

## GOOD FORECASTING OR INFORMATION LEAKAGE EXPLAINING MARKET BEHAVIOR PRIOR TO THE ANNOUNCEMENT OF SOVEREIGN RATING DOWNGRADES: EVIDENCE FROM TURKEY

ÜLKE KREDİ DERECELENDİRME NOTLARININ DÜŞÜRÜLMESİNE  
İLİŞKİN DUYURULAR ÖNCESİNDE PİYASANIN DAVRANIŞINI İYİ  
TAHMİN Mİ BİLGİ SIZINTISI MI AÇIKLIYOR: TÜRKİYE ÖRNEĞİ

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### Abstract

This paper aims to empirically test the impact of Turkey's sovereign credit rating downgrades by three major credit rating agencies on the Borsa İstanbul equity market prior to the official announcement, and to ascertain whether any significant impact found is due to market players' accurate forecasting or information leakages. In this paper, the effects of nine downgrade announcements between 2016 and 2018 are analyzed using the Event Study method. In eight of the nine events, statistically significant negative cumulative abnormal returns were estimated during the five trading days before the announcement. Evidence suggests that three of the eight events reflected information leakage to the market, and five indicated sound forecasting by market players alongside some information leakage. These results reveal that it is necessary to take preventive measures against information leakage before the announcement of the ratings assessments.

**Keywords:** Sovereign Credit Rating, Information Leakage, Insider Trading, Market Forecasting, Event Study

**JEL Classification:** G14, G15, G24

### Özet

Bu çalışmada, üç büyük kredi derecelendirme kuruluşunun Türkiye için yaptığı aşağı yönlü kredi not değişikliği duyurularının duyuru öncesindeki dönemde Borsa İstanbul pay piyasasına etkisi incelenmiş;

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eğer önemli bir etki varsa, bu etkinin piyasa oyuncularının notu iyi tahmin etmelerinden mi yoksa piyasaya önceden bilgi sızmasından mı kaynaklandığı ampirik olarak test edilmiştir. Bu amaçla, 2016-2018 döneminde 9 ayrı tarihteki not düşürme duyurusunun etkisi Olay Çalışması yöntemi ile analiz edilmiştir. Araştırma sonucunda, not düşüşlerinin olduğu 9 tarihin 8’inde, not duyurusu öncesindeki beş işlem gününde istatistiksel olarak anlamlı negatif kümülatif anormal getiriler tahmin edilmiştir. Duyurular öncesinde negatif kümülatif anormal getiriler tespit edilen söz konusu 8 not açıklamasının 3’ünde bilgi sızıntısı olduğuna, 5’inde ise piyasanın not tahminini iyi yaptığına ancak belli bir dereceye kadar piyasaya önceden bilgi de sızmış olabileceğine dair bulgulara ulaşılmıştır. Bu sonuçlar, not duyuruları öncesinde bilgi sızıntısına karşı önleyici tedbirlerin alınmasının gerekli olduğunu ortaya koymaktadır.

**Anahtar Kelimeler:** Ülke Kredi Derecelendirme Notu, Bilgi Sızıntısı, İçeriden Öğrenenlerin Ticareti, Piyasa Tahmini, Olay Çalışması

**JEL Sınıflandırması:** G14, G15, G24

## 1. Introduction

Credit rating is an opinion of a rating agency regarding the ability and the willingness of a debtor to meet its financial obligations in future in full amount and within the established due dates. Though credit rating agencies have different methodologies and rating notations, the rating assignments are divided into various scales from the highest solvency to the lowest solvency and are expressed in a corresponding letter, group of letters, numbers, words, or combinations.

The credit rating is given by an independent credit rating agency. Standard and Poor’s, Fitch and Moody’s are amongst the most recognized international credit rating agencies in the world. Their ratings are divided into three main categories: (i) investment grade, (ii) speculative level and (iii) default level. An outlook, “negative”, “stable”, or “positive”, is also assigned by them with a consideration given to any changes in economic and/or fundamental business conditions.

