2,-1] (%)	-1.727	-1.515	-0.213***	-6.05	102,603
CAR[0,+1] (%)	-1.206	-1.853	0.648***	17.88	102,602
CAR[0,+2] (%)	-1.255	-1.931	0.676***	17.14	102,599

Table 5: Cross-sectional differences in time lags and the stock price reaction to analyst recommendation and forecast revisions

This table presents the results from OLS regressions. The dependent variable is either the time lag between the IBES announcement date and the First Call announcement date for analyst recommendations and forecast revisions (Panel A) or the cumulative abnormal returns (CARs) around the announcement date of analyst recommendation and forecast revisions (Panel B). We focus on analyst recommendations (forecasts of the one-year-ahead annual earnings per share) of U.S. firms in the time period from January 1994 to December 2001. In Panel A, the time lag is the difference in trading days between the announcement dates reported in IBES and First Call, respectively. In Panel B, CARs are calculated as the difference between cumulative raw returns and cumulative returns of the value-weighted CRSP index. CARs for downgrades (downward revisions) are multiplied by -1 to facilitate the comparison of results across upgrades (upward revisions) and downgrades (downward revisions). We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. We define an analyst forecast as an upward revision or downward revision by comparing the current with its previous forecast. Recommendations (forecasts) in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation (the forecasted earnings per share), and the announcement date of the recommendation (forecast), allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. The explanatory variables are firm, broker, and analyst characteristics. Appendix C provides detailed descriptions of all variables. The t-values (in parentheses) are based on the cluster-robust variant of the Huber-White (Huber, 1967; White, 1982) sandwich estimator which accounts for the dependence of observations within clusters (multiple recommendations/forecasts on one firm). ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Cross-sectional differences in time lags

	Time lag (trading days)			
	Analyst recommendations		Analyst forecasts	
	Upgrades	Downgrades	Upward revisions	Downward revisions
	(1)	(2)	(3)	(4)
Firm characteristics				
Log(market capitalization)	-0.010	-0.047***	-0.024***	-0.046***
	(-0.82)	(-4.61)	(-2.92)	(-6.89)
Broker characteristics				
Number of analysts employed	-0.001***	-0.003***	-0.005***	-0.004***
	(-4.11)	(-9.88)	(-22.58)	(-23.63)
Analyst characteristics				
Star analyst (d)	-0.001	0.039	-0.103***	-0.076***
	(-0.02)	(0.88)	(-4.02)	(-3.40)
Number of rec./forecasts issued	0.024	0.029	0.003	0.004
	(1.22)	(1.64)	(0.72)	(0.96)
Number of companies followed	-0.011***	-0.004	0.009***	0.010***
	(-2.92)	(-1.29)	(6.77)	(8.65)
Firm-specific experience (years)	-0.025**	-0.023***	0.002	0.003
	(-2.53)	(-2.65)	(0.57)	(0.96)
Constant	0.753***	1.078***	1.319***	1.348***
	(6.90)	(11.50)	(20.01)	(23.14)
Adj. R^2	0.004	0.009	0.023	0.021
N	10,113	14,522	56,694	85,565

Panel B: Cross-sectional differences in the stock price reaction to analyst recommendation and forecast revisions

	CAR[0,+1] (%)							
	Analyst recommendations				Analyst forecasts			
	Upgrades		Downgrades		Upward revisions		Downward revisions	
	IBES time stamps	First Call time stamps	IBES time stamps	First Call time stamps	IBES time stamps	First Call time stamps	IBES time stamps	First Call time stamps
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm characteristics								
Log(market capitalization)	-0.558***	-0.705***	-0.388***	-0.471***	-0.027	-0.076**	-0.045	-0.122***
	(-9.10)	(-11.04)	(-5.07)	(-5.60)	(-0.99)	(-2.54)	(-1.58)	(-3.79)
Broker characteristics								
Number of analysts employed	0.012***	0.013***	0.015***	0.012***	0.003***	0.003***	0.005***	0.005***
	(8.71)	(8.74)	(7.83)	(5.92)	(6.03)	(4.80)	(10.21)	(8.19)
Analyst characteristics								
Star analyst (d)	0.599***	0.740***	0.135	0.135	-0.001	0.029	-0.162**	-0.221***
	(3.17)	(3.85)	(0.53)	(0.51)	(-0.01)	(0.36)	(-2.16)	(-2.68)
Number of rec./forecasts issued	0.014	-0.077	-0.130	-0.250***	0.020*	0.011	-0.048***	-0.064***
	(0.20)	(-1.09)	(-1.58)	(-2.67)	(1.92)	(0.99)	(-4.54)	(-5.48)
Number of companies followed	-0.033***	-0.038***	-0.075***	-0.088***	-0.010***	-0.014***	-0.012***	-0.021***
	(-4.65)	(-5.44)	(-5.98)	(-6.17)	(-4.18)	(-5.21)	(-4.51)	(-6.40)
Firm-specific experience (years)	0.043	0.017	-0.077	-0.187***	-0.017	-0.021	-0.057***	-0.069***
	(1.02)	(0.40)	(-1.43)	(-3.14)	(-1.26)	(-1.47)	(-4.58)	(-5.06)
Constant	6.594***	8.372***	7.854***	10.311***	0.969***	1.811***	1.826***	3.362***
	(13.22)	(16.10)	(12.77)	(15.12)	(4.82)	(7.86)	(9.01)	(14.12)
Adj. R^2	0.022	0.029	0.009	0.010	0.001	0.001	0.003	0.003
N	10,113	10,113	14,522	14,522	56,694	56,694	85,565	85,565

