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TRABAJO FIN DE GRADO

Visual trading system in financial markets based on return analysis and technical indicators. The use of news information and interval-valued data

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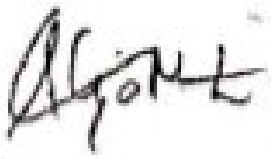
Declaro, bajo mi responsabilidad, que el Proyecto presentado con el título Visual trading system in financial markets based on return analysis and technical indicators. The use of news information and interval-valued data en la ETS de Ingeniería - ICAI de la Universidad Pontificia Comillas en el curso académico 4ºGITI es de mi autoría, original e inédito y no ha sido presentado con anterioridad a otros efectos. El Proyecto no es plagio de otro, ni total ni parcialmente y la información que ha sido tomada de otros documentos está debidamente referenciada.

Fdo.:  Fecha: 27/06/2020

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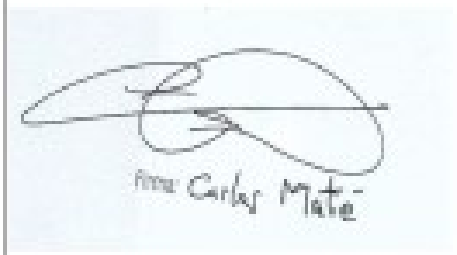

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MÉTODO DE BOLSA PARA MERCADOS FINANCIEROS BASADOS EN EL ANÁLISIS DE RETORNO E INDICADORES TÉCNICOS. EL USO DE NOTICIAS Y DATOS TEMPORALES.

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Resumen

Introducción

A lo largo de los últimos años las nuevas tecnologías han permitido que muchas personas hayan podido acceder a la inversión en bolsa, la apertura de los mercados y la sencillez que muchas empresas han puesto a los pequeños inversores, han hecho que ya no sea necesario acudir a una entidad financiera para comprar o vender activos; sino que, gracias a internet, cualquier inversor puede invertir desde un ordenador o móvil.

Si bien es cierto que los mercados de valores no han cambiado su esencia, donde al final todo se trata de predecir los valores de las acciones y comprar o vender en función de ello, han aparecido nuevos actores. La entrada de nuevos inversores y la supresión de barreras de entrada han hecho que los grandes inversores se hayan vuelto más escépticos y la tecnificación del sector haya aumentado. Además, los nuevos tiempos han hecho que aparezcan nuevas industrias, como la del sector tecnológico; un sector revolucionario sensible a nuevos descubrimientos y hábitos de consumo.

Un hecho contradictorio es que, a pesar de la aparición de nuevos inversores y la capacidad de información de éstos, el porcentaje de personas que pierden dinero en bolsa ha aumentado. Se estima que entre el 75% y el 90% de las personas que entran en este mundo pierden dinero. La razón es que la complejidad de los mercados financieros, el aumento de productos bursátiles y la alta competitividad de los agentes económicos, no está bien estudiada por estos inversores.

Existen muchos métodos que ayudan a los inversores a tratar de predecir los movimientos del mercado, muchos de ellos emplean herramientas matemáticas y estudios sobre pasados gráficos para estimar el crecimiento o la caída de la demanda de ciertos valores. También existen estudios que relacionan fenómenos económicos con los comportamientos sociológicos de las personas y así utilizarlos en el beneficio económico. La revolución de la información ha llegado también a los mercados y cualquiera con interés sobre el tema puede obtener notificaciones que afecten a empresas y a la economía en general.

Este trabajo se centrará en las noticias como indicador principal de la toma de decisiones para intentar predecir el comportamiento de las acciones de unas compañías preseleccionadas procedentes del NASDAQ 100 y del SP-100. Se observarán la reacción de las acciones tras la publicación de noticias y se tratará de señalar una serie de pautas para crear un criterio de inversión en bolsa.

Metodología

En los capítulos 2 y 3 se especifican los criterios de estudio empleados, desvelando las compañías estudiadas, los criterios de investigación, y las pautas de los análisis realizados. Se comienza explicando los resultados de investigaciones anteriores, que serán de ayuda para la exploración posterior y sobre los cuales se fundamentarán las indagaciones de este documento (Capítulo 1). Más adelante se tratan los medios y los criterios propios para los datos de este trabajo (Capítulo 2).

El método de estudio se ha basado en la duración de los efectos de una noticia y la variación de precios de las acciones tras la publicación de noticias, artículos y trabajos, tomando los resultados de cada empresa por separado y clasificándolos por categorías según su mercado, es

decir, según se trate de una compañía del NASDAQ 100 o del SP-100. Cada noticia es asignada un valor según las ecuaciones expuestas en el capítulo 2, que dictamina el carácter positivo o negativo de la noticia. El carácter de una noticia refleja el grado de optimismo que hay sobre una acción, y aunque la clasificación se realiza por mercados, dentro de cada mercado se segmentan los datos en función del carácter de las noticias para saber así el efecto de cada uno.

Los ingresos que se obtendrían estudiando las noticias pueden ser muy diferentes en función del momento del día en el que se haya comprado o vendido una acción, así que para tener una visión más completa del problema se han estudiado los máximos, mínimos y últimos precios diarios de cada acción para así ver las diferencias entre unos y otros.

Resultados y Conclusiones

Tras el análisis de los resultados, se concluye que el estudio de las noticias puede ser beneficioso y que puede ser útil para predecir el comportamiento de los mercados. Se observa que los rendimientos alcanzados en el NASDAQ 100 y el SP-100 no son similares y por lo tanto deben ser estudiados por separado.

Comparando los datos se observa un mayor rendimiento en el caso de los últimos precios diarios, mientras que cuando se invierte en los precios máximos diarios se registran los peores resultados del trabajo; aun así, ninguna franja ha registrado pérdidas significativas.

Asimismo, las fluctuaciones tras la publicación de noticias negativas han sido superior a las de noticias positivas, probablemente debido a que el miedo de los mercados a perder dinero es mayor que la posibilidad de ganar dinero.

El estudio alcanza los objetivos de analizar el comportamiento de algunas empresas tras la publicación de noticias, si bien no se ha logrado automatizar el proceso por medio de un programa, se proponen pasos y conclusiones muy remarcables para posibles inversores.

VISUAL TRADING SYSTEM IN FINANCIAL MARKETS BASED ON RETURN ANALYSIS AND TECHNICAL INDICATORS. THE USE OF NEWS INFORMATION AND INTERVAL-VALUED DATA.

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ABSTRACT

Introduction

Over the last few years, new technologies have allowed many people to access investment in the stock market, the opening of markets and the simplicity that many companies have placed on small investors, have made it no longer necessary to go to a financial institution to buy or sell assets; thanks to the internet, any investor can invest from a computer or mobile phone.

Although it is true that the stock markets have not changed their essence, where in the end it is all about predicting the values of the shares and buying or selling based on it, new actors have appeared. The entry of new investors and the removal of obstacles have made large investors more skeptical and the technification of the sector has been increased. In addition, new times have made new industries appear, such as the technology sector, a revolutionary sector, sensitive to new discoveries and consumer habits.

A contradictory fact is that, despite the appearance of new investors and their information capacity, the percentage of people who lose money in the stock market has increased. It is said that

between 75% and 90% of the people who enter this world lose money. The complexity of financial markets, the increase in stock products and the high competitiveness of economic agents, are the main reasons why little investors lose money.

There are many methods that help investors try to predict market movements, many of them use mathematical tools and past studies to estimate the growth or fall in demand for certain securities. There are studies that relate economic phenomena to people's sociological behaviors and use them for economic gain. The technological revolution has also reached the markets and anyone with an interest in the subject can obtain notifications that affect companies and the economy in general.

This work will be focused on the news as the main indicator of decision-making to try to predict the behavior of the shares of preselected companies from the NASDAQ 100 and the SP-100. The shares reaction after the publication of the news will be observed and an attempt will be made to point out a series of guidelines to create a criterion for investment in the stock market.

Methodology

Chapters 2 and 3 specify the study criteria used, revealing the companies studied, the research criteria, and the guidelines for the analyzes carried out. It begins by explaining the results of previous investigations, which will be a help for subsequent exploration and on which the inquiries of this document will be based (Chapter 1). The criteria and the realization for the data of this work are discussed in Chapter 2.

The method has been based on the duration of the effects of a news item and the variation in share prices after the publication of news, articles and works, taking the results of each company separately and classifying them by categories according to their market, that is, depending on whether it is a NASDAQ 100 or SP-100 company. Each new is assigned a value according to the equations presented in Chapter 2, which dictates the positive or negative character of the news item. The character reflects the degree of optimism that there is about an action, and although the classification is made by markets, within each market the data is segmented according to the character of the news so as to know the effect of each one.

The income obtained studying the news can be very different depending on the time of day when a stock was bought or sold, so to have a more complete view of the problem, the maximums,

minimums and latest daily prices have been studied. of each action to see the differences between them.

Results and Conclusions

After analyzing the results, it is concluded that studying the news can be beneficial and that it can be useful in predicting the behavior of the markets. It is observed that the yields achieved in the NASDAQ 100 and the SP-100 are not similar and therefore must be studied separately.

Comparing the data, a higher yield is observed in the case of the latest daily prices, while when investing in the maximum daily prices, the worst results of the work are recorded; even so, no strip has registered significant losses.

Also, fluctuations after negative news releases have been higher than positive news, probably because the markets' fear of losing money outweighs the making money optimism.

The objectives of analyzing the behavior of some companies after the publication of news has been achieved. However, it has not been possible to automate the process through a program, but very remarkable steps and conclusions are proposed for potential investors.

ACKNOLEDGEMENTS

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Acronyms

ROI	Return on Investment
SP	Standard and Poor´s
IA	Interval Analysis
SDA	Symbolic Data Analysis
ITS	Interval Time Series
MWH	Megawatt hour
ICAI	Instituto Católico de Artes e Industrias
TFG	Trabajo de Fin de Grado
EMA	Exponential Moving Average
RSI	Relative Strength Index
NA	Not Applicable

Chapter I

State of the art

1.1. Introduction

News effect is not unknows in stock markets. Since the beginnings of 19th century many investors have looked at the newspapers to see the last events and evaluate their investments. Time passed and the analysis began to be more cautious and deeper, giving the readers bigger perspectives.

The optimism and skepticism have always been present and the fear of biased information and fake news made professors and companies began to study the phenomena of news effect on assets. Many have attempted to approach it, digging into the human psychology, but these studies didn't explain the difference between optimistic and pessimistic news from an analytical view nor explained the ROI investors could make; the limited media and the slowness of the process were a big obstacle to give clear conclusions.

In the decade of 2010 due to the technological revolution, many people had access to internet via computers or smartphones, this led to the appearance of many portals, blogs and digital newspapers who offered unlimited instant information. Stock market opened their doors to new investors and the information they had was bigger than ever. Many studies who investigate news and markets have appeared since then, without the barriers past works had. For academic reasons, this paper will only include formal academic researches.

1.2. Financial Analyst Journal

In 2017 Steven L. Heston (professor at the university of Maryland) and Nitish Ranjan Sinha (member of the Federal Reserve of India) published the report "News vs Sentiment: Predicting Stock Returns from New Stories" which is a study that analyses the impact of news in the market prices. Their work details how the nature of each type of new has a totally different consequence in markets.

In first place they split news in two groups, positive and negative news. Positive news were those who made optimistic forecasts while negative news were those who made pessimistic forecasts. To accomplish as much news analyses as possible they designed a neural network where they declare:

"The classifier was trained using a random sample of 3,000 triple-annotated news articles spanning the 14 months from December 2004 to January 2006. Analysts of blogs and other outlets of public opinion annotated the news articles. The annotation order was randomized so that manual annotators would not have been able to anticipate stock returns from reading the news articles. Given that the training sample was less than 1% of our data, the effect of data snooping is minuscule.6 The system had about 75% accuracy against the average assessment of human analysts. The engine is described in greater detail in Sinha (2016) and Infonic (2008). Table 1 presents summary statistics for our text data. The neural network predicts an average 29.9% chance that an article is positive and a 27.5% chance that an article is negative.

Table 1. Characteristics of News Sentiment Variables

Sentiment Variable	Mean	Standard Deviation
Thomson Reuters net sentiment	2.4%	39.0%
Thomson Reuters negative sentiment	27.5	24.6
Thomson Reuters positive sentiment	29.9	21.7

Note: This table shows the average net company sentiment (positive minus negative), positive sentiment, and negative sentiment for 900,754 articles using the Thomson Reuters sentiment engine.

„[1]

The results justified that positive news have shorter responses than negative ones, being able to have a maximum duration of 7 days while negatives can last a maximum of 15 days. Their paper also included a section where they compare the ROI of companies who had and didn't have any news, digging into the positive and negative news effect.

