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DATA ANALYSIS FOR UNDERSTANDING THE IMPACT OF COVID–19 VACCINATIONS ON THE SOCIETY

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Abstract:
In the context of COVID-19 pandemic, the rapid roll-out of a vaccine and the implementation of a worldwide immunization campaign is critical, but its success will depend on the availability of an operational and transparent distribution chain that can be audited by all relevant stakeholders. In this paper, we discuss about data analysis can help in several aspects of COVID-19 vaccination on the society. We present a system in which machine learning technology is used to guaranty data integrity and vaccination, manufacturing and Supply. Defined to monitor and track the proper vaccine distribution conditions against the safe handling rules defined by vaccine producers enabling the awareness.
In this paper author analyzing vaccines dataset to forecast required vaccines compare to manufacturing or available vaccines and by using this forecasting manufacturers may increase and decrease their manufacturing quantity. This forecasting can impact society by taking decision on manufacturing vaccines and if in society more cases occurred then forecasting will be high and by seeing forecasting manufacturers may increase production.
Keywords: Covid-19, Machine Learning, data analysis

1.Introduction

1.1 Objective

This study attempts to understand coronavirus disease 2019 (COVID-19) vaccine demand and hesitancy by assessing the public's vaccination intention and willingness-to-pay (WTP).Confidence in COVID-19 vaccines produced in China and preference for domestically made or foreign-made vaccines was also investigated.

1.2 Origin

[1].The origin of the outbreak of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was initially detected in Wuhan, China in December 2019.
[2].The new coronavirus spread rapidly around the world within a month of its onset. On 11 March 2020, the World Health Organization (WHO) declared COVID-19 a worldwide pandemic. By the end of May, the COVID-19 had infected over 5 million people across 215 countries or territories and caused more than 300,000 fatalities worldwide.
[3].In the absence of a vaccine or effective treatment, all the nations worldwide are struggling to contain the spread of the COVID-19 with the enforcement of quarantine and lockdowns, social distancing measures, community-use of facemasks at all times, and travel restrictions.
[4].These have resulted in the tremendous impairment of physical and psychosocial well-being of people and has driven a massive decline in the global economy.
[5].The multi-faceted catastrophic consequences associated with the COVID-19 outbreak have intensified international efforts in developing an effective prevention method to keep outbreaks under control.
[6].There is an intense international effort in developing a safe and effective COVID-19 vaccine, with an estimate of over 100 candidate vaccines currently in different development stages, and several candidate vaccines already in clinical trials.

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[7].A vaccine against COVID-19 may soon be available for public use; as such, urgent understanding is warranted to investigate the acceptability of a COVID-19 vaccine to prepare for effective promotion strategies.

2. Literature Survey

We commenced a cross-sectional, web-based anonymous survey using an online questionnaire. The survey was conducted from 1–19 May 2020. The research team used WeChat (the most popular social media platform in China) to advertise and circulate the survey link to their network members. Network members were requested to distribute the survey invitation to all their contacts throughout the country. The participants were informed that their participation was voluntary, and consent was implied through their completion of the questionnaire. The inclusion criteria were that the respondents were Chinese citizens who were at least 18 years old, and able to comprehend and read Chinese.

Instruments

The survey consisted of questions that assessed 1) demographic background, self-perceived health status, and COVID-19 experience; 2) perception of COVID-19 and COVID-19 vaccination; 3) intention to receive a COVID-19 vaccine; 4) WTP for a COVID-19 vaccine; and 5) vaccine confidence and preference.

Demographics, health status and COVID-19 experience.

Personal details, including age, gender, ethnicity, religion, marital status, occupation and average monthly household income were collected. The participants were also queried if they had existing chronic diseases and to rate their overall health status. COVID-19 experience assessed whether participants had any family members, or any friends, neighbors or colleagues with confirmed COVID-19.

Perception of COVID-19 and COVID-19 vaccination.

