The Estimation On Reimaging Education Since Covid 19 And Its Impact On Edtech Stocks In Jordan

Fayrouz Abousweilem

Business School
Al-Ahliyya Amman University
Jordan
fayrz@yahoo.com
ORCID: 0000-0001-5452-8343

Abstract

Constantly evolving technology is the language of new education. Edutainment- the fascinating world of concept attainment decreases the gradient of learning curves. The hybrid EdTech movement will create a revolution in education. The tech-enabled education solutions will be more appealing to the modern educational paradigms. The post-Covid trends in the market show positive signals for EdTech investments. The work aims to analyze the last ten years' educational service index performance in Jordan when compared with the general index. The behavioral market inefficiencies are also investigated with proper inferential models along with EDA.

Keywords: EdTech, Eduservice, Kruskal-Wallis scram, Covid 19.

1. Introduction

The Covid-19 pandemic seriously upsets the education systems across the globe [18]. The Jordan Government closed all universities, kindergartens and schools, on 15 March 2020 [22]. This may haveled to increased learning inequality and dropout. During covid 19 pandemic, the government of Jordan committed to ensuring education continuity for students providing distance learning. To provide access to a learning management system and educational contents the televised classes are transmitted nationally and organized digital platforms with itsestablishments. The Ministry of Education (MoE) developed a quick response plan to prevent the risk of students dropping out due to interruptions in learning [1].

Robust national commitments to sustain the privilege of education during the COVID-19 [10] pandemic have been established such as effectively preparing schools for reopening with guidance and training for teachers and allowing opportunities for education through distance learning, and the accessibility of sanitation and hygiene materials in schools, adding to social distancing and rotation. An Education During Emergency Plan (EDEP) [11] was established to state both instant and long-term issues and challenges to safeguardcontinuousness of equitable access to classic education, for example, to address the digital division through an EdTech Strategy [2]. The pandemic enabled EdTech to become the leading sector for growth.

EdTech is a practice to practice of introducing IT tools into the classroom to create a more inclusive, engaging, and individualized learning experience. IoT devices and technology have made it possible for students to get learning material without having to be physically present in the classroom [3]. One of the most important uses of EdTech may be at the management level where the use of technology and connectivity can increase system flexibility as well as national and international cooperation. Some best Jordanian-based EdTech companies are Abwaab, Little Thinking Minds, Adam WaMishmish, Alfredo books, Labtoons, Hello world kids, etc [4] [20].

Jordan-based educational technology startup has raised $3 million in a round led by US-based investor Rubix to expand its business in the Middle East and North Africa region [5].

Covid 19 negatively affects the economy in developed as well as developing countries [17]. The majority of the world stock markets suffered losses in covid 19. Jordan is a small economic country, covid 19 make many changes in the Jordan stock market [15] [19]. This paper makes a study about the impact of covid 19 on Jordan's EdTech startup stocks. The purpose of this study is to analyze the performance of the educational service sector index in Jordan. For this purpose, we collect twelve years of data (from 2010 to 2022). This data is compared with the general index. This paper gives a detailed study of weekly, monthly, and yearly differences in the eduservice index.

2.   Sample and data collection procedure

This work is limited to the EdTech stocks in Jordan. The present study is focused on the performance of the educational service index in the Jordan stock market. This study examined monthly data relating to the educational service index in Jordan from April 2010 to March 2022.

3.   Analysis and results

To study the performance of educational services in the ASE stock, proper scaling is applied using time series packages in the R programming [23]. In this discussion performance of the educational service, the section is analyzed and the calendar anomalies like the month of the year and turning month effects are explained with proper statistical tools.

The distribution of unweighted indices of educational services and general index from the AES data is shown in the following figure.

Figure 1 contains two graphs, the above graph (red color) shows the Educational service index and the below graph (cyan color) shows the general index. When we compare these two graphs the starting index value of Eduservice is comparatively higher than a general index.
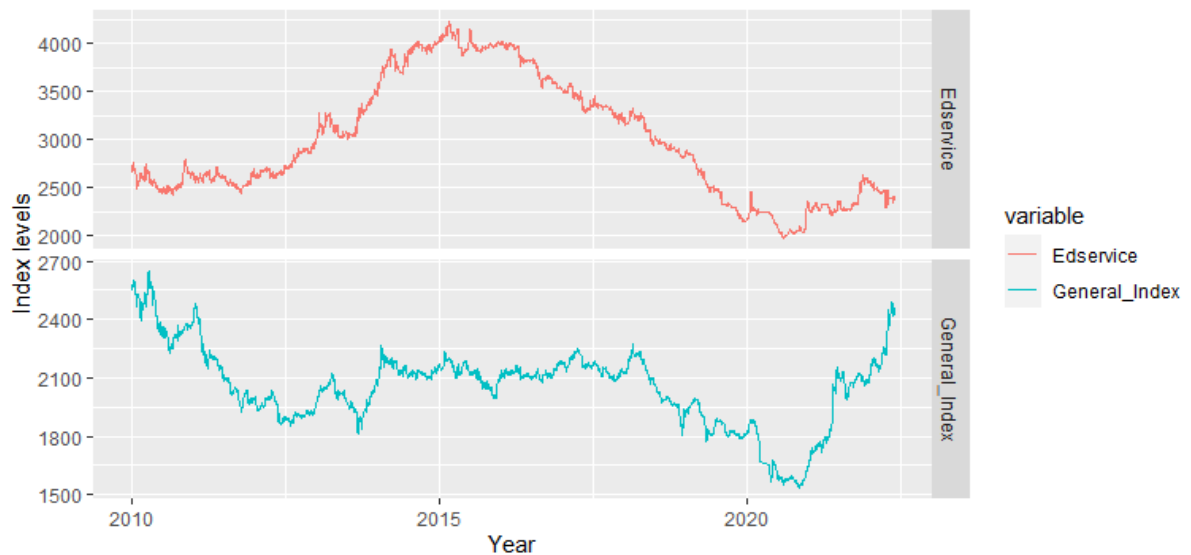

Figure 1: Distribution of unweighted indices of educational services and general index from the AES data

The returns considered are daily percentage returns.

$$r_t = \ln \ln (P_t) - \ln (P_t - 1)$$

For each series, the start date was chosen based on the earliest date of the available data.

From figure1 we can understand that the Eduservice graph is not linear. There are high and low values. After a period of decrease, the bandwidth was and it became stable. This indicates a chance for stability.

