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CONTENTS

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Measuring the usefulness of information publication time to proxy for returns[1]

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Abstract: This paper deals with investors' reaction to financial reports submitted by firms to the stock exchange, and specifically measures the influence of publication timing on investors: by using the proximity of the publication date to the regulated publication deadline as an independent variable the study examines whether deadline proximity causes a change in investors' reaction (as reflected in share returns).

Understanding the connection between the publication date and investors' reaction contributes to the general understanding of financial reports and to the understanding of investors as recipients of those reports.

Methodology: quantitative analysis is used based on empirical data collected at the Tel-Aviv Stock Exchange from financial reports published over the fiscal years 2009–2013. The data include quarterly and yearly financial reports and share performance for the corresponding periods. By bundling report publications made within a specific proximity to the deadline and comparing them with investors' reaction, non-parametric tests reveal a statistically significant correlation between the publication date deadline proximity to the share performance (returns).

The conclusion of this research is that the time of financial report publication has an influence on investors' reaction. This suggests that investors react to financial reports not just based on their intrinsic information content but also in respect of their publication time.

Keywords: stock performance, predictive analytics, financial report publications.

JEL codes: G14, L25, M41.

Introduction

The aim of this paper is to study the nature of relationship between the following two variables:

– Deadline proximity: measuring a time-span between a financial report publication date and the deadline for publishing (which is regulated by the Israel Securities Authority).

– Investors' reaction to publications: measuring the aggregate response of investors to publications as reflected by share performance movements (returns).

In addition to establishing the said relationship between the two variables, the article also examines the reasons for this and concludes with the outcomes deriving therefrom.

The conclusion presented by this paper is that the date in which financial reports are published (in relation to the regulated deadline) has an impact on investors, and in turn influences share prices. Results demonstrate the existence of a trend, statistically significant, in which investors' reaction is related to the deadline proximity (days left to the financial report presentation deadline date at the date on which the report is filed) of the publication.

This conclusion suggests that investors' reaction to publications made by firms is not limited to the intrinsic content of information contained in the publications themselves but is rather more influenced by external effects such as the deadline proximity of the published report. As will be elaborated in the conclusion section, the conclusions contribute to the general understanding of financial reports and investors' reaction by benchmarking TASE as a stock exchange of smaller proportions and with a less regulated environment than US based stock exchanges upon which most of the relevant research has been conducted.

The Israel Securities Authority regulations for financial report publication state that reports are to be sent by firms to the stock exchange after their period of reference (quarter/year) has passed, similarly to the mandatory 10-Q and 10-K filings which are regulated by the Securities and Exchange Commission at the US based stock exchanges. Given 2–3 months to produce the reports, public firms traded at TASE are required to publish the reports within two months following the quarter's end in the case of quarterly reports, or within three months following the quarter's end in the case of annual reports (Tabel 1).

Table 1. Publication regulated deadline dates per quarter

Quarter	Quarter end date	Report delivery deadline
Q1	31 March	31 May
Q2	30 June	31 August
Q3	31 September	30 November
Q4	31 December	31 March

Over the five year period examined for this research (2009 to 2013), nearly 16% of the firms have filed their reports to the Tel Aviv Stock Exchange on the last possible day for publication, 50% of firms do so in the last five days before the publication deadline date. As opposed to the latter 50% which are con-
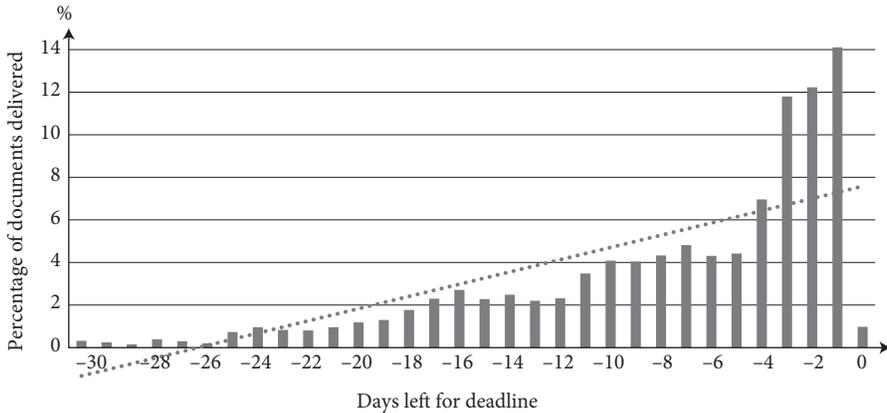
Figure 1. Distribution of reports filed for publication at TASE during last month before the regulated deadline

sidered „late filers", more than 20% of firms prefer to present the report early, meaning more than two weeks before the publication deadline date (Figure 1).

Quarterly financial reports can be viewed as a channel of information between firms and investors. It is quite obvious that the exact same item of news, when read in a certain channel and not in another, might produce a differing extent of reactions. The volatility of reactions to news stories has been demonstrated in previous research [Das and Chen 2007; Antweiler and Frank 2006].

News and information always come within a context. Whilst both channel and information might be identical, the different context in which information arrives may cause a great deal of difference in aggregate investors' reaction. Controlling for channels, previous research [Baumeister et al. 2001] noted that negative oriented information has a bigger impact and is more thoroughly processed and absorbed than positive oriented information across a wide range of contexts.