Table 6: Replication of analyses from existing studies

This table replicates parts of the analysis from Table 6 in Jegadeesh and Kim (2006) (Panel A) and parts of the analysis from Table 2 in Irvine et al. (2007) (Panel B). In Panel A, we focus on analyst recommendations revisions in the U.S. and Germany in the time period from November 1, 1993 to July 31, 2002, and in Panel B, we focus on initial buy and strong recommendations in the U.S. in the time period from March 31, 1996 to December 31, 1997 and from March 31, 2000 to December 31, 2000. Panel A reports average cumulative abnormal returns (CARs) around the announcement date of analyst recommendation revisions using IBES samples, a First Call sample, and a Thomson One sample, respectively. Panel B reports average abnormal returns (ARs) around the announcement date of analyst recommendations using an IBES sample and a First Call sample, respectively. ARs (CARs) are calculated as the difference between (cumulative) raw returns and (cumulative) market returns of the respective country. For the U.S., we use the value-weighted CRSP index as the market index and for Germany, we use the MSCI Germany index. In Panel A, we characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Replication of analysis from Jegadeesh and Kim (2006)

	CAR[0,+1] (%)	CAR[0,+2] (%)
Upgrades		
IBES sample, U.S.	2.098***	2.221***
IBES sample, Germany	0.152*	0.183**
Difference	1.946***	2.038***
First Call sample, U.S.	2.192***	2.293***
Thomson One sample, Germany	1.635***	1.859***
Difference	0.556**	0.434
Downgrades		
IBES sample, U.S.	-3.289***	-3.429***
IBES sample, Germany	-0.405***	-0.463***
Difference	-2.884***	-2.966***
First Call sample, U.S.	-3.784***	-3.891***
Thomson One sample, Germany	-2.524***	-2.809***
Difference	-1.260***	-1.082***

Panel B: Replication of analysis from Irvine et al. (2007)

	IBES sample	First Call sample
AR[-10] (%)	0.092**	0.143***
AR[-9] (%)	0.069*	0.015
AR[-8] (%)	0.059	0.046
AR[-7] (%)	0.114***	0.021
AR[-6] (%)	0.075*	0.022
AR[-5] (%)	0.103***	-0.041
AR[-4] (%)	0.022	0.081
AR[-3] (%)	0.107***	0.071
AR[-2] (%)	0.155***	0.046
AR[-1] (%)	0.230***	0.180***
AR[0] (%)	0.689***	1.274***
AR[+1] (%)	0.134***	0.227***
AR[+2] (%)	0.082**	0.025
AR[+3] (%)	0.028	-0.003
AR[+4] (%)	0.090**	0.061
AR[+5] (%)	-0.008	0.056
AR[+6] (%)	-0.006	0.016
AR[+7] (%)	0.037	0.080*
AR[+8] (%)	-0.069*	0.089*
AR[+9] (%)	0.079**	0.015
AR[+10] (%)	0.007	-0.072

Table 7: Stock price reaction to analyst recommendation and forecast revisions: Broadening event windows

This table presents average cumulative abnormal returns (CARs) around the announcement date of analyst recommendation (Panel A) and forecast revisions (Panel B) using IBES time stamps and First Call time stamps, respectively. We focus on analyst recommendations (forecasts of the one-year-ahead annual earnings per share) of U.S. firms. CARs are calculated as the difference between cumulative raw returns and cumulative returns of the value-weighted CRSP index. We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. We define an analyst forecast as an upward revision or downward revision by comparing the current with its previous forecast. Recommendations (forecasts) in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation (the forecasted earnings per share), and the announcement date of the recommendation (forecast), allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Means of the two groups are tested for equality using a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Analyst recommendations