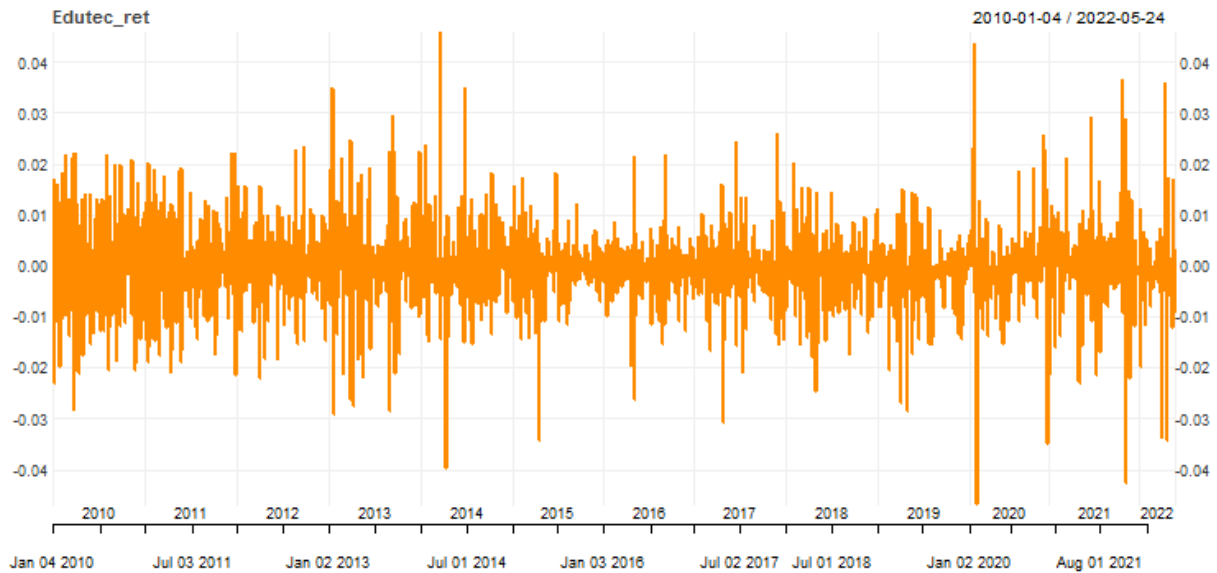The distribution of daily returns of Educational services daily return is shown in the following figure,

Figure 2: The distribution of daily returns of Educational services daily return

For the analysis of Educational services daily return we take 10 years (from 2010 to 2022) data. Here each plot in the grid shows each year's data. In this graph sub-peaks on the right side mean the possibility of a high return. If the sub-peaks are on the left side it indicates a low return.

The distribution of daily returns of Educational service daily return over a year with respect to months is shown in the following figures
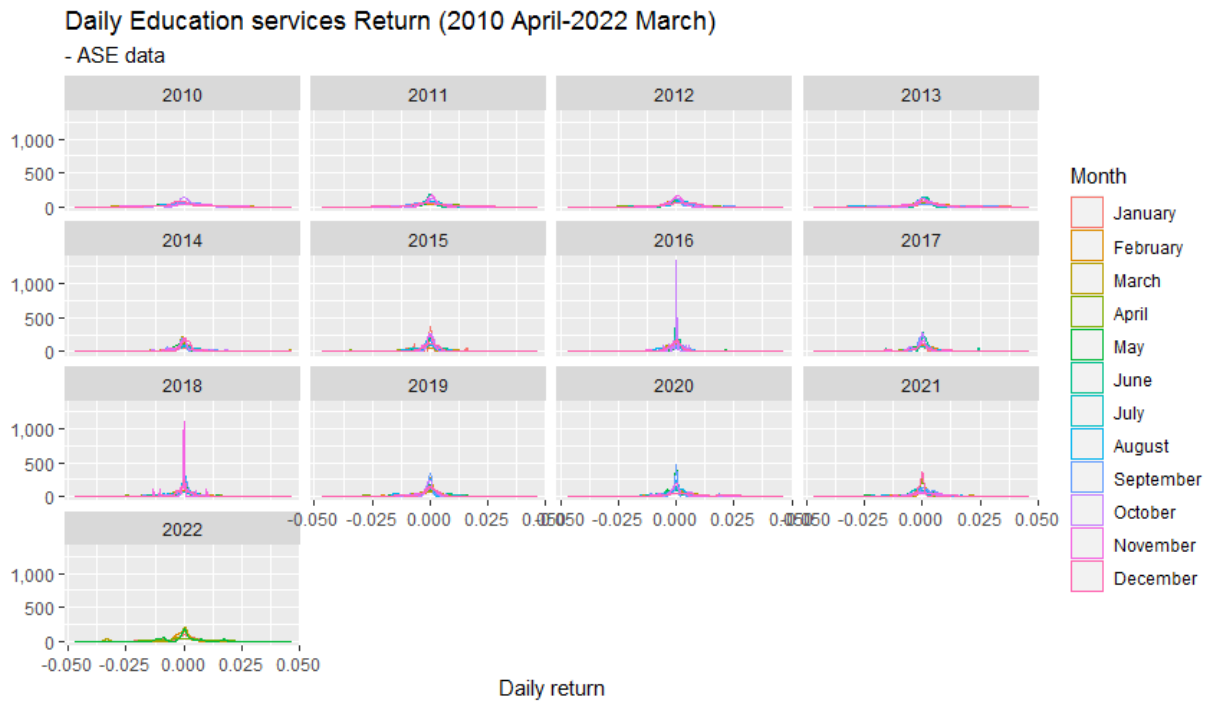
Figure 3: daily Education service return (2010 April to 2022 March)