The strong form of the efficient market theory [Fama 1970] states that all future information is already reflected in a stock's price (including inside information). An outcome for this form of efficiency is that one can never "beat the market", since the latter already incorporates everything expected to happen within the stock price. If so, we should question whether the market reacts to the data in the financial report or to the difference between that data and the prior assumptions held by the reader before reading. Previous research [Morris et al. 2005] demonstrated that whilst holding information about stock price trends constant, expectations of investors toward trend continuation are influenced by the language used to describe the trend.

If the efficiency itself is subject to the environment should we not question the outcomes deriving from fundamental analysis showing a larger differentiation in environments with different (higher) information dissemination? Put

simply, the ability to extract data quickly and efficiently from the report is as important as the actual data contained in it. Therefore we should treat the speed of information dissemination as an influencer on performance. This paper illustrates such a case to demonstrate this concept which can be implemented in many relations and forms.

Another possible interpretation can be found within the relationship to investors (rather than managers who control publications): as stated by [Będowska-Sójka 2014], "At a time of high volatility informed traders are willing to place large orders because high volatility provides a sufficient camouflage of their information". The last days before the deadline date can be treated as a highly volatile time span (as it encompass filings for the majority of firms). This can lead in turn to the encouragement of stealth investors to choose these days, thus changing the composition of investors between the filing groups (early/late).

Tel-Aviv Stock Exchange (TASE): Being the only public market in Israel for trading securities, it lists almost all of the Israeli market's public firms. Although an impressive 60% of which are also traded in other stock exchanges around the world, TASE holds a very important role in Israel's economy. As of January 2015 TASE consists of over 567 public firms, over a thousand mutual funds, 180 exchange traded funds and also corporate and government bonds. TASE is a privately held firm, its 26 owners are banks and large investment companies which are the only ones allowed to coordinate the exchange and ask for operation fees for their services. Of these 26 members, there are three foreign banks (Barclays, Citibank, HSBC), and four foreign investment firms (Merrill Lynch, UBS, Citi Group and Deutsche Securities). All other members are Israeli. The aggregated market value of all TASE market firms is estimated, as of January 2015, at 810 Billion NIS, which were equivalent to about 207 Billion US dollars at the time of estimation.

TASE offers its users a computerized system called TACT (similar to the US system named "EDGAR"). It is a fully automated trading system which allows collaboration and seamless integration of real time information. All products, including shares, bonds, treasury bills and derivatives, are traded using this system. The positive impact of adopting this system on trade composition has been demonstrated in several research papers [Shapiro 1986; Amihud, Hauser, and Kirsh 2003; Kalay, Wei, and Wohl 2002]. TASE allows dual listing, in many cases the New York Stock Exchange or the NASDAQ are the preferred choice by firms. Foreign holdings of international investors in TASE tend to be fixed at around 11% during the last decade.

A note on location and market volume: questioning whether the Tel Aviv stock exchange qualifies as a representative stock exchange for performance prediction can be answered through similarity with research done at the major stock exchanges, measured by trade volume and market cap (NYSE, NASDAQ, JPX, EURONEXT, LSE). In order to qualify research conducted at the Tel Aviv Stock Exchange this paper deals with the same metrics, measurements and time

frames as previous research focusing on stock exchanges in developed markets [Iqbal and Farooqi 2011; Li 2006; Hirschey, Palmrose, and Scholz 2003].

The paper is divided into four sections. The first section includes a literature review of both parent and immediate disciplines. The second section deals with methodology, with special focus placed on data sampling, manipulation and preliminary steps taken in processing the data. The third section demonstrates and describes the findings. The last section summarizes the conclusions, which support the correlation between stock performance and report filing timing and include a discussion of the possible reasons as to why this correlation exists, and suggestions for future research.

1. Literature review

Numerous articles have been written over the effects which financial reports have on company figures. These effects were researched by looking into two main verticals: a quantitative vertical mostly dealing with timing to performance ratios and a qualitative vertical which deals with text analysis.

From the quantitative point of view researchers who dealt with the concept of timing [Mackinlay 1997] did it in an indirect fashion, through examining presentation timing of restatements (presenting additional data over the same time period in which existing data already exists), whilst other researchers [Hirschey, Palmrose, and Scholz 2003; Anderson and Yohn 2002] differ by focusing on the efficiency of dissimilation of new data for a new time period.

At the qualitative vertical a great deal of research has already been conducted to establish a relationship between the quality of financial reports and their impact on investment decisions, thus placing emphasis on the narrative composition of the reports presented. These research papers [Biddle and Hilary 2006; Abarbanell 1991] are usually single-dimensioned from the timing point of view, (meaning they only deal with presenting new data), and focus on qualitative measures such as text and fundamentally related attributes.

This research can be categorized amongst other research done in the quantitative vertical. However it differs to a rather large extent from the timing based research group, since the data used are actually based on metadata and are not firsthand stock exchange data. What this means is that comparison data which was used for correlation testing was actually calculated (days from deadline) and is not considered a part of, or is in any of the financial data.