	IBES time stamps	First Call time stamps	Difference	t-value	N
Upgrades					
U.S.					
CAR[-1,+1] (%)	3.805	3.848	-0.043	-0.71	50,073
CAR[-2,+2] (%)	3.930	3.956	-0.026	-0.39	50,069
U.S., 1994-2001					
CAR[-1,+1] (%)	4.335	4.551	-0.216	-1.57	11,092
CAR[-2,+2] (%)	4.718	4.882	-0.164	-1.04	11,089
Downgrades					
U.S.					
CAR[-1,+1] (%)	-5.089	-5.191	0.102	1.36	63,086
CAR[-2,+2] (%)	-5.232	-5.279	0.047	0.58	63,074
U.S., 1994-2001					
CAR[-1,+1] (%)	-7.228	-7.710	0.482***	2.80	15,970
CAR[-2,+2] (%)	-7.817	-8.066	0.249	1.33	15,969

Panel B: Analyst forecasts

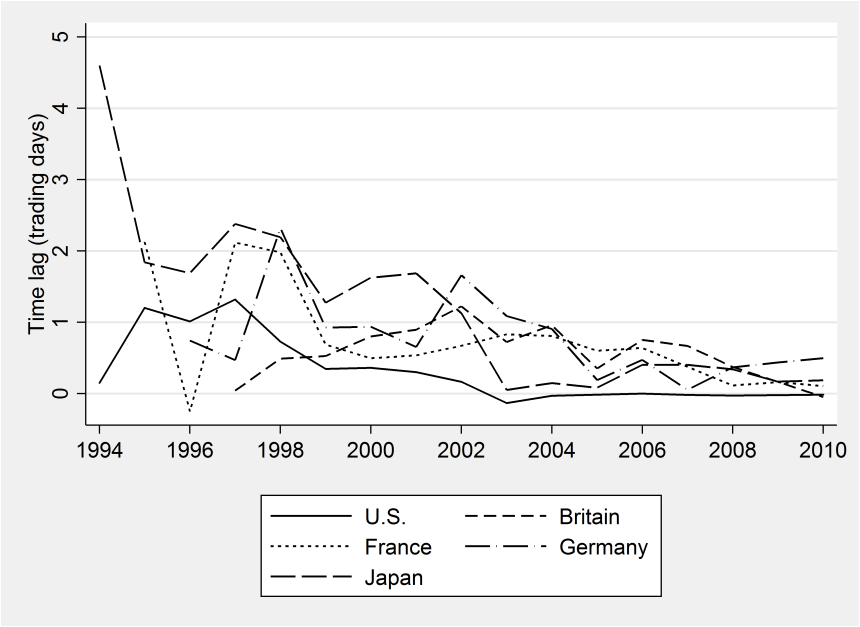
	IBES time stamps	First Call time stamps	Difference	t-value	N
Upward revisions					
U.S.					
CAR[-1,+1] (%)	2.148	2.221	-0.073***	-4.07	378,664
CAR[-2,+2] (%)	2.464	2.522	-0.058***	-2.88	378,640
CAR[-5,+5] (%)	3.081	3.123	-0.042	-1.64	378,544
CAR[-10,+10] (%)	3.792	3.805	-0.013	-0.39	378,167
U.S., 1990-2001					
CAR[-1,+1] (%)	1.648	2.045	-0.397***	-8.33	67,315
CAR[-2,+2] (%)	2.154	2.472	-0.318***	-5.79	67,313
CAR[-5,+5] (%)	3.283	3.516	-0.233***	-3.22	67,303
CAR[-10,+10] (%)	4.562	4.629	-0.067	-0.69	67,282
Downward revisions					
U.S.					
CAR[-1,+1] (%)	-2.508	-2.655	0.147***	7.48	440,503
CAR[-2,+2] (%)	-2.832	-2.939	0.107***	4.85	440,474
CAR[-5,+5] (%)	-3.294	-3.369	0.074***	2.71	440,386
CAR[-10,+10] (%)	-3.769	-3.807	0.038	1.12	440,020
U.S., 1990-2001					
CAR[-1,+1] (%)	-2.416	-3.023	0.607***	13.45	102,601
CAR[-2,+2] (%)	-2.978	-3.430	0.452***	8.82	102,597
CAR[-5,+5] (%)	-3.886	-4.201	0.316***	4.93	102,571
CAR[-10,+10] (%)	-4.751	-4.902	0.151*	1.92	102,514

Figures

Figure 1: Time lags between IBES announcement date, First Call/Thomson One announcement date, and IBES activation date for analyst recommendations