A visual inspection of the graphs of daily returns for each month for the educational service index was done across the years. From these plots, it is found that in 2015, 2016, 2018, 2020, and 2021 there is a higher frequency of returns in some specific months. To study the monthly effect on return, a deeper analysis is required. The following figures illustrate the distribution of returns over a month in the aforementioned years.
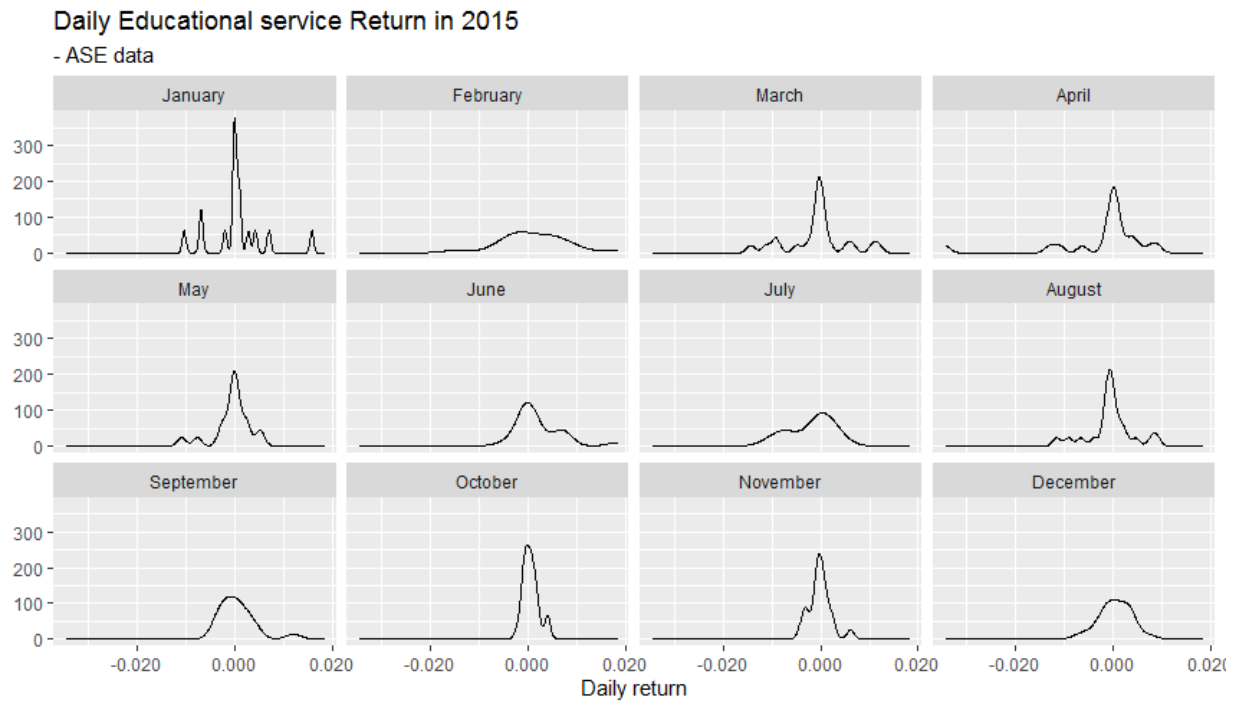
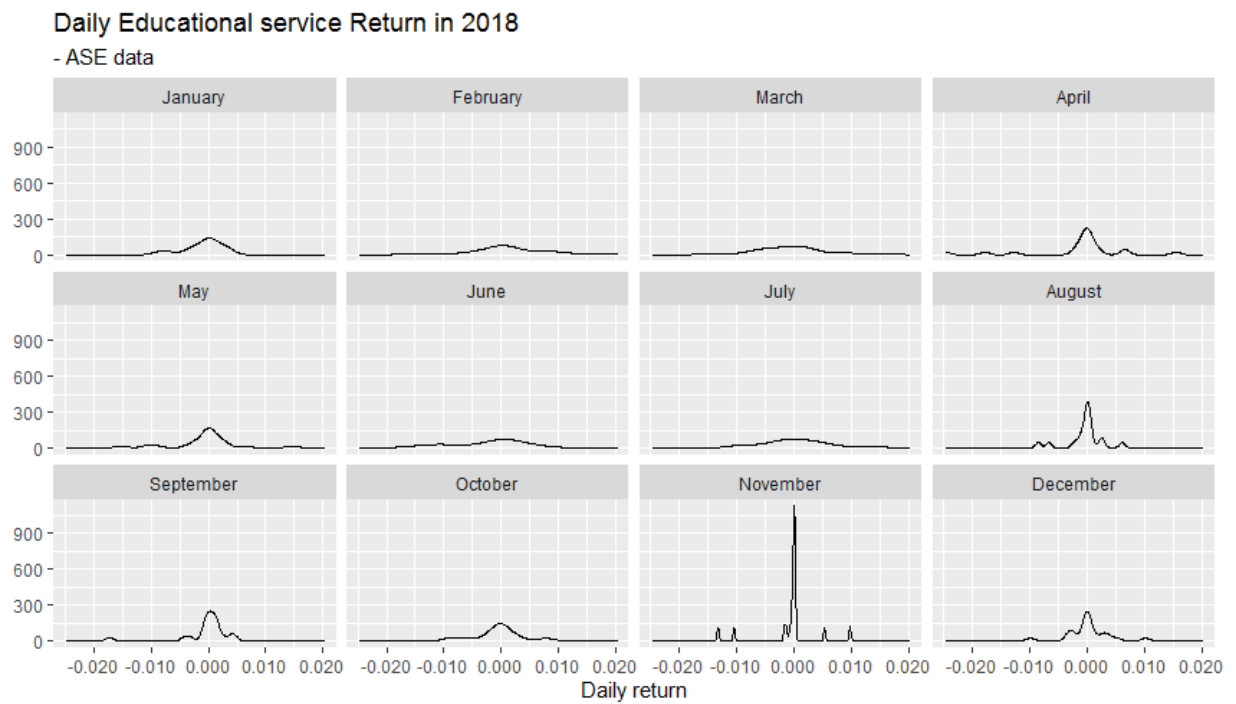Figure 4: Daily Education service return 2015

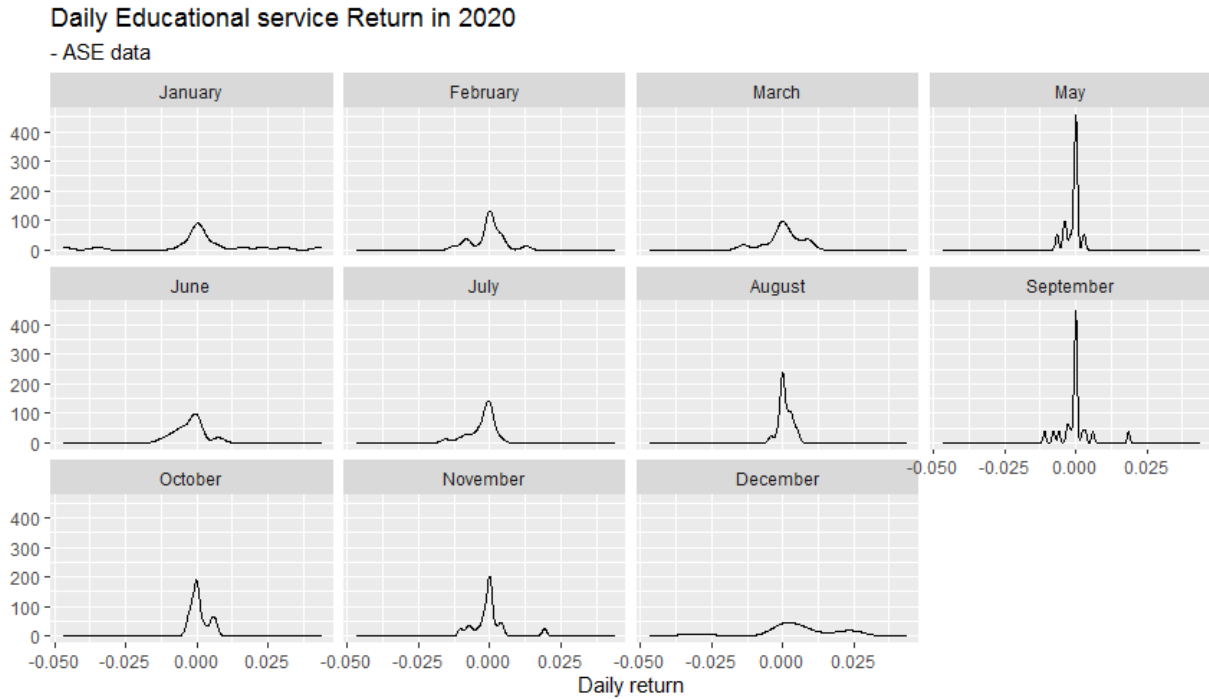Figure 5: Daily Education service return in 2018

