

## Reviewer 1 – FIT2083 teaching staff. Alan Dorin.

30590566      ARIE MARK      HENDRIKSE      Using the Beta Coefficient to analyse how the volatility between different GICS sectors within the S&P500 changed during the COVID-19 pandemic from the same time last year.

TITLE: See if you can simplify your title (and avoid using "same time last year" which isn't helpful to readers in 5 years, for example.)

ABSTRACT: As for the title, be specific about time periods so that the paper can be interpreted when readers consult it several years from now. In abstracts, avoid use of "I" and refer instead to "this paper" or "this research", or "the research in this paper...". Please only capitalise proper nouns (gold, not Gold) but, if you wish to capitalise stocks for clarity you may do this as long as you do it consistently or use italics. Please read your sentences aloud (here and throughout). This will help you pick up awkward phrasing.

INTROD: Please define B-coeff. for your readers from other disciplines. and/or provide a reference early on (rather than later). The first 4 or 5 lines under "How will this help the public?" aren't easily related by the reader to what has come before. Can the link be made more explicit? Please do make it clear that your stats here are all from USA (right?). They may not be reflective of our own Australian conditions. Lastly, please add a sentence at the end of this section outlining the remaining sections of the paper.

ResQuestion: You have improved some parts of the original research question, but unfortunately the "same time last year" text makes the question less clear than it was in some regards also.

Method: Good work.

Results: Good figures, well done. I especially like Fig. 4. Can you shift the x-axis labels down slightly to avoid the overlap with the negative 2019 figures? Please label the y-axes.

Discussion: In your discussion you mention some stocks specifically. These are (very) hard to find in the x-axis of the figure. Can you help the reader to locate them somehow? E.g. use colour coding, arrows in the digrams, or some textual info. to help the reader find them. \* You mention a specific 9-week period in this section, but that is the first time (I can see) that the period is mentioned. Why not bring this to the top of your study to be specific about when it was conducted and with which data?

Conclusion: What do you mean by "The standard deviation of change was 0.4609, but only for a portion of industries"? The std. dev. is calculated across the board for all of your data set isn't it? Please can you explain this remark (or fix it)? Both here and in the Discussion, can you convert your findings into a specific and "actionable" recommendation?

Bibliography: Please provide all required Bibliographic info. to allow a reader to locate a reference e.g. Albulescu - is this a book? web page, report...? (include URLs, date of access, publisher, page numbers etc.) Please see hyperlink in assignment specification for details. There's no need for ALL-CAPS titles unless required by the standard entry format. Overall, Bibliography is good.

Overall - a very good job!

## Reviewer 2 – Student Feedback. Amit Harim.

### > ENTER THE PAPER'S TITLE AND THE AUTHOR'S NAME

Using the Beta Coefficient to analyse how the volatility between different GICS sectors within the S&P500 changed during the COVID-19 pandemic from the same time last year.

Author: Arie Hendrikse

### > RESTATE THE PAPER'S AIMS AND MAIN FINDING IN YOUR OWN WORDS (IN JUST A FEW SENTENCES)

The paper investigated how the volatility of stocks was influenced by the COVID-19 pandemic. It found that most industries experienced increased volatility in their values compared to previous years. It also provides some explanation for the change in volatility in a number of industries.

> **SIGNIFICANCE OF THE PROBLEM** [3] How important is this problem for the world? For the intended beneficiaries? Justify your score here. What could be improved?

The change in stock volatility is certainly an important measure for investors and policy makers to be aware of, especially following the COVID-19 crisis. It is an important problem and can certainly help policy makers and investors by adding another metric for them to consider. It could be more useful by selecting a different target audience though. For example, low volatility might be useful for pensioners who want stability or young workers who prefer a less risky alternative. Adding a short section about investment with low volatility and mentioning these beneficiaries in the section would make these results more applicable to real life.

#### > ACHIEVEMENT OF STATED OBJECTIVE [3]

Does the paper clearly establish its main point (problem, issue etc.), stay focused and deliver on this objective? Is the research question stated *and answered* by this paper? Justify your score here. What could be improved?

The paper consistently focuses on the change in volatility in industries as a result of the COVID-19 pandemic. The method clearly explains the usefulness of the beta coefficient in determining this difference in volatility and calculates it before and after the crisis. However, in the discussion section it deviates from the objective and instead explores the current volatility of industries (with the exception of gold which was said to have previously been a “safe haven”). While this is still relevant to the topic, it would be better to state the volatility of industries before the crisis too for each of the discussion paragraphs. Currently, it still effectively answers the research question through the results and in the conclusion.