Specific research over late filed reports (after the deadline) observed a worse stock performance [Alford, Jones, and Zmijewski 1994; Bagnoli, Kross, and Watts 2002], as expected in regard to the correlation discovered in this paper. Such research was also conducted in relation to Form 10-Ks filed after SEC deadline, revealing a worse financial performance of a firm compared with previous year performance and expected performance [Li and Ramesh 2009].

It can be argued that the very existence of quarterly and early reports illustrates a somewhat ambiguous side of Fama's "Efficient market hypotheses" [Fama 1970]. The efficient market hypothesis in its strongest form assumes that all investors are exposed to the same data. Even when accepting this hypothesis it is also clear that no two investors really value a stock in the same way – the exact same information given to two different investors can be treated in a completely opposite manner.

This is of importance when making a distinction between institutional investors and non-institutional investors as indicated in previous research [Lakonishok et al. 1991; Musto 1999], which related increased price reactions around calendar quarter-ends with the incentives of institutional investors to window dress (to improve the appearance of the portfolio performance before presenting it, the manager will sell stocks with large losses and purchase high flying stocks near the end of the quarter). Such actions are also documented in post-EDGAR research [Carhart et al. 2002; Morey and O'Neal 2006].

When trying to measure the impact which early delivery of reports has on stock performance we should question whether the variance composition of different investors from various aspects (institutional/non institutional, bearish/bullish, fast/slow moving) is distributed evenly (homogenously) throughout the range. This is because early presentation may possess an indirect influence over the stock performance not due to its intrinsic properties, but rather through the different types of investors reacting to its data, meaning that the prices are affected by a mediator variable (which is the reaction of different investors to the delivery of reports). Previous research [Dontoh and Ronen 1993], which examined abnormal trading volume surrounding the filing of periodic financial reports had also showed lack of homogeneity of investor type.

On viewing the bigger picture, the very essence of a financial report is not just about the data included, but is also about the aggregate reaction of all investors to it. Creating overreaction or under reaction is not "efficiency" in terms of data dissimilation but rather an after-effect. Stating that "all investors are exposed to the same data" as the efficient market hypotheses argues [Fama 1970] may become an unfulfilled prerequisite, due to the reason that the very reaction of aggregate investors is also considered data, that should also be "exposed to all investors" in the same way.

Previous research [Piotroski 2000] has added another important observation to the discussion about fundamental analysis showing that the effectiveness of a report filing should also be measured with regard to the ability of investors to successfully process its information quickly: "More importantly, the effectiveness of the fundamental analysis strategy to differentiate value firms is greatest in slow information-dissemination environments." [Piotroski 2000].

More recent research [Ball and Shivakumar 2008; Li and Ramesh 2009] also questions the value of information conveyed by the SEC form 10-K, suggesting a possible connection between earlier filings and information asymmetry.

Referring specifically to the Tel Aviv Stock Exchange, it's relatively small size and composition may act as an environmental attribute allowing analysts and investors to better process the early delivered reports (in relation to other global stock exchanges), meaning that one can relate to some extent to TASE as a fast information-dissemination environment in contrast to other (bigger and global) stock exchanges. Although research [Leuz and Wysocki 2008] has indicated that an increase in the quantity of public information can help reduce uncertainty about firm value, this should be viewed in consideration of the dissemination attributes of the information examined.

It should be noted that in an average quarter over 200 reports are sent to the Tel Aviv Stock Exchange within a time span of two days ("late delivered" group). This might present a problem to the non-institutional investors (due to lack of resources), creating the exact situation referred to in Piotroski's research – quick processing as an attribute of effectiveness [Piotroski 2000]. Another notable dimension is risk – non-institutional investors may expect analysts or economic journalists to extract the highlights for them, but nevertheless this poses an increasing risk for investors (as opposed to reports sent early, long before the deadline), so the volatility increases and relative stock performance moves downwards.

Metadata can help us understand the existing data in its proper context and enhance analytical performance: the simplest example is a report delivered after the deadline. Whether it is for conscious reasons (such as keeping the stock price high as long as possible before breaking problematic news to the public), or just failing to meet the delivery deadline due to administrative reasons, the very reason a report was handed in late can direct an investor into a different type of reading, resulting in a shift in aggregate reaction from liberal to conservative (and eventually, bullish to bearish). Previous research [Alford, Jones, and Zmijewski 1994] found that late filers typically face significant economic events which account for the delayed filing of reports.

Previous research [Kahneman, Knetsch, and Thaler 2008] referred to the objectiveness of an investor when buying rather than selling and relates it to the endowment effect. This effect was originally meant to describe a phenomenon in which people give higher financial value to products they actually own than to another product (similar or identical) that they do not own. His research found that the willingness to accept is always higher than the willingness to pay. The question is, does having a financial report qualify as ownership of a certain product? Does the very reason of a having (meaning getting a report before the deadline) a report, even without reading it, lower investor risk and volatility factors, simply due to the fact he is no longer "waiting for news" regarding an investment, but already has all the data the firm supplies?

