Case of Product-Related Announcement

Team #1: Insiders

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CONTENTS

01 **Introduction**

- Target event and mechanism
- Literature review

02 **Generate normal return**

- Basic Information
- Threshold for Regression
- Coefficient Table

03 **Data visualization and hypothesis test**

04 **Conclusion and discussion**

Introduction

Target event and mechanism

Literature review

/01

1.1 Target event and mechanism

- **Product-related announcement**

  Formally released information about firm products

  Either positive or negative and either have dramatic impact or insignificant

- **Expected influence on stock price movements**

  Positive trigger

  Relatively larger impact than other events

  Over 90% of the announcements are positive news for the company

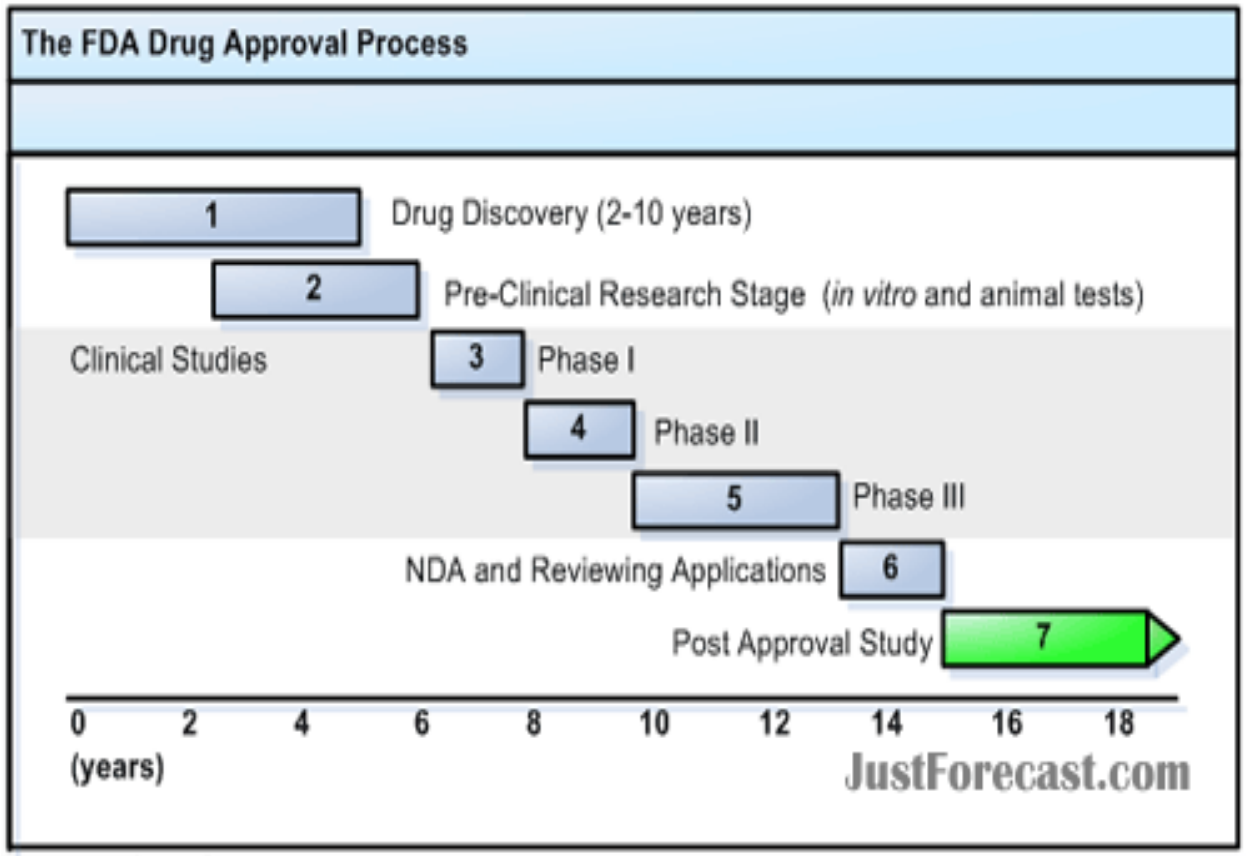
  Firms in the given sample are basically from pharmaceuticals industry

1.1 Target event and mechanism

Top ten company (highest abnormal return) & announcement headlines

PERMNO	ar	day	Headline
90025	7.073588	0	Anesiva Phase 3 Trial of Adlea Meets Primary Endpoint to Significantly Reduce Pain After Total Knee Replacement Surgery
91186	6.260523	1	FDA Approves Vanda Pharmaceuticals' Fanapt(TM) for the Treatment of Schizophrenia
14535	4.820075	0	Aquinox Pharmaceuticals Inc. Reports Unaudited Consolidated Earnings Results for the Second Quarter and Six Months Ended June 30, 2015; Announces Positive Results from Secondary Endpoints from Phase 2 LEADERSHIP Trial in BPS/IC
14305	4.350799	1	Celator Pharmaceuticals, Inc. Announces Positive Results from the Phase 3 Trial of VYXEOS Celator Pharmaceuticals
86444	3.293134	0	Inovio Biomedical Corporation Influenza Vaccines Demonstrate 100% Protection Against Current Pandemic A/ H1N1 Influenza Viruses in Animal Studies
79122	3.136648	0	Amarin Corporation plc Issues Topline Results from the Vascepa Cardiovascular Outcomes
76383	3.112201	0	Avanir Pharmaceuticals Announces Positive Results of Phase III Study for Zenvia in Diabetic Neuropathic Pain
88208	3.012523	0	Celsion Corporation Announces Final Clinical and Translational Research Data from its Ovation Study at the AACR Special Conference on Ovarian Cancer
16532	2.964356	0	California Department of Pesticide Regulation Proposes to Register SenesTech's ContraPest for Sale and Use in California
13621	2.900661	1	Puma Biotechnology Announces Positive Top Line Results from Phase III PB272 Trial

1.1 Target event and mechanism



01
- Over 7 procedures，12-15 years

02
- A normal firm typically spend $500 million

03
- 1/5000 preclinical compounds may finally become new drug into the market.

