**A close up of a sign

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**Summary of Pandemic Prediction Model**

I attempt to predict the extent of the COVID-19 pandemic in Singapore using the SEIRD model. The SEIRD model is compartmental model in epidemiology which assigns the Singapore’s population of an estimated 5,600,000 individuals their respective compartments while representing the flow of these individuals through said compartments over time. My work is based on the work done by [Elina Loli Piccolominii and Fabia Zama](https://www.medrxiv.org/content/10.1101/2020.04.03.20049734v1) which was used to model the spread of COVID-19 in Italy. The inflection point produced by the model is then used to determine the “Risk-off” and “Risk-on” dates. Risk-off dates suggests that investors and clients should attempt to de-lever/hedge/reduce the exposure of their respective portfolios as the fundamentals of the disease suggests a spreading infection. Conversely Risk-on dates suggests a declining rate of infections and that it is safe to resume normal market operations.

**SEIRD Model**

The 5 compartments to which the population of Singapore was assgined are as follows.

1. Supcetibles
2. Exposed
3. Infected
4. Recovered
5. Dead

The parameters of the SEIRD model are as follows.

1. Population size : 5,600,000
2. Average duration of Infection : 14 days
3. Gamma : 1 / 14 (Average duration of Infection)
4. Delta : 1 / 7 (Incubation period of the disease)
5. R\_0\_start : 7.25 (Number of people an infected person can spread the disease to)
6. K : 0.85 (Sensitivity of R0\_start to the imposition of a lockdown)
7. X0 : 38 (Day which the lockdown was imposed)
8. R\_0\_end : 0.5 (Number of people an infected person can spread the disease to post lockdown)
9. S: 0.1 Probability of Indection
10. Rho : 1/35 (Number of days until the death of an infected patient)
11. Population demographics by agegroup
12. Vulnerability of each age group to COVID-19

\*Estimated values.

For the purposes of predicting the spread and market implications of COVID-19 in Singapore, we will primarily convern ourselves with the Infected compartment.

**Model Results**

Given the above parameters, the SEIRD model predicts peak infections to occur 48 days after the inception date of the model. In this context, the inception date of the model was on the 1st of March 2020 and the peak infection date is predicted to be on the 18th of April 2020. This is 2 days prior to the actual peak infection date reported in Singapore on the 20th of April 2020.

A screenshot of a social media post

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A picture containing knife, table

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**Conclusion**

The model reccomends that investors in the Singapore markets de-lever/hedge/reduce their exposures between the 1st of March 2020 to the 18th of April 2020. Subsequently, investors should be able to resume investing activities as per normal. The SEIRD model can be used for country specific prediction of inflection points, risk-on and risk off dates.

**Limitations of the Model**

The model highly sensitive to the estimates provided above (labeled in red). Furthermore, due to differing countries implementing differing medical protocols in dealing with COVID-19, the parameters of model will need to be individually adjusted for each country. The SEIRD model also does not serve to predict the implications of pandemics worldwide. Furthermore, it is also unable to propose sectors to avoid or invest as these decisions are dependent on the client’s mandate and investment strategies.

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