Credit ratings are central to financial markets. Announced changes in a country’s credit rating affect not only its borrowing capacity, cost of borrowing, and investment climate, but also local equity markets.

We can evaluate the impact of credit rating changes on equity markets by distinguishing the periods (i) *before* and (ii) *after* the official rating announcement. The former tracks market reactions prior to the information being published, while the latter reflects post-announcement impacts. In an efficient market, rating changes are not expected to affect prices before an announcement since this information is not published. Thus, abnormal returns before an announcement can be explained in two ways. First, market players might forecast a sovereign rating ahead of the decision by considering the rating agencies’ announcements calendar (usually published at the beginning of each year) and by closely following economic developments. A second factor is potential information leakage—market players are informed ahead of time of a prospective ratings announcement.

If some market players are informed in advance, they can use this information to obtain unfair profits. This will distort share prices and the stock market index. Such activities, called “insider trading,” are subject to administrative and/or criminal sanctions in almost every country.

That is why, when a country's credit rating is announced, whether the rating has been previously leaked or not, as much as whether the grade is fair, can be a source of contention. For example, when Standard & Poor's downgraded Turkey's credit rating from BB to BB – on 01.05.2018, a newspaper column published the article, "S&P insider trading?". The article claims that the sales that came one day before the announcement of the rating and the decrease in the stock market index may be caused by leakage of information<sup>1</sup>. Another justification for why such claims are frequently voiced in Turkey, is due to the leakage of the rating for Turkey by an employee of Moody's to Turkish bankers in 2000. The incident was confirmed by audio recordings and the said employee was later terminated by Moody's<sup>2</sup>. However, it is possible to find similar allegations not only in Turkey, but also in other countries. As a matter of fact, when Standard and Poor's reduced the rating of the USA from AAA to AA + in 2011, the US capital markets authority Securities and Exchange Commission launched an investigation about insider trading on the said rating agency<sup>3</sup>.

Previous studies on credit ratings focus mostly on the *post-announcement* period, and with a few exceptions [e.g. Şensoy *et al*<sup>4</sup>.], it has been found that markets are mostly affected by the announcements.

Kaminsky and Schumkler concluded that changes in the sovereign ratings of 16 developing countries between 1999 and 2000 affected both the stock and bond markets, also spreading to other states sensitive to rating changes because of fragile economic conditions<sup>5</sup>.

Li *et al.* found that the sovereign rating and outlook changes announced for Sweden between 1992 and 2002 affected long-run market outcomes<sup>6</sup>.

A study conducted by Norden and Weber on the response of US stock and credit default swap (CDS) markets to the rating announcements made by the three major rating agencies during the period 2000–2002, found that markets not only anticipate rating downgrades but that there are differential impacts from one agency to another<sup>7</sup>.

1 NTV (2010), <https://www.ntv.com.tr/ekonomi/sifirci-hocaya-kostebek-sorgusu,o08BI9A7yUGwOnEuyZADuw>, Accessed on February 6, 2020

2 İnan, E. (2018). "S&P'den Öğrenenin Ticareti mi?", Vatan Gazetesi, <http://www.gazetevatan.com/ercan-inan-1163041-yazar-yazisi-s-p-den-ogrenenin-ticareti-mi-/>, 02.06.2018

3 New York Times (2011). <https://dealbook.nytimes.com/2011/08/15/was-there-insider-trading-on-s-p-s-downgrade>, Accessed on February 2, 2020.

4 Şensoy *et al.* (2016). Do sovereign rating announcements have an impact on regional stock market co-movements? The case of Central and Eastern Europe, *Economic Systems*, 40(4): 552-567.

5 Kaminsky, G., Scumkler, S. (1999). Emerging markets instability: Do sovereign ratings affect country risk and stock returns, *The World Bank Economic Review*, 16(2):171-195.

6 Li *et al.* (2004). Effects of credit rating announcements: the Swedish stock market, *International Journal of Finance*, 16(1): 2872-2891

7 Norden, L., Weber, M. (2004). Informational efficiency of credit default swap and stock markets: The impact of credit rating announcements, *Journal of Banking & Finance*, 28(11): 2813-2843.