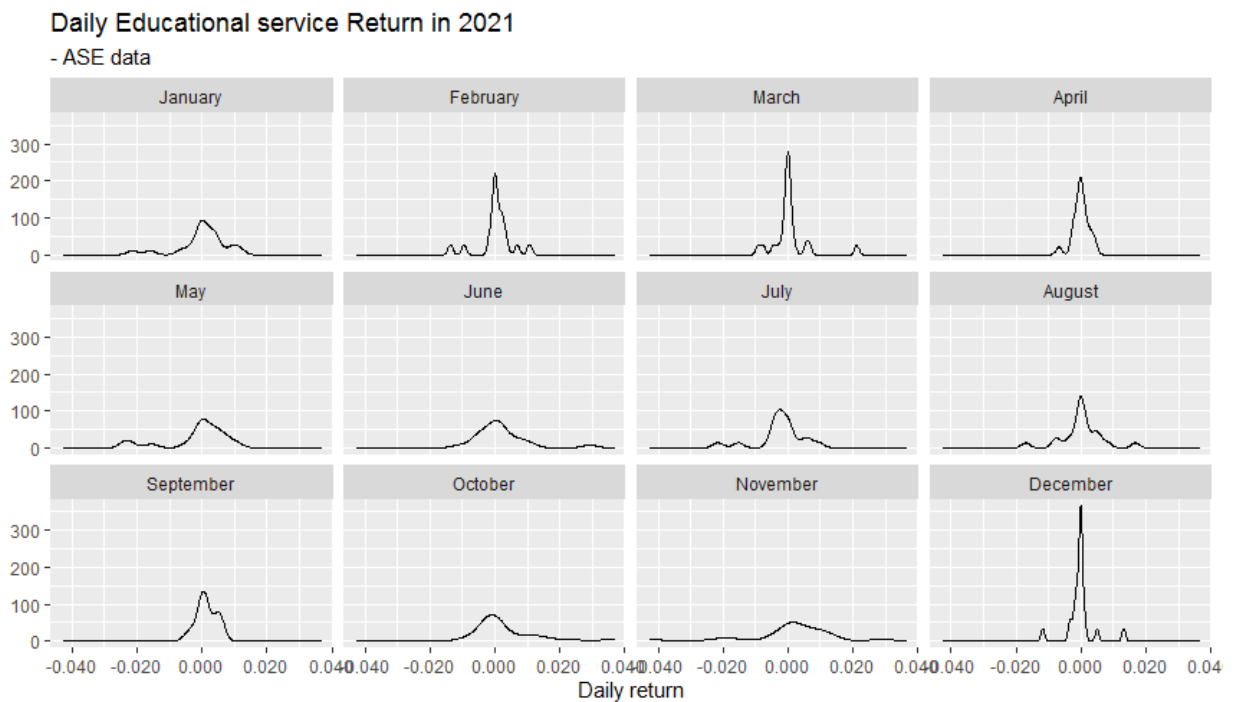Figure 6: Daily Education service return in 2020

Figure 7: Daily Education service return in 2021

From the above plots, it is difficult to find a pattern over months showing a significant contribution to the daily returns. So the most general group measure (that satisfiesFisher's characteristics of good estimate), the monthly average is used to assess the monthly effect on returns of both the indices.

The average monthly return of the ASE Educational services index is calculated over the period of study and is shown in the following figures
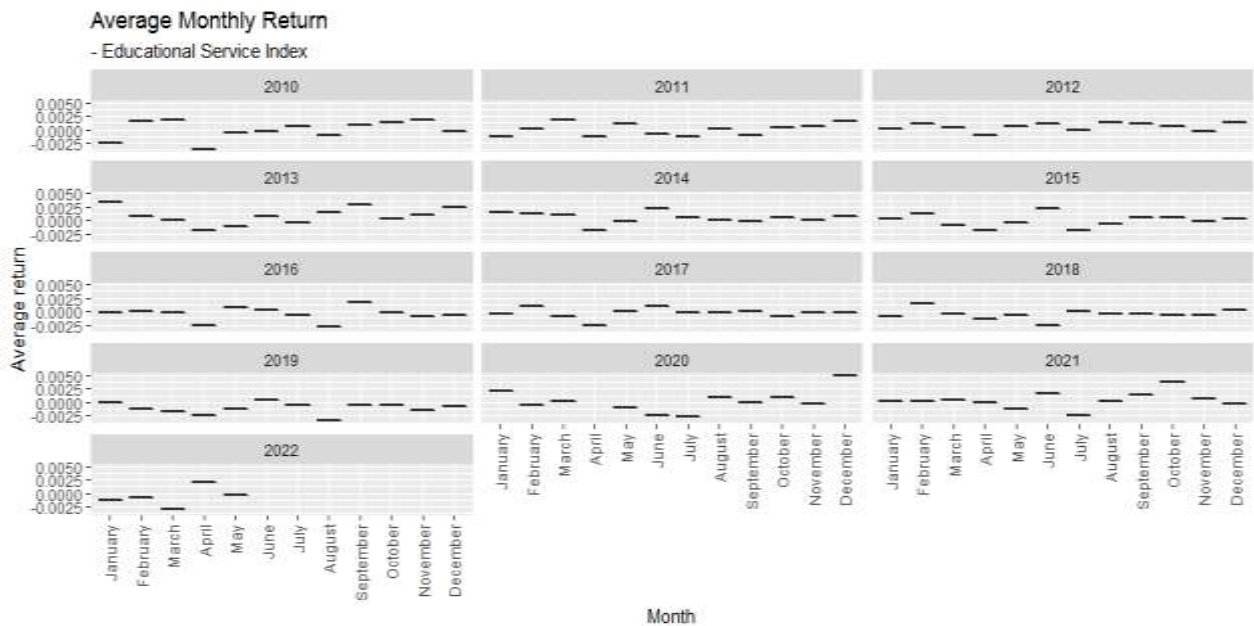