04
- R&D breakthrough in this industry are usually rare and significant

1.2 Literature review

- Chaney, P. K. and Devinney, T. M. (1992), NEW PRODUCT INNOVATIONS AND STOCK PRICE PERFORMANCE. Journal of Business Finance & Accounting, 19: 677-695.

- On average, firms announcing new product or service innovations earn an excess return of approximately 0.60 percent over a three-day period centered on the product announcement date.
- This effect was found to vary marginally from industry to industry (CAPM α for Chemicals & Pharmaceuticals is 0.21，with significance level at 95%)
- Truly new products or innovations are shown to out-perform the simple reformulations of existing products, while announcements for multiple products outperform single product announcements.
- The relative magnitude of the market's reaction to an announcement was not related to some obvious firm and industry characteristics. （unrelated to firm size, research and development expenditure measures, profitability measures, or the level of industry concentration)
- Also workable in long-term stock portfolio implications: over the period 1974-1988, the firm sample was shown to outperform the market by a large and consistent margin

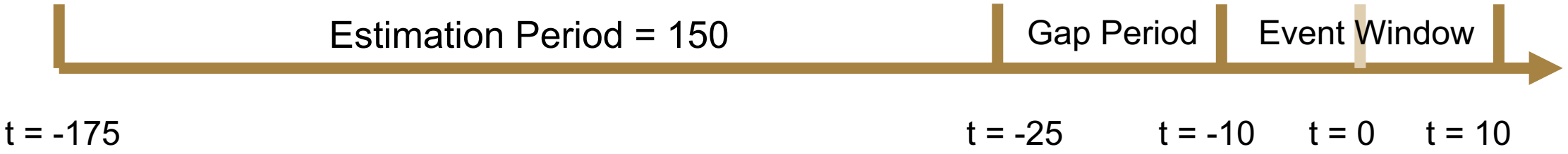
Generate Normal Return

Through estimation period

/02

2.1 Basic Information

Market Model & Fama-French 3 Factor Model → Normal Return (-10 ~ 10)



2.2 Threshold for Regression

Most companies have datapoint equal to 150.

Some companies have missing datapoint.

We set a threshold of 120 datapoints to be included in the regression result.

01. PERMNO = 15221

- Datapoint = 82
- Listed on 2015-02-18 and event day is 2015-07-23

02. PERMNO = 16067

- Datapoint = 106
- Listed on 2016-05-18 and event day is 2016-11-28

2.3 Coefficient Table

Market Model

Market Model - Intercept

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
-0.001019	-0.0044689	-0.0009835	0.0020554	0.0051748	-1.95

Market Model - MKT

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
1.0167817	0.420135	0.8189046	1.5638105	0.8413367	11.96

Fama-French 3 Factor Model

FF3-Intercept

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
-0.0009851	-0.004655	-0.0006502	0.0019916	0.0052867	-1.84

FF3-Market excess return

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
0.8422087	0.3210516	0.7175556	1.369497	0.7839879	10.63

FF3-SMB

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
0.9094078	0.2433064	0.8740029	1.6880842	1.2710383	7.08

FF3-HML

Mean	25th Pctl	Median	75th Pctl	Std Dev	t Value
-0.2619984	-1.0267779	-0.1695348	0.3937261	1.4280845	-1.82