"In our study, we distinguished the effect of news from the positive or negative sentiment of that news. We also found a news publication effect, where firms with neutral news outperform firms without any news. Controlling for this publication effect, we showed that positive news affects stock prices within one week. However, negative news predicts low stock returns for up to one quarter, which is consistent with short-sale constraints that delay the incorporation of bad news. We found that most of the delayed reaction to news occurs around subsequent earnings announcements. This finding is consistent with earnings releases and earnings-related trading acting as a channel to incorporate information into stock prices."[2]

Their second division was about the complexity of the new; it stated that a simple article can have an effect of one or two days, but when there appears several news during the week, the effect can move towards 13 weeks. However, not all news have the same value. They noticed that when a new was very difficult to read, full of technicisms, complex graphics and published on financial newspapers, the effect was underrated. On the other hand, when the news were easy to read, the markets overreacted.

The division criteria for news was:

- Character: Academic paper, Social media, newspaper…

[1] Steven L. Heston and Nitish Ranjan Sinha, "News vs Sentiment: Predicting Stock Returns from New Stories", Financial Analyst Journal, Nº102469, December 2018, p.69
[2] Steven L. Heston and Nitish Ranjan Sinha, "News vs Sentiment: Predicting Stock Returns from New Stories", Financial Analyst Journal, Nº102469, December 2018, p.80

- Lexical and morphological estimation: It refers to the sentiment classification, lexical and sentiment patterns, and reprocessing.

Tips about the performance of companies depending on news:

- Companies with barely news tend to underperform compared with companies with lots of news.
- News with returns estimations have bigger effects on markets compared with no return's estimation news.
- Post stock markets behavior news has important effect in posterior tendencies.

To study the real effect of news, their paper included a table where companies earnings were analyzed before, during and after the launch of news. The first column declares the number of weeks after news; each earnings column has the average earning and a t-statistic that states the difference between all cases."

Table 7. Long–Short Excess Returns before, during, and after Earnings Announcement Weeks

	Pre-Earnings		Earnings		Post-Earnings	
Week after News	Average	*t*-Statistic	Average	*t*-Statistic	Average	*t*-Statistic
0	3.40%	31.34	5.90%	13.39		
1	0.32	1.88	0.81	1.71		
2	0.09	0.42	0.80	1.27	0.04%	0.08
3	0.30	1.32	1.44	2.91	0.37	1.05
4	0.10	0.35	−0.13	−0.21	−0.31	−1.19
5	0.31	1.01	0.57	0.81	−0.08	−0.39
6	0.07	0.20	1.16	1.82	0.23	1.12
7	−0.89	−2.21	−0.20	−0.37	0.04	0.21
8	−0.23	−0.51	0.09	0.17	0.13	0.79
9	0.24	0.44	0.66	0.93	0.15	0.90
10	−0.19	−0.27	0.10	0.18	0.23	1.27
11	−0.95	−1.17	0.93	1.75	0.27	1.77
12	0.00	0.00	−1.52	−2.91	0.42	2.67
13	1.09	0.81	0.85	1.73	0.36	2.26
Weeks 1–13	0.25	0.11	5.57	2.66	1.83	2.14
Weeks 2–13	−0.07	−0.03	4.76	2.33	1.83	2.14

„[3]

The table shows that news effect in markets can be very profitable almost doubling the earnings a trader would obtain if he had not taken it into account. Pre-earnings column has lower

[3] Steven L. Heston and Nitish Ranjan Sinha, "News vs Sentiment: Predicting Stock Returns from New Stories", Financial Analyst Journal, Nº102469, December 2018, p.79

benefits than earnings and post-earning columns and the gap between the three columns is visible. The moment when the higher benefits take place is in the publication, but the effect persists even after the launch of news as post-earnings column has better numbers than pre-earnings column.

The news study is important because it is a channel of price discovery, it serves as publicity to companies, give information to investors and acts as showcases.

1.3. Columbia Business School Research

In 2019 Paul Glasserman, Fulin Li and Harry Mays Mamaysky; three reputed professors from the Columbia Business School; wrote an article called "Time Variation in the News-Returns Relationship" where they study how do information and new technologies act over markets.

They argue that digital information and high-speed notifications developed in recent years have made possible the access of information for little investors and made more prudent big trading agencies.

The principal differences between big and little traders are:

- Impulsivity: Little traders are anxious and volatile trying to predict the next tendencies instead of the calm and patience of big firms that try to wait as much as possible to forecast the consequences of events.
- Volume: It is said that stock markets are a play in which a few big whales dictate the direction of prices while lots of little insects try to take advantage of the tendencies implemented by them. Although this is true from a certain point of view, the reality is far more complex if one keeps in mind that big firms don't act together, on many occasions they have different purposes and they fight each other to earn money.
- Perspective: Although little traders have more information than ever before, big firms still have much more resources, which give them the chance of having a more global and complete perspective with more information and capacity of action.

The article is oriented to more formal and institutional investors with more resources and patience, it gives the big companies perspective and their methodology.

"We focus on the role of institutional investors in the market's reaction (or underreaction) to news. Hendershott, Livdan, and Schürhoff (2015) find that institutions trade ahead of news, whereas Huang, Tan, and Wermers (2019) find that they mainly trade on the tone of early news

reports. Sinha (2016) suggests that stocks with greater institutional ownership may not be immune from behavioral biases, while noting a possible role for strategic trading as a factor in return predictability. We argue for the importance of strategic trading in explaining apparent underreaction by interacting sentiment with institutional ownership and short interest, and by controlling for intermediary capital, passive investing, and the informativeness of news."[4]

According to the article´s conclusion, big corporations prefer to wait from 4 to 10 days in order to guaranty their investments. This has been observed because the trace of this firms can be very well identified by the changes in prices, volumes, or prices tables. It is true that this companies can try to hide themselves from the public eye by contracting different buy/sell procedures, but it is also able to see part of these transactions by hiring some trading products that allow the investigators to see the hidden volume; which tells the real number of contracts that have been bought or sold in a specific frame time.

The results of this studio showed that 4-10 days after the publication of a relevant new the markets created strong inclinations in favor of the news behavior.

The criteria to declare the behavior of a new; which is the same used for this paper; consists in grading the mark of a new between -1 and +1. (-1 For very negative news and +1 for very positive news) The formula (2.1) gives a mark for each new.

$$M = \frac{W_{pos} - W_{neg}}{W_{tot}} \qquad (2.1)$$

- M = Mark
- W_{pos} = Number of positives words in the article
- W_{neg} = Number of negative words in the article
- W_{tot} = total number of words

Positive coefficients show the level of optimism the notice spread while negative coefficients show the level of pessimism the notice spread.

The article studies the SP500 and using the formula (2.1) dictates the correlation between the entropy of news and informativeness of them. The correlation is big and the investigators use it to

[4] Paul Glasserman, Fulin Li and Harry Mays Mamaysky, "Time Variation in the News-Returns Relationship", July 2019, p.6

evaluate the earnings depending on the level of informativeness of news. The following table extracted from the article examines the diary earnings based on the level of entropy.

“

Summary statistics for earnings regressions

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
SUE (5% Win)	40,000	−0.042	1.397	−4.320	−0.508	0.564	3.271
SAFE (5% Win)	36,812	0.097	0.281	−0.568	−0.007	0.177	0.991
Sent	35,839	−0.011	0.016	−0.250	−0.019	0.000	0.111
Forecast Dispersion (1% Win)	40,053	0.146	0.172	0.000	0.040	0.185	1.217
Forecast Revisions (1% Win)	40,289	−0.001	0.003	−0.028	−0.0003	0.000	0.007
$CAR_{-2,-2}$	40,478	0.029	1.918	−37.216	−0.803	0.806	55.365
$CAR_{-30,-3}$	40,477	−0.061	9.234	−82.174	−4.477	4.198	209.534
Short Interest (%)	38,817	3.188	3.575	0.000	1.193	3.776	77.120
Institutional Ownership (%, 1% Win)	40,320	71.423	19.075	0.962	61.612	84.583	111.719
log(Market Cap)	40,425	23.152	1.162	19.079	22.377	23.831	27.481
IHS(Book/Market) (1% Win)	38,274	0.448	0.303	−0.109	0.227	0.612	1.583
log(Illiquidity)	40,468	−22.466	1.387	−27.596	−23.361	−21.589	−13.853
α	40,467	0.015	0.116	−0.976	−0.046	0.069	1.222

„[5]

According to the table, the level of informativeness of a new and the amount of earnings is not necessarily correlated, in fact the third column shows that the average earnings can turn negative in some cases. The article concludes that not all news have the same value and the easier to read a new is, the bigger effect it has.

1.4. Interval Analysis

In 2012 Carlos Mate Jiménez; professor at the ICAI university; published an article called “El análisis de intervalos. Aplicaciones en la ingeniería” where he details the utility and use of intervals in the engineering world.

He mentions that the IA and SDA helps engineers and scientists to determine the real measure of an analysis. The maximum error found in a study or how it is called in statistics, the Absolut Uncertainty, establishes the gaps between the biggest and the lowest possible values of a measure. In the stock markets world and particularly on this paper, this tool will be very helpful

[5] Paul Glasserman, Fulin Li and Harry Mays Mamaysky, “Time Variation in the News-Returns Relationship”, July 2019, p.49

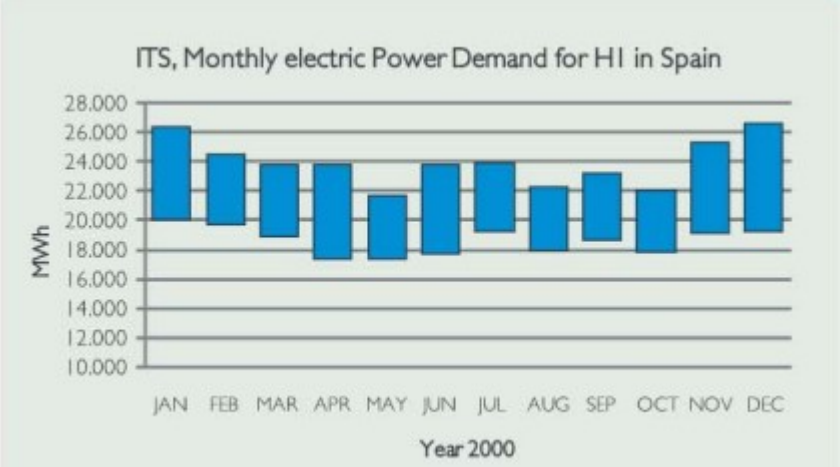
when estimating the possible prices a share can reach when studying news. Based on the data collected, the conclusions achieved, and the past experiences observed, intervals will share important information about the prediction of market´s tendencies.

The IA is connected to the accuracy, in engineering, it would be bounded to exactitude of measures while on this project it will be used in order to detail the probabilities of certain estimations.

If the IA is related to accuracy, it is also related with errors. At this point it can surge a philosophical. Whether you use a classical logic or a blurred logic, your reasoning will be to assume the same density of probabilities for every point of the interval or to specify each point to a certain value, respectively. This will be very useful to value risks and to precise the possible earnings available.

To connect this article to the present work, it is necessary to include the ITS, as it is very used not only in the engineering but also in the finance world.

In the engineering world it is very useful in the electricity market because the amount of energy generated hast to be in harmony with the amount of energy consumed. To make these two factors the same, there are complex algorithms who forecast the amount of energy consumed depending on the time of the day, week, month, and year thus the electricity generators produce enough electricity:



[6]

The figure presents the amount of power; in MWh; monthly consumed in Spain in the year 2000. It is a relevant graphic that is used in IA in order to forecast future electric power demands that help producers to estimate future electric generations.

[6] Carlos Mate Jiménez, "El análisis de intervalos. Aplicaciones en la ingeniería", 2012, p.24

This paper will try to follow the same methodology energy markets do, studying past stock market behaviors, analyzing intervals and assuming conclusions that help investors to predict the market behaviors

Chapter II

Model's description

2.1. Objectives and Specification

Trading systems base their techniques in general behaviors that markets have replicated on several occasions, their fundamental statement is that if an event has happened once it can happen twice. To determine if two events are similar, they use mathematical indicators that describe the same values. These indicators don't have a value itself; they are in fact a corroboration of the trader's intuition that help them in order to verify their suspicions.

In financial markets, news and events can give traders clues about how the tendencies of the next days, weeks or months will go. They are the starting point for many traders who see them as a possible indicator to make their investments.

This work will study the framework of interval-valued data to analyze returns and to trade based on news and technical indicators. An original, basic, and visual trading system exploring different scenarios is one of the expected outputs of this project.

The project will consist in the study of two different markets, the NASDAQ 100 and the SP-100.

The NASDAQ 100 is a very famous American market centered in technological companies. This companies are relatively young compared with some traditional institutions such as banks or fashion brands whose presence in the market have been longer. Due to the modernity of these companies, they are commonly accused of being vulnerable versus new developments and regulations, thus it is logical to think that news and notifications can affect this market notably.