#### > WRITING AND GRAPHICAL QUALITY [4] How good are the organisation, sentence structure, figures, tables, spelling and clarity of this paper? Justify your score here. What could be improved?

The paper is logically organised and sentences were easy to follow. The figures included in the method and results section are visually appealing and enhance the article. For the method graphs there could be two improvements. Firstly, the diagram displaying all real estate stocks is a bit crowded and would be better if only 4 or 5 representative stocks were displayed instead. Also, extending the timeframe of these three graphs or displaying the corresponding trends a year earlier would help readers to visually see the difference in the trends. This paper is mostly clear. However, it would benefit from having a background information section in the introduction where you give a brief explanation for the important terms in the paper, such as volatility, adjusted closing price and GIC. This will clarify the rest of the paper, especially to readers who do not have a background in economics. Another suggested change would be to write the paper in third person rather than first person, following general practice. Several sentences in the abstract, introduction and method will need to be modified. Also, underneath figure 4 the author writes about the date range and pricing range for figure 3 but it should say figure 4.

#### > REPLICABILITY [4] Is the method explained clearly enough that you could repeat the study yourself? Are the parameters, algorithms and processes explained? Justify your score here. What could be improved?

The method is generally explained well and could be replicated. The method for calculating the beta index is clearly stated so it could be similarly used for a future event. However, it would be useful to explicitly state the starting and ending date for the closing prices for the stocks to ensure that this data can be retrieved in a repeated experiment. An alternative would be to add a link to the scraped data in the bibliography. Furthermore, adding a reference to an explanation for generating an “ordinary least squares regression model” will make this part more concrete.

#### > TECHNICAL SOUNDNESS [3] Is the paper technically well developed? If experimental results are described, are the results investigated statistically? Justify your score here. What could be improved?

The technical side of this paper is logically developed, with concepts built upon through the method up to formula for calculating the beta coefficient. The results are not supported by rigorous statistical analysis, however they are backed both by intuitive explanations and some supporting figures and claims. It would be helpful to use a chi square test on the volatility data, as this would provide more statistical support to reject  $H_0$  and consolidate the paper.

#### > OVERALL QUALITY AND COMMENTS FOR AUTHORS [3] Overall, how do you feel about this paper? Is it ready for publication and presentation at our unit mini-conference? Or is more work required? Justify your score here. What could be improved? Also, detail here any specific suggestions for improvement of typographical errors, ambiguous sentences or general comments on the paper.

This paper is ready for publication with minor modifications. The main suggested edits have already been mentioned above for each review section. The paper uses a clear method and logical reasoning to determine that the COVID-19 increased the volatility in stock values. I could not find any major logical flaws in the methodology, but additional statistical analysis (chi square test) would consolidate the findings. Therefore, most of the issues mentioned in this review are with the presentation of the findings

and can be realistically fixed before the conference date. A small modification to the last sentence of the results to say “the null hypothesis can be rejected” rather than “disproving the null hypothesis” would be more accurate. Overall, this is a convincing paper about an interesting and relevant issue.

## To Reviewer 1.

R1 #1. *‘As for the title, be specific about time periods so that the paper can be interpreted when readers consult it several years from now.’*

Thank you to the reviewer for this suggestion, I agree I need to specify the year. This oversight was made as I did not consider that COVID-19 could well and truly still be affecting markets in 2021. I have changed the title to offer more clarity, as well as the question. On top of this, I have also specified in the title that it is a preliminary view as to allow future readers to further understand that the research was conducted at a time when the events were still developing. Furthermore, I have moved the definition of what GICS is from the method to the introduction for the same reason.

R1 #2 *‘avoid use of "I" and refer instead to "this paper" or "this research", or "the research in this paper..."’*

Thank you for bringing this to light. I was not aware that this was standard in research, and therefore this feedback is much appreciated as it will improve my future papers from here on out. As suggested, I have removed all personal pronouns from the paper, unless in the method section.

R1 #3 *‘INTROD: Please define B-coeff. for your readers from other disciplines. and/or provide a reference early on (rather than later). The first 4 or 5 lines under "How will this help the public?" aren't easily related by the reader to what has come before. Can the link be made more explicit?’*

I have moved the definition of the Beta Coefficient to the introduction before it is mentioned. This is a great idea and I agree that it helps those without a statistical background make more sense of what comes next. I have also omitted it from the title as it is not yet defined, this also helps your previous feedback to simplify the title.