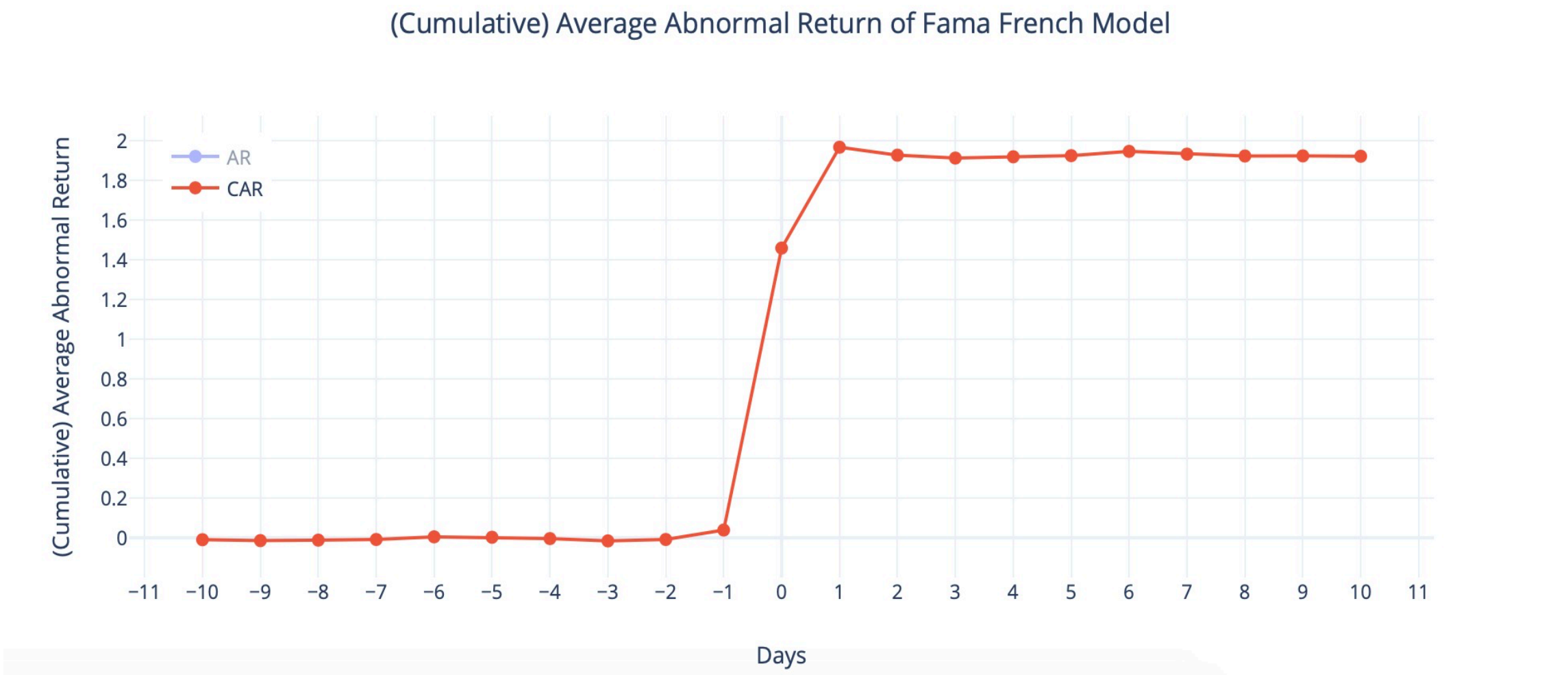
Data Visualization and Hypothesis Tests

For Abnormal Return and Cumulative Abnormal Return

By Jimi

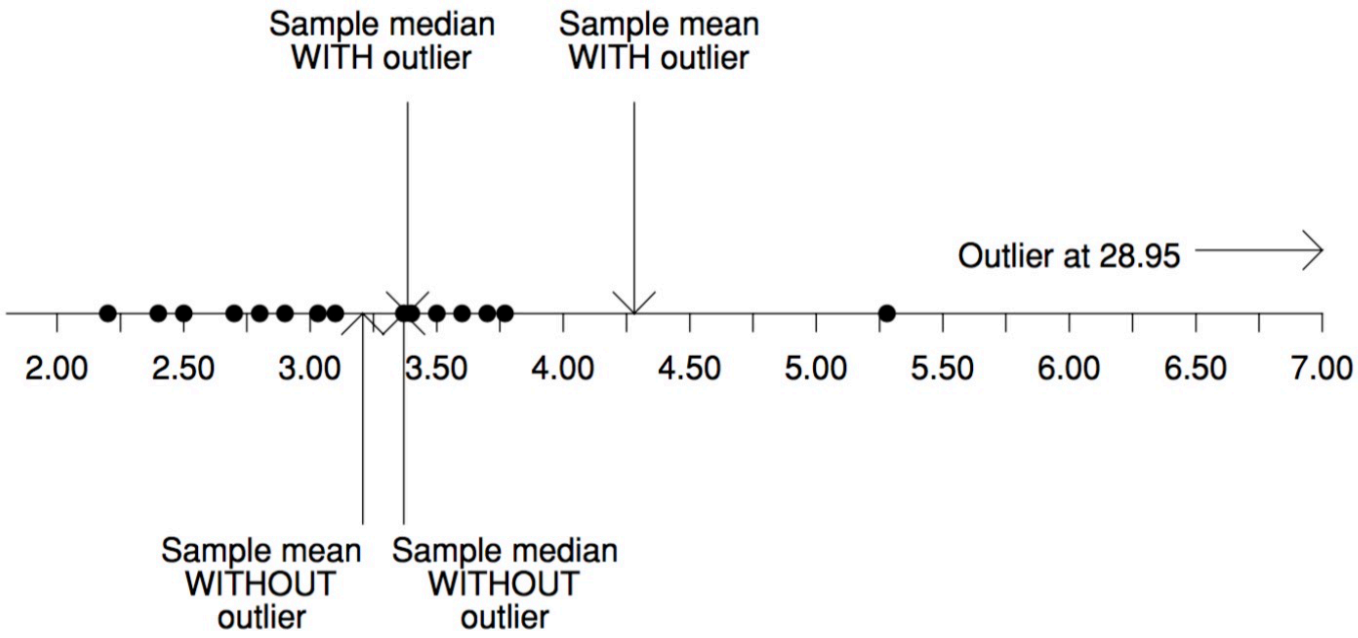
/03

Average AR and Average CAR Line Chart

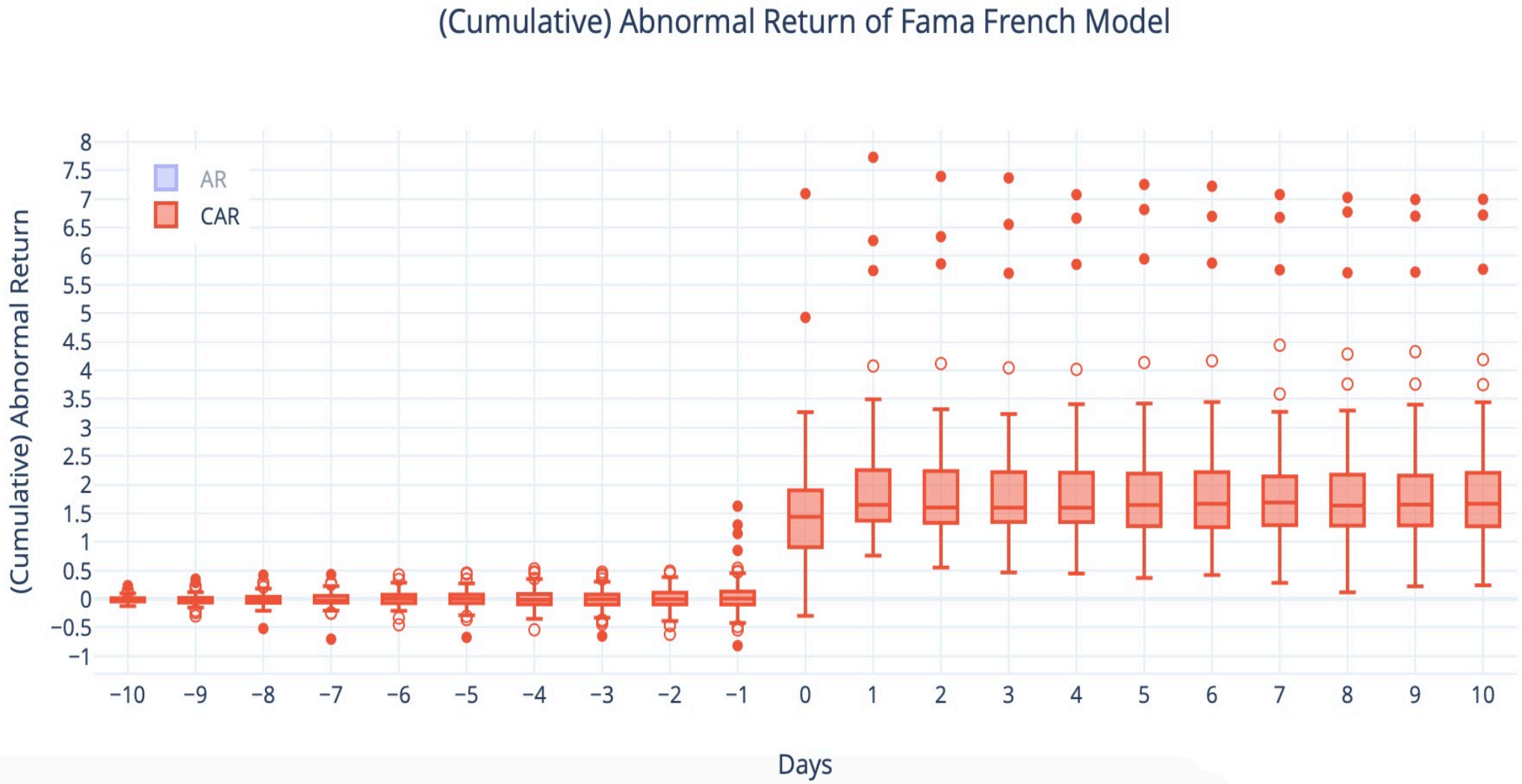


Mean or Median?

2.20	2.20	2.40	2.40	2.50	2.70	2.80	2.90
3.03	3.03	3.10	3.37	3.40	3.40	3.40	3.50
3.60	3.70	3.70	3.70	3.70	3.77	5.28	28.95



AR and CAR Boxplot



Three outliers

- Anesiva
- **Phase 3 Trial** of Adlea Meets Primary Endpoint to Significantly Reduce Pain After Total Knee Replacement Surgery. Adlea is a long-acting, non-opioid drug candidate in development for the management of acute pain following orthopedic surgery

- Vanda Pharmaceuticals
- **FDA granted marketing approval** of Fanapt for the Treatment of Schizophrenia .The approval was supported by two placebo-controlled Phase III clinical studies