The selected companies have been:

NASDAQ100 Companies

NAME	ACRONIMS
eBay Inc.	EBAY
Electronic Arts	EA
Expedia Group	EXPE
Intuit. Inc.	INTU
NetApp	NTAP
NetEase. Inc.	NTES
Netflix	NFLX
NVIDIA Corporation	NVDA
NXP Semiconductors N.V.	NxPI
O´Reilly Automotive. Inc	ORLY
PayPal Holdings. Inc	PYPL
Starbucks Corporation	SBUX
VeriSign	VRSN
Verisk Analytics	VRSK
Vertex Pharmaceuticals	VRTX

Table 1. Companies studies from NASDAQ100

The other market under study has been the SP-100 which is a very well-known American risk rating agency that includes the one hundred most valuable companies of the Standard& Poor's. Unlike the Nasdaq, the SP-100 is not specialized in one sector, in fact, there are multiple sectors in

it such as the automobilist sector, the banking sector or the alimentation sector. Moreover, is that some of these companies have been in the marker for a while, so it is plausible to think that SP100 won´t be as influenced as Nasdaq by actual events or news. Many sectors involve many circumstances and as a matter of fact, it is not the same to invest in commodities than to invest in forex or stocks, for that reason SP100 won´t have the same sensibility to the method although the analysis and the studying methods have been the same in both cases.

The list of SP100 companies studied are:

Sp-100 Companies

NAME	ACRONIM
Apple	AAPL
Abbott Laboratories	ABT
Amazon.com	AMZN
American Express	AXP
Boeing	BA
Bank of America	BAC
Capital One	COF
Cisco Systems	CSCO
Chevron Corporation	CVC
DuPont	DD
Dell	DELL
Walt Disney Company	DIS
Dow Chemical	DOW
Devon Energy	DVN
Ford	F
FedEx	FDX
General Dynamics	GD
General Electric	GE
Gilead Sciences	GILD
Google	GOOG
Goldman Sachs	GS
Halliburton	HAK
Home Depot	HD
H. J. Heinz Company	HNZ

Honeywell International	HON
Hewlett-Packard	HPQ
IBM	IBM
Intel	INTC
Johnson & Johnson	JNJ
JP Morgan Chase & Co	JPM
Kraft Foods	KFT
Coca-Cola Company	KO
Lockheed Martin	LMT
MasterCard	MA
McDonald´s	MCD
Medtronic	MDT
3M	MMM
Merck & Co	MRK
Microsoft	MSFT
Nike	NIKE
Oracle	ORCL
Pepsi CO	PEP
Pfizer	PFE
Procter & Gamble	PG
Qualcomm	QCOM
Regions Financial	RF
Schlumberger	SLB
AT&T	T
Time Warner	TWX
Texas Instruments	TXN
United Technologies Corporation	UTX
Verizon Communications	VZ
Wal-Mart	WMT

Table 2. Companies studies from SP-100

To study these companies, it is necessary to see enough and counteracted information, so the data received gives relevant and real information. Stock markets are not easy to read or predict, is for that, that economists, mathematics and investigators have developed lots of mechanisms that help traders to forecast next tendencies and movements; this mechanisms are named indicators, there are lots of them and there are based on the experience and mathematical formulas developed by their creators. In this project there will be 7 different indicators that will try to explain the behavior of markets:

- Last Price: It is the final price of a certain share from a company in the day.
- Low Price: It is the lowest price a share from a company has reached in the diary session.
- High Price: It is the highest price a share from a company has reached in the diary session.
- Volume: It is the number of contracts bought or sold in an established time frame from a certain company.
- EMA 50: Exponential Moving Average. It is a statistical resource which consists in an exponential average over the last 50 days frame prices; whose weights are different, growing exponentially from the oldest records to the most recent ones.
- RSI 14: Relative Strength Index. It is an estimating indicator that is used to analyze if an active is overpriced or sub priced. It records the last 14 days prices and with a statistical formula determines the range of the current prices. It goes from 0 to 100 and in this project; as it is regularly used; it will be considered that when the RSI14 is over 70, the share is overpriced and when the share is below 30, the price is sub priced.
- News: The most important indicator of the project. It will supply the latest news from blogs, newspapers and agencies made about the companies under study.

The indicators are based on mathematical formulas and use the current and past prices from companies to forecast future prices. Sometimes the investor must pay for some of them and it is very important to find a reliable source that gives the investor the real information. Reliable news are complicated to find, because although it is true that many devices claim to be able to supply them, most of them are untrustworthy. However, a frequent tool used not only for news but also for the rest of indictors is Bloomberg.

Bloomberg is a financial and software company that distributes their own computers, that include an analytical software that enables their users to have histograms, indicators, news about companies. Any company that is present in any stock market is registered in Bloomberg; it is very common to find these computers in the trading companies and the service it gives is very expensive too.

Bloomberg´s software does not allow to directly transfer information from Blomberg´s devices to regular computers, it is only possible to copy the numerical information and past it into an Excel sheet. For that reason, the information from each company will be directly taken from a Bloomberg computer and transferred to an office document, this information does not include graphics, it only contains columns of numbers that will need to be threated.

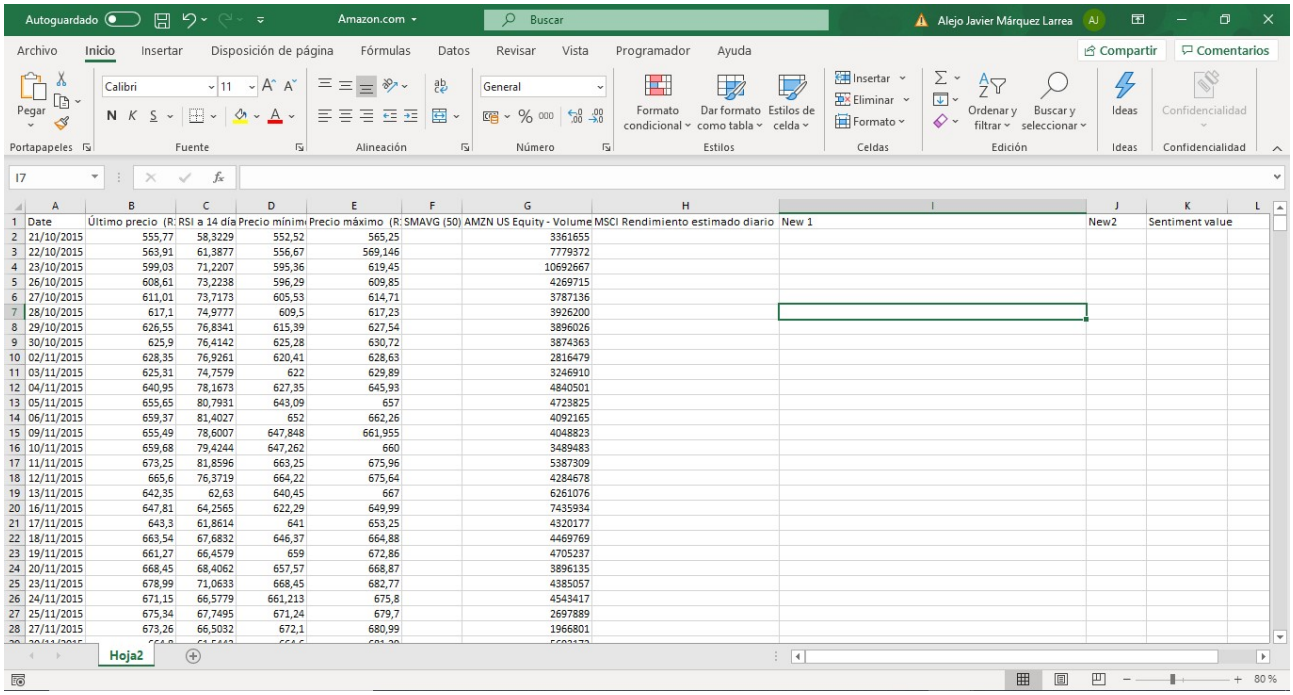
The graphics will be designed and represented in a MATLAB program to make it easier to read and work with.

According to the Paul Glasserman, Fulin Li and Harry Mays Mamaysky article "News vs Sentiment: Predicting Stock Returns from New Stories", not all news have the same effect and it would not be practical to study every news; therefore, only those whose coefficients from formula (2.1) are bigger than 0,4 will be studied.

The reason why 0,4 is the lowest coefficient studied is because based on the experience and developments seen in the project, this is the lowest coefficient with relevant effect on stocks, causing trends changes and volatile prices.

2.2. Excel sheets

The information extracted from Bloomberg can be copied into an Excel sheet whose format is presented in table 3.



	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Último precio (R	RSI a 14 día	Precio mínimo	Precio máximo (R	SMAVG (50)	AMZN US Equity - Volume	MSCI Rendimiento estimado diario	New 1	New2	Sentiment value	
2	21/10/2015	555,77	58,3229	552,52	565,25		3361655					
3	22/10/2015	563,91	61,3877	556,67	569,146		7779372					
4	23/10/2015	599,03	71,2207	595,36	619,45		10692667					
5	26/10/2015	608,61	73,2238	596,29	609,85		4269715					
6	27/10/2015	611,01	73,7173	605,53	614,71		3787136					
7	28/10/2015	617,1	74,9777	609,5	617,23		3926200					
8	29/10/2015	626,55	76,8341	615,39	627,54		3896026					
9	30/10/2015	625,9	76,4142	625,28	630,72		3874363					
10	02/11/2015	628,35	76,9261	620,41	628,63		2816479					
11	03/11/2015	625,31	74,7579	622	629,89		3246910					
12	04/11/2015	640,95	78,1673	627,35	645,93		4840501					
13	05/11/2015	655,65	80,7931	643,09	657		4723825					
14	06/11/2015	659,37	81,4027	652	662,26		4092165					
15	09/11/2015	655,49	78,6007	647,848	661,955		4048823					
16	10/11/2015	659,68	79,4244	647,262	660		3489483					
17	11/11/2015	673,25	81,8596	663,25	675,96		5387309					
18	12/11/2015	665,6	76,3719	664,22	675,64		4284678					
19	13/11/2015	642,35	62,63	640,45	667		6261076					
20	16/11/2015	647,81	64,2565	622,29	649,99		7435934					
21	17/11/2015	643,3	61,8614	641	653,25		4320177					
22	18/11/2015	663,54	67,6832	646,37	664,88		4469769					
23	19/11/2015	661,27	66,4579	659	672,86		4705237					
24	20/11/2015	668,45	68,4062	657,57	668,87		3896135					
25	23/11/2015	678,99	71,0633	668,45	682,77		4385057					
26	24/11/2015	671,15	66,5779	661,213	675,8		4543417					
27	25/11/2015	675,34	67,7495	671,24	679,7		2697889					
28	27/11/2015	673,26	66,5032	672,1	680,99		1966801					

Table 3. Excel format example

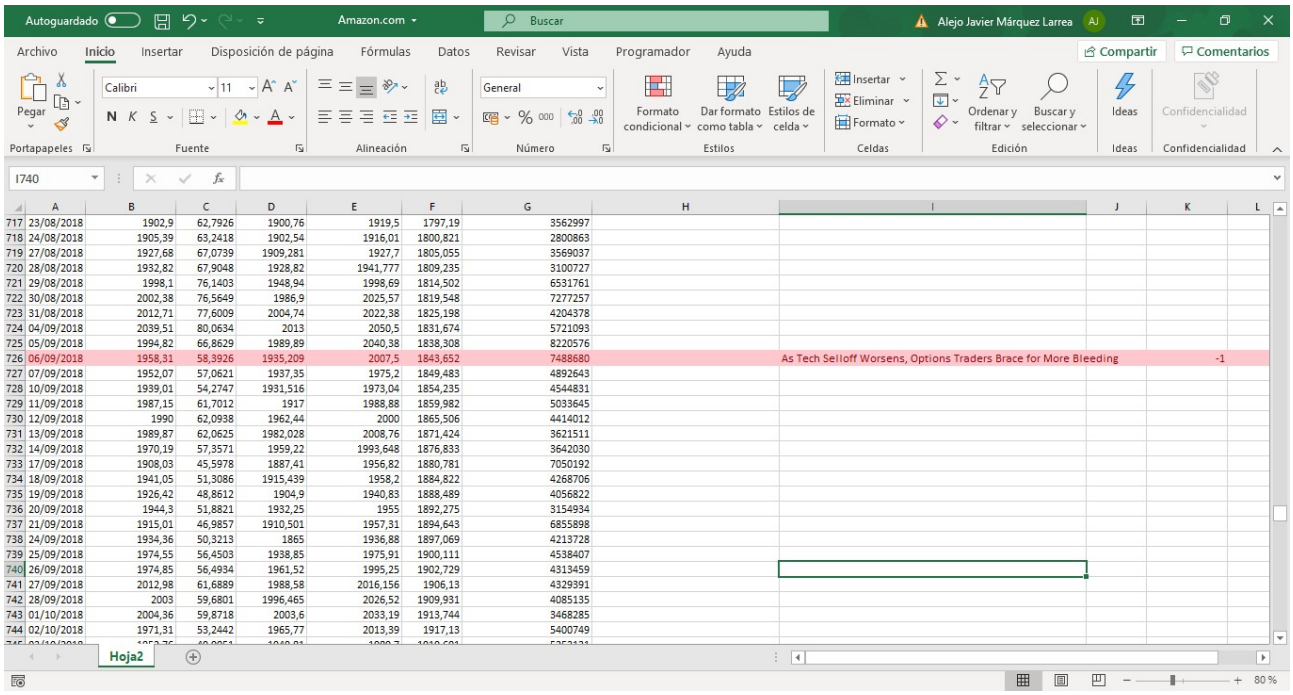
In this case the chosen company has been Amazon. This is a standard report for all the companies from this paper where:

- Column A is for the date
- Column B is for the last price the share of the company has reached in that day
- Column C is for the RSI 14
- Column D is the minimum price the value of the company has reached in that day
- Column E is the maximum price the value of the company has reached in that day
- Column F is for EMA 50
- Column G is for the volume
- The rest of the columns are there to mark the relevant news and their behavior coefficient.