Brooks *et al.* found evidence that the most reactive indices to downgrades in emerging markets are the share market and exchange rates, and that those impacts were clearer in the cases announced by S&P and Fitch among the four credit rating agencies examined<sup>8</sup>.

Martell found that the downgrades of credit ratings in 29 developing countries between 1986 and 2003 had a significant impact on these countries' stock markets and that more attention was paid to S&P's ratings announcements than to Moody's<sup>9</sup>.

Hill and Fatf also found similar evidence of stronger reactions to changes in S&P rating assessments than in those of the other agencies using a sample of 101 countries over the period 1990–2006<sup>10</sup>.

Timmermans showed that the downgrades announced for the European market in the period 1997–2012 caused negative abnormal returns, with upgrades having an impact only on the day the rating was announced, and that small-scale companies and financial institutions reacted strongly to downgrades<sup>11</sup>.

Mateev examined the impact of sovereign credit rating changes on nine Eastern European countries between 1997 and 2007 and found that sovereign bond rating changes in one country trigger significant changes in yield spreads and stock market returns in neighboring countries<sup>12</sup>.

Bayar *et al.* studied 13 Eurozone countries during the financial crises in 2008–2012 and revealed that there is a long-term relationship between credit ratings and the equity index<sup>13</sup>.

Bissoondoyal-Bheenick *et al.* showed that a sovereign rating change in one country might have spillover effects on other countries using a sample of ten Southeast Asian countries between 1989 and 2010<sup>14</sup>.

Similar results have been for Turkey. For example, Korkmaz *et al.* analyzed the impact on the BIST 30 index of the upgrade in Turkey's rating scores to investment grade in May 2013 and subsequent downgrade to non-investment grade in September 2016<sup>15</sup>. The authors concluded that the investment-grade rating had an overall positive impact on market returns after the announcement

8 Brooks *et al.* (2004). The national market impact of sovereign rating changes, *Journal of Banking & Finance* Volume 28 (1): 233-250

9 Martell, R. (2005). The effect of sovereign credit rating changes on emerging stock markets. Working Paper.

10 Hill, P., Faff, R. (2010). The market impact of relative agency activity in the sovereign ratings market, *Journal of Business Finance and Accounting*, 37:1309-1347

11 Timmermans, M.A.J. (2012). Credit rating changes and the effect on stock prices: How credit rating changes affect stock prices in the European market, Master Thesis, Tilburg University.

12 Mateev, M. (2014). The effect of sovereign credit rating announcements on emerging bond and stock markets: new evidences, *Oxford Journal: An International Journal of Business & Economics*, 7(1).

13 Bayar *et al.* (2013). Effects of sovereign credit ratings on the Eurozone stock markets during the recent financial crises, *International Journal of Business and Social Science*, 4(12):133-145

14 Bissoondoyal-Bheenick *et al.* (2014). Rating spillover effects on the stock markets. *Journal of Multinational Financial Management*, 25:51-63.

15 Korkmaz *et al.* (2017). Ülke kredi notlarının pay getirileri üzerindeki etkileri: Bist 30 endeksi üzerinde bir event study analizi, *Namık Kemal Üniversitesi Sosyal Bilimler Metinleri ICOMEP Özel Sayısı*: 171-187.

but that the subsequent 2016 downgrade saw no significant changes in market returns. Yıldırım *et al.* (2018) analyzed the impact of S&P and Moody's rating announcements for Turkey from 2012 to 2016 on the six sector indices on the Borsa İstanbul<sup>16</sup>. They found that rating announcements had an impact on selected indices. Çağlak *et al.* examined the impact of rating agencies' announcements for Turkey on the 14 sector indices on the Borsa İstanbul between 1992 and 2018<sup>17</sup>. It was concluded that 50 percent of these sector indices were affected by the announcements. Credit announcements thus clearly impact indices overall, and this effect does not vary among the credit rating agencies.