Research by [Brown and Warner 1980] studied the impact of the annual earnings announcement over share prices. They concluded that even when a report has been proven to contain useful and valuable information it was not

integrated immediately it was disclosed. This conclusion is aligned with this paper's conclusion that as the approach of non-homogeneous report presentation (meaning delivery is made on different days for different firms) affects the market, and most of all affects the investor's ability to make a proper analysis in an orderly fashion, rather than taking an educated guess when facing hundreds of reports in a very short time frame. This result also concurs with previous research [Meier and Schaumburg 2006] indicating that institutional investors may possess incentives to trade on dates near the quarter-end for various reasons, so there is an end of quarter bias in favour of institutional investors.

2. Methodology

This study uses quantitative analysis of empirical data collected at the Tel-Aviv Stock Exchange from financial reports published over the fiscal years 2009–2013. The data include quarterly and yearly financial reports and share performance for the corresponding periods.

In order to understand the nature of the connection between the publication and the investors' reaction to the publication, a process of bundling report publications (made within a specific proximity to the deadline) and comparing them with investors' reaction is conducted.

After the bundling process a battery of statistical tests are run against the data to check for the existence of a statistically significant correlation between the publication date deadline proximity to share performance (returns).

Steps taken in order to sample and prepare the data for non-parametric tests:
– **Sampling**: collecting data for financial report publications and daily stock quotes. See elaboration in Section 2.1.
– **Classification:** splitting the data by the type of report, create a distinction between the following types: native report, original report, fix to report, unified report. See elaboration in Section 2.2.
– **Standardizing:** creating a relative scale for measurement of investors' reaction as reflected by the stock returns. A standardized share performance measure creates an estimation of how well a share performed with relation to the entire market performance on a specific day. See elaboration in Section 2.3.
– **Bundling:** publications made by public firms were bundled by time-span proximity to the publication deadline. See elaboration in Section 2.4.
– **Filtering:** Removing extreme entries from the corpus and dataset of inactive firms and deadline proximity outliers. See elaboration in Section 2.5.

After conducting the preliminary steps, a total of 10,632 financial reports were included amongst all the timing (proximity) groups. Two measures were used in this process. The first was a figure of non-standardized (see Section 2.3) share price changes during the selected period, which reflect investor response

to the publication on the day following the publication. The second was a figure of a standardized (see Section 2.3) value of stock price changes, which allowed controlling for market-wise stock movements (influences on all traded stocks), which are not an outcome of a specific publication. After obtaining both standardized and unstandardized figures a comparison between the groups was conducted. The results examine whether there are statistically significant changes amongst the groups in relation to the time left for the report delivery deadline (i.e. deadline proximity).

2.1. Sampling

This research uses data gathered from the following two sources:
– Quarterly and yearly reports: financial reports which were delivered by public firms to the Tel-Aviv Stock Exchange during the years 2009–2013.
– Daily return values (share performance quotes) for each firm whose shares were offered for trade at the Tel-Aviv Stock Exchange during the years 2009–2013.

Sampling financial report publications:

Downloading the corpus of financial reports was done using the TASE filing access framework. A total of 9,687 individual reports were downloaded for the years 2009–2013 (averaging at 1,937 reports for each year of the selected period).

Tagging: Every report was given a unique report identifier, as well as the corresponding firm identification within TASE, and the corresponding share identification.

Dating: Each of the reports examined was attributed a date indication, referring to the date it was sent to the stock exchange (thus released to the general public) and the corresponding quarter and year for which the content is relevant.

Sampling daily return values:

Downloading the daily return values was done using the TASE data access framework. Approximately 400 thousand share performance figures were sampled, representing all individual TASE quotes for the five year period mentioned (in a daily resolution), for each firm whose shares were offered for trade during any part of the selected period (2009–2013).

Tagging: Every performance entity consisted of a share identification, a relevant trade date and a number representing the change from the previous day in percent.

2.2. Classification

As part of the working process at TASE, public firms can file several types of reports. As customary in respect of restatements, fixing reports can be issued by firms to relate to the same period of time to which earlier publications already refer. In order to control situations where two reports refer to the same period of time, a classification process was conducted for each report. This

process allowed the creation of a distinction between the following four types of financial reports: native report, original report, fix to report, unified report.

The simplest type of report, which is called a „native" report, is a report introduced by a firm for publication on TASE. Some reports are issued with fixes on a later date. In this situation, the original file status is changed from „native" to „original", and the file containing the fix is given the status „fix". Another document is created „on the fly", titled „unified", which contains both the text of the „original" document and of the „fix" document (Figure 2).

Native	Fix	Original	Unified
A single document, refering to a specific quarter	A document refering to the same quarter as the native document	Representing the first native document which was allocated to this quarter	Combined text of all documents refering to the same quarter
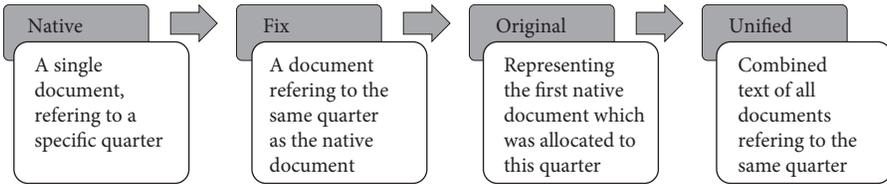
Firgure 2. Types of documents in the corpus of financial report publications

The dataset has a grand total of 9,687 files, of which 5,679 are native, 1,512 fix, and 1,248 of both original and unified. The average of reports per firm in these 20 quarters is 27.7 (meaning fix publications are relatively common). Native and original files are distributed evenly between quarters, varying between 24.87% and 25.13% per quarter (Table 2).