This figure shows the average time lag between the IBES announcement date and the First Call/Thomson One announcement date (Panel A) and the average time lag between the IBES activation date and the IBES announcement date for analyst recommendations (Panel B). In the U.S. sample, we compare IBES recommendations with recommendations in First Call. In the non-U.S. samples, we compare IBES recommendations with Thomson One recommendations. We exclude years with fewer than 20 observations in the respective country's sample. The announcement date refers to the date on which the analyst originally published the recommendation according to IBES and First Call/Thomson One, respectively. The activation date refers to the date on which the information is entered into the IBES database. The time lag is the difference in trading days between the announcement dates reported in IBES and First Call/Thomson One, respectively (Panel A) and between the IBES activation date and the IBES announcement date (Panel B). Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. Recommendations in IBES and Thomson One are matched based on the stock's CUSIP, a standardized broker name, and the announcement date of the recommendation, also allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. In Panel B, when comparing IBES activation dates and IBES announcement dates, we eliminate observations with a negative time lag and observations with a time lag that exceeds 30 days.

Panel A: Time lag between IBES announcement date and First Call/Thomson One announcement date for analyst recommendations



Panel B: Time lag between IBES activation date and IBES announcement date for analyst recommendations

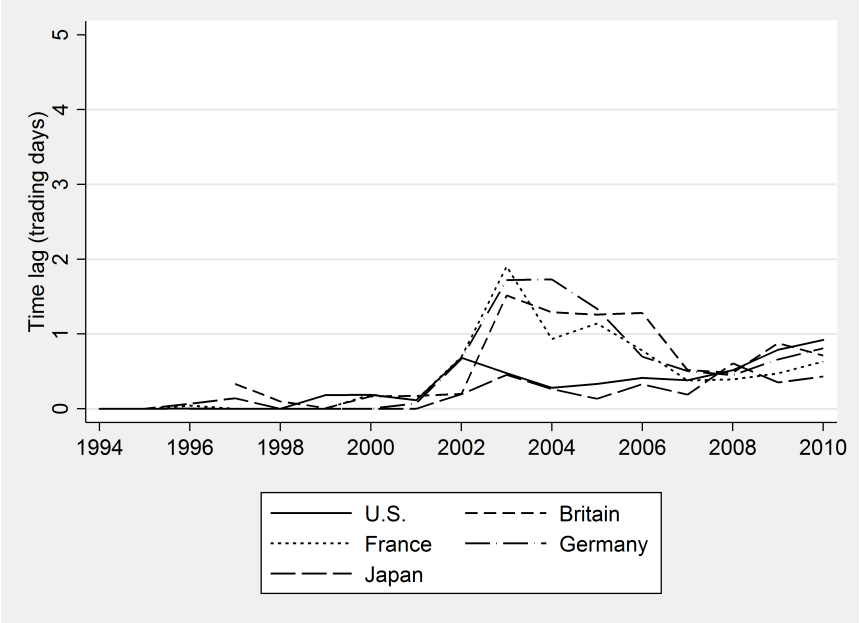
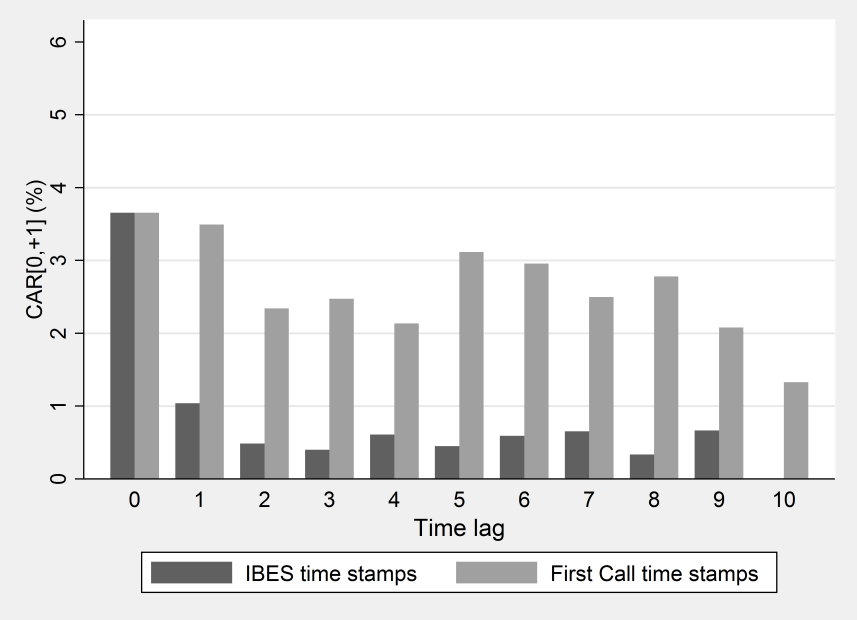


Figure 2: Stock price reaction to analyst recommendation revisions using IBES time stamps and First Call time stamps

This figure shows average cumulative abnormal returns (CARs) around the announcement date of analyst recommendation revisions for time lags ranging from zero to 10 trading days using IBES time stamps and First Call time stamps, respectively. CARs are calculated as the difference between cumulative raw returns and cumulative returns of the value-weighted CRSP index. The time lag is the difference in trading days between the announcement dates reported in IBES and First Call, respectively. We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties.