The chosen news must fulfill the strict conditions of the “News vs Sentiment: Predicting Stock Returns from New Stories” article and be especially relevant in the days after the news have been published. This could seem subjective and although as every classification made by a human being there is a subjective element, the results and the dogma applied prove their reliability.

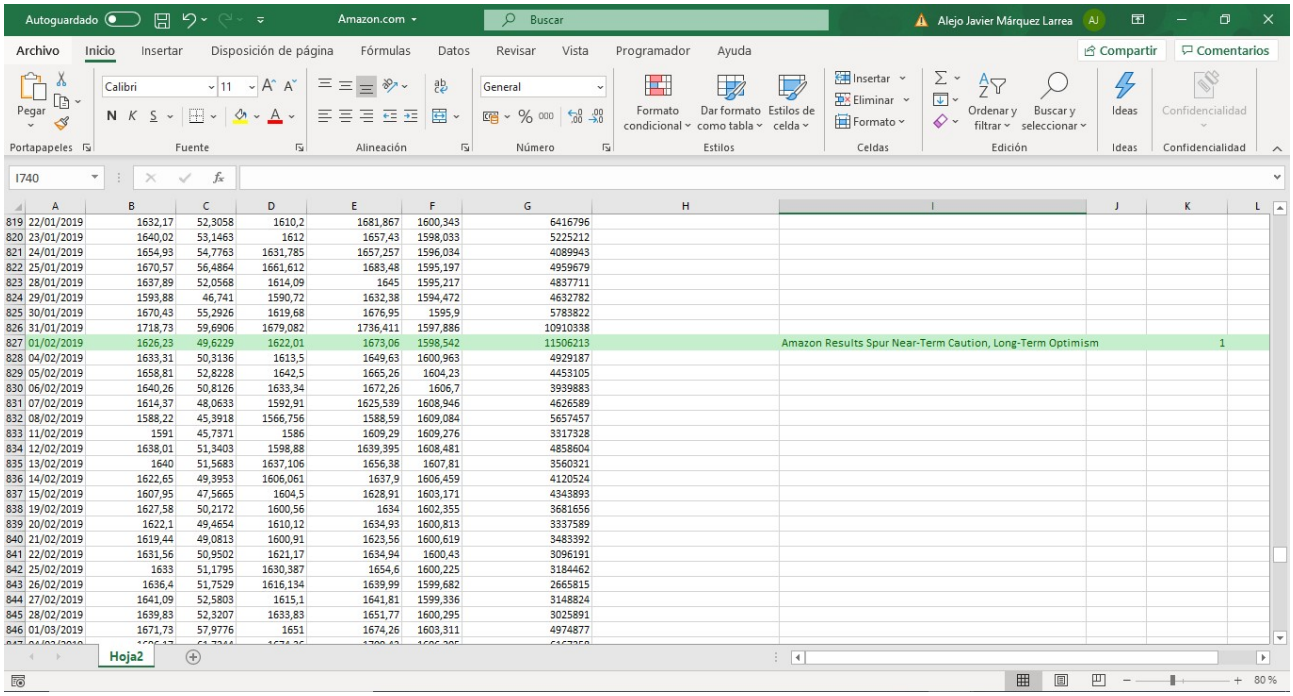
The color code is green for positive news and red for negative news. (Positive news are news whose behavior coefficient are between 0 and 1, while negative news are news whose behavior coefficient are between 0 and -1)

To continue with the Amazon´s case here there is an example of a negative and a positive newin tables 4 and 5:



717	23/08/2018	1902,9	62,7926	1900,76	1919,5	1797,19	3562997				
718	24/08/2018	1905,39	63,2418	1902,54	1916,01	1800,821	2800863				
719	27/08/2018	1927,68	67,0739	1909,281	1927,7	1805,055	3569037				
720	28/08/2018	1932,82	67,9048	1928,82	1941,777	1809,235	3100727				
721	29/08/2018	1998,1	76,1403	1948,94	1998,69	1814,502	6531761				
722	30/08/2018	2002,38	76,5649	1986,9	2025,57	1819,548	7277257				
723	31/08/2018	2012,71	77,6009	2004,74	2022,38	1825,198	4204378				
724	04/09/2018	2039,51	80,0634	2013	2050,5	1831,674	5721093				
725	05/09/2018	1994,82	66,8629	1989,89	2040,38	1838,308	8220576				
726	06/09/2018	1958,31	58,3926	1935,209	2007,5	1843,652	7488680	As Tech Selloff Worsens, Options Traders Brace for More Bleeding			-1
727	07/09/2018	1952,07	57,0621	1937,35	1975,2	1849,483	4892643				
728	10/09/2018	1939,01	54,2747	1931,516	1973,04	1854,235	4544831				
729	11/09/2018	1987,15	61,7012	1917	1988,88	1859,982	5033645				
730	12/09/2018	1990	62,0938	1962,44	2000	1865,506	4414012				
731	13/09/2018	1989,87	62,0625	1982,028	2008,76	1871,424	3621511				
732	14/09/2018	1970,19	57,3571	1959,22	1993,648	1876,833	3642030				
733	17/09/2018	1908,03	45,5978	1887,41	1956,82	1880,781	7050192				
734	18/09/2018	1941,05	51,3086	1915,439	1958,2	1884,822	4268706				
735	19/09/2018	1926,42	48,8612	1904,9	1940,83	1888,489	4056822				
736	20/09/2018	1944,3	51,8821	1932,25	1955	1892,275	3154934				
737	21/09/2018	1915,01	46,9857	1910,501	1957,31	1894,643	6855898				
738	24/09/2018	1934,36	50,3213	1865	1936,88	1897,069	4213728				
739	25/09/2018	1974,55	56,4503	1938,85	1975,91	1900,111	4538407				
740	26/09/2018	1974,85	56,4934	1961,52	1995,25	1902,729	4313459				
741	27/09/2018	2012,98	61,6889	1988,58	2016,156	1906,13	4329391				
742	28/09/2018	2003	59,6801	1996,465	2026,52	1909,931	4085135				
743	01/10/2018	2004,36	59,8718	2003,6	2033,19	1913,744	3468285				
744	02/10/2018	1971,31	53,2442	1965,77	2013,39	1917,13	5400749				

Table 4. Example of negative new



819	22/01/2019	1632,17	52,3058	1610,2	1681,867	1600,343	6416796				
820	23/01/2019	1640,02	53,1463	1612	1657,43	1598,033	5225212				
821	24/01/2019	1654,93	54,7763	1631,785	1657,257	1596,034	4089943				
822	25/01/2019	1670,57	56,4864	1661,612	1683,48	1595,197	4959679				
823	28/01/2019	1637,89	52,0568	1614,09	1645	1595,217	4837711				
824	29/01/2019	1593,88	46,741	1590,72	1632,38	1594,472	4632782				
825	30/01/2019	1670,43	55,2926	1619,68	1676,95	1595,9	5783822				
826	31/01/2019	1718,73	59,6906	1679,082	1736,411	1597,886	10910338				
827	01/02/2019	1626,23	49,6229	1622,01	1673,06	1598,542	11506213	Amazon Results Spur Near-Term Caution, Long-Term Optimism			1
828	04/02/2019	1633,31	50,3136	1613,5	1649,63	1600,963	4929187				
829	05/02/2019	1658,81	52,8228	1642,5	1665,26	1604,23	4453105				
830	06/02/2019	1640,26	50,8126	1633,34	1672,26	1606,7	3939883				
831	07/02/2019	1614,37	48,0633	1592,91	1625,539	1608,946	4626589				
832	08/02/2019	1588,22	45,3918	1566,756	1588,59	1609,084	5657457				
833	11/02/2019	1591	45,7371	1586	1609,29	1609,276	3317328				
834	12/02/2019	1638,01	51,3403	1598,88	1639,395	1608,481	4858604				
835	13/02/2019	1640	51,5683	1637,106	1656,38	1607,81	3560321				
836	14/02/2019	1622,65	49,3953	1606,061	1637,9	1606,459	4120524				
837	15/02/2019	1607,95	47,5665	1604,5	1628,91	1603,171	4343893				
838	19/02/2019	1627,58	50,2172	1600,56	1634	1602,355	3681656				
839	20/02/2019	1622,1	49,4654	1610,12	1634,93	1600,813	3337589				
840	21/02/2019	1619,44	49,0813	1600,91	1623,56	1600,619	3483392				
841	22/02/2019	1631,56	50,9502	1621,17	1634,94	1600,43	3096191				
842	25/02/2019	1633	51,1795	1630,387	1654,6	1600,225	3184462				
843	26/02/2019	1636,4	51,7529	1616,134	1639,99	1599,682	2665815				
844	27/02/2019	1641,09	52,5803	1615,1	1641,81	1599,336	3148824				
845	28/02/2019	1639,83	52,3207	1633,83	1651,77	1600,295	3025891				
846	01/03/2019	1671,73	57,9776	1651	1674,26	1603,311	4974877				

Table 5. Example of positive new

Every new has a its title and coefficient according to formula 2.1, that declares the strength and predictability the new has.

2.3. MATLAB

The Excel´s information can be very tedious and hard to synthesize due to the presence of multiple numbers that can distract the reader from the real purpose of them; which is to be able to see the development of the companies' stock values along time. The MATLAB program will represent the data saved in Excel trying to emulate the Bloomberg´s style but with a trading component view.

The figures should be clear enough so the reader can extract as much conclusions as possible, it is hard to be able to process all that information with just one graphic so the program will make three different graphics, each one with different indicators:

Figure (1) is the simplest graphic of all. The top of it shows the name of the company and the initial and final dates studied; the ordinates show the assets´ prices in dollars and the abscises are numbered from 0 to 1117, these numbers correspond to the number of days studied, under the number of days there are the years when the graphics took place. Finally, the graphic includes labels declaring the relevant news detected with green or red colors depending if the new is positive or negative.

Figure 1. MATLAB's first graphic

Figure (2) is the second image generated by the program, it is divided in two parts, the upper part is very similar to Figure (1) but with the EMA-50 present; while the bottom shows the volume, with the same information than Figure (1) in the abscises and the number of contracts sold or bought in the ordinates. This visualization has been chosen because it is very common in trading to show information like that.

Figure 2. MATLAB's second graphic

Figure (3) is the last image generated by the program, it is very similar to Figure (2) but the bottom does not have the volume, instead it has the RSI-14. The ordinates show the percentage of RSI-14, there are three discontinuous lines that are represent the 30%, 50% and 70%, each of them have different colors being green for buying, red for selling and black for neutral.

RSI-14 is an indicator that estimates if an asset is overpriced or sub priced, in this paper it will be considered that when the RSI-14 is lower than 30% it is sub priced and the investor should buy; when the RSI-14 is higher than 70%, it is overpriced and the investor should sell and when the RSI-14 is above 50% it is well-priced.