Table 2. Inventory of financial report publications per period

Row labels	Fix	Native	Original	Unified	Grand total
2009	298	1,135	237	237	1,907
1	64	296	51	51	462
2	52	296	45	45	438
3	45	305	41	41	432
4	137	238	100	100	575
2010	376	1,085	298	298	2,058
1	61	295	52	52	460
2	53	299	48	48	448
3	41	307	38	38	424
4	221	185	160	160	726
2011	376	1,072	319	319	2,086
1	77	263	66	66	492
2	52	302	46	46	446
3	98	264	84	84	530

Tab. 2 continued

4	149	223	123	123	618
2012	292	1,144	247	247	1,930
1	86	272	77	77	512
2	40	809	37	37	423
3	39	311	36	36	422
4	127	525	97	97	573
2013	170	1,242	147	147	1,706
1	32	318	90	90	410
2	36	317	91	91	415
3	44	310	38	38	430
4	58	297	48	48	415
Grand total	1,512	5,679	1,248	1,248	9,687

2.3. Standardizing

Creating a standardized scale for relative share performance: trade data are available to the general public in any given time through share quotes. The most common performance indicators are the opening and closing figures, followed by the low and high figures and the volume of trade. These figures are stand-alone figures, measuring the absolute figures of a specific share.

A standardized share performance measure provides an estimation of how well a share performed in relation to the entire market performance on a specific day. This measure is especially relevant with regard to the deadline proximity method conducted in this paper, since the goal is not comparing a single share through different times, but rather to compare groups of shares (bundled by deadline proximity). Several stock exchanges have an index indicating the overall performance, for example, the NASDAQ Composite Index.

In order to avoid the inherent bias in which share prices are skewed on a certain day which shows overall good (or bad) results for the entire stock population ("green days" or "red days"), returns were standardized in relation to the entire stock population performance. This allows control of the share performance changes which are not single share related, but a cross-share trend (which affects several shares). The standardization was conducted on a daily basis (single day resolution), using the following method:

– Using the unstandardized performance figure (acronym: UPF) as a base value (calculated as the percentage difference between the opening and closing price).
– For each day an average and a standard deviation were computed for every daily UPF.

– A standardized figure for each quote was calculated by extracting the average of UPF from the selected UPF and dividing the outcome by the standard deviation of the UPF population for the selected day.

The standardized data was computed in accordance with all stock changes for every day, meaning the average and standard deviation were taken by using not just stocks of firms which issued a report, but all the active stocks available for trade.

2.4. Bundling

In order to establish a connection between the time of filing and the investors' reaction to the filing, we need to test if the performance of stocks is different when controlling for the proximity of the actual publication date with the regulated publication deadline. In order to allow this comparison publications made by public firms were bundled by time-span proximity to the publication deadline. For an entire month prior to the deadline, 31 separate groups were created each containing data for a specific proximity (single day to 31 days). The bundling process includes the following steps:

– Creating 31 different publication groups for each time-span daily group of the month prior to the regulated deadline (filtering returns which do not fall within the 31 groups will be done at the next stage, see Item 2.5).
– Classify each publication to a certain group based on the deadline proximity of the report.
– Calculate returns for each group (average and median for both standardized and unstandardized groups).

2.5. Filtering

The downloaded corpus of financial reports and the respective share returns for each firm were filtered as follows:

– Filtering of inactive firms.
– Filtering by deadline proximity.

After filtering both inactive firms and time related outliers the data showed the following characteristics: on average, 25% of the firms had sent their reports to TASE on the last two days possible, whilst 50% of firms did so in the last 5 days. On the other hand, 20% of firms presented the report more than two weeks before the deadline and 1% of reports were delivered late, filed on the following day after the deadline.

Filtering of inactive firms
Population for filtering:

– Firms which have actively traded stocks at TASE in less than 19 out of the 20 quarters of the period examined (2009–2013) were excluded from the dataset.

– Firms which ceased trading for any reason during the five year period tested for this research were excluded from the dataset.

Exclusion of reports was made for all four types of reports and their respective stock performance values.

Filtering by deadline proximity

Population for filtering:

– Publications which were made earlier than 31 days before the regulated publication deadline were excluded from the corpus and were considered as deadline proximity outliers.

– Publications which were made later by more than one day after the regulated publication deadline were excluded from the corpus and were considered as deadline proximity outliers.

2.6. Justification for methodology

Bundling by days (deadline proximity): similar methodology was adopted in research by [Hirshleifer, Lim, and Teoh 2009] which used time based clustering to find heightened market movements over particular times in which information related to a large number of firms. In addition, research [Alford, Jones, and Zmijewski 1994] conducted on US based stock exchanges also used day based bundling by defining the equivalent SEC form 10-Ks as "early" in cases where it was filed at least five calendar days prior to the SEC deadline and bundling filings by categories (early, late and on-time).