All these studies have examined *post-announcement impacts*. To date, little research has focused on the *pre-announcement phase*. The most comprehensive to date is the Event Study research by Michaelides *et al.* using data from 65 countries for the period 1998–2012<sup>18</sup>. The authors found statistically significant abnormal returns were observed in the stock indices due to information leakage, especially before credit rating downgrade announcements. The study also concluded that the related parties interviewed by the credit rating agencies before the rating announcement were likely to leak information.

To date, no such study has been conducted on the Turkish equities market, a gap the present research seeks to fill. This present study analyzes the impact of Turkey's sovereign ratings prior to the announcements. It contributes to the literature in two respects. The first is the study's explicit and novel tests of whether information leakages have occurred prior to sovereign rating downgrades in Turkey. The second is that it takes the impact of the calendar of rating assessments published by the credit rating agencies into account to clarify whether market reaction before the announcement likely resulted from information leakage, sound forecasting by market players, or a combination of both.

In this context, the paper consists of four sections. In the following second section, the scope, data and methods of the research are identified. The third section outlines the findings. The last section discusses the conclusions and offers several recommendations.

## 2. Scope, Data and Methodology

This paper seeks to empirically test the impact of sovereign credit rating downgrades by three major credit rating agencies on the Borsa İstanbul equities market prior to the official announcement and to ascertain whether any significant impact found is due to market players' accurate forecasting or information leakages.

16 Yıldırım *et al.* (2017). Kredi derecelendirme kuruluşlarından S&P, Moody's ve Fitch'in Türkiye için yapmış oldukları not açıklamalarının hisse senedi endeksleri üzerine etkisi: Borsa İstanbul Örneği 2012-2016, Maliye Finans Yazıları, 109:9-30.

17 Çağlak *et al.* (2018). Uluslararası Kredi Derecelendirme Kuruluşlarının Kredi Not Kararlarının Türkiye Finansal Piyasalarına Etkisi: Borsa İstanbul Sektör Endeksleri Üzerine Bir Uygulama, Ömer Halisdemir Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi, 11: 41-63

18 Michaelides *et al.* (2015). The adverse effects of systematic leakage ahead of official sovereign debt rating announcements, Journal of Financial Economics, 113 (3): 526-547

**Table 1:** Calendar and Announcement Days for Turkey's Sovereign Ratings

Credit Rating Agency	Rating Calendar	Rating	Outlook	Announcement Day	Rating Change	Outlook Change	Event Number
Moody's	Not Available	Ba3	Negative	17.08.2018	Downgrade	-	1
S&P	17.08.2018	B+	Stable	17.08.2018	Downgrade	-	1
Fitch	13.07.2018	BB	Negative	13.07.2018	Downgrade	-	2
Moody's	Not Available	Ba2	Under review	01.06.2018	-	Downgrade	3
S&P	01.05.2018	BB-	Stable	01.05.2018	Downgrade	-	4
Moody's	Not Available	Ba2	Stable	07.03.2018	Downgrade	-	5
Moody's	Not Available	Ba1	Negative	17.03.2017	-	Downgrade	6
S&P	27.01.2017	BB	Negative	27.01.2017	-	Downgrade	7
Fitch	27.01.2017	BB+	Stable	27.01.2017	Downgrade	-	-
S&P	04.11.2016	BB	Stable	04.11.2016	-	Upgrade	-
Moody's	Before October	Ba1	Stable	23.09.2016	Downgrade	-	8
Fitch	19.08.2016	BBB-	Negative	19.08.2016	-	Downgrade	9
S&P	20.07.2016	BB	Negative	20.07.2016	Downgrade	-	-
Moody's	05.08.2016	Baa3	Negative watch	18.07.2016	-	Downgrade	-
S&P	06.05.2016	BB+	Stable	06.05.2016	-	Upgrade	-
Moody's		Baa3	Negative	Previous rating			
S&P		BB+	Negative	Previous rating			
Fitch		BBB-	Stable	Previous rating			

**Source:** Trading Economics, S&P, Moody's, Fitch

The study focuses on the 2016–2018 period due to the lack of rating agency calendar announcements and limited rating downgrades for Turkey before 2016 and considering the troubled economic conditions after 2018. Table 1 shows that there were 15 ratings announcements during this period. Our study is limited to “rating and outlook downgrades” since there were only two rating upgrades, and these were limited to outlook change. Also, since rating announcements on July 18, 2016, and July 20, 2016, were released immediately after the failed coup attempt of July 15, 2016, and were linked to this incident, they were excluded from the analysis. We also note that on January 27, 2017, and on August 19, 2018, two different rating agencies expressed rating opinions on the same day.