Panel A: Upgrades



Panel B: Downgrades

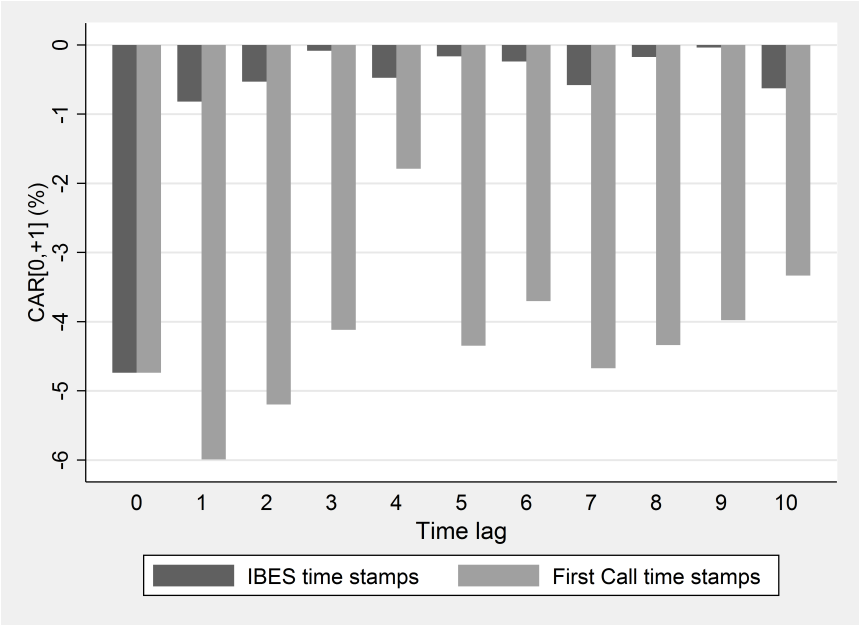
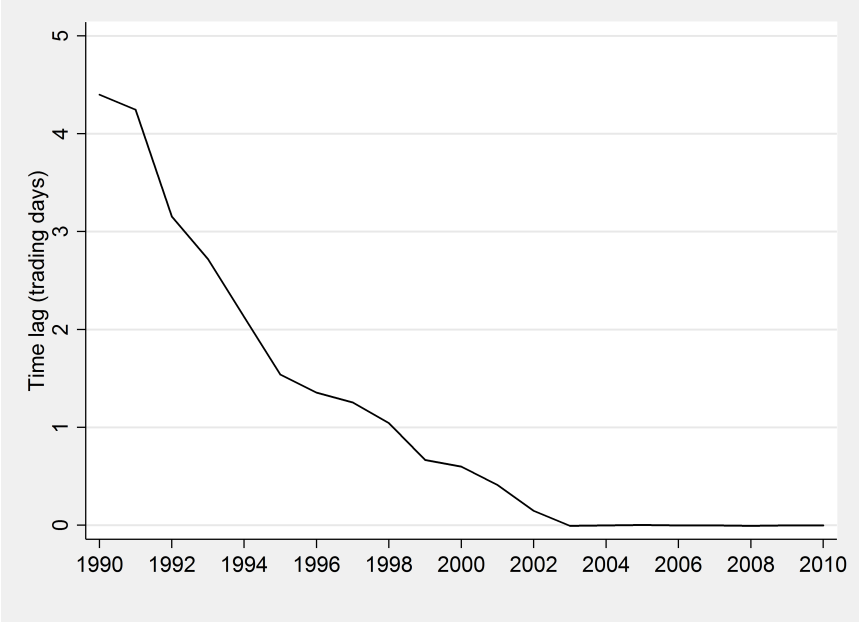


Figure 3: Time lag between IBES announcement date and First Call announcement date for analyst forecasts

This figure shows the average time lag between the IBES announcement date and the First Call announcement date for analyst forecasts. We focus on forecasts of the one-year-ahead annual earnings per share of U.S. firms. The time lag is the difference in trading days between the announcement dates reported in IBES and First Call, respectively. Forecasts in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the forecasted earnings per share, and the announcement date of the forecast, allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties.