HBM-derived items were used to measure the participants' perception of COVID-19 and COVID-19 vaccination. The questions probed perceived susceptibility to COVID-19 (three items), perceived severity of COVID-19 (three items), perceived benefits of a COVID-19 vaccine (two items), perceived barriers to getting a vaccination against COVID-19 (five items) and cues to action (two items). All the response options were 'strongly agree', 'agree', 'disagree' or 'strongly disagree'.

Intention to receive a COVID-19 vaccine and willingness to pay (WTP).

The intention to accept a COVID-19 vaccine was measured using a one-item question (If a vaccine against COVID-19 was available on the market, would you take it?) on a four-point scale ('definitely not' to 'definitely yes'). WTP was measured using a one-item question (What is the maximum amount you are willing to pay for the COVID-19 vaccine?) on a nine-point scale (CNY¥100/US$14 to CNY¥900/US$125, at a currency ratio of 7:1). The price range
options were based on the approximate minimum-maximum price range of currently available vaccines in China.

Vaccine confidence and preference.

Participants were asked to rate their level of confidence in using 1) domestically-manufactured and 2) foreign-manufactured COVID-19 vaccine on a four-point rating scale ('completely confident', 'confident', 'not confident', and 'completely not confident'). Preference in domestic or foreign/imported COVID-19 vaccine was also queried. The full questionnaire is provided as supplemental material.

Statistical analysis

We ran univariate analyses followed by a multivariable logistic regression analysis, including all factors showing significance ($p<0.05$), to determine factors associated with the definite intention to take the COVID-19 vaccine. Odds ratios (OR), 95% confidence intervals (95% CI) and *p*-values were calculated for each independent variable. The model fit of multivariable logistic regression analysis was assessed using the Hosmer-Lemeshow goodness-of-fit test. The distribution of WTP responses does not follow a normal distribution. The majority of respondents were willing to pay between CNY¥100 and CNY¥400, and a lower proportion reported a WTP of CNY¥500 and above. Hence