Using a standardized scale: selecting the autonomous stock performance and the standardized (share wise) value was made in previous research [Kloptchenko et al. 2004; Tetlock, Saar-tsechansky, and Macskassy 2007] in the same manner, thus measuring both an independent stock performance ratio and a unified figure matching all the actual stock price movements on a specific day. A standardized trend model for each firm's earnings was also adopted in previous research [Bernard and Thomas 1989] in timing related correlation discovery, using a standardized trend model (for each firm's earnings). A similar standardization of stock prices was taken by previous research [Tetlock, Saar-tsechansky, and Macskassy 2007; Kraft, Vashishtha, and Venkatachalam 2014], which showed success in capturing movements which were relative to other active stock movements during a selected period (a single day in this case).

Justification for classification by filing types: this method had been used by [Hranaiova and Byers 2007] whilst including re-statements to research market response reactions to financial restatements. Creating unified documents was implemented to prevent treating the fix documents in the same way as the original ones which may cause unnecessary bias, especially due to the fact that data for the same quarter was presented previously so the original timing would not be overwritten. Applying different predictive force based on the timing of

notification was also adopted in relation to restatement effects on investor reliance on earnings [Anderson and Yohn 2002].

Testing a five year period has also been chosen in previous research conducted at the Tel Aviv Stock Exchange [Amihud, Hauser, and Kirsh 2003]. As in previous research [Hirschey et al. 2005], data does not include any cases of overlapping events or performance observation.

3. Findings

3.1. Descriptive statistics

The following tests were all conducted using the IBM SPSS statistics' framework:
– Shapiro-Wilk test of Normality,
– Kolmogorov-Smirnov test of normality,
– Levene's test for homogeneity of variance,
– Kendall-Tau Correlation,
– Jonckheere's trend test.

Case processing summary: a total of 10,632 cases were processed for standardized and unstandardized stock performance groups combined, for the period of 31 proximity groups (as elaborated in the methodology analysis sub chapter) (Table 3).

Table 3. Case processing summary

	Valid		Missing		Total	
	N	**percent**	**N**	**percent**	**N**	**percent**
Standardized returns	5,316	100	0	0	5,316	100
Unstandardized returns	5,316	100	0	0	5,316	100

The overall mean of standardized share returns for the selected period was 0.878, with a standard deviation of 1.087, whilst the mean of unstandardized share returns was 0.002 (as expected for a long, five year period), with a standard deviation of 0.0339 (Table 4).

The Shapiro-Wilk test of Normality showed that for every year tested (2009–2013), the distribution was not normal with $p < 0.05$. The same $p < 0.05$ was shown for the Kolmogorov-Smirnov test of normality (Table 5).

Therefore, due to lack of normality in the data, non-parametric tests were used in order to examine correlation and trend. In order to use Kendall-Tau and

Table 4. Mean and standard deviation for both standardized and unstandardized returns

	Days before deadline	Standardized returns	Unstandardized returns
Valid	5,316	5,316	5,316
Missing	–	–	–
Mean	–7.660	0.878	0.002
Std. deviation	6.718	1.088	0.034
Variance	45.132	1.183	0.001

Table 5. Normality test: Shapiro-Wilk and Kolomogorov-Smirnov

	Year	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Significance	Statistic	df	Significance
Standardized returns	2009	0.190	302	0.0001	0.007	302	0.0001
	2010	0.137	1,320	0.0001	0.778	1,320	0.0001
	2011	0.148	1,329	0.0001	0.799	1,329	0.0001
	2012	0.188	1,346	0.0001	0.743	1,346	0.0001
	2013	0.166	1,019	0.0001	0.843	1,019	0.0001
Unstandardized returns	2009	0.200	302	0.0001	0.601	302	0.0001
	2010	0.167	1,320	0.0001	0.735	1,320	0.0001
	2011	0.175	1,329	0.0001	0.740	1,329	0.0001
	2012	0.202	1,346	0.0001	0.730	1,346	0.0001
	2013	0.189	1,019	0.0001	0.812	1,019	0.0001

Table 6. ANOVA test between based on absolute differences from the median, between standardized and unstandardized returns

		Sum of Squares	df	Mean Square	F	Sig.
Median difference, standardized	between groups	36	31	1.174	1.439	0.055
	within groups	4,311	5,284.000	0.816		
	total	4,347.188	5,315.000			
Median difference, unstandardized	between groups	0.03	31	0.001	1.116	0.301
	within groups	1,523.000	5284	0.001		
	total	4,552.000	5,315.000			

Jonckheere's trend tests, homogeneity of variance is a prerequisite. Levene's test for homogeneity of variance was conducted in a robust way based on medians instead of means. Results were F(1.439), P = 0.055 for the standardized group and F(1.116), P = 0.301 for the unstandardized group (Table 6).

The homogeneity test did not show any significance (p > 0.05) for both standardized and unstandardized stock performance, so the null hypothesis was retained, which means variance is evenly distributed between groups.

As there is no normality in the distribution of stock performance (both standardized and unstandardized) Levene's test however showed an equal distribution of variance between the groups (including both standardized and unstandardized). The prerequisites are met for Kendall-Tau and Jonckheere's trend tests. These tests are non-parametric and are used for non-normal distributions (as Shapiro-Wilk results shows), but require equal variance (as Levene's test shows).