- Aquinox Pharmaceuticals
- Reports second quarter **earnings with decreased net loss** before income & taxes ($4.750 million against $5.424 million a year ago)
- Announces Positive Results from Secondary Endpoints **from Phase 2 LEADERSHIP Trial** in BPS/IC

Student's t Test for CAR(0, 1), CAR(-2, 2), and CAR(-5, 5)

$$H_0 : \mu = 0 \text{ vs. } H_1 : \mu \neq 0$$

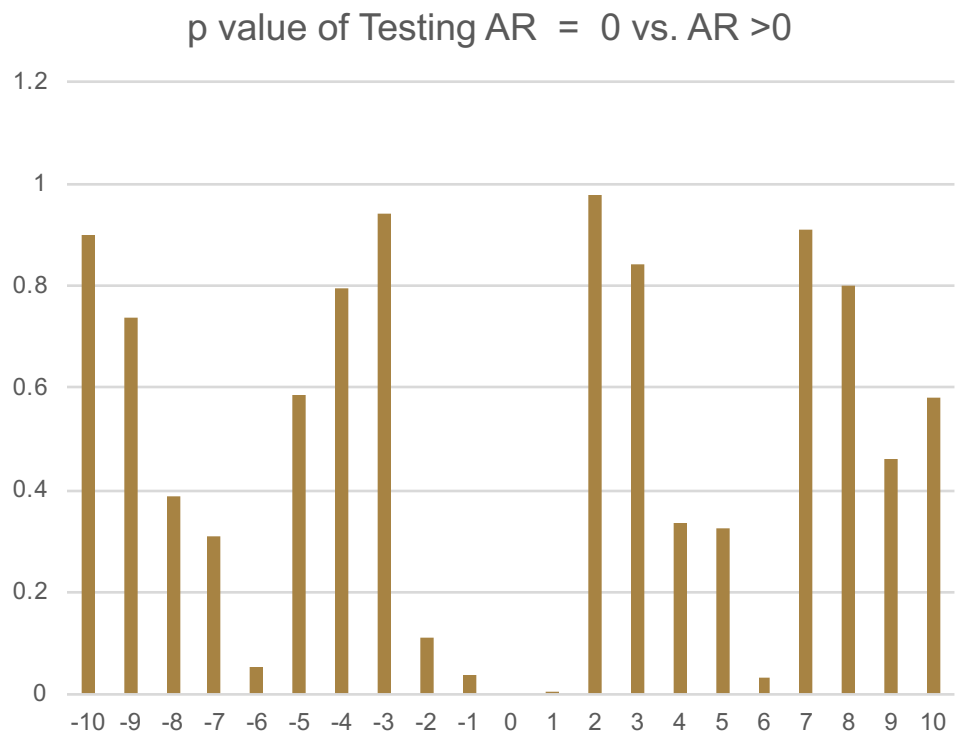
$$t = \frac{\overline{X} - \mu}{s/\sqrt{n}} \sim t(n-1), \text{ p-value} = Pr_{H_0}(T > |t|)$$

range	Mean	Total Count	Positive Count	Negative Count	t value	p value
(0,1)	1.926263658	98	97	1	17.29383261	2.15×10^{-31}
(-2,2)	1.940971847	98	98	0	18.22921168	4.28×10^{-33}
(-5,5)	1.918107837	98	98	0	17.53465202	7.77×10^{-31}