Figure 8: Average monthly return

From the above plot it is observed that in the month of April, there is a declining trend in average return during almost all years except in 2021 and 2022. Also, the return distribution in the June-July months shows a consistent performance throughout the period of study. Furthermore, February, March, and December months witness a high average return in the period of study. The significance of these observed patterns will be analyzed further for confirmation.

To confirm this and identify the Months/Months that affect the return, further inferential statistical models are used. The following hypothesis is formulated to achieve this broad objective [16]:

H_0 : (Null Hypothesis): There is no month-of-the-year effect in ASE educational service index.
H_1:(Alternate hypothesis): There is the month-of-the-year effect in ASE educational service index.

The presence of unit root is tested with the unit root test and confirmed with the KPSS test on ASE general returns. The stationary of the return is tested with the ADF test [6] [21]. The following table shows the results of these tests.

Tests on un-weighted index

Index	Test	Test Statistics	p-value	Status
ASE Educational service index	ADF test	13.978	0.07	Reject H_0
	PP-test	12.832	0.03	Reject H_0
	KPPS-test	0.4737	0.017	Can't reject H_0

Tests on monthly return

Index	Test	Test Statistics	p-value	Status
ASE Educational service index	ADF test	-24.1474	0.01	Reject H_0
	PP-test	-33.101	0.01	Reject H_0
	KPPS-test	0.3912	0.10	Can't reject H_0

Table 1: Results of ADF test

P-values of ADF and PP tests [12] in closing prices are greater than 0.01. So the null hypothesis –the series has a unit root can't be rejected. Also, the p-value of the KPPS test on closing prices is not 0.01. So the null hypothesis- series is stationary can't be rejected. A similar interpretation can be applied to monthly average returns.

In a conclusion, closing prices of the ASE educational service index do have a unit root and are stationary. But the monthly return series does not have a unit root and are stationary.

The expressive statistics of the monthly returns of the ASE general index are shown in the following figure.

Series: ASE Educational Service Index

Samples: 3035 April:2012 March

Observations: 132

Mean:0.0

Median:0.0

SD:0.007

Maximum:0.046

Minimum:-0.047

Range:0.093

MAD:0.003

Skewness:-0.098

Kurtosis:2.78

Jarque-Bera:237.2

Probability:0.0
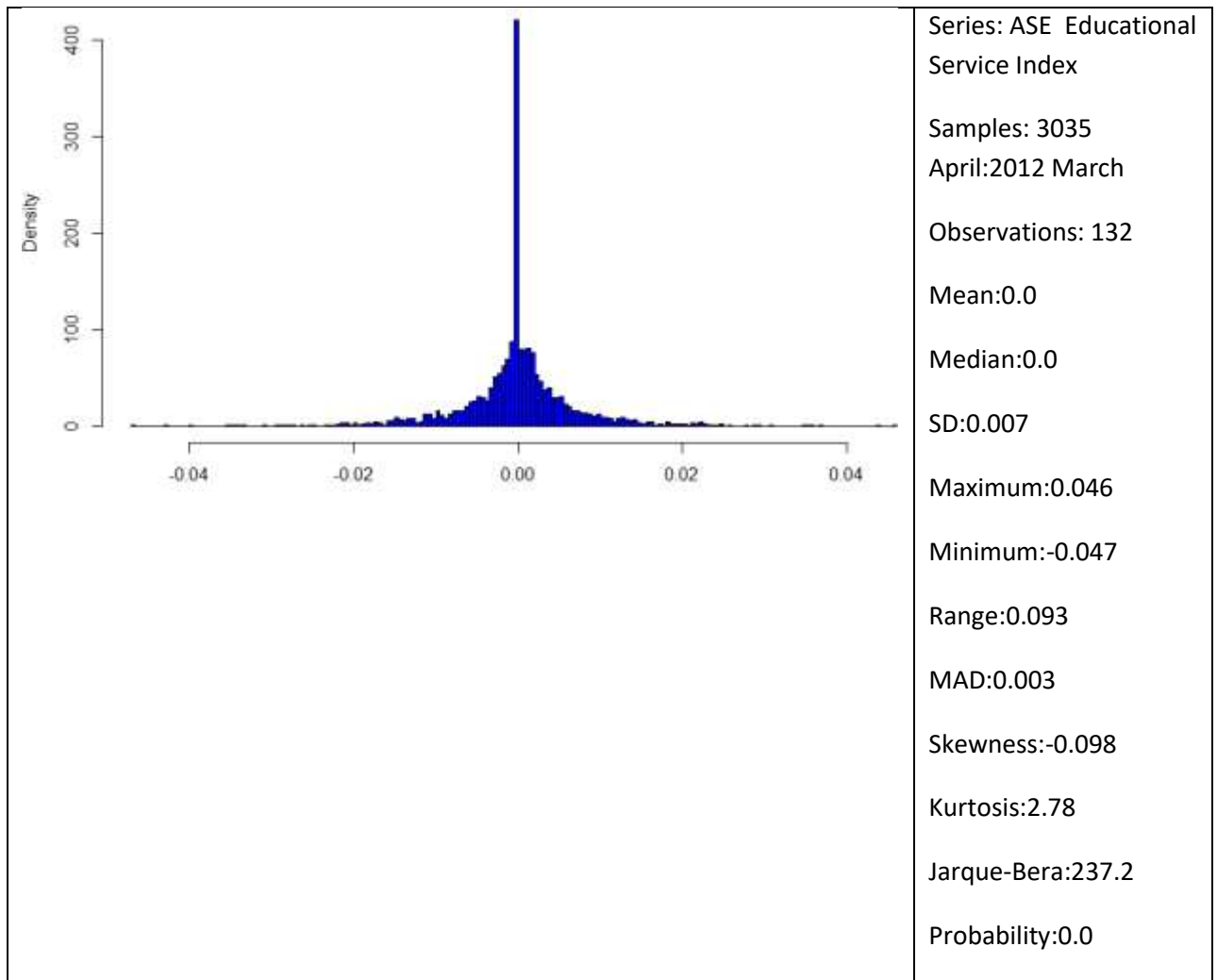
Figure 9: The descriptive statistics of the monthly returns of the ASE general index

From the figures, is analyzed that descriptive statistics of monthly returns of ASE general index return provide a kurtosis of 4.78.Subsequently the value is larger than 3, the series returns leptokurtic.