Thus, our research addresses nine dates (events) between 2016 and 2018, on which eleven downgrades were announced. For five of the nine dates, rating assessments were in line with the rating agencies' published calendar; there was no calendar for the other four.

The impact of the announcements on the Borsa İstanbul equities market has been analyzed with the Event Study method as widely used in the literature. To carry out analysis, abnormal returns and cumulative abnormal returns are calculated for 15 days (ten days before and five days following the announcement) for each event via a Market Model. Based on the approach of Michaelides *et al.*<sup>19</sup>, the MSCI Emerging Markets (EM) Index was selected as the independent variable, and the MSCI Turkey Index was selected as the dependent variable. The MSCI EM Index, which measures the return performance of stock markets in 24 developing countries, including Turkey, represents

<sup>19</sup> Michaelides *et al.* (2015), pp.526-547

approximately 85% of the market value of these countries' exchanges. The MSCI Turkey Index is calculated for about 85% of the size of the Borsa İstanbul equity market, with 18 stocks from 7 different sectors<sup>20</sup>.

The first step is to ascertain daily returns for the market indexes. Equation (1) is used to calculate the daily return of index  $i$  on day  $t$ .

$$R_{it} = (P_{it} - P_{it-1})/P_{it-1} \quad (1)$$

Here  $R_{it}$  is the daily return of index  $i$  on day  $t$ , while  $P_{it}$  is the closing value of index  $i$  at day  $t$  and  $P_{it-1}$  is the closing value of index  $i$  on day  $t-1$ .

Then, the Market Model is formulated using Equation (2).

$$ER_j = \alpha + \beta_j R_m + \varepsilon \quad (2)$$

Here  $ER_j$  is the expected return of the MSCI Turkey Index,  $\alpha_i$  is the constant term in the regression equation,  $\beta_j$  is the relation between the MSCI Turkey Index and the MSCI EM Index,  $R_m$  is the return on the MSCI EM Index, and  $\varepsilon$  is an error term. To estimate the coefficients, a daily return of both indexes from 250 trading days ( $t-11$ ,  $t-260$ ) before  $t-10$  has been used<sup>21</sup> (Kılıç, 2009).

Following the estimation of the model, Equations (3) and (4) are used to ascertain the daily abnormal returns and cumulative abnormal returns for each window, respectively.

$$AR_{jt} = R_{jt} - [\alpha + \beta_j R_m] \quad (3)$$

$$CAR_{jt} = \sum AR_{jt} \quad (4)$$

Here  $R_{jt}$  is the actual return on day  $t$ ,  $AR_{jt}$  is the average abnormal return of the MSCI Turkey Index on day  $t$  and  $CAR_{jt}$  is the cumulative abnormal return over an event window extending from  $t=T$ .

The study applies a three-stage analysis. The first step is to reveal whether ARs and CARs are available in the period before the announcement. If yes, the second stage determines whether the statistical significance of ARs and CARs should be tested, since this signals a potential leak of information and/or sound market forecasting. For this reason, one parametric and one non-parametric test are applied. Following random walk theory<sup>22</sup>, given price changes in the stock market are serially independent, the Independent Sample t Test, which best fits the stock market price series, was used as a parametric test. The Shapiro-Wilk test was carried out to determine whether the data was normally distributed before this test to comply with the assumption of normal distribution<sup>23</sup>. Then, as a non-parametric

20 MSCI, <https://www.msci.com/emerging-markets>, Accessed on February 13, 2020

21 Kılıç, S. (2019). Impact of Forward-Looking Disclosures on Stock Prices: Evidence from Borsa İstanbul, *Business and Economics Research Journal*, 10(4): 833-844.