Student's t Test of AR for Each Day in the Event Period

$$H_0 : \mu = 0 \text{ vs. } H_1 : \mu > 0$$

$$t = \frac{\overline{X} - \mu}{s/\sqrt{n}} \sim t(n-1), \text{ p-value} = Pr_{H_0}(T > t)$$

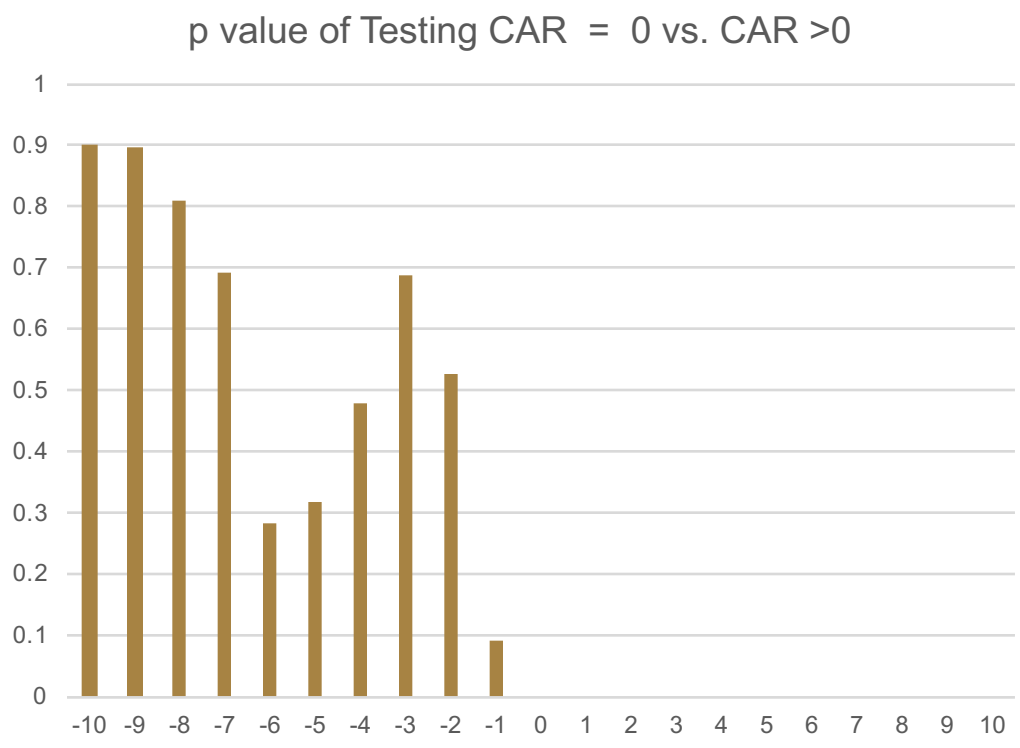


day	mean	count	negative_count	positive_count	t_value	p_value
-10	-0.0078244	98	58	40	-1.3004132	0.90172969
-9	-0.0044823	98	57	41	-0.6345411	0.73638924
-8	0.00215975	98	47	51	0.28817441	0.38691405
-7	0.0034435	98	53	45	0.49677894	0.31023449
-6	0.01318301	98	49	49	1.61304108	0.05500911
-5	-0.001824	98	55	43	-0.2229618	0.58798296
-4	-0.0069282	98	59	39	-0.8242573	0.79409222
-3	-0.0117175	98	56	42	-1.5771871	0.94099583
-2	0.0072639	98	47	51	1.22749094	0.11130437
-1	0.04747189	98	48	50	1.81850763	0.03603628
0	1.41863043	98	8	90	12.3412227	6.72E-22
1	0.50763323	98	36	62	4.92549678	1.73E-06
2	-0.0400276	98	63	35	-2.0226237	0.97706767
3	-0.0144903	98	58	40	-1.0199906	0.84486491
4	0.00644047	98	49	49	0.42620792	0.33545033
5	0.00565546	98	57	41	0.45310995	0.32574076
6	0.02151665	98	47	51	1.87857638	0.03165269
7	-0.0136335	98	57	41	-1.3498433	0.90989603
8	-0.0097451	98	51	47	-0.8524525	0.80196856
9	0.00068055	98	55	43	0.09638796	0.46170566
10	-0.0020444	98	59	39	-0.2057948	0.58130877