R1 #4 *‘ Please do make it clear that your stats here are all from USA (right?). They may not be reflective of our own Australian conditions’*

At first I thought this would necessary to mention, yet the NASDAQ does not contain only USA based companies and a lot of the US companies operate overseas. I understand that a majority are from the USA but with the page limit there wasn't enough space to specify each country. As the S&P500 of the NASDAQ was stated, it is already outlined what market the paper is focusing on. I have assumed that the reader understands what countries the NASDAQ as well as S&P500 refer to, and a reference is made to a list of the stocks used.

That being said, I have added a reminder that the NASDAQ may not reflect Australian conditions, thanks to the reviewer for pointing this out.

R1 #5 *‘Lastly, please add a sentence at the end of this section outlining the remaining sections of the paper.’*

Thank you for reminding me to outline the remainder of the paper. I was not aware of this standard so once again the sharing of the reviewers' expertise is greatly appreciated. I have added this to the end of the introduction.

R1 #6 *‘Can you shift the x-axis labels down slightly to avoid the overlap with the negative 2019 figures? Please label the y-axes.’*

I agree that the Fig.4 x-axis labels should be shifted down for better readability. I have shifted the x-labels down where needed which has helped a lot! I have added a y-axis label to Fig.4 as suggested and I agree this helps with navigation of the graph. Furthermore, I added an x-axis label.

R1 #7 *‘Discussion: In your discussion you mention some stocks specifically. These are (very) hard to find in the x-axis of the figure. Can you help the reader to locate them somehow?’*

I mentioned some particular stocks in the discussion as an example of how future researchers could use the information and I feel that adding arrows or pointing out particular industries would make the graph confusing if people wanted to use it on future research regarding a single industry that may not have been talked about. I feel adding pointers to industries that are subjectively interesting to me doesn't allow for a clear representation of the results to other people who may be looking for something else. Particular graphs for each industry could have been added to the discussion, unfortunately there was not enough space. I understand these results may be hard to find if you were using the study for the particular discussion points I made; however,

those discussion points will only help a select few in their purpose for reading the study. I hope you can understand my reasoning and can see how pointers would be useful for my discussion but limits the results for a variety of other uses.

R1 #8 *'You mention a specific 9-week period in this section, but that is the first time (I can see) that the period is mentioned. Why not bring this to the top of your study to be specific about when it was conducted and with which data?'*

This is a great point. Originally I had the reasoning included as to why my data took this time-frame but during cutting parts out to reach the page limit I must have either accidentally removed it or thought of it as not important at the time. I have amended the paper to include this in the introduction. This period was chosen due to that being the first date of lockdown on any S&P500 stocks headquarter location.

R1 #9 *'Conclusion: What do you mean by "The standard deviation of change was 0.4609, but only for a portion of industries"? The std. dev. is calculated across the board for all of your data set isn't it? Please can you explain this remark (or fix it)? Both here and in the Discussion'*

This was a typing error on my behalf, originally the conclusion was supposed to go along the lines of "The volatility has changed, but only for a portion of industries" yet I reduced it due to the page limit requirement. The sd was calculated across all delta B-coeff so the results are still statistically sound. Thank you for pointing this out as it might have given doubt to the credibility of the study or expertise of me, the author. I have changed the conclusion to add the part that was accidentally cut out. I have removed the standard deviation all together as to make room for other changes in this review. It is still present in the results, however.

R1 #10 *'can you convert your findings into a specific and "actionable" recommendation?'*

I would love to be able to give some sort of financial recommendation! However, as my knowledge of macro-economics is still somewhat immature it would be irresponsible, and possibly dangerous for me to provide advice to policy makers or investors. I am hoping that someone with more expertise would be able to use these findings to then provide recommendations. As a researcher it would give me a slight feeling of imposter syndrome to pretend to know a solution or provide recommendations on topics that I have little expertise in, as some may then use that advice thinking I know what I am talking about with that regard. Your suggestion has helped made me realise I should add a recommendation that more research be done into why the markets are behaving in this way. This can be seen at the end of the conclusion.

R1 #11 *'Bibliography: Please provide all required Bibliographic info. to allow a reader to locate a reference e.g. Albulescu - is this a book? web page, report...? (include URLs, date of access, publisher, page numbers etc.) Please see hyperlink in assignment specification for details. There's no need for ALL-CAPS titles unless required by the standard entry format.'*

I have added hyperlinks for all citations I did not find in journals. Thank you for bringing this up as I did not know this was needed. I have also removed capitalisation from citations as suggested and I agree this makes it look a lot cleaner and less like I'm yelling at the reader. Furthermore, I have edited the citations to follow the recommended format and be more consistent with one another (i.e 'available at' and 'retrieved from' were previously both used) I have also added page numbers for journals where missing. As per the reviewer's suggestions I added access dates to websites by going through my browser history and adding the timestamp for my visits.