22 Cootner, P. H. (1964), *The Random Character of Stock Market Prices*, MIT Press, Cambridge.

23 Korkmaz et al., 2017, 180; Büyükoztürk, Ş. (2012), *Sosyal Bilimler İçin Veri Analizi El Kitabı*. 16. Baskı, Ankara: Pegem Akademi Yayıncılık.

test, the Mann-Whitney test, which is equivalent to the Independent Sample t Test, was applied. If it is found that CARs prior to the announcement are statistically significant, it should be clarified at the third stage if this is due to information leakage or sound market forecasting, depending on whether the announcement is included in the rating agency calendar. If it is, this might be considered good forecasting; otherwise, the conclusion is that there has been information leakage.

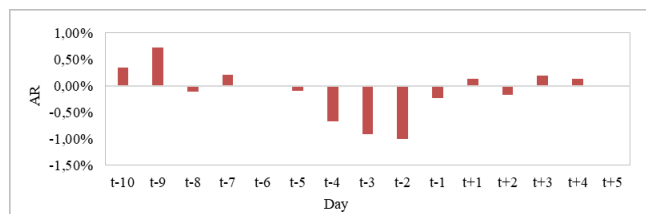
### 3. Empirical Findings

Figure 1 and Table 2 show that average ARs for the five days before the announcement differ significantly from other days. While the estimate for the daily average of ARs was  $-0.58\%$  in the five days before the announcement, it was  $0.05\%$  for the five days after.

**Table 2: ARs Before and After Announcements**

Day	19.8.16	23.9.16	27.1.17	17.3.17	7.3.18	1.5.18	1.6.18	13.7.18	17.8.18	Average
t-10	1.62%	1.34%	0.46%	1.57%	0.88%	-1.30%	-0.46%	0.47%	-1.47%	0.35%
t-9	0.75%	0.17%	0.53%	-0.42%	-0.13%	2.44%	1.13%	-0.12%	2.20%	0.73%
t-8	-0.66%	0.05%	0.44%	-1.62%	0.93%	-0.70%	-0.90%	0.90%	0.60%	-0.11%
t-7	1.04%	-0.27%	-0.42%	0.04%	0.34%	-0.53%	-0.47%	1.90%	0.23%	0.21%
t-6	-1.42%	-1.24%	1.32%	0.62%	0.78%	0.28%	1.93%	-0.67%	-1.44%	0.02%
t-5	-0.08%	1.47%	-0.54%	-1.09%	-1.27%	-0.75%	3.30%	-0.02%	-1.84%	-0.09%
t-4	-0.62%	-0.52%	1.01%	-0.63%	0.02%	-1.97%	-1.06%	-3.23%	0.95%	-0.67%
t-3	0.60%	0.26%	-1.61%	0.25%	0.35%	-0.54%	-0.59%	-4.82%	-2.15%	-0.91%
t-2	-0.65%	1.70%	0.36%	-0.26%	-0.92%	0.36%	-3.80%	-2.43%	-3.36%	-1.00%
t-1	0.48%	0.07%	0.37%	0.16%	0.43%	-3.56%	-2.18%	-0.02%	2.14%	-0.24%
t+1	-0.11%	-3.01%	3.46%	0.19%	-0.70%	0.73%	-0.90%	-0.07%	1.61%	0.13%
t+2	-1.00%	0.28%	0.41%	-0.40%	-0.36%	-1.25%	-1.31%	2.05%	0.10%	-0.16%
t+3	-1.42%	0.53%	0.24%	-0.58%	0.41%	0.07%	-1.27%	0.86%	2.85%	0.19%
t+4	0.76%	-1.04%	0.92%	-0.17%	-0.20%	-1.86%	2.22%	1.09%	-0.56%	0.13%
t+5	0.45%	0.03%	1.09%	0.89%	-0.51%	-1.56%	-1.91%	0.72%	0.59%	-0.02%