Student's t Test of CAR for Each Day in the Event Period

$$H_0 : \mu = 0 \text{ vs. } H_1 : \mu > 0$$

$$t = \frac{\overline{X} - \mu}{s/\sqrt{n}} \sim t(n-1), \text{ p-value} = Pr_{H_0}(T > t)$$



day	mean	count	negative_count	positive_count	t_value	p_value
-10	-0.0078244	98	58	40	-1.3004132	0.90172969
-9	-0.0123067	98	55	43	-1.28966	0.89988238
-8	-0.0101469	98	56	42	-0.8775517	0.80882229
-7	-0.0067034	98	54	44	-0.5023099	0.69170602
-6	0.00767415	98	47	51	0.56855117	0.2854942
-5	0.00793793	98	47	51	0.47775274	0.31695612
-4	0.00081916	98	53	45	0.04605523	0.48168095
-3	-0.0092412	98	50	48	-0.4912728	0.68782259
-2	-0.0013964	98	49	49	-0.0696911	0.52770774
-1	0.0453658	98	47	51	1.3472934	0.09052861
0	1.4686513	98	9	89	13.1769496	1.49E-23
1	1.9675579	98	0	98	18.4423597	1.29E-33
2	1.91685139	98	0	98	18.0047481	7.73E-33
3	1.8966759	98	0	98	17.8750647	1.32E-32
4	1.90785915	98	0	98	17.9829927	8.46E-33
5	1.91375439	98	0	98	17.4344815	8.30E-32
6	1.9356334	98	0	98	17.4741034	7.03E-32
7	1.92487151	98	0	98	17.4014068	9.54E-32
8	1.91882427	98	0	98	17.2655583	1.69E-31
9	1.9182552	98	0	98	17.2902024	1.52E-31
10	1.91313039	98	0	98	17.2109058	2.13E-31

Wilcoxon Signed Rank Test

2.3 Wilcoxon signed rank test

Assumption 2.2

(i) The sample random variables $X_1,\ldots,X_n$ are independent;

(ii) The probability distributions of $X_1,\ldots,X_n$ are continuous and symmetric about a common median θ (not necessarily identical).

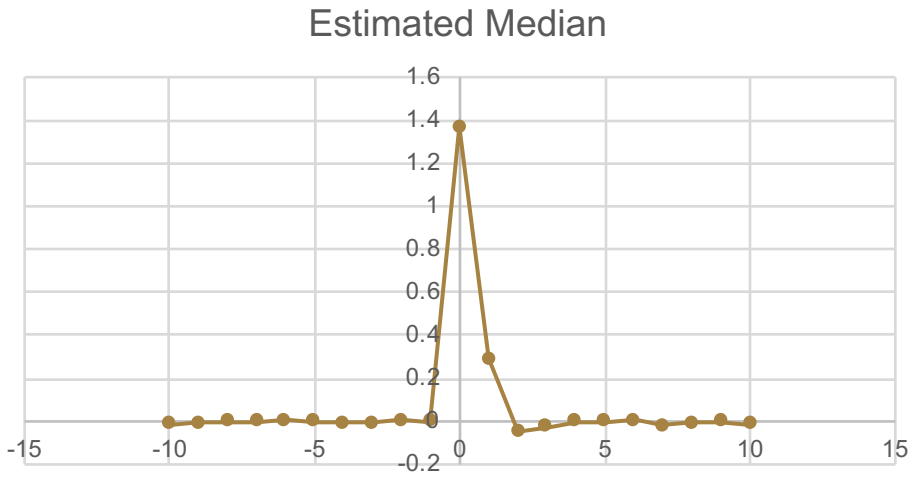
Null hypothesis: $H_0:\theta=0$, where θ is the median of $X_1,\ldots,X_n$.

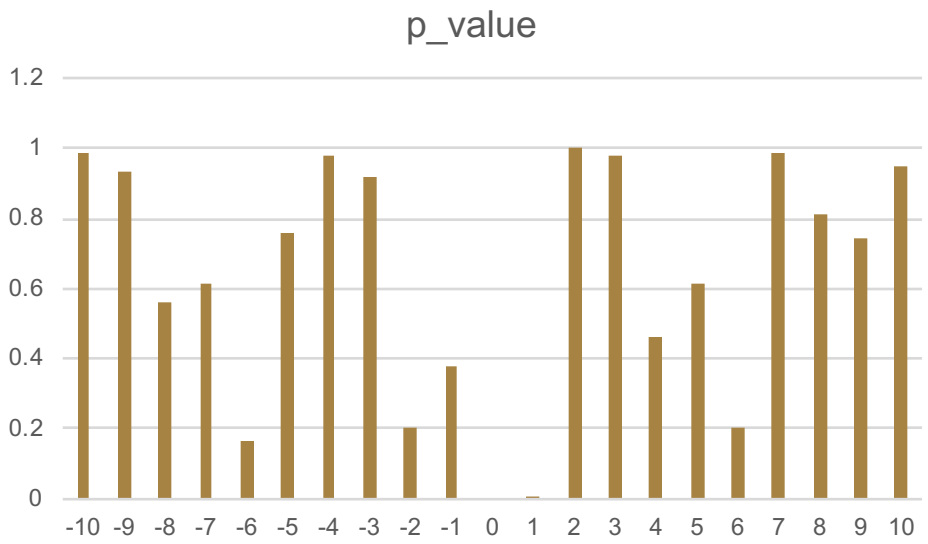
Rank: Assume no ties among $|X_1|,\ldots,|X_n|$. Let $|X|_{(1)}<\cdots<|X|_{(n)}$ be ordered values of $|X_1|,\ldots,|X_n|$. Define the *rank* R_i of X_i by $R_i=k$ if $|X_i|=|X|_{(k)}$. That is, the X_i with the k^{th} smallest absolute value has rank $R_i=k$.