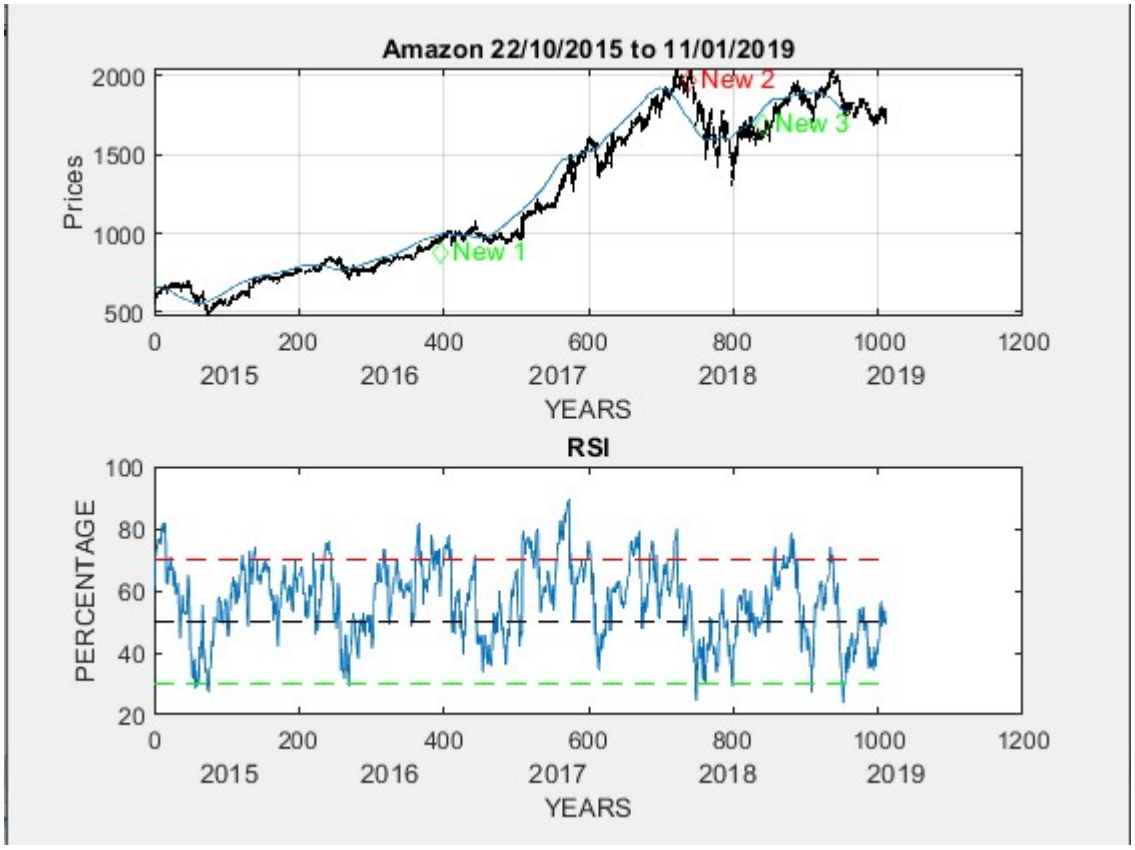


Figure 3. MATLAB's third graphic

From Figure (1) to figure (3) there is an evolution, from the simplest to the most sophisticated image generated by the program. Figure (1) is an introduction from Figures (2) and (3), it provides the evolution of the asset but unlike Figure (2) and (3) does not include any mathematical indicator. It only reflects the news effect but doesn't dig deeper into it.

Figures (2) and (3) introduce new indicators to reflect how mathematics can explain the news effect. The relevance of EMA-50 and RSI-14 will be discussed in future chapters but the reason they were introduced on this paper was to see if there is a correlation between them and news´ effect.

The script of the program is composed of three parts, the first part is the **data** part, where the program calls the Excel sheet with the command **readtable** and reads all columns using the command **xlsread.** Each column has a different assigned name because it is a candle chart, thus it has an open, close, maximum and minimum part; the second part is where the Figure (1) chart is

made, using the **candle** command and noting every news studied in the company. Part three is where Figures (2) and (3) are made, they follow the same structure than part two but applying the command subplot in order to generate two different charts in one figure.

Code:

```
%Import data
data = readtable('Amazon.xlsx');
%data
Open = xlsread('Amazon.xlsx','hoja1','B2:B1021');
Close = xlsread('Amazon.xlsx','hoja1','C2:C1021');
Min = xlsread('Amazon.xlsx','hoja1','D2:D1021');
Max = xlsread('Amazon.xlsx','hoja1','E2:E1021');
Volume = xlsread('Amazon.xlsx','hoja1','F2:F1021');
EMA = xlsread('Amazon.xlsx','hoja1','G2:G1021');
RSI = xlsread('Amazon.xlsx','hoja1','H2:H1021');
start_date = 10/2015;
stop_date = 01/2019;
time = start_date:stop_date;
%Plot
figure;
candle(Max,Min,Close,Open,'k');
title('Amazon 22/10/2015 to 11/01/2019');
ylabel('Prizes');xlabel({'2015              2016              2017
2018              2019       ';'YEARS'} );
text(382,909,{'\diamondsuitNew 1'},'Color','Green','FontSize',10);
text(725,1995,{'\diamondsuitNew 2'},'Color','Red','FontSize',10);
text(826,1719,{'\diamondsuitNew 3'},'Color','Green','FontSize',10);
%Multiple plots
%Graphic EMA&Volume&Classical graffic
figure;
subplot(2,1,1),candle(Max,Min,Close,Open,'k');%Classical graphic
title('Amazon 22/10/2015 to 11/01/2019');
ylabel('Prizes');
ylabel('Prizes');xlabel({'2015              2016              2017
2018              2019       ';'YEARS'} );
text(382,909,{'\diamondsuitNew 1'},'Color','Green','FontSize',10);
text(725,1995,{'\diamondsuitNew 2'},'Color','Red','FontSize',10);
text(826,1719,{'\diamondsuitNew 3'},'Color','Green','FontSize',10);
hold on;
plot(EMA);%EMA
subplot(2,1,2),bar(Volume);%Volume
ylabel('Prizes');xlabel({'2015              2016              2017
2018              2019       ';'YEARS'} );
ylabel('Number of contracts');
title('Volume');
%Graphic EMA&Volume&Classical graffic%RSI
figure;
subplot(2,1,1),candle(Max,Min,Close,Open,'k');%Classical graphic
title('Amazon 22/10/2015 to 11/01/2019');
ylabel('Prizes');
ylabel('Prizes');xlabel({'2015              2016              2017
2018              2019       ';'YEARS'} );
text(382,909,{'\diamondsuitNew 1'},'Color','Green','FontSize',10);
text(725,1995,{'\diamondsuitNew 2'},'Color','Red','FontSize',10);
text(826,1719,{'\diamondsuitNew 3'},'Color','Green','FontSize',10);
hold on;
plot(EMA);%EMA
%plot(RSI);%RSI
%subplot(2,1,2),bar(Volume);%Volume
subplot(2,1,2),plot(RSI);%Volume
```

```
line([0,1013],[30,30],'Color', 'g','LineStyle','--');
line([0,1013],[70,70],'Color', 'r','LineStyle','--');
line([0,1013],[50,50],'Color', 'black','LineStyle','--');
ylabel('Prizes');xlabel({'2015              2016              2017
2018              2019       ';'YEARS'} );
%ylabel('Number of contracts');
ylabel('PERCENTAGE');
%title('Volume');
title('RSI');
```

2.4. Numeric Implementation

To study the effects of news the data will be divided in two groups, one for the NASDAQ companies and the other one for the SP-100 companies. This split is necessary because the effects of news on one and another market are very different, NASDAQ companies tend to be part of the technological sector while SP-100 is a mix of many sectors, so it is convenient to present them separated. This matter will be explained deeper in the next chapter.

Both markets have the same number and type of tables. For each market, each company has been studied individually, and their news have been given a coefficient according to formula (2.1), depending on the sign of this coefficient the news have been catalogued as positive or negative. Sometimes there appear several news about one same company separated in time, in those cases, the news are studied in a different column depending on if there have appeared 2 or, 3 or more news.

Table (6) is the first table type of the study, it shows the news time effect, which details the effect of news in days.

NEWS					
POSITIVES			NEGATIVES		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS

Table 6. News time effect table

Cases with 2 or 3 news are cases where the same tendency has included several news. The requirements to be catalogued as one of these cases are that the tendency has not changed in the travel from one to another new and that the gap between news is less than a hundred days.

Table (7) is an example of how the paper expresses news´ effect, it is for NASDAQ companies, it does not detail each company´s performance, it just shows the results of them all.

Column for 3 news is empty because there have not been 3 news cases found on this paper for NASDAQ companies. However, that won´t be the case for SP-100 companies.

	NEWS				
POSITIVES			NEGATIVES		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
2	51		6	41	
3	48		3	31	
4	30		6	28	
12	43		8	29	
32	50		5	18	
6	36		9		
6	41		8		
1	30		8		
7	31		7		
7	39		3		

Table 7. News time effect table for NASDAQ companies

Table (6) structure has been used with EMA-50 and RSI-14 as well, it has been noted the number of days the news time effect would have had according to those indicators and their results have been compared with the real development of assets.

To see news´ time effect according to EMA-50 it has been counted the numbers of days elapsed since the news were published till the EMA-50 graphic crossed the prices graphic. This process has been carried out using Figure (2) charts and Excel sheets.

To see news´ time effect according to RSI-14 it has been counted the number of days elapsed since the news were published till the RSI-14 graphic reached the point of buy or sell, thus when the prices reached the 30% or 70% RSI levels, that was the final point. This process has been carried out using Figure (3) and Excel sheets.

The second type of table is used for analyzing last, highest, and lowest diary news; they are the “prices after news”, “highest prices after news” and “lowest prices after news” tables. The philosophy behind these three tables is the same. Bloomberg gives information about the last, lowest, and highest price a share has had during the day and it is important to study those three prices separately to compare the range of profits an investor could obtain depending on the moment of investment.

The esthetics of the tables are a title that shows the case it is studying (1, 2 or 3 news cases), a division between positive and negative news and a number of days that study the evolution of prices after the launch of news.

1 NEW

Positives					Negatives				
1 day	2 days	3 days	5 days	10 days	1 day	2 days	3 days	5 days	10 days

Table 8. Prices variation tables esthetic

Table (8) corresponds to one new cases, depending on the case, the table has more or less columns for days; for instance, in the three or more news table there will be two extra columns for positive and negative news to express the evolution of the share for twenty and sixty days. More news imply more days of study because as it was explained in Chapter (II), the more news appear, the bigger the effect is not only in prices but also in time.

Table (9) is an example of how the investigation has studied the news time effect, it shows how two news affect NASDAQ companies with the structure presented in Table (8). The numbers under the day columns show the variation of assets´ prices in dollars after the launch of news.

2 NEWS

Positives						**Negatives**					
1 day	2 days	3 days	5 days	10 days	20 days	1 day	2 days	3 days	5 days	10 days	20 days
0,11	1,28	0,34	3,4	3,04	8,95	-0,11	-0,17	0,08	-0,38	-0,86	-15,02
4,41	4,27	10,13	12,51	16,16	-6,12	-1,08	-4,58	-3,98	-4,62	-12,01	-28,03
5,91	14,17	9,07	6,88	46,29	32,79	-0,43	-13,29	-22,19	-52,43	-51,89	-47,38
0,48	7,69	8,99	11,14	12,65	11,37						

Table 9. Two news tables from NASDAQ companies

Chapter III

Results analysis

3.1. Introduction

This chapter shows the final results of the research; it begins explaining the news time effect and details the difference of real stocks development and how it should evolution according to EMA-50 and RSI-14; it continues explaining the changes of prices after the publications and gives information about the reasons the stock markets behave that way.

The tables shown in this chapter have the same structure than in Chapter (II) but instead of presenting all the results like in Figures (7) and (9) there will only appear the averages of each column, it provides a general idea of the behavior and in some sections like in 3.2.1 and 3.2.2 there are corrected averages that measure weights and discriminate uncommon behaviors.

NASDAQ and SP-100 results are threated separately and the conclusions of each market can be different, although there aren't big changes between them, the trading criteria is different is some cases and the reader should take it into account if plans to apply this method.

3.2. News time effect

According to the "News vs Sentiment: Predicting Stock Returns from New Stories" article, news have a specific time effect on the stock markets. Although that duration can vary depending on the market, there should not appear big differences.

To measure the duration of the effect, it has been counted in days the gap between the day the new was published until the day the tendency that began with that new stops. This duration does not vary significantly in most cases, even when comparing NASDAQ and SP-100 there are not big differences in news´ effects.

Some general characteristics that both markets share are:

- The effect of news increases exponentially with the number of news. In future sections it will be seen that this phenomenon occurs equally with the prices.
- Positive and negative news do not have the same frame time, in fact negative news have presented greater durations than positives.
- EMA´s and RSI´s frame times do not coincide, this is because while RSI considers fourteen days for its calculation, the EMA-50 uses fifty, thus it is a mere coincidence that they coincide.
- EMA´s and RSI´s frame times do not coincide with the real news time effect, because while these two mathematical tools use several days of calculus, they have an inertia that cannot follow the agility and speed of news. News have a quick response, sometimes they can have their effect delayed but in general they are very quick, therefore its effect is much quicker than the possible response of the indicators.