Appendix

Appendix A: Literature review

This table provides an overview of studies investigating the announcement effect on either analyst recommendations or forecasts that were published in top finance and accounting journals (Accounting Review, Journal of Accounting and Economics, Journal of Accounting Research, Journal of Finance, Journal of Financial Economics, Review of Financial Studies) between 2011 and 2013.

Study	**Recommendations/ forecasts**	**Database**	**Investigation period**	**Performance measure**
Clement et al. (2011)	Forecasts	IBES	1995-2005	Market-adjusted returns [0,+1]
Haushalter and Lowry (2011)	Recommendations	IBES	1995-2007	Market-adjusted returns [-1,0]
Kirk (2011)	Recommendations	Hand-collected, IBES, Thomson One (Investext)	1999-2006	Size-adjusted returns [0,+1]
Lehavy et al. (2011)	Forecasts	IBES	1995-2006	Size-adjusted returns [0]
Loh and Stulz (2011)	Recommendations	IBES, First Call	1994-2006	Size-, book-to-market, and momentum-adjusted returns [0,+1]
Jung et al. (2012)	Recommendations	IBES	1993-2006	Market-adjusted returns [0,+2]
Lui et al. (2012)	Recommendations	Thomson One (Investext)	2000-2006	Market-adjusted returns [-1,+1]
Firth et al. (2013)	Recommendations	IBES, CSMAR, WindDB	2004-2008	Market-adjusted returns [-1,+1], CAR[-1,+1] based on market model
Hilary and Hsu (2013)	Forecasts	IBES	1994-2006	Market-adjusted returns [-1,+1]
Hilary and Shen (2013)	Forecasts	IBES	1996-2006	Size-adjusted returns [-1,+1]
Hui and Yeung (2013)	Forecasts	IBES, Thomson One (Investext)	2004-2008	Size-adjusted returns [-1,+1]

Appendix B: Results from robustness tests

Table A1: Swiss sample

This table presents the average time lag between the IBES announcement date and the BAM (Burkhalter Asset Management) announcement date for analyst recommendations (Panel A) and the average cumulative abnormal returns (CARs) around the announcement date of analyst recommendation revisions using IBES time stamps and BAM time stamps, respectively (Panel B). In Panel A, the time lag is the difference in trading days between the announcement dates reported in IBES and BAM, respectively. The number of observations (#) and the number of positive time lags as percentage of all observations (>0) are reported. In Panel B, CARs are calculated as the difference between cumulative raw returns and cumulative returns of the MSCI Switzerland index. We characterize an analyst recommendation as an upgrade (e.g., from buy to strong buy) or downgrade (e.g., from buy to hold) by comparing the stock's current with its previous recommendation. Recommendations in IBES and BAM are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

Panel A: Time lag between IBES announcement date and BAM announcement date for analyst recommendations

	Mean	#	>0
2002	2.289***	235	66.8%
2003	1.534***	378	58.2%
2004	0.970***	396	50.0%
2005	0.237**	503	31.0%
2006	0.268***	615	31.9%
Total	0.840***	2,127	43.6%

Panel B: Stock price reaction to analyst recommendation revisions using BAM time stamps and IBES time stamps

	IBES time stamps	BAM time stamps	Difference	t-value	N
Upgrades					
CAR[-2,-1] (%)	1.234	0.931	0.303	1.11	522
CAR[0,+1] (%)	1.053	1.789	-0.737***	-3.07	522
CAR[0,+2] (%)	1.244	2.018	-0.774***	-2.78	522
Downgrades					
CAR[-2,-1] (%)	-2.164	-2.003	-0.161	-0.32	586
CAR[0,+1] (%)	-0.596	-1.411	0.814***	3.06	586
CAR[0,+2] (%)	-0.710	-1.601	0.891***	3.13	586

Table A2: Time lags between IBES/Compustat announcement date and First Call announcement date for earnings announcements

This table presents the average time lag between the IBES/Compustat announcement date and the First Call announcement date for earnings announcements. The time lag is the difference in trading days between the announcement dates reported in IBES/Compustat and First Call, respectively. The table also reports the number of observations (#) and the number of positive time lags as percentage of all observations (>0). Earnings announcements in IBES/Compustat and First Call are matched based on the stock's CUSIP and the announcement date of the earnings announcement, allowing for a 10-day window before and after the IBES/Compustat announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