The final step was to obtain results from the Kendall-Tau correlation. The value of r tau was –0.047 with p < 0.05 for standardized performance and value of r tau = –0.02 with p < 0.05 for unstandardized performance (see elaboration on the conclusions section). Both figures from Kendall Tau were statistically significant at p < 0.05 (Table 7).

Table 7. Kendall Tau correlation coefficient and significance

Kendall's tau		Standardized returns	Unstandardized returns	Deadline proximity
Standardized returns	Correlation coefficient	1	0.745	–0.047
	Sig (2-tailed)		0.000	0.000
	N	5,316.000	5,316.000	5,316.000
Unstandardized returns	Correlation coefficient	0.745	1	–0.020
	Sig (2-tailed)	0.000		0.042
	N	5,316.000	5,316.000	5,316.000
Deadline proximity	Correlation coefficient	–0.047	–0.020	1.000
	Sig (2-tailed)	0.000	0.042	
	N	5,316.000	5,316.000	5,316.000

A crosscheck with Jonckheere's trend test was conducted to make sure the p-values of the Kendall-Tau were computed correctly. As seen in Table 7 in the appendix, the p-values indeed showed the same p-values as the Kendall Tau correlation, so the significance of the relation between parameters (days to deadline and stock performance) was again proven to exist for both standardized and unstandardized sets (Table 8).

Table 8. Trend test results showing same p-value as the Kendall Tau for crosscheck purposes

	Standardized returns	**Unstandardized returns**
Number of levels in proximity days	32	32
N	5,316	5,316
Observed J-T Statistic	6,247,522.500	6,247,522.500
Mean J-T Statistic	6,565,615.00	6,565,615.00
Std. Deviation of J-T Statistic	64,367.317	63065.497
Std. J-T Statistic	−4.942	−2.037
Asymp. Sig. (2-tailed)	0.000	0.042

Note on nonparametric tests:

Since the normality test for distribution has indicated that data was not distributed normally (not following the normal/Gaussian distribution), non-parametric tests had to be made. Non-parametric rank tests have been reported in previous research [Corrado 1989; Campbell and Wasley 1996] to be more powerful than the parametric t-tests for detecting abnormal daily returns and trading volume. Since the particular non-parametric tests needed have required homogeneity of variance to be present at the source data, the dataset had to be manipulated in order to allow the Levene's test to run against medians.

In order to run Levene's test for homogeneity of variance based on median values instead of means the following process took place: first, computing and aggregating a median value for each of the groups, done twice (for both standardized and unstandardized figures). Then the difference between the actual reading (daily stock performance) and the median was computed and an absolute value from the latter was also obtained. Levene's test was performed on the absolute figures and succeeded in retaining the null hypothesis which stated that the variances are equal throughout the groups. This step served as the prerequisite for statistical tests that require such homogeneity of variance which were conducted later – Kendall Tau and Jonckheere's trend test.

3.2. Inferential statistics

The results of the non-parametric tests using the data collected from the Tel Aviv Stock Exchange for the years 2009–2013 show the following:
– Delivery timing of financial reports (early/late publication) has an impact on investors' reaction (as reflected in share returns).
– There is a correlation between the publication date deadline proximity and the share performance.
– The correlation found is statistically significant, showing a negative relation between deadline proximity and returns. Publications with larger proximity

are likely to gain a larger reaction amongst investors rather than publications with smaller proximity to the publication's regulated deadline.

These results align with previous research conducted on the US market: significant market reactions to SEC form 10-K early filings were indicated in several studies [Qi, Woody, and Haw 2000; Asthana and Balsam 2001; Griffin 2003; Asthana, Balsam, and Sankaraguruswamy 2004].

Based on the results, in cases where a report was delivered early to the stock exchange, the relative share performance of the firm will be more likely to have a performance that ranked higher in relation to other stocks.

