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TALMIS

MACROECONOMIC FORECASTING USING MACHINE LEARNING METHODS

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DATA SCIENCE BOOTCAMP | MAY 9 TO JULY 29, 2022

THE PROJECT TEAM

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Data Scientist, TRATON GROUP (2020 - Present)

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Management Consultant, Deloitte (2017-2018)

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Postdoctoral Research Associate (2020-2021)

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PATRIZIA WILL

THE COMPANY

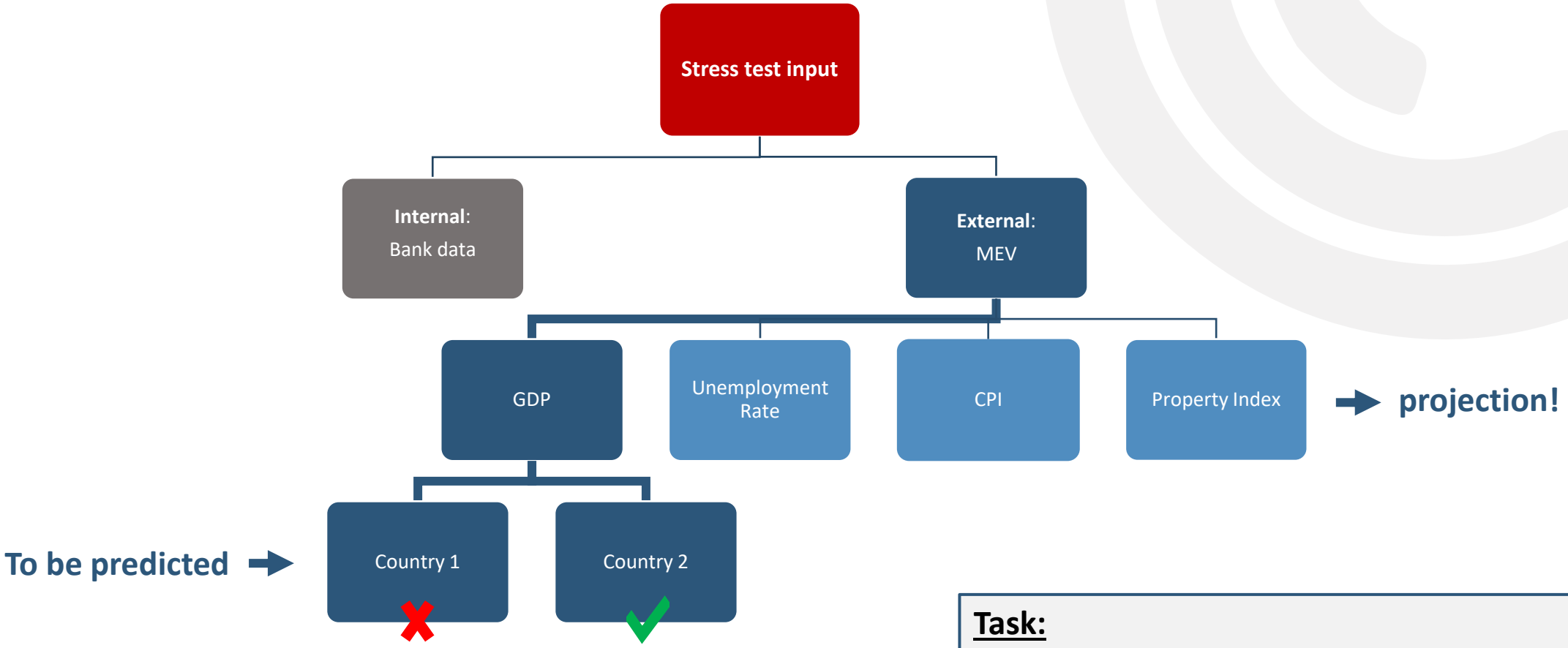
Consulting Services

Treasury, ALM, Capital Markets, **Risk & Finance**

Advisory Services

Asset Liability Management, Balance Sheet Management, Treasury & Investment

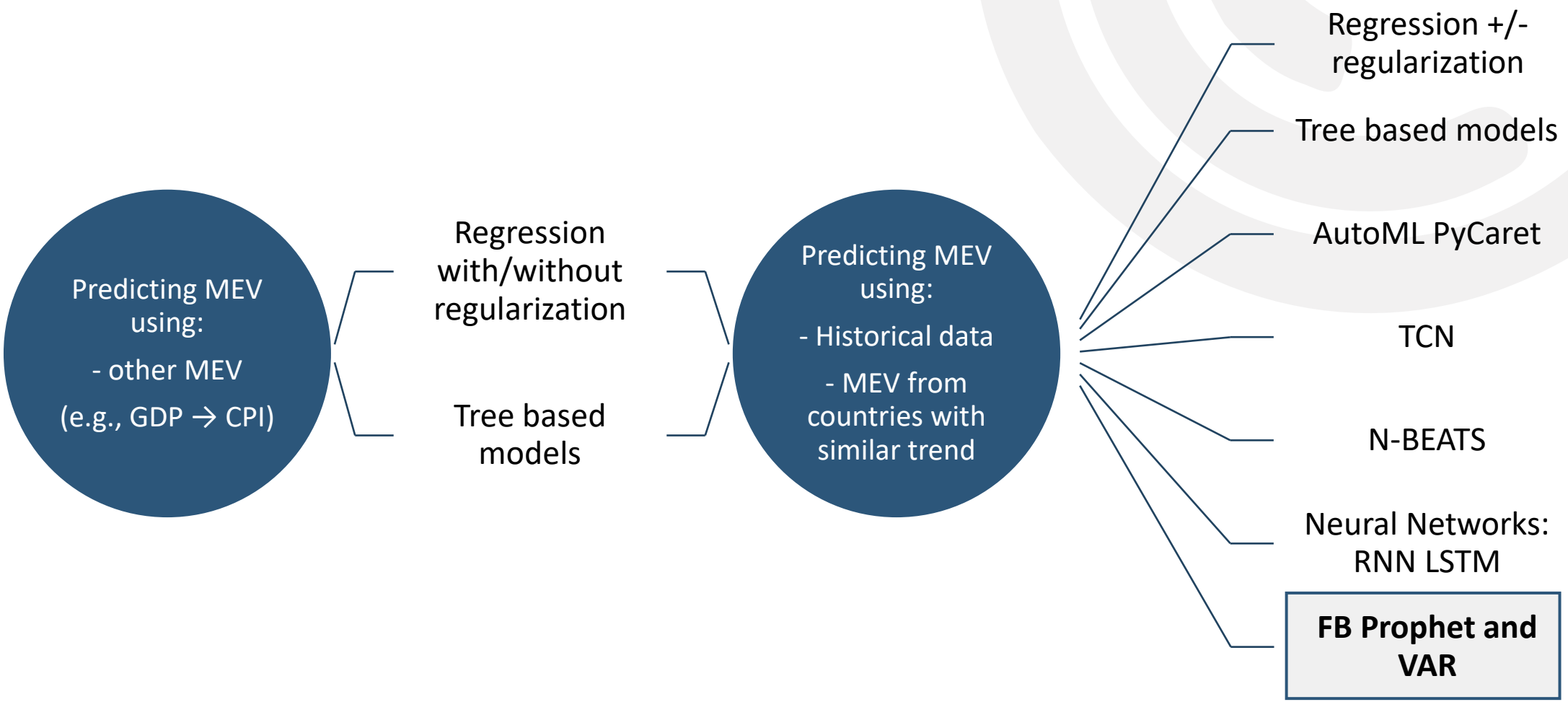
BACKGROUND



Task:
Predict missing **MEVs** for a **stress test** exercise using projected MEV of another country.

MEV: MacroEconomic Variable
CPI: Consumer Price Index
GDP: Gross Domestic Product

PROCESS TO FIND BEST APPROACH



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