Kurtosis means the probability of the stock prices fluctuating remarkably and this is remarkably important from stockholders' viewpoint. By looking at the distribution and volatility of the prices the distribution shape elucidates whether the stocks are pricing risky assets. From the results, it is evident that the substantial dissimilarities in daily prices are more evident than those assessed by the normal distribution. The leptokurtic distribution [13], representative of the extreme positive kurtosis, recommends that risk-seeking stakeholders

practice fluctuations causing in significantly high or low revenues. Occasionally, when returns are very high the investors make maximum profits. Eventually they also suffer losses when the returns are low.

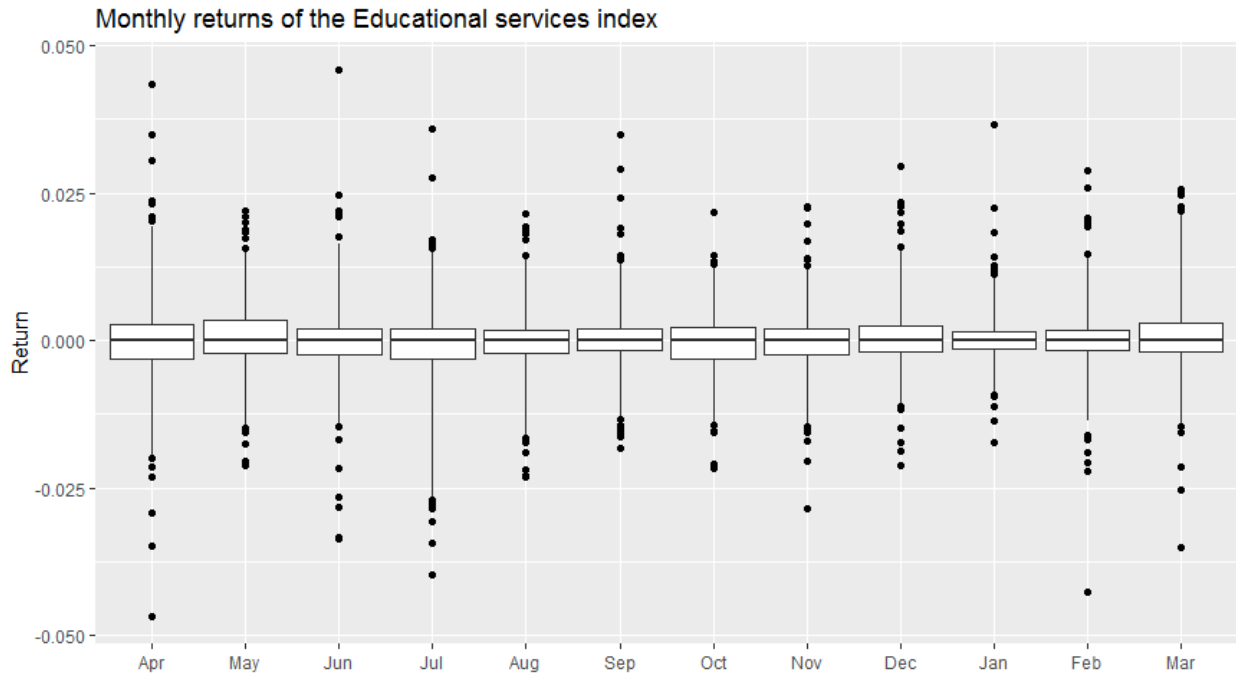**Month effect in Jordan Market Educational Service Index**

Figure 10: Monthly return of the educational service index

In the above-given box plot graph [24] our 10 years of data is classified as monthly. Each box indicates a five-point (minimum, maximum, mean, median, and inter-quartile range) summary. The dots are called outliers, our layers are exceptional data. The dots above the box are higher values and below the box are lower values. The presence of outliers decreases the accuracy of prediction. If outliers are present report them and remove them before the remaining analysis.

In the above graph, some month's boxes have larger widths, which shows more variability. To check the significance of this variability we use the Kruskal-Wallis scram sum test [7].

The result of statistical tests on the significance of the monthly difference is given below:

K-W Chi square	df	p-value
12.532	11	0.042
Source: ASE educational service data		

Table 2: The result of statistical tests on the significance of monthly difference

So there is significant evidence for the month of the year effect on ASE educational service return.
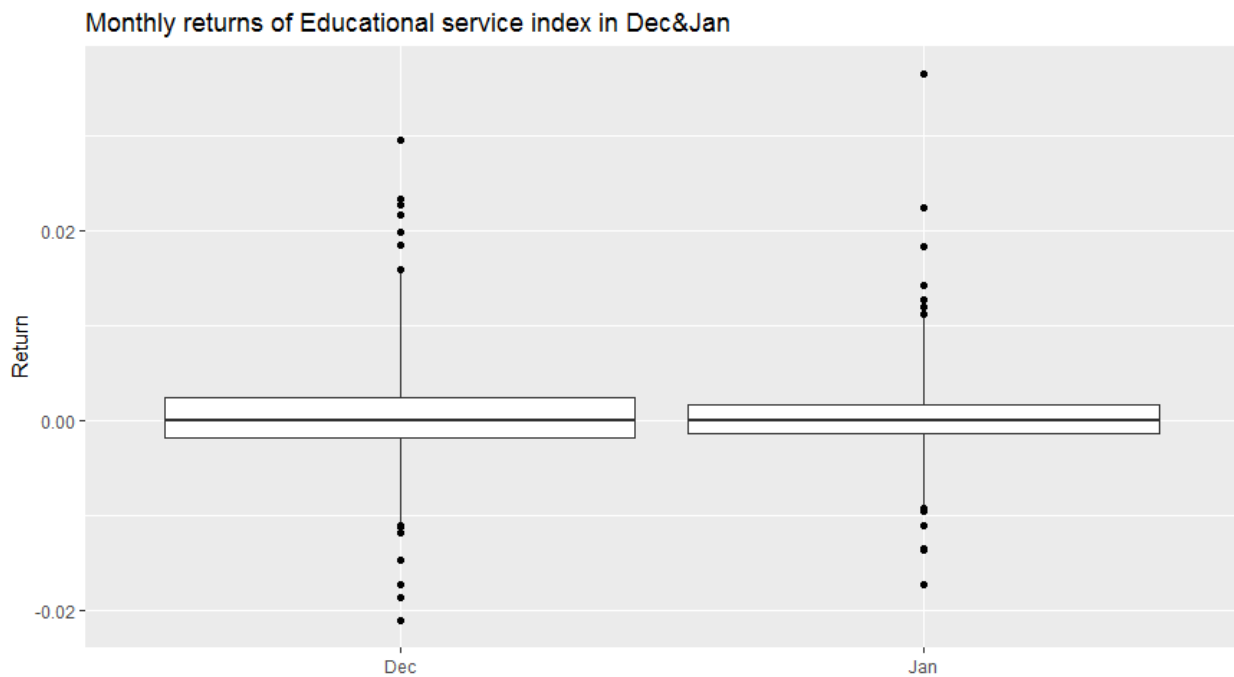
Figure 11: Monthly returns of educational service index in Dec & Jan