The next sections study NASDAQ and SP100 separately to concrete each market´s particularities because although the differences aren't very big, small details can provoke a positive or a negative investment in stock market:

3.2.1. Nasdaq

NASDAQ results are very similar to the articles mentioned in Chapter (I). Table (10) reflects the simple average time effect of news in the NASDAQ companies studied, it follows the structure of Table (6).

NEWS					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
3,89	26,75	55	7,82	57,4	71

Table 10. Simple Average News time effect on Nasdaq companies

The difference between positive and negative news is clear, in cases of 1 and 2 news the effect of negative news almost doubles the positives and in 3 or more news the difference is remarkable. The results show a minimum effect of almost four days, a quick response from markets which shows the rapid effect of news.

Although simple average can be very useful to obtain a general perspective of NADAQ companies behavior, there have been some exceptional cases whose effects were very different and varied the regular performances, is for that that Table (11) shows an exponential average of news time effect, which give more weight to most popular time frames and discriminate the statistical errors:

NEWS					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
2,81	24,8	40	5,26	47	62

Table 11. Exponential Average News time effect on Nasdaq companies

The gap between positive and negative news remains in Table (11), which confirms that negative news have bigger durations than positives.

The difference between Tables (10) and (11) is bigger when it refers to bigger durations, there can be a maximum of ten days difference between one table and the other but in stock markets, time is money and it is not the same closing an operation one day or another.

The frame times predicted by RSI and EMA-50 have been noted too. To account the duration of EMA-50 it has been calculated the days between the new was published and the EMA-50 first cut across stocks prices, like in Figure (2). In the case of RSI, the calculus has been between the publication of the new and the moment RSI reaches its thirty or seventy per cent value, those values are the ones selected to buy because the assets are underpriced (30%) , or to sell because the assets are overpriced (80%).

Figures (4), (5) and (6) show the difference between the real evolution of prices and RSI-14 and EMA-50 estimations, the statistical resource used is the R-squared (r^2), whose formula is formula (3.1).

$$R^2 = 1 - \frac{SS_{RES}}{SS_{TOT}} \qquad (3.1)$$

R-squared tables and charts are expressed in percentages. Figure (4) shows the level of similarity between real stocks evolution and RSI-14.

REAL vs RSI-14

COMPARISON TABLE					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
31,57894737	37,5	66,6666667	82,3529412	25	NA

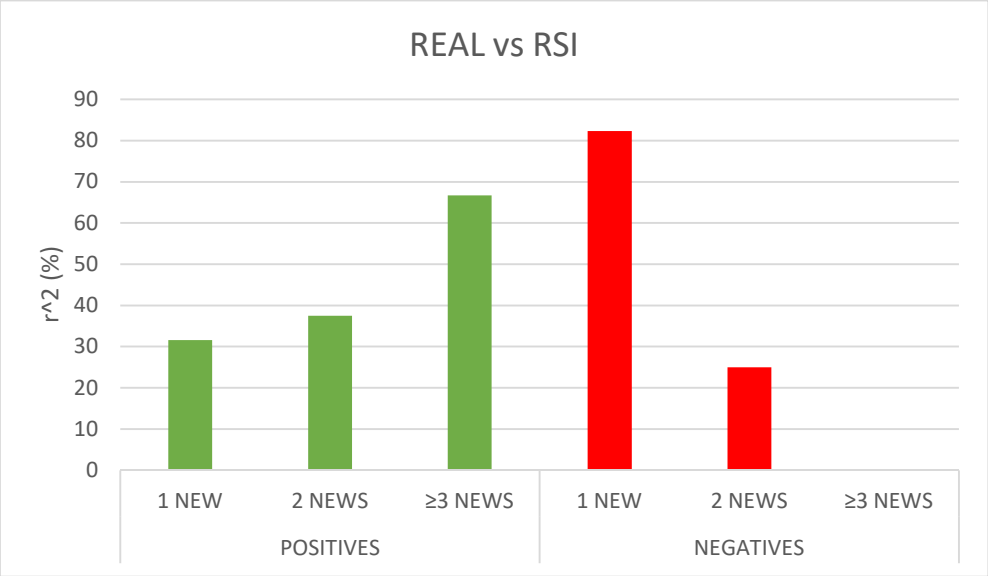


Figure 4. Real frame time versus RSI frame time

Figure (4) results can be chaotic considering that when referring to positive news, the levels of correlations are bigger when the numbers of news are bigger while with negative news it's the opposite. More news imply more time effect so it would be logic that as RSI-14 uses an inertia of 14 days in order to study the prices, real and RSI-14 developments should be more alike with more news. However, negative news show RSI-14 and news do not follow any rule. Nevertheless, there are not enough cases to assert anything, especially with 3 news cases.

Figure (5) follows the same structure than Figure (4) but comparing real and EMA-50 developments.

REAL vs EMA-50

COMPARISON TABLE					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
31,57894737	50	62,19	41,1764706	25	NA

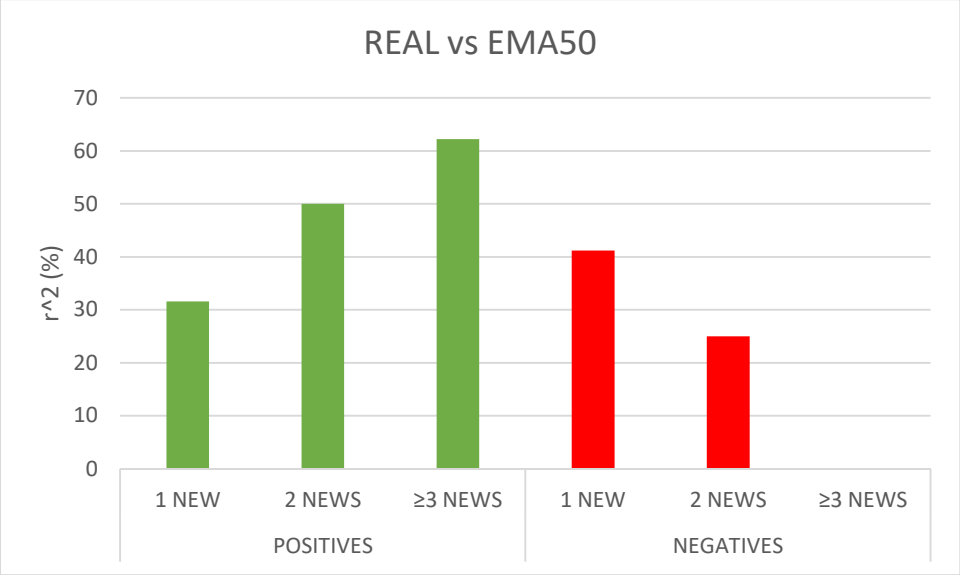


Figure 5. Real frame time versus EMA-50 frame time

Figure (5) results are very similar to Figure´s (4), the positive news correlation between real and EMA-50 developments is bigger with more news and in negative news, it occurs the opposite. There is not a logic explanation for this, and it is probably because there are not enough data to check it.

EMA-50 carries an inertia of 50 days; more than RSI-14; and there are only two differences between their results, the 2 positive news cases and 1 negative new; the tendency appears to be that

with more days, positive news correlation with mathematical indicators is bigger, while with negatives it's the opposite.

Some trading techniques use the RSI and the EMA, usually they consist in investing only when the RSI and EMA criteria coincides. Although this method does not consist in investing according to those indicators, they can be helpful.

EMA-50 can be a very useful tool for closing an operation, its big capacity and inertia allows it to be very conservative and determine a good final price.

On the other hand, RSI is very good to open an operation, as its volatility and predictability can determine whether it is a good or bad moment to open an investment.

3.2.2. SP-100

Time frames corresponding to SP100 companies can vary from NASDAQ companies. Although the difference should not be big, there can be a difference of various days which in financial markets is vital. In addition, the number of SP-100 companies studied is bigger than in NASDAQ, so the results are more reliable.

Table (12) shows the simple average of the news time effect on SP100 markets, it follows the same structure than Figure (10).

NEWS					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
4,05	39,9	67,2	5,195	29,4	71,2

Table 12. Simple Average News time effect in SP100 companies

The gap between positive and negative news is lower in SP-100 companies than in NASDAQ ones, in fact, in 2 news case the positive news show longer durations than negatives. Although 1 or 3 news have longer durations in negative cases, the difference is very little being 1 and 4 days, respectively. SP-100 tends to be more equilibrate than NASDAQ.

To have a more realistic reference, in Table (13) it has been calculated an exponential average that discriminates uncommon cases, giving more importance to normal ones; it follows the same structure than Table (11).

NEWS

POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
3,36	37,375	63,93	5	29,33	69,13

Table 13. News time effect Exponential Average in Nasdaq companies

The results Table (13) shows confirm the previous ones from Table (12), the time frames differ notably between Nasdaq and SP100 and positive and negative different news time effect are smaller on SP-100 than in NASDAQ

SP100 is not a technological market like NASDAQ, it includes multiple interdisciplinary companies that have different characteristics; consequently, SP-100 is more general than NASDAQ and its results are less concrete.

To see the similarity between the theoretical evolution of RSI-14 and real development of prices, Figure (6) checks the R-squared according to formula (3.1) in percentages.

REAL vs RSI

COMPARISON TABLE					
POSITIVES			**NEGATIVES**		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
42,5925926	50	89	39,0243902	80	NA

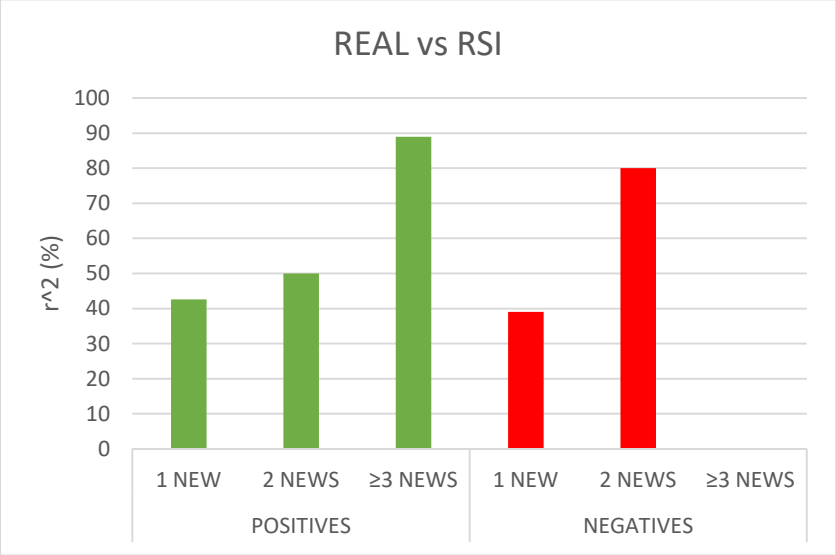


Figure 6. Real frame time versus RSI frame time

In this case, Figure (6) shows that R-squared grows with the number of news and although the 1 news cases is bigger on positive news than in negatives, the tendency is to be bigger on negatives according to 2 news cases; which coincides with the idea that with more time effects, RSI-14 and news time effect are more similar.

It occurs the opposite to NASDAQ, so probably technological companies are less compatible to RSI-14 than other sectors. To see if this behavior is present on EMA-50 too, Figure (7) analyses the R-squared between Real and EMA-50 effects.

REAL vs EMA50

COMPARISON TABLE					
POSITIVES			NEGATIVES		
1 NEW	2 NEWS	≥3 NEWS	1 NEW	2 NEWS	≥3 NEWS
25,92592593	30	82	29,2682927	0	NA

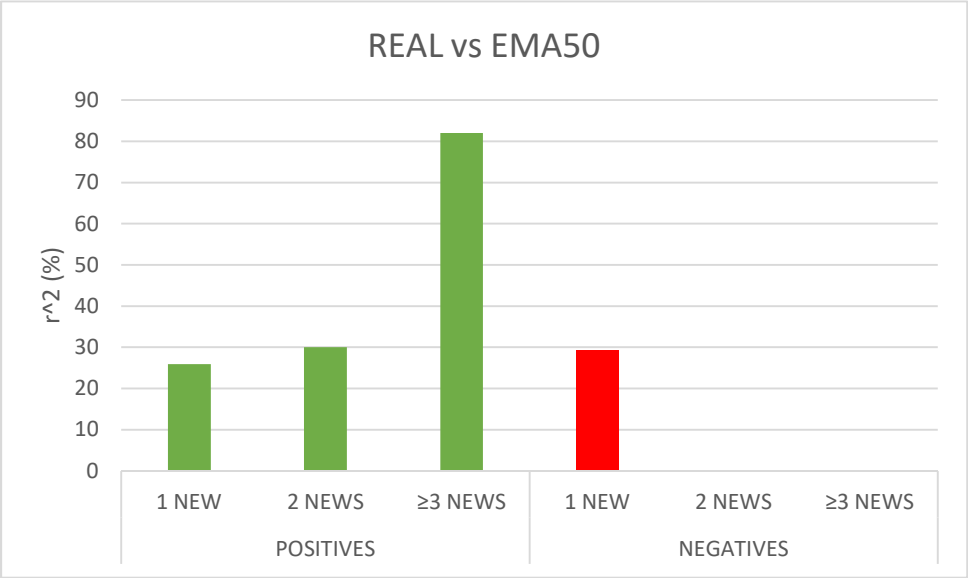


Figure 7. Real frame time versus EMA-50 frame time

Figure (7) follows the RSI-14 tendency shown in Figure (6) with positive news but not in negatives, so it can be confirmed that positive news agree with RSI-14 and EMA-50 when many news appear, but not with negatives. Although EMA-50 and real evolution do not coincide on negative cases, it only confirms that there is not apparently relation with the actual data. However, there were not enough cases to decline a possible relationship between them.