Test statistic: There are several equivalent forms of the Wilcoxon signed rank test statistic. We will consider the following form:

$$T^+=\sum_{i=1}^{n}R_i\psi_i,\quad \text{where}\quad \psi_i=I_{\{X_i>0\}},\ i=1,\ldots,n. \tag{2.6}$$

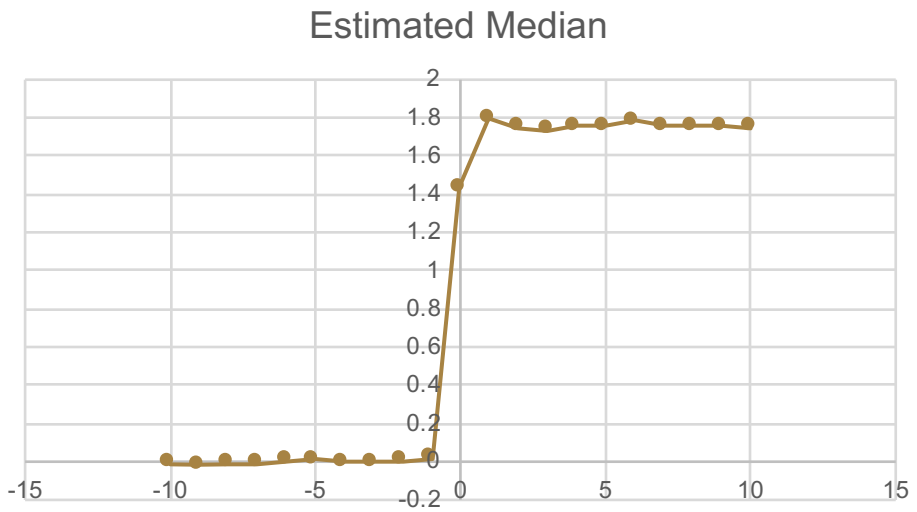
Wilcoxon Signed Rank Test of AR for Each Day

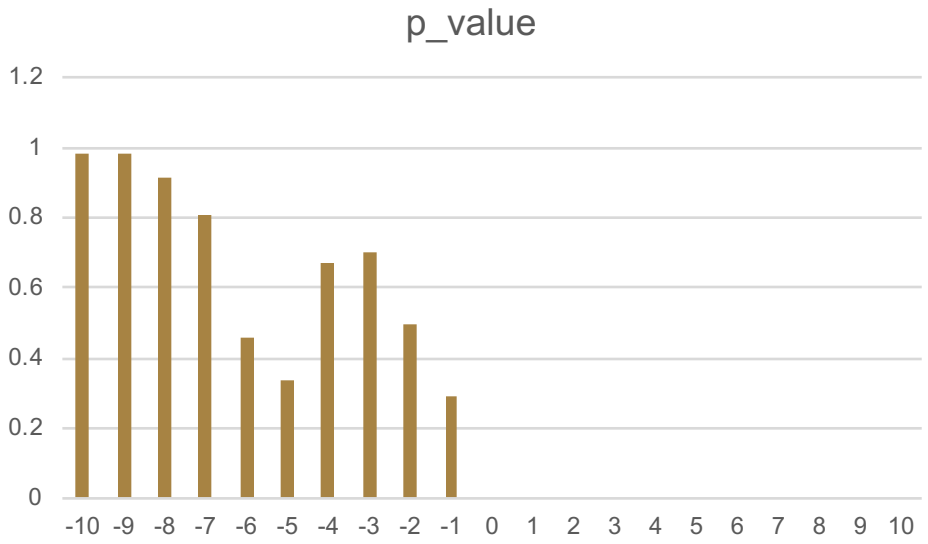




day	Estimated Median	count	negative_count	positive_count	T+	p_value
-10	-0.0111815	98	58	40	1813	0.98508019
-9	-0.0067511	98	57	41	2001	0.93396901
-8	-0.0010438	98	47	51	2384	0.5591562
-7	-0.0019173	98	53	45	2343	0.61566571
-6	0.00640956	98	49	49	2649	0.16385926
-5	-0.0038819	98	55	43	2229	0.75743788
-4	-0.0094755	98	59	39	1847	0.9799021
-3	-0.007239	98	56	42	2037	0.91596803
-2	0.0035506	98	47	51	2661	0.20249552
-1	0.00171832	98	48	50	2512	0.38027919
0	1.37074174	98	8	90	4767	5.41E-17
1	0.28823017	98	36	62	3633	9.47E-06
2	-0.0474862	98	63	35	1566	0.99884614
3	-0.0239705	98	58	40	1860	0.97755398
4	0.00136752	98	49	49	2453	0.46188872
5	-0.0034289	98	57	41	2343	0.61566571
6	0.00749707	98	47	51	2662	0.20149753
7	-0.019402	98	57	41	1808	0.98573536
8	-0.0062347	98	51	47	2178	0.81024706
9	-0.0041817	98	55	43	2239	0.74622228
10	-0.0107025	98	59	39	1961	0.95029937

Wilcoxon Signed Rank Test of CAR for Each Day





day	Estimated Median	count	negative_count	positive_count	T+	p_value
-10	-0.0111815	98	58	40	1813	0.98508019
-9	-0.0158864	98	55	43	1806	0.98599041
-8	-0.012075	98	56	42	2038	0.91542
-7	-0.0089941	98	54	44	2184	0.8044283
-6	0.00398827	98	47	51	2405	0.45987424
-5	0.00736952	98	47	51	2496	0.33425645
-4	-0.0041949	98	53	45	2254	0.67096623
-3	-0.0059454	98	50	48	2229	0.70282351
-2	0.00310305	98	49	49	2381	0.49425825
-1	0.01504165	98	47	51	2528	0.29345016
0	1.43757826	98	9	89	4675	6.77E-17
1	1.79750536	98	0	98	4753	6.19E-18
2	1.74652557	98	0	98	4753	6.19E-18
3	1.73811798	98	0	98	4753	6.19E-18
4	1.75448892	98	0	98	4753	6.19E-18
5	1.75344736	98	0	98	4753	6.19E-18
6	1.78397015	98	0	98	4753	6.19E-18
7	1.75606258	98	0	98	4753	6.19E-18
8	1.75280198	98	0	98	4753	6.19E-18
9	1.75703191	98	0	98	4753	6.19E-18
10	1.75211272	98	0	98	4753	6.19E-18