	Time lag between IBES announcement date and First Call announcement date			Time lag between Compustat announcement date and First Call announcement date		
	Mean	#	>0	Mean	#	>0
1990	-0.500	22	31.8%	0.370	54	18.5%
1991	-0.737***	961	12.9%	-0.583***	1,248	10.2%
1992	0.003	4,886	20.7%	0.083***	6,566	22.5%
1993	1.774***	6,363	53.5%	1.681***	7,847	54.1%
1994	1.350***	8,341	36.7%	1.506***	10,489	49.4%
1995	1.466***	9,251	33.6%	1.677***	11,330	58.1%
1996	1.543***	10,560	36.8%	1.663***	13,339	55.2%
1997	1.350***	12,109	33.5%	1.431***	15,499	49.4%
1998	0.232***	15,358	9.2%	0.283***	20,261	18.5%
1999	0.043***	16,394	4.7%	-0.018***	21,006	4.5%
2000	0.004	16,302	4.6%	0.005	23,046	6.2%
2001	0.055***	15,395	5.0%	0.013*	21,395	4.8%
2002	0.007	14,980	1.9%	-0.017***	19,854	3.7%
2003	-0.002	15,972	0.6%	0.038***	19,642	4.0%
2004	-0.021***	17,192	0.4%	0.030***	20,899	5.3%
2005	-0.017***	19,029	0.1%	0.026***	22,394	4.0%
2006	-0.006***	20,322	0.1%	0.019***	23,469	4.3%
2007	-0.011***	21,166	0.0%	0.053***	23,717	5.5%
2008	-0.011***	21,183	0.0%	0.015***	22,820	4.3%
2009	-0.010***	18,096	0.1%	-0.009*	19,727	2.6%
2010	-0.003**	14,911	0.1%	-0.005	16,112	1.7%
90-98	1.055***	67,851	33.7%	1.131***	86,633	54.4%
Total	0.258***	278,793	8.2%	0.298***	340,714	13.9%

Table A3: Descriptive statistics on firm, broker, and analyst characteristics

This table presents descriptive statistics on firm, broker, and analyst characteristics of analyst recommendations (Panel A) and analyst forecasts (Panel B). We focus on analyst recommendations (forecasts of the one-year-ahead annual earnings per share) of U.S. firms in the time period from January 1994 to December 2001. For each firm, broker, and analyst we average the respective variable over the sample period. Appendix C provides detailed descriptions of all variables.

Panel A: Analyst recommendations

	Mean	10%	Median	90%	Std. dev.	N
Firm characteristics						
Market capitalization (USDm)	2,066	56	335	3,379	8,882	5,094
Broker characteristics						
Number of analysts employed	20.717	2.333	9.333	51.000	31.542	101
Analyst characteristics						
Star analyst (d)	0.151	0.000	0.000	1.000	0.358	3,501
Number of rec. issued	1.482	1.000	1.375	2.000	0.529	3,501
Number of companies followed	6.330	1.750	5.714	11.333	4.318	3,501
Firm-specific experience (years)	0.794	0.000	0.500	2.000	0.853	3,501

Panel B: Analyst forecasts

	Mean	10%	Median	90%	Std. dev.	N
Firm characteristics						
Market capitalization (USDm)	1,873	47	285	3,094	8,256	5,242
Broker characteristics						
Number of analysts employed	21.204	2.000	8.857	57.250	33.339	105
Analyst characteristics						
Star analyst (d)	0.146	0.000	0.000	1.000	0.353	3,786
Number of forecasts issued	3.566	1.667	3.429	5.500	1.629	3,786
Number of companies followed	9.559	2.000	8.333	18.000	7.227	3,786
Firm-specific experience (years)	1.381	0.000	1.000	3.667	1.524	3,786

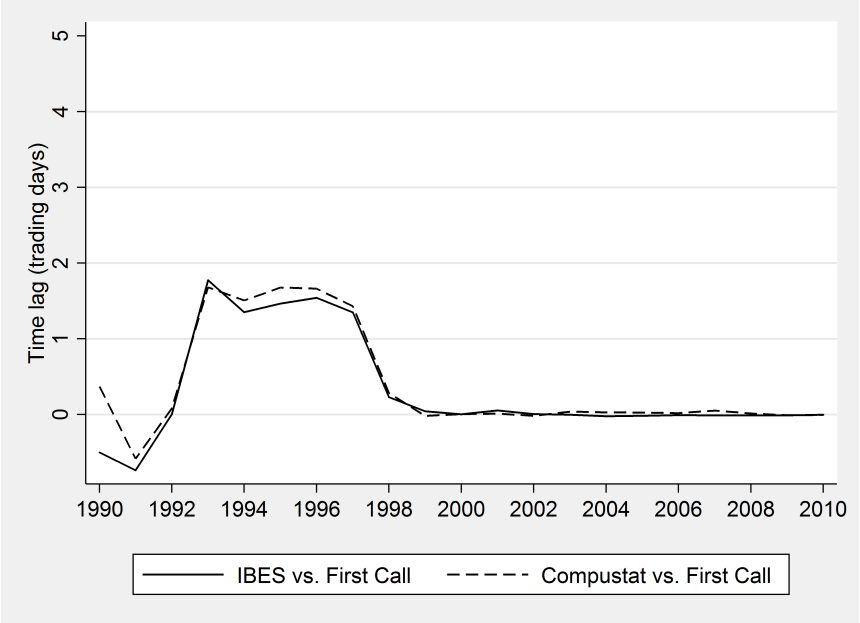
Table A4: Replication of analysis from Irvine et al. (2007)

