Proof of Concept (Team A)

APAN 5900 Solving Real World Problems with Analytics

Predicting the Financial Risks of Real Estates Owned by REITs Affected by Hurricanes

Team Members: Raven Feng, Zixin Chen,Yicheng Shi, Zilin Zeng, Zehua Rong, Jingshu Yang, Aansh Mehta, Maddie Tremblay, Romauli Butarbutar

1. Clarity of Articulation

1.1 Goals

S&P Global Market Intelligence is a company providing multi-asset class, and real time data, research, news, and analytics to investors, financial institutions, corporations, and universities. This project aims to analyze and predict the financial risks of real estates owned by REITs affected by hurricanes (that made landfall) using data mainly generated from S&P Global Market Intelligence. Furthermore, our group wants to estimate the financial losses of real estates owned by REITs affected by the hurricanes in the future using the insights we gained from the historical data.

1.2 Data Resources

Hurricane Data:

The hurricane data is from the Kossin dataset. This Kossin dataset is from the Proceedings of the National Academy of Sciences (PNAS) official website, which contains 4180 tropical cyclones from 1978 to 2017, and this Kossin dataset records the key information about hurricanes including date, wind speed, longitude, and latitude.

Asset Data:

The real estate net book value data is generated from S&P Global Market Intelligence, which is also known as the S&P Capital IQ Pro platform. Our team extracted the locations and net book value each year of real estates owned by REITs in the U.S.

Macroeconomic Factor:

Considering the possible significant macroeconomic influence, our team collected the inflation rate and GDP change over the period from 1978 to 2017 to mitigate the effect of external macroeconomic factors.

1.3 Research Questions

There are three research questions inspired by the current data exploratory analysis:

What is the relationship between the frequency of hurricanes (that made a landfall) and the real estate book value loss of REITs?

What is the relationship between the wind speed of hurricanes and the real estate book value of REITs?

What is the relationship between the area of the hurricane (longitude & latitude) and the real estate book value change of REITs?

1.4 Methodology

Firstly, our group has planned to relate the hurricane affected area data from the Kossin dataset with the real estate location data from the S&P Capital IQ Pro using latitude and longitude to find the interaction.

Secondly, we determine the companies of REITs that their real estates were hit by the hurricanes as the test group, and the companies of REITs that were not affected by the hurricanes over time as our control group.

Thirdly, we test the net book value change of real estates of the test group and the control group to identify whether the hurricanes have influence on the real estates and if yes, what kind of relationship is between these two events.

Finally, our group plans to use linear regression models to predict the potential future financial risks of real estate owned REITs influenced by the hurricanes to provide our sponsor analytical data and information for their business decisions.

2. Sponsor Sign-off on Success Criteria

2.1 Milestone

Week 5

- Confirmed the metrics used in research questions
- Dig out the methodology

Week 6

- Updated the research questions and methodology
- Added the data modeling and macroeconomic factor slides.

Week 7

- Modified the research questions and added detailed data modeling steps.

Week 8

- Receive the feedback from clients and design the next steps based on it.

2.2 Technical-side Success Criteria

Based on the feedback from our sponsor, we define technical-side success criteria and business-side success criteria. For the technical side, we will explore the hurricanes above category three instead of total hurricane wind speed to find out the relationship between wind speed of hurricanes and the real estate book value of REITs. We should understand how different average wind speeds (category of hurricanes) affect average asset book value using a two-side hypothesis test, then we can find out if it is the null hypothesis or alternative hypothesis and if there is any positive or negative relationship between two key factors.

2.3 Business-side Success Criteria

For the business-side success criteria, our success criteria should be that if we find out the price change of real estates impacted by the hurricanes and explore the correlation between them. We will specifically expand the range including 50 miles from the latitude at the landfall location of the hurricane and track of the hurricane inland for 400 miles. These are the key criteria to evaluate if our research is successful on the business side or not.

3. Research and Methods

3.1 Approaches for each question

3.1.1 What is the relationship between frequency of hurricanes and the real estate book value loss of REITs?

In order to answer this question, we must look at hurricanes as well as real-estate data. For hurricane frequency data we used the International Best Track Archive for Climate Stewardship

(IBTrACS) database which contains information on specific aspects of storms such as landfall location, path, radius, storm speed, and direction. This database is maintained by the National Oceanic and Atmospheric Administration. The real-estate book value data can be found using the S&P Capital IQ platform. This data is provided on a quarterly basis. In addition to the book value the location of the property is also important when comparing to the incidence of a storm in that location. Using these time series, timeline of storms and changes in book value, we will be able to predict the potential financial loss given a specific storm intensity.

3.1.2 What is the relationship between wind speed of a hurricane and the real estate book value of a REIT property?

Similar to the first research question, the wind speed of specific storms or specific areas can be taken from the IBTrACS database. Additionally, we will utilize the methodology outlined in Kossin et al. The Kossin database accounts for more accurate measurement of tropical cyclones and hurricanes due to technological and methodological improvements since the 1950s.

3.1.3 How does a property's location, in terms of latitude and longitude, affect the real estate book value of REITs?

This question seeks to answer how location can impact the severity of potential losses as a result of storms. This would use geospatial data of a storm's path as well as the time period when the storm happened. By adding a time component it is possible to show the relationship between a property's location and how frequently it is in a storm's path.

3.2 Ultimate Benefit to S&P GMI

By showing the severity of potential impact of storms to specific properties investors, government, and other market participants can make better decisions for capital investment and public policy. Showing the relationship between specific aspects of storms such as wind speed could help risk analysts act in real-time to the potential impact of storms in the future.

3.3 Further Analysis and Next Steps

3.3.1 Remaining Analysis

More granular analysis is needed from our team taking the variables and steps outlined in earlier sections. We also need to incorporate the feedback received from our first client presentation on 10/28/21. We received feedback with regards to our sourcing and overall analytical structure. We are in process of organizing our thoughts and actioning on these items

3.3.2 Next Steps

For the remaining weeks our plan is to devote the next week to better organizing our data sets and clearly outlining how we will use Kossin et al and related sources to demonstrate the relationship between storm intensity and real estate book value of REIT properties. Then we will conduct our analysis and synthesize thoughts for the client with the hopes of having our ideas and general direction approved for further analysis. Then finally we will devote one final week to incorporating feedback and adding any additional findings to our earlier analysis.