Summary from the Data

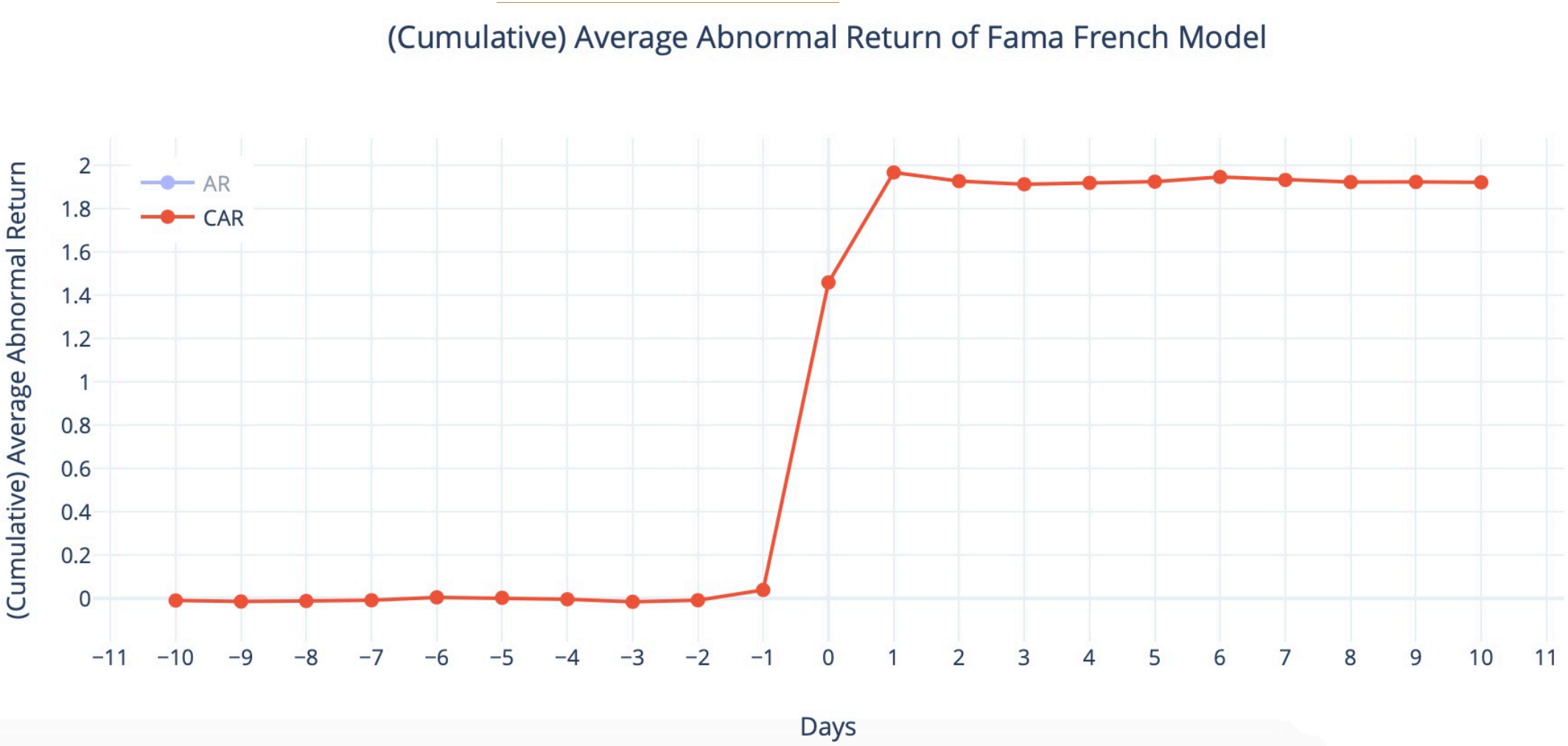
1. The average data does not tell everything. It can be driven by the extreme values.
2. The boxplot shows that there are extreme values that are pharmaceutical companies.
3. Student's t test shows that the AR and CAR is statistically different from 0 in day 0 but leave some problems like in day -1.
4. The Wilcoxon Signed Rank Test and Walsh Average estimation supports that there no information leakage in general

Conclusion & Discussion

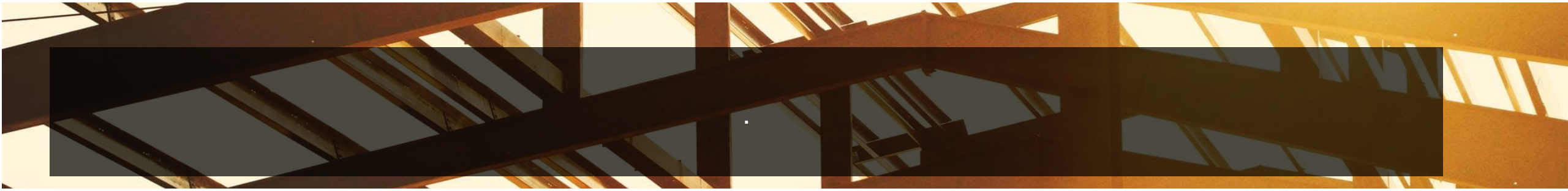
For Abnormal Return and Cumulative Abnormal Return

/04

The cumulative abnormal return over FF model



The car (t = -1) is small ==?== No insight trading?



Statistically

Schedule?

Money ! Money ! Money!

My friend have told me xxx would have a product related announcement tomorrow
If I invest $1 into that stock,
How much money can I get back 10 days later?

- 3.6838
-

The insight trading do good or harm to the market ?

Liquidity?

Unfairness?

Bob

Should Be Banned!!!

.....

Informative?

Efficient

Market?

Oliver

Shouldn't Be Banned!!!

.....

Group #1: Insiders

2019/7/18