This table replicates parts of the analysis from Table 2 in Irvine et al. (2007). We focus on initial buy and strong buy recommendations in the time period from March 31, 1996 to December 31, 1997 and from March 31, 2000 to December 31, 2000. Average abnormal returns (ARs) around the announcement date of analyst recommendations using IBES time stamps and First Call time stamps, respectively, are reported. ARs are calculated as the difference between raw returns and returns of the value-weighted CRSP index. Recommendations in IBES and First Call are matched based on the stock's CUSIP, a standardized broker name, the recommendation, and the announcement date of the recommendation, allowing for a 10-day window before and after the IBES announcement date. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties. Significance is tested by a standard t-test. ***, **, * denote statistical significance at the 1%, 5%, 10% level.

	Merged sample	
	IBES time stamps	First Call time stamps
AR[-10] (%)	0.164**	0.184**
AR[-9] (%)	0.081	0.033
AR[-8] (%)	-0.029	-0.008
AR[-7] (%)	0.233***	0.076
AR[-6] (%)	0.149*	0.076
AR[-5] (%)	0.180**	0.071
AR[-4] (%)	0.101	0.149
AR[-3] (%)	0.179**	0.135
AR[-2] (%)	0.225***	0.090
AR[-1] (%)	0.219**	0.304***
AR[0] (%)	1.285***	1.625***
AR[+1] (%)	0.181**	0.331***
AR[+2] (%)	0.290***	0.265***
AR[+3] (%)	0.118	-0.006
AR[+4] (%)	0.075	0.090
AR[+5] (%)	-0.050	0.047
AR[+6] (%)	-0.090	-0.092
AR[+7] (%)	0.077	0.194**
AR[+8] (%)	-0.071	0.000
AR[+9] (%)	0.085	0.068
AR[+10] (%)	0.004	-0.046

Figure A1: Time lags between IBES/Compustat announcement date and First Call announcement date for earnings announcements

This figure shows the average time lag between the IBES/Compustat announcement date and the First Call announcement date. The time lag is the difference in trading days between the announcement dates reported in IBES/Compustat and First Call, respectively. Earnings announcements in IBES/Compustat and First Call are matched based on the stock's CUSIP and the announcement date of the earnings announcement, allowing for a 10-day window before and after both the IBES/Compustat and the First Call announcement dates. When there are multiple matches, the closest date observation is chosen and the earlier date in case of ties.



Appendix C: Variable descriptions

This table defines the firm, broker, and analyst characteristics used in the study.

Variable	Description	Literature
Firm characteristics		
Market capitalization	Number of shares outstanding times the share prices at the most recent fiscal year-end	Gleason and Lee (2003); Clement et al. (2011); Jung et al. (2012); Hui and Yeung (2013)
Broker characteristics		
Number of analysts employed	Number of analysts employed by the broker in a given year	Clement and Tse (2003); Ertimur et al. (2007); Clement et al. (2011); Jung et al. (2012)
Analyst characteristics		
Star analyst (dummy)	Dummy variable that equals one if the analyst has been awarded the All-American Research Team title by the Institutional Investor magazine at least once between 2001 and 2010. The title is given to top analysts in each industry sector and the status lasts for one year. We consider all four rankings: first place, second place, third place, and runner-up	Gleason and Lee (2003); Fang and Yasuda (2014)
Number of rec./ forecasts issued	Number of recommendations/forecasts issued by the analyst for a firm in a given year	Clement and Tse (2003); Ertimur et al. (2007)
Number of companies followed	Number of companies followed by the analyst in a given year	Clement and Tse (2003); Ertimur et al. (2007); Jung et al. (2012)
Firm-specific experience (years)	Number of years in which the analyst supplied recommendations/forecasts on a firm in a given year	Clement and Tse (2003); Ertimur et al. (2007); Clement et al. (2011); Jung et al. (2012)