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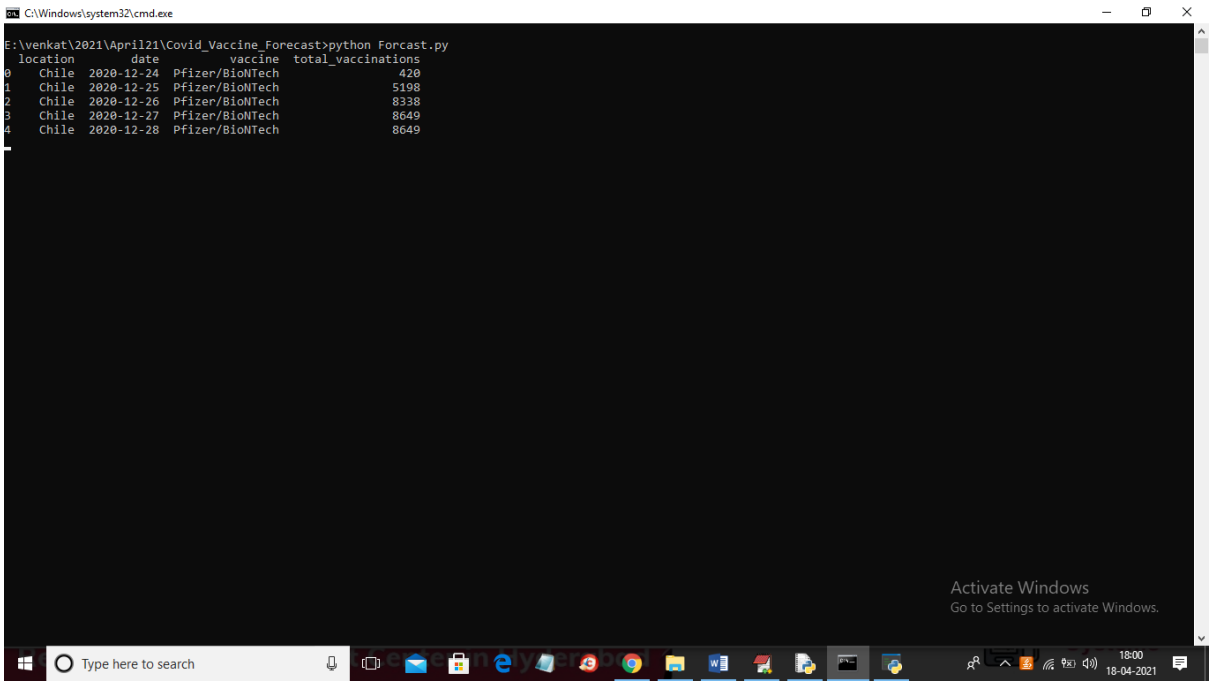
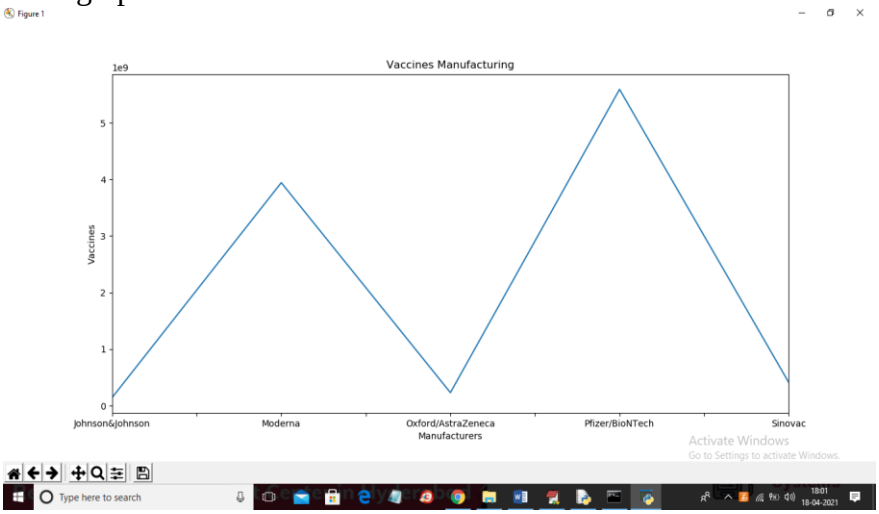
the WTP was divided into three price ranges (CNY¥100/200, CNY¥300/400, and ≥CNY¥500). A multivariable multinomial logistic regression was employed to model factors associated with marginal WTP for the COVID-19 vaccine for three price ranges, with CNY¥100/200, the lowest coded category as the reference group. Likewise, only significant factors in the univariate analyses, with *p*-values of <0.05, were selected for the multinomial logistic regression analysis. The possibility of income level as a moderator on the relationship between the constructs of HBM (scores of perceived susceptibility, severity, benefit, barriers and cues to action) and WTP was investigated using Hayes' PROCESS macro version 3.5. All statistical analyses were performed using the Statistical Package for the Social Sciences version 20.0 (IBM Corp., Armonk, NY, USA). A *p*-value of less than 0.05 was considered statistically significant.

3. Results

Analysis so it will generate more graphs so I developed code as console based application.



In above screen application starts accessing dataset and once it read all records then it will analyse all dataset to give below graph.