**Figure 1: Daily Averages of ARs**

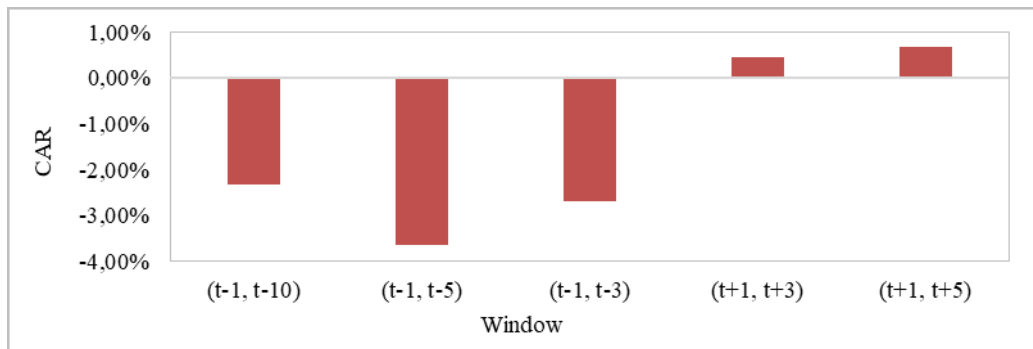


Similarly, all windows before the announcement have negative CARs, while all windows following have positive CARs (Table 3 and Figure 2).



**Table 3:** CARs Before and After the Announcement

Window	19.8.16	23.9.16	27.1.17	17.3.17	7.3.18	1.5.18	1.6.18	13.7.18	17.8.18	Average
(t-1, t-10)	1.06%	3.02%	1.94%	-1.37%	1.41%	-6.29%	-3.12%	-8.04%	-4.13%	-2.32%
(t-1, t-5)	-0.27%	2.98%	-0.40%	-1.57%	-1.39%	-6.47%	-4.34%	-10.52%	-4.26%	-3.65%
(t-1, t-3)	0.43%	2.03%	-0.88%	0.15%	-0.14%	-3.75%	-6.57%	-7.27%	-3.37%	-2.67%
(t+1, t+3)	-2.53%	-2.21%	4.11%	-0.78%	-0.65%	-0.45%	-3.48%	2.84%	4.55%	0.45%
(t+1, t+5)	-1.32%	-3.22%	6.12%	-0.06%	-1.36%	-3.88%	-3.17%	4.65%	4.58%	0.69%

**Figure 2:** CAR Averages for Event Windows

In general, the estimated ARs and CARs point to a highly negative impact on the market before the announcement and mostly positive impact afterward. A negative AR of more than 1.20% occurred at least one day during the ten days before the announcement, and negative CARs were detected in different windows before the announcement for eight events. Under normal circumstances, negative impacts from a downgrade would be expected after—and *not before*—its announcement. However, our findings are not in line with this expectation, which indicates information leakage before the announcement and/or sound marketing forecasting in advance.

The second stage of the analysis ascertains whether negative cumulative abnormal returns in eight of the nine rating announcement dates are statistically significant. For this purpose, it is necessary to determine when the leak and/or accurate forecast first started in the period before the announcement. Thus, the pre-announcement period should be divided into two sub-periods, and the CARs calculated for these sub-periods should be compared. When Table 2 and Figure 1 are analyzed, we see that in the ten days before the announcement, there are mainly negative returns after the transaction day t-5. Therefore, assuming that the probability of information leakage and/or accurate forecast begins on the day (t-5); leakage/forecast period were considered as day (t-1) to (t-5), and pre-leakage/pre-forecast period as day (t-6) to (t-10). If there is a statistically significant

difference between these two five-day periods, it would be safe to assume information leakage and/or sound forecasting before the downgrade.

The summary of the parametric and non-parametric test results is given in Table 4. Since the Shapiro-Wilk p-values are greater than 0.05 in eight days, Independent Sample t Test results are interpretable for these eight days. Independent Sample t Test results show that a significant difference was detected at the 5% level. The non-parametric Mann-Whitney test revealed the same results at the 5% significance level.