t-value	df	p-value
0.945	469	0.9248
Source: ASE data		

Since the p-value is greater than 0.05, the null hypothesis is that the mean difference in return over the specified months is not significant. So there is no statistical evidence to conclude that the January effect is significant in ASE educational service index return.

A quantitative model to confirm these insights from the summary analysis is formulated using dummy variable regression after removing the outliers from the cleaned daily return data. The twelve months are taken as input variables and daily return is taken as output variables. If the p-value is lesser than 0.05 then that month has an impact.

Variable	beta	Std.Error	t-value	p-value
January	0.000472	0.00062	0.761544	0.446392
February	-1.57E-05	0.000628	-0.02504	0.980028
March	0.000787	0.00062	1.27013	0.204136
April	6.06E-06	0.000431	0.014068	0.988777
May	0.000447	0.000614	0.728056	0.466636
June	-0.00011	0.000604	-0.17373	0.862088
July	0.00154	0.00062	-2.49041	0.012813**
August	-0.0003	0.000616	-0.47881	0.632111
September	0.000299	0.000623	0.480016	0.631251
October	-0.0007	0.00062	-1.13673	0.255741
November	-0.00039	0.000624	-0.62032	0.535092
December	0.00052	0.000626	0.831	0.406039

So the dummy variable regression model on daily return can be written as:

$$\begin{aligned}
R_t = {} & 0.000472(\text{Jan}) - 0.000015(\text{Feb}) + 0.000787(\text{Mar}) \\
& + 0.00006(\text{Apr}) + 0.00047(\text{May}) \\
& - 0.00011(\text{Jun}) + 0.00154\text{Jul} \\
& - 0.0003(\text{Aug}) + 0.000299(\text{Sept}) \\
& - 0.0007(\text{Oct}) - 0.00039(\text{Nov}) \\
& + 0.00052(\text{Dec}) \ldots \ldots \ldots (1)
\end{aligned}$$

It can be seen in the above table that July is the only month whose dummy variable coefficient is statistically significant at both 5 level of significance. The coefficient of July is positive which means it has a positive impact. The regression equation (1) as a whole is significant at a 5% level of significance with the calculated F statistic value at 2.062 with an observed

significance level of 0.0199 and the R^2 (multiple) is 0.048. So the presence of July effect on ASE educational return over the period of study can be inferred.

Performance of Educational Service Index during Covid 19 Period

The ASE educational service index from January 2019 to March 2022 is shown in the following Figure
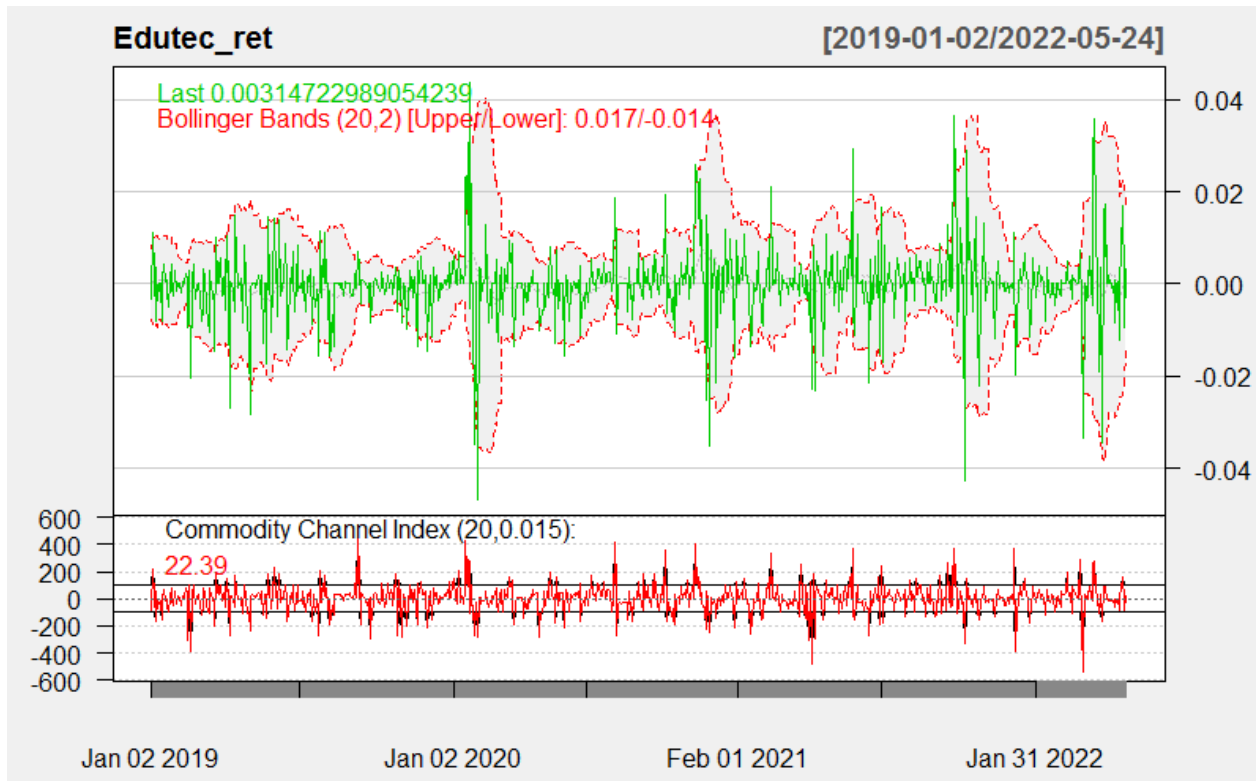

Figure 12: The ASE educational service index from January 2019 to March 2022

The green line in the above figure shows the variation in the index. January 2020 has a high peak value. February 2021 also shows variation after the small changes the start of January 2022 has a high chance. After analyzing the above figure we can find that before 2020 January the intensity of variation is small. That indicates that there is an impact of covid 19 on educational services.