Nevertheless, as it happened with Nasdaq, the simple news don't have special implications with RSI and EMa-50 because their effect is too quick for those indicators to follow.

3.3. Prices effect after news

In this section studies how do latest prices of the day react against news in Nasdaq and SP-100; to measure that, it will be accounted the last prices each market presents in the following days

after news. Depending on the number of news the study will include more or less days as it was pointed out in Table (8).

The document will study two principal aspects:

- The level of success. The paper details how good the method works when assigning a positive or negative coefficient (2.1). If a new has a positive coefficient, the assets should have upgoing tendencies and when a new has a negative coefficient, the assets should have down going tendencies.
- The revenues: The document details the revenues this method proves to have; it includes tables that show the general performance of it.

3.3.1. Nasdaq

During this paper it has been mentioned several times the implication of the technological sector in this market; the technological sector is highly sensible to recent developments, new necessities, and actuality. Those reasons explain the sensibility NASDAQ has with news.

Commonly, technologies stablish new routines, working methods and so on. These new habits imply that regulations made by governments get outdated and need to become actualized. For that reason, when those new regulations come to life, news spread quickly and affect specially to new technologies. Another argument that explains technologies´ sensibility against news is that these modern tools depend on being the latest version with the latest tools , so when another company brings a better model, moderner and cheaper, previous models' loose importance.

A common example could be the buy of a mobile phone. The consumer looks for different models that fulfil his requirements, he analyzes brands, models, and prices. Once the buyer has made up his mind, he buys his new mobile phone. If two different brads offer their mobile phones; for approximately the same price, it is probable that the buyer chooses the one that brings more utilities unless he is very loyal to the other brand.

According to these points, the results obtained from the study declare that effectively NASDAQ depends very much on news. Note that when talking about levels of success it is referring that the coefficient of news forecasts correctly the tendencies of the stock values after releasing news:

Table (14) expresses how many times; in percent; the coefficient (2.1) forecasts the assets behavior. The table is divided in days, from 1 to 10 days it says the percentage of times coefficient (2.1) has coincided with the stocks behavior after the release of news.

Levels of success with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
Success (%)	96,55	86,21	86,21	75,86	62,07	100	95,45	95,44	77,27	63,64

Levels of success with ≥3 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
Success (%)	100	100	100	100	100	100	NA

Levels of success with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	100	66,6666667	100	100	100	100	100	NA

Table 14. Nasdaq companies´ sensibility against news

Table (14) shows that Nasdaq is very sensible against news reaching the hundred per cent sensibility in many cases. To do these tables it has been taken into account that when a new had a positive coefficient, the prices have increased and when a negative new had a negative coefficient, the prices fell in the day shown in the tables respect to the publication day of the new.

To see the revenues of the method, Table (15) shows three different tables with the performance of Nasdaq companies with one, two and three news where the numbers declare the amount of money; in American dollars; won per share. To calculate this numbers, it has been made a simple average between all companies studied for NASDAQ.

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	1,76	2,19	2,76	2,36	1,84	2,33	4,19	8,27	6,53	1,55

Profits with 2 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
$/share	3,46	5,86	7,38	8,39	10,73	22,26	NA

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	4,79	2,83	3,78	3,91	13,09	17,15	34,71	NA

Table 15. Nasdaq companies´ profits against news

The first important thing to mention about Table (15) is that there are not negative profits registered, which confirms the quality of the method. The amount of profits changes depending on the number of news, days and characters.

In 1 news cases, it has been noticed that the profits begin to reduce in day 3, which coincides with the news effect times studied in Table (7). Moreover, is that data shows that negative news are more profitable that positives, this is logical because investors tend to be more afraid of losing money than earning money, so negative events provoke negative results.

In 2 news case, there are not any example of negative news, so the perspective will be oriented only to positives. Again, the results confirm the studies from Table (7), increasing profits till the last record. In this occasion profits are bigger than in 1 news examples, this is because safe investors confirm the good predictions and put their money into the market. It has to be said that the numbers of cases with 2 positive news; according to the requirements of the method; is low, so it is a very uncommon investment so when it come the investor should take it.

In 3 news cases there are not negative cases either, therefore the study will only count with the positive news. The results are not that lineal like in the 2-news column. but still very plausive according to the frame times studied in Table (7). Generally. they are the most profitable cases but like it happened with 2 news cases, they are very uncommon cases, so the suggestion made is to take it when the occasion comes.

In general, more news imply more time and more time implies more money because the effect is longer, the cautious traders join the game and the market tends to be optimistic. For conservative investors it would be interesting to use the RSI-14 in order to close the investment.

Benjamin Graham is his book "*the intelligent investor* "uses the value investing to determine the optimal value of a share depending on the dividends, assets, and charts that the company has. However, that job is very long, tedious, and hard to fulfill, needing a lot of time and information not everybody has; for that reason, indicators like RSI-14 are very useful.

3.3.2. SP-100

SP-100 is not said to be as sensible as Nasdaq to news because it incorporates several sectors, some of them with many years of existence, the regulations for them are fixed and the products they produce are not necessary vulnerable versus new competitors, because as it includes some of the biggest companies in the world, the can put entrance barriers in their fields.

Nevertheless, experience and popularity doesn´t mean they are not sensible to news, because although their reputation is well known there exist economical results, fines, non-profitable investments, outdated business model, counts assessments, illegal practices and many more circumstances that can radically affect the course of a company, thus they are still vulnerable versus news.

In addition, one shouldn't forget that this is a globalized world where everything that happen in one part of the world and affect to the other, so there is not any business model prevented from being affected by global events and consequently from the news there appear.

The level of success for the SP-100 companies studied is presented in Table (16).

Levels of success with 1 NEW

	Positives					Negatives				
Nº days	1	2	3	5	10	1	2	3	5	10
Success (%)	87,5	90	87,5	80	85	81,82	87,88	93,94	90,91	96,97

Levels of success with 2 NEWS

	Positives						Negatives					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
Success (%)	100	100	100	100	100	100	100	100	66,67	100	100	100

≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	100	100	50	100	100	100	50	NA

Table 16. SP-100 companies´ sensibility against news

The results show that the sensibility of shares´ prices against news is very high reaching the 100% sensibility in multiple times, which states that due to the nature of SP-100, there is not any market that is free of news influence.

It can surprise some readers that the results obtained jump suddenly from high percentages of sensibility to not so high percentages, the reason of this is that there are not many cases of certain columns such as 3 positive news, therefore small variation affect the percentage a lot.

As it happened in the previous market, when referring to one positive new, the effect starts to decline after the third day, which coincides with the time frame statement. However, when talking about one negative new this tendency survives until the tenth day.

In the two-news table, the effect is almost constant in every case, no matter if the new is positive or negative.

The three-news table is probably the least reliable table of the three because there were few cases found.

To talk about the last prices effect revenues, Table (17) shows positive and negative the number of dollars an investor could have won if he had followed this method. To calculate it, it has

been made a simple average with the results of all companies like it was done for NASDAQ´s companies in table (16).

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	1,76	5,02	5,37	3,86	6,55	2,74	4,51	4,25	6,21	8,98

Profits with 2 NEWS

	Positives						Negatives					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
$/share	2,73	6,85	7,13	8,48	19,53	11,74	0,54	6,01	8,69	19,14	21,59	30,14

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	4,2	5,79	5,21	8,71	9,77	18,35	53,94	NA

Table 17. Profits companies´ profits against news

According to the results of Table (17), the method is a profitable way for making money in the markets, it does not have negative results in any of the cases.

Negatice news seem to be more profitable than positive news due to the fear of markets, although there are some examples like in the 1 new table where it is not until the tenth day that the negative news have bigger effects than positives. In the 2-news table, this occurs until the fifth day so it could be said that positive news are quicker and more volatile than negatives.

The results of Nasdaq and SP-100 show there are not important differences among them except the time frames developments. Consequently, the method proves to work in different markets with very similar performances.

3.4. Effects on lowest prices

During the day, the stock prices have positive and negative tendencies and when someone refers to the lowest price, he is referring to the lowest prices a share has reached in that day. The reason why this document studies the lowest prices is to include another perspective about the method studying deeper performance of stocks.

The lowest prices commonly bring news, articles, and opinions so their importance is vital. The study of them is essential and is important to take them into account for future investing circumstances.

Section 3.4 has the same types of tables than section 3.3, two series of tables referring to the level of success coefficient (2.1) shows and the level of revenues a trader could obtain if he had invested at the lowest prices of the day. The conclusions extracted will compare the results obtained in this section with the previous ones.

3.4.1. NASDAQ

NASDAQ companies can have different tendencies when comparing last prices with lowest prices because their natures are very different. Stock markets have open and closure times, and the busiest hours; when most trades take place; are during the 9:00-9:30 period and during the last thirty minutes before closure; therefore the volumes played in the last prices are not the same than in the lowest prices.

Lowest prices do not show at a specific time or have similar levels of volume than last prices, they are more aleatory, and that affects to the trading methods that base their criteria on the generalization of common behaviors, thus the method should not work with lowest prices as well as with last prices.

Table (19)shows the levels of success NASDAQ companies have had with 1,2 and 3 news like Table (14) did with last diary prices.

Levels of success with 1 NEW

	Positives					Negatives				
Nº days	1	2	3	5	10	1	2	3	5	10
Success (%)	92,86	96,43	82,14	75	71,42	68,75	81,25	87,5	68,75	68,75

Levels of success with 2 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
Success (%)	91,67	91,67	91,67	100	91,67	100	NA

Levels of success with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	100	100	100	100	66,67	100	100	NA

Table 18. Nasdaq companies´ lowest prices sensibility against news

Table (19) has remarkable differences compared with Table (15):

In the 1 new table, the positive news sensibility starts to decrease in the second day while in the previous section that happened in the third, although the levels of sensibility are similar (except when it comes to negative news), the percentages fall more than 32% in the first days compared with last prices, which shows that news and lowest prices relationship is not as strong as in last prices. However, the 2 and 3 news tables show levels of success similar to last prices results, the reason could be that with higher time frames, the effects tend to stabilize and reach common levels, although as there are not negative cases found, this theory cannot be confirmed.

On the other hand, when it comes to the profits tables, Table (20) shows there are important changes.

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	2,67	3,14	2,59	4,01	2,71	-0,09	2,7	3,57	0,55	-4,22

Profits with 2 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
$/share	2,55	5,3	7,29	8,72	9,04	19,01	NA

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	6,6	7,02	6,87	6,51	12,29	28,17	34,71	NA

Table 19. Nasdaq companies´ lowest prices profits against news

Unlike the sensibility of prices after news, the profits have real differences when talking about lowest prices results. There is a generalize decrease of profits in all cases, with negative profits in the first and tenth day in 1 negative new column.

Table (20) evidences that the relationship between lowest prices and events is not as strong as in other cases, so the investor should be especially cautious when working with lowest prices, that although is positive in the greater part of circumstances its efficiency is lower than with last prices.

3.4.2. SP-100

Now it is the turn for SP-100, a market is much more diverse than NASDAQ, so the results obtained with Nasdaq do not have to be the same. However, in the previous section the results were very similar in both markets, so no confirmations may be made before looking at the results.

Table (21) exposes the levels of success about lowest prices against news.

Levels of success with 1 NEW

	Positives					Negatives				
Nº days	1	2	3	5	10	1	2	3	5	10
Success (%)	87,18	89,74	87,18	87,18	87,18	62,5	59,37	82,05	76,92	87,17

Levels of succes with 2 NEWS

	Positives						Negatives					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
Success (%)	75	100	100	100	100	100	66,67	66,67	66,67	100	100	100

≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	100	100	50	100	100	100	50	NA

Table 20. SP-100 companies´ lowest prices sensibility against news

SP-100 includes negative news in the second table which would help to confirm the theory that states that negative news do not work as well on lowest prices than with last prices.

Effectively, as it happened with the NASDAQ, all cases look very similar except the negative news. The levels of success in negative news fall respect last diary prices results, therefore the idea that the negative cases have less strength with the method is applicable to SP-100 as well as to Nasdaq.