**Table 4:** Test Results

Period	N	19.8.16	23.9.16	27.1.17	17.3.17	7.3.18	1.5.18	1.6.18	13.7.18	17.8.18
<b>P values for Shapiro- Wilk Test</b>										
Pre-leakage/Pre-Forecast	5	0.57**	0.01	0.632**	0.31**	0.65**	0.79**	0.79**	0.40**	0.43**
Leakage/Forecast	5	0.12**	0.12**	0.63**	0.23**	0.72**	0.46**	0.46**	0.28**	0.89**
<b>P values for Independent Sample Test</b>										
Pre-leakage/Pre-Forecast	5	0.000*	0.185	0.003*	0.007*	0.000*	0.019**	0.019**	0.016**	0.013**
Leakage/Forecast	5									
<b>P values for Mann-Whitney Test</b>										
Pre-leakage/Pre-Forecast	5	0.009*	0.601	0.016**	0.009*	0.009*	0.016**	0.016**	0.009*	0.016**
Leakage/Forecast	5									

\*. \*\* show significance at %1 and %5 respectively

Taking these findings into account, prior to the announcement of the downgrade rating for Turkey during the 2016–2018 period, it can be statistically ascertained that during the five days before the announcement there were information leaks to the market and/or the market was well able to forecast the ratings in eight out of nine cases. The fact that the market did not react as expected after the announcement also supports this finding. After the announcement, the impact was limited since the market reacted to the rating announcement before it was made; in other words, the rating assessment was built into the price. Additionally, important news and developments related to the overall share market prior to the announcement, which may lead to divergence from emerging markets, were also examined. The news and developments in question were not adequate to explain the abnormal returns.

The analysis turns to the final stage. Based on the calendar announced previously by the rating agencies, the dates were evaluated to find out when information leakage was possible, and when the market was estimating accurately. It is possible to conclude that the ratings in three of the eight cases (March 17, 2017; March 03, 2018; June 1, 2018), whose CARs were significant before the announcement, were leaked since these announcements had not been scheduled previously—the market did not know when the rating would be announced. Therefore, if we observe positions taken in the market that appear to reflect prior knowledge of the ratings, it stands to reason that information

leakage was the likely cause. The remaining five announcements (August 19, 2016; January 27, 2017; May 1, 2018; July 13, 2018, and August 17, 2018), for which CARs were statistically significant for the days before the announcement, were in line with the calendar previously announced by the rating agency, and it is most likely that the market had forecast these ratings accurately.

#### 4. Conclusion

It is a matter of debate whether ratings are leaked to the market in advance as well as whether the ratings given are fair. The leakage of information in advance is an indication that the market is not working efficiently. The result is a deterioration in the functioning of the price realization mechanism, allowing traders to reap unfair profits.

Our study has tested empirically whether the eleven sovereign ratings downgrade announcements for Turkey by three major credit rating agencies on nine days were leaked to the market before the official announcements. This study differs from previous studies in the sense that it analyses for the first time for Turkey whether the abnormal returns prior to the announcements of ratings were due to information leakage or sound forecasting.

According to the results of our study, the announcements regarding Turkey's sovereign rating downgrades created a greater impact on the equity market before the announcement than afterward. Also, for eight out of the nine events examined in the study, statistically significant negative AR and CARs were estimated in the five days before the announcement. Since three of the mentioned eight dates announced were not previously scheduled by the rating agencies and were confirmed to have negative AR and CARs, it can be concluded that these announcements were leaked in advance. As the remaining five rating explanations were in the calendar announced by the rating agency, it is most likely that these announcements were forecast correctly by the market. However, it stands to reason that it is unlikely that the market predicted *all five rating announcements* within the calendar with 100 percent accuracy. This finding, combined with the finding of leakage in all three events that were not within the predetermined calendar, indicates that information leakage was present, to some extent, in the other five events.

The findings regarding information leakage point to the need for credit rating agencies to take measures to avoid such missteps in the future. A follow-up study that assesses the share of transactions on the market undertaken by foreign investors prior to the announcement might reveal whether the information leakage originated in Turkey or with the foreign rating agencies.

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