Here we can see two terms Bollinger band and Commodity Channel Index. Bollinger Bands is a tool used to decide entry and exit points for a trade. The bands are used to find out overbought and oversold conditions [8]. The Commodity Channel Index (CCI) is a technical indicator. This is

premeditated by defining the variance between the mean price of a security and the average of the means over the period chosen and this change is equated to the average variance over the period of time [9].

The average return of the educational service index during this time period is shown in the following table.

Month	Year	Average return
January	2019	-0.00014
February	2019	-0.00129
March	2019	-0.00176
April	2019	-0.00233
May	2019	-0.00126
June	2019	0.00037
July	2019	-0.00056
August	2019	-0.00326
September	2019	-0.00051
October	2019	-0.00053
November	2019	-0.00141
December	2019	-0.00081
January	2020	0.002
February	2020	-0.00057
March	2020	0.000268
May	2020	-0.00094
June	2020	-0.00239
July	2020	-0.00269
August	2020	0.000895
September	2020	-8.12E-05
October	2020	0.000901
November	2020	-0.00028
December	2020	0.004924
January	2021	0.00014
February	2021	0.000239
March	2021	0.000421
April	2021	-4.74E-05
May	2021	-0.00133
June	2021	0.00164
July	2021	-0.0024
August	2021	0.000217
September	2021	0.00142
October	2021	0.00385
November	2021	0.000767
December	2021	-0.00029
January	2022	-0.00119
February	2022	-0.0009
March	2022	-0.00284
April	2022	0.002131
May	2022	-0.00023

Table 3: The average return of the educational service index during this time period (2019-2022)

In table 3 is takenthe average return of every month from the year 2019 to 2022.

In 2019 the value of the average return is negative. From 2020 for some months like   August, October give a positive return. In Jordan's first covid 19 cases were reported on 2020 March 2 [14] and the schools were suspended on 2020 March 15. From this, we can understand that covid 19 makes an impact onthe Educational service market.

From table 3 it is clear that there are better seasonal (related to reopening of educational institutions, examination period, etc.,) returns during the post-Covid 19 period.

Conclusions

From the technical analysis of the time series data of the ASE educational services index shows consistently high values, compared to the ASE general index. Moreover, the only calendar anomaly detected on this index is the July effect. During post Covid period, the index shows signs of positive seasonal mean return.

After covid 19 the demand for Educational apps increased. These apps are very useful for education. In the coming years, the EdTech industry will witness consistent growth with various solutions addressing different segments of the Jordan education sector. Therefore creating more informed, well-versed, and skill-based youth, making the country a global talent pool.

References

1. UNICEF Jordan COVID-19 Education Response. (September 2020). UNICEF for every child. https://www.unicef.org/jordan/media/3436/file/COVID19%20Education%20Response.pdf
2. Wajih Owais and Min Jeong Kim, Reimagining the future of education in Jordan, The Jordan Times, Published Jan 23, 2022.
3. Education Technology: What Is Edtech? A Guide. https://builtin.com/edtech
4. EdTech Startups in Amman. (March 29, 2022). https://tracxn.com/explore/EdTech-Startups-in-Amman
5. Aman Malik, Jordan ed-tech startup Edunation nabs $3 mn for MENA.(June28. 2021). The Capital Quest, https://thecapitalquest.com/2021/06/28/jordan-ed-tech-startup-edunation-mops-up-3-mn-for-mena-expansion/
6. Stationarity and detrending (ADF/KPSS).

https://www.statsmodels.org/devel/examples/notebooks/gen
erated/stationarity_detrending_adf_kpss.html

7. Kruskal–Wallis one-way analysis of variance. Wikipedia.
https://en.wikipedia.org/wiki/Kruskal%E2%80%93Wallis_one-
way_analysis_of_variance

8. Adam Hayes, Bollinger Band. (July 10, 2022).
https://www.investopedia.com/terms/b/bollingerbands.asp

9. Cory Mitchell, Commodity Channel Index (CCI). (May 25, 2022).
https://www.investopedia.com/terms/c/commoditychannelin
dex.asp

10. Coronavirus global health emergency.
https://www.un.org/en/coronavirus

11. Education During Emergency Plan (EDEP) 2020/2022.
https://education4resilience.iiep.unesco.org/index.php/resour
ces/2020/education-during-emergency-plan-edep-20202022

12. Phillips–Perron test. Wikipedia.
https://en.wikipedia.org/wiki/Phillips%E2%80%93Perron_test

13. Adam Hayes, Leptokurtic Distributions.
https://www.investopedia.com/terms/l/leptokurtic.asp

14. Jordan: First COVID-19 case confirmed March 2 /update 2. (03
MAR 2020).
https://crisis24.garda.com/alerts/2020/03/jordan-first-covid-
19-case-confirmed-march-2-update-2

15. Economy of Jordan.
https://www.britannica.com/place/Jordan/Economy

16. Shaun Turney. Null & Alternative Hypotheses | Definitions,
Templates & Examples. (May 6, 2022).
https://www.scribbr.com/statistics/null-and-alternative-
hypotheses/

17. Coronavirus: the economic impact.
https://www.unido.org/stories/coronavirus-economic-impact-
10-july-2020

18. The global education crisis is even worse than we thought.
Here's what needs to happen, Education, skills and learning.
(January 16, 2022).
https://www.weforum.org/agenda/2022/01/global-education-
crisis-children-students-covid19/

19. COVID-19 Brief: Impact on the Economies of Low-Income
Countries.
https://www.usglc.org/coronavirus/economies-of-developing-
countries/

20. Jordan based edtech startup Hello World Kids raises an
Undisclosed amount in Pre-Series A round. (December 27,
2022).
https://www.vcbay.news/2021/12/27/jordan-based-edtech-
startup-hello-world-kids-raises-an-undisclosed-amount-in-pre-
series-a-round/

21. Selva Prabhakaran. KPSS Test for Stationarity.
https://www.machinelearningplus.com/author/selva86/

22. Government of Jordan announces new measures to address COVID-19 outbreak. https://www.netherlandsandyou.nl/latest-news/news/2020/03/14/new-measures-covid19-jordan

23. Learn R Programming simply easy learning. https://www.tutorialspoint.com/r/index.htm

24. Box plot. Wikipedia. https://en.wikipedia.org/wiki/Box_plot