Moreover, Table (22) shows this tendency affects revenues too.

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	1,18	3,17	4,54	3,21	6,85	1,88	2,79	3,09	2,25	7,29

Profits with 2 NEWS

	Positives						**Negatives**					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
$/share	3,33	10,58	11,61	12,91	22,52	15,09	1,93	6,47	9,52	10,97	11,48	31,61

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	2,8	8,11	5,96	8,73	15,47	18,105	28,26	NA

Table 21. SP-100 companies´ lowest prices profits against news

Table (22) shows there is a generalize decrease of profits in all cases (Like NASDAQ companies), there are positive results without negative earnings, but the losses compared with the last price results are between 6 and 7 dollar pers action in average.

3.5. Effects on highest prices

Highest prices are a very important reference in trading to study the prices´ evolution, thus it is recommendable to look at their reactions against news. Highest prices carry bigger volumes and can get as unpredictable as low prices because they do not appear at a certain hour like it occurs with last prices, they don't follow a especial tendency that helps to forecast them, consequently their study can help to know more about stock markets nature.

The study includes the same tables last prices and low prices had, splitting the companies into Nasdaq and SP-100 markets; with each group of table there will be a brief comparison with the results of previous sections.

3.5.1. Nasdaq

Table (23) explains the news effect on highest diary prices, studying the level of success of coefficient (2.1) with 1, 2 and 3 or more news in percent.

Levels of success with 1 NEW

	Positives					Negatives				
Nº days	1	2	3	5	10	1	2	3	5	10
Success (%)	76	84	88	80	60	78,26	91,3	91,3	65,22	69,59

Levels of success with 2 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
Success (%)	100	100	100	100	100	100	NA

Levels of success with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	66,67	66,67	66,67	66,67	100	66,67	100	NA

Table 22. Nasdaq companies´ highest prices sensibility against news

Table (23) results show time frames similar to the last prices results, for instance, in the one new table, the levels of success percentages start to decrease at the third day, in the two news table, the levels of success stay constant all over the process and in the three news table, it occurs the same. However, as it happened with the lowest prices, the levels of success show strong falls compared with last prices that reach the 20% in some cases.

These results prove that the method works better with last results than with lowest or highest prices. To confirm this tendency it is necessary to study the profit in Table (24).

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	1,2	1,63	1,85	2,04	2,06	2,03	3,25	4,14	3,3	0,89

Profits with 2 NEWS

	Positives						Negatives
Nº days	1	2	3	5	10	20	NA
$/share	6,55	8,49	9,86	16,11	19,67	28,39	NA

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	3,96	3,93	6,27	4,19	5,54	9,83	25,79	NA

Table 23. Nasdaq companies´ highest prices profits against news

The Table (24) results are very random, in some cases the profits with highest prices are bigger than last prices but in others it happens the complete opposite. The difference is wide in both cases so there is not apparent explanation for this. In tables 1 and 3 the last results are more profitable but in 2 news table it happens the contrary.

Nevertheless, tables 2 and 3 have less data thus their results are not as trustworthy as table for 1 new; therefore, if any assumptions can be made is that strength of news in highest prices are weaker than in last prices.

3.5.2. SP-100

To see if SP-100 companies follow the same behavior than highest prices in Nasdaq, Table (25) studies the levels of success coefficient (2.1) has with SP-100 highest prices.

Levels of success with 1 NEW

	Positives					Negatives				
Nº days	1	2	3	5	10	1	2	3	5	10
Success (%)	53,85	71,79	69,23	76,92	82,05	78,78	87,87	100	90,91	93,93

Levels of succes with 2 NEWS

	Positives						Negatives					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
Success (%)	50	50	75	75	100	50	66,67	100	66,67	100	100	100

≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
Success (%)	50	50	50	50	100	50	50	NA

Table 24. SP-100 companies´ highest prices sensibility against news

The results of Table (25) show a big difference compared with the results obtained with the last prices results; the correlation suffers a big decrease that reaches the 50% decrease in many cases. In addition, the levels of success are very low, which means that the method shouldn't be used for highest prices in SP-100.

It is necessary to mention that while in some previous cases the effect of news in highest prices suffered a decrease only in negative news, in this case it happens to all cases, so the tendencies that began to appear with lowest prices is clear on highest prices in SP-100 companies.

To see if this effect happens in revenues too, Table (26) studies the benefits for SP-100 companies in highest prices.

Profits with 1 NEW

	Positives					Negatives				
Nºdays	1	2	3	5	10	1	2	3	5	10
$/share	-0,25	1,95	2,67	1,79	4,04	3,49	5,37	4,95	5,83	10,86

Profits with 2 NEWS

	Positives						Negatives					
Nº days	1	2	3	5	10	20	1	2	3	5	10	20
$/share	-1,3	2,58	6,57	6,49	16,03	8,7	2,36	7,02	11,13	10,72	12,3	31,02

Profits with ≥3 NEWS

	Positives							Negatives
Nº days	1 day	2 days	3 days	5 days	10 days	20 days	60 days	NA
$/share	4,86	-1,13	-1,68	-1,67	6,7	8,45	20,49	NA

Table 25. SP-100 companies´ highest prices profits against news

Table (26) confirms suspicious from Table (25) whit a big fall of profits that reach negative earnings in many cases including all positive news.

On the other hand, although no negative news registered negative earnings, the profits fall remarkably. Results show this is not a method for highest prices.

Chapter IV

Conclusions

4.1. Introduction

The purpose of Chapter (IV) is to recap the main points of the document, verifying the most important arguments, revising the conclusions and to determine the viability of the method.

Stock markets are thought to obtain profits so everything will go around the profitability of the method and how to apply it.

4.2. Methodology´s conclusions:

The method of investigation has had lots of influences such as the “Time Variation in the News-Returns Relationship” and “News vs Sentiment: Predicting Stock Returns from New Stories” articles, and has studied the effect news have on stock markets.

The resolution of using Bloomberg to obtain the information has been a right due to the verified data it gives and the global reputation this tool has. Although the use of this tool could be a tedious to transfer all the information to other devices, the fact that it includes relevant news has been vital for the development of the paper and the use of coefficients that followed the "Time Variation in the News-Returns Relationship" law.

The requirements that news needed to be included in the paper were very strict, having to register big coefficients and show relevant developments in posterior stock market tendencies, but as the results have shown, it was necessary in order to find a profitable and appliable method.

Moreover is that the decision of dividing results according to their markets (Nasdaq or SP-100) has been correct, because as the results showed their behaviors were very different and the profits would not be the same depending on the market applied. The reason of this is that while NASDAQ is a market known for the technologies´ presence, vulnerable against news and new events, SP-100 includes many different markets and not all of them are equally affected versus news. Nevertheless, although the effect of news was greater on NASDAQ than in SP-100, the difference was not very big because in a globalized world, everything can affect to the development of a company.

The process of noting the time frames and specifying the effect of news has been very visual and precise, starting from the publication of the new until the tendency generated by the new was exhausted. Depending on the number of news and whether the new was positive or negative, the effect was stronger, lasted more days and gave more profits. However, the severe requirements the method has and the number of certain cases registered, such as negative news with two or three news, was very low or inexistent in many cases, therefore it implies that the method is very conservative which prevents investors from possible losses.

Indicators have been used merely for the time frames study, the have proved to be useful for conservative openings and closures, but when it comes to news time effect their levels of correlations were very low.

4.3. Results:

The principal results obtained have been:

- The news have relevant information about stocks and their effect is very notorious and can lead to the profitable method.
- Negative and positive news do not have the same relevance when talking about time duration effects or profits obtained. Generally, negative news have longer effects and due to that, their effect can be more profitable than positives, the fear of losing money is bigger in the markets than the stimulation of growth, therefore there can be more opportunities with negative news. However, the number of positive news is bigger than negatives, so although the negative news are more profitable than positives, the global efficiency of the method shows that there could be more money earnt due to positive news than to negatives because of the quantity of them.
- Sp-100 and Nasdaq have proved to be very similar in most cases but there are some differences when it comes to time frames and profits. The gap between one and another market is less than 30% difference. Although the difference is not very big, stock markets need to be precise so each market should be treated independently.
- Comparing the last, lowest, and highest prices recorded during the day, the group that has shown better results is the last prices results. Last prices have shown to be very profitable according to this method, being very constant in the two markets studied and with levels of sensibility very high. However lowest and highest prices do not show the same results, in the case of lowest prices the profits and levels of success are lower compared to last prices records, that increases with highest prices, that suffer a decrease of the 50% in some cases compared with the last prices results.
- The timeframes registered by EMA-50 and RSI-14 do not follow the same tendencies than real stock markets, this is because the effect of news is generally quicker than these indicators. Their role is to determine when the prices are starting to behave unregularly and prevent the trader from losses.

4.4. Recommendation for future studies

The results have shown the method is economically viable, but it would be interesting to include the indicators behavior in the stock markets tendencies as well as some more indicators whose nature adapts more to the essence of news.

EMA-50 and RSI-14 are very common tool when analyzing stock tendencies but it would be more appropriate to add EMAs or RSI with lower interties whose number of days are lower in order to have better levels of correlation with news time effect.

Moreover, is that indicators have only been used in this paper to analyze news time effect but in future studies it would be useful to compare the RSI and EMA prediction with the real performance of markets.

Chapter V

Sustainable Development Goals

This TFG has been created in order to help traders and investors to use new technologies and information to perform positively on stock markets, therefore its first objective is to help as much people as possible to obtain benefits from their savings.

It is said that between the 75% and 90% of people who come into the stock markets world loses money, thus the method this paper has shown can help many people to change that percentage and make it more profitable and equally distributed .

According to the united nations sustainable development goals, the fundamental goals of this work collaborate with several of their points such as numbers 5, 8 and 10.

Goal number 5, **"Gender Equality"**. According to multiple studies the presence of women who invest in financial products is much lower than males presence, in fact, some statistics show that the total amount of female traders and investors do not reach the 20% of the total. This is a gap that should be overcome in the next years. This tendency has been explained in multiple occasions justifying it arguing that women tend to have more fear against risks than men. However, results show that female investors obtain better results than men, they usually invest on more consistent companies with longer backgrounds and positive results than some men, who tend to look for emerging companies, with inspiring future perspectives trying to find the next Apple Inc.

Consequently, a possible solution to reduce this gender gap could be to provide this TFG to different people with diverse backgrounds that may help many women to understand the increases and descents of markets with a reliable method that could allow them to obtain new economic resources.

Goal number 8, **"Decent work and Economic Growth"**. The recent events and the development of the economy has changed the traditional vision of getting a job, buy a house and earn a living, but times are changing, and the classic indefinite contract is being substituted for temporary contracts based on punctual projects instead of long term contracts. Moreover is that recent economical and health crisis have led to lower salaries and the reductions of labor benefits; for that reason, now more than ever is important to obtain multiple incomes where people can control their revenues and investments without relying excessively on their working status.

Entrepreneurship is not an option anymore, hiring and dismissal are very volatile caused by the economic system, thus one of the few things people can control is the management of their savings. This investment system enables trders to obtain new incomes compatible with more standard jobs increasing his purchasing power depending more on his abilities rather than on their companies results.

Furthermore, is that it gives more confidence and criteria that could allow people for future businesses based on the revenues and experience obtained by the work in the stock markets. In many cases this could lead to become independent economically, the possibility to open new businesses, generate new job offers and consequently creating wealth and prosperity.

Goal number 10, **"Reduced inequalities"**. Stock markets have always had multiple methods, investment analysis and business models, who have tried to forecast the tendencies of

markets. New technologies have only increased that philosophy by programming complex programs who work more efficiently than human beings. However, something that has never changed in this world is that the most important commodity in the world is information.

The information is the first and ultimate responsible for the evolution of companies, deciding whether they get used to modern times or they get old and overcome by new companies. The more information investors have, the more probabilities they have to earn money. Nowadays information is everywhere, and everybody can have access to it, the thing that this paper uses information to help traders to take new investments, is a reduction of the gap between big financial firms and small traders.

Financial markets have gone through multiple phases and suffered big transformations since the fifties, when stock markets did not have as much power as nowadays. A good example is the case of J.P. Morgan, one of the most important investment banking companies in the world, that had less than 30 employees on that time and now has more than 30.000 around the world. The growth of this sector has been remarkable, and new technologies have opened the gates to new small shareholders to control their deposits.

New financial products; some of them known by derivatives; are high risk products that common people do not understand very well, but still invest on them. The complexity of markets has grown too and financial engineering has an important position in it; most people who invest on stocks lose money and although big firms tend to earn a lot of money, the 2008 crisis shows that these corporations can fall too. However, the gap between big companies and small investors is very big and one of the causes is that many small investors do not have a method who guides them to a beneficial revenue.

This method could reduce the gap between big and small investors by reducing the small investors losses and providing then a good method with tested results.

Chapter VI

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