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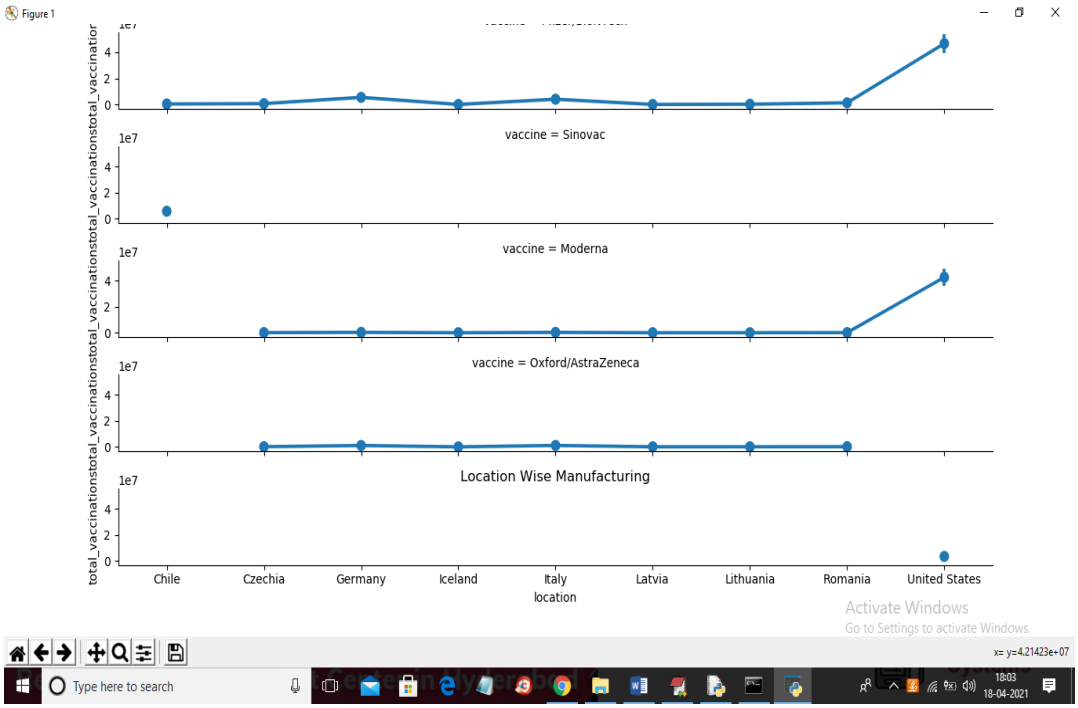
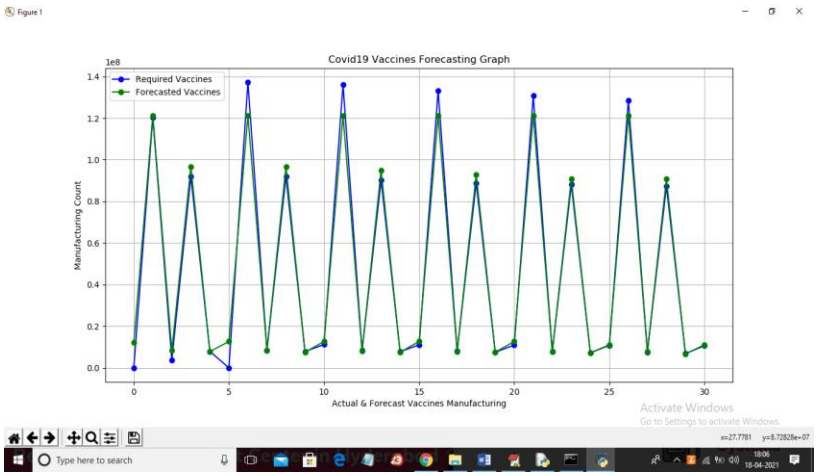
In above graph x-axis represents vaccine manufacturer companies and y-axis represents count of manufacturing vaccines. There is huge manufacturing so we will get count in power exponents and in top graph we can see 1e9 as total manufacturing quantity and now closed above graph to get below graph.



In above graph x-axis represents location/country names and y-axis represents vaccines manufacturing count for each country. In above graph each separate graph represents manufacturer making vaccines count for different countries. From above graph we can say that in UNITED STATES more vaccines are consuming and manufacturing. Now close above graph to get below forecasting result



In above graph x-axis represents forecasting for next 30 days and y-axis represents required count. In above graph blue line represents required/manufacturing vaccines and green line represents forecasted vaccines. In above graph we can see there is close difference between require and