## **To Reviewer 2.**

R2 #1 *'While this is still relevant to the topic, it would be better to state the volatility of industries before the crisis too for each of the discussion paragraphs'*

I agree more should be said regarding 2019 for each topic. I have edited paragraphs 1,2,3 and 4 of the discussion section to either mention last year or to more directly show a comparison between 2019 and 2020. I have highlighted some of these changes in blue. Thank you for pointing this out! I think this is important enough that I have trimmed part of the discussion asking for more research into particular behaviour as this has now been added to the conclusion as per other reviewers' recommendations.

R2 #2 *'An alternative would be to add a link to the scraped data in the bibliography'*

I can see you have left a comment on the review acknowledging that you missed the citation. I have left this the same.

R2 #3 *'Firstly, the diagram displaying all real estate stocks is a bit crowded and would be better if only 4 or 5 representative stocks were displayed instead.'*

I can agree that this is super crowded! However, the diagram showing all of the real estate stocks is supposed to be this way as to illustrate to the reader how I have converted the complicated data into its' mean to make it simpler to work with.

R2 #4 *'extending the timeframe of these three graphs or displaying the corresponding trends a year earlier would help readers to visually see the difference in the trends'*

I agree that a year earlier could have been displayed, however my purpose for these graphs was to show how I calculated the volatility of an industry, and to illustrate the movement of the industry with regards to the rest of the market. As the study does not focus on the returns of an industry but rather the volatility of the industry, comparing the daily return on a side by side graph would perhaps confuse the reader into thinking the paper is about comparing returns with years prior. As the beta coefficient is a single number over a period of time the best way to graph this for a comparison would be a bar graph. I thank you for this feedback however as it brings to light that I am not explaining the graphs clearly enough. So, I have rewritten some parts to make this more concise.

R2 #5 *'However, it would benefit from having a background information section in the introduction where you give a brief explanation for the important terms in the paper, such as volatility, adjusted closing price and GIC.'*

This has resonated with me and I wholeheartedly agree. The reader may be left confused during the introduction, so I have moved all of my definitions from the method into the introduction as suggested. It is extremely helpful that you noticed this, so thank you!

R2 #6 *'Furthermore, adding a reference to an explanation for generating an "ordinary least squares regression model" will make this part more concrete.'*

I have followed this suggestion by referencing some notes on OLS from a Stanford statistics class. It is way too complex for me to explain in the paper so I hope that the brief formula coupled with the reference can help readers to dive deeper into the statistics if they wish to do so. There is a lot of readily made software for calculating the beta that accurately use an OLS including the built in regression python module, therefore a full understanding won't be needed to replicate the study. Only an understanding of what it means.

R2 #7 *'Another suggested change would be to write the paper in third person rather than first person, following general practice. Several sentences in the abstract, introduction and method will need to be modified.'*

I have changed the entire paper to not speak in first person. This was an oversight on my behalf following the template that was given and I wasn't aware of this practice. I will take this on board, and it will continue to influence my research positively for the rest of my career, thank you for teaching me something new!

R2 #8 *'underneath figure 4 the author writes about the date range and pricing range for figure 3 but it should say figure 4.'*

I compliment the reviewer's sharp eye in finding this mistake. I have edited the caption under Figure 4 as suggested.

R2 #9 *'It would be helpful to use a chi square test on the volatility data, as this would provide more statistical support to reject  $H_0$  and consolidate the paper.'*

This suggestion was attempted by using the calculation  $\text{SUM}((2019-2020)^2)/2019$  for each industry, but I arrived at a Chi-squared value of -27 which doesn't make a lot of sense. I believe this is due to my data being numerical and already taking using some regression analysis. The expected value is therefore sometimes negative which after speaking with some colleagues who are more verbose on statistics, doesn't make a lot of sense to use in chi-squared. I believe my expertise regarding chi-squared isn't strong enough to be able to form meaningful quantitative data and draw conclusions from it. I apologise to the reviewer and hope they can understand I did my best to implement this. If the reviewer has time to spare it would be appreciated if he could follow up with me and further elaborate on how this test could be implemented over this work. If not I would hope that future researchers or analysts would be able to use this data to come to a chi-squared conclusion.

R2 #10 *'A small modification to the last sentence of the results to say "the null hypothesis can be rejected" rather than "disproving the null hypothesis" would be more accurate.'*

This has been changed and does make it sound a lot more professional. Thank you for this feedback.