The effect is a relatively linear trend, with a negative correlation between share performance and publication deadline proximity. This negative correlation can be seen through the statistical measures (Kendall-Tau test and Jonckheere's trend test) and is also visible visually (Figure 3 and 4).
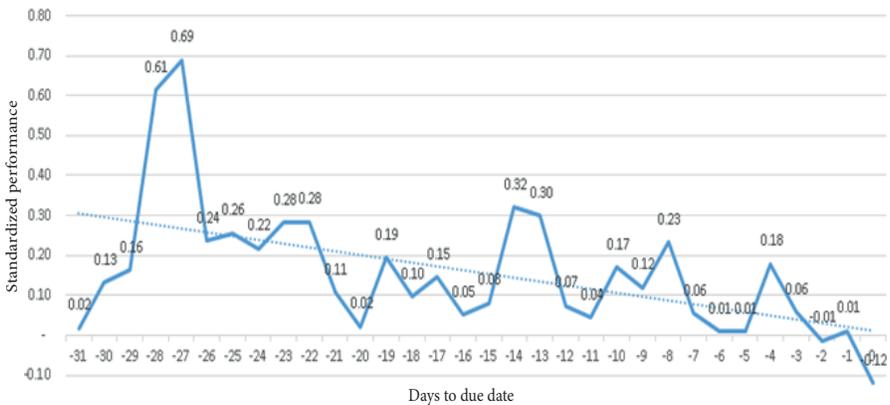
Figure 3. Standardized values in relation to days left before the deadline, on the X axes, from left to right are the days left for presentation
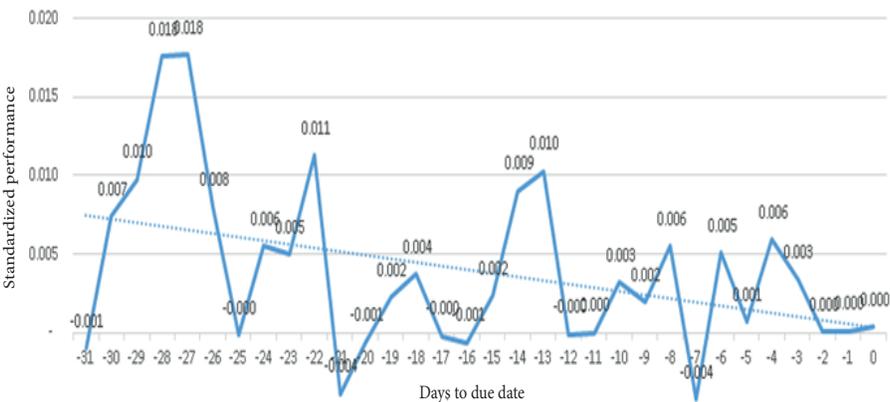
Figure 4. Unstandardized values in relation to days left before the deadline, on the X axes, from left to right are the days left for presentation

Conclusions

This paper deals with investors' reaction to the publication of financial reports made by firms to the stock exchange. Specifically this study measures the influence of publication timing on investors: by using the proximity of the publication date to the regulated publication deadline as an independent variable, this study examines whether deadline proximity causes a change in investors' reaction (as reflected in share returns).

The conclusion of this paper is that the date on which financial reports are published (in relation to the regulated deadline) has an impact on investors, and in turn, influences share prices. Results demonstrate the existence of a trend, statistically significant, in which investors' reaction is related to the deadline proximity (days left to the deadline for financial report presentation and the date on which the report is filed) of the publication.

Additional conclusions deriving from the test results:

Investors' reaction to publications issued by firms is not limited to the intrinsic content of information contained in the publications themselves, but rather can be influenced by external attributes such as the deadline proximity of the published report. The earlier a report is presented (i.e. far from the deadline date), the more chance of the respective share to show a better performance, compared to the performance it would have shown when presentation would have been late rather than early.

These results align with previous research [Choudhary, Markley, and Schlotzer 2009] conducted on the US market, showing that earlier SEC form 10-K's timing are associated with a decrease in measures of information asymmetry which is observed around the publication date and may lead to a decrease in returns. Combining the two conclusions suggests an interesting connection between information asymmetry and deadline proximity.

When referring to share performance in relation to the other share returns made the same day (standardized measure) the correlation between deadline proximity and returns has twice the magnitude, as illustrated in Table 7. This means that shares where their corresponding reports were filed early (late) proved more likely to outperform (under-perform) the average of the entire stocks on the market within the day of publication. The magnitude of this effect drops as the time of publication moves towards the deadline date. The heightened magnitude measured over the standardized values (compared with the unstandardized values) suggests that measuring the deadline proximity effect should check for additional variables influencing the entire population of public firms in order to filter their effects.

These conclusions contribute to the general understanding of financial reports and investors' reaction, by benchmarking TASE as a stock exchange of smaller proportions and a less regulated environment than the US based stock exchanges upon which most of the relevant research has been conducted.

Observing the effect of deadline proximity over stock reaction on the TASE reinforces the similar results on US based exchanges and provides evidence as to the global nature of the phenomenon described.

Recommendations for future research

Several researchers have presented a different approach towards the topic of this paper Menike and Man [1995] has researched whether the reports' reflection on stock performance is industry related and he performed an industry based segmentation for measuring the report publication impact over performance whilst checking a specific industry. This might be an interesting direction to follow, thus taking both deadline proximity and industry into consideration.

An industry based approach can be also supported by recent research [Dzikowska and Jankowska 2012], which shows particular industries to be prone to greater influence in times of crisis. A heterogeneous division of influence (and risk) between public firms may also lead to the strategic management of publications, and in turn prove useful as a proxy for return changes.

Research conducted at the Karachi Stock Exchange by [Iqbal and Farooqi 2011] found no abnormal return in the period after the time of publication (such as earnings' announcements or the filing of financial reports). The research did not make a distinction between the deadline proximity of different publications, but rather treated those as a fixed variable.

Reviewing the Karachi Stock Exchange data in the light of the deadline proximity method may shift their conclusion of no filing to stock correlation and supply additional weight to the method presented here. Previous research [Hirshleifer, Lim, and Teoh 2009] conducted on the US market indicated that investors react less to earnings' announcements when they face a large number of competing announcements on that day. Although earnings' announcements are not bound by regulatory deadlines, studying the relationship between the timing of the announcements and investors' reaction in conjunction with proximity to other fixed dates (quarter end, fiscal years) may produce interesting observations.

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