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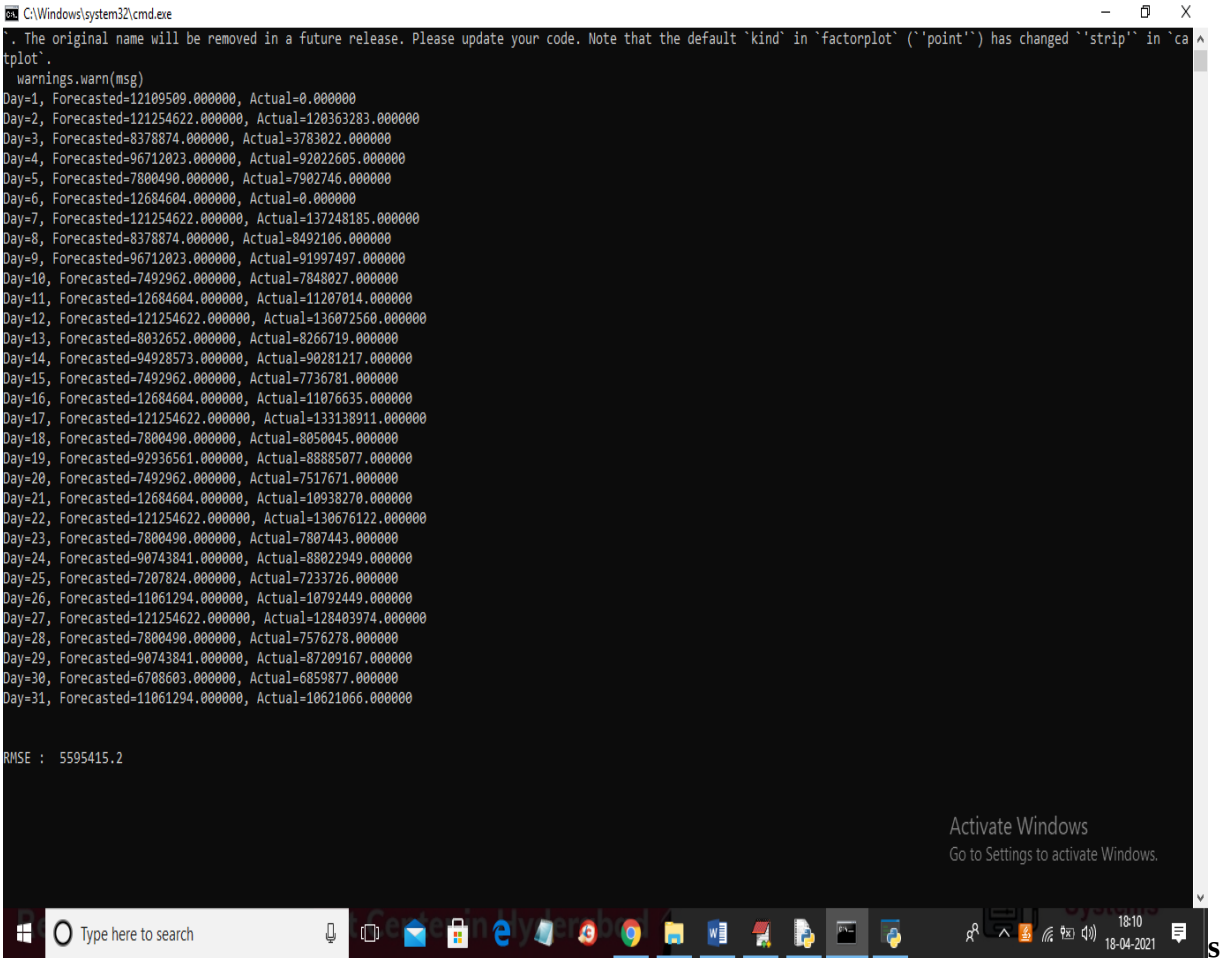
forecasted vaccines so manufacture will go in normal way. If there is huge difference in require and forecast values then manufacturer will increase making count. This forecast will impact society in having sufficient vaccines on particular day or time. In above graph on 5th day more vaccines require and company will adjust making as per forecasting. In below console we can see real values of actual/require and forecast vaccines



In above screen we can see actual/require and forecast vaccines for next 30 days. In above screen we can see little close difference between require and forecast vaccines.

4. Conclusion

The findings demonstrate the utility of HBM constructs in understanding COVID-19 vaccination intent and WTP. It is important to improve health promotion and reduce the barriers to COVID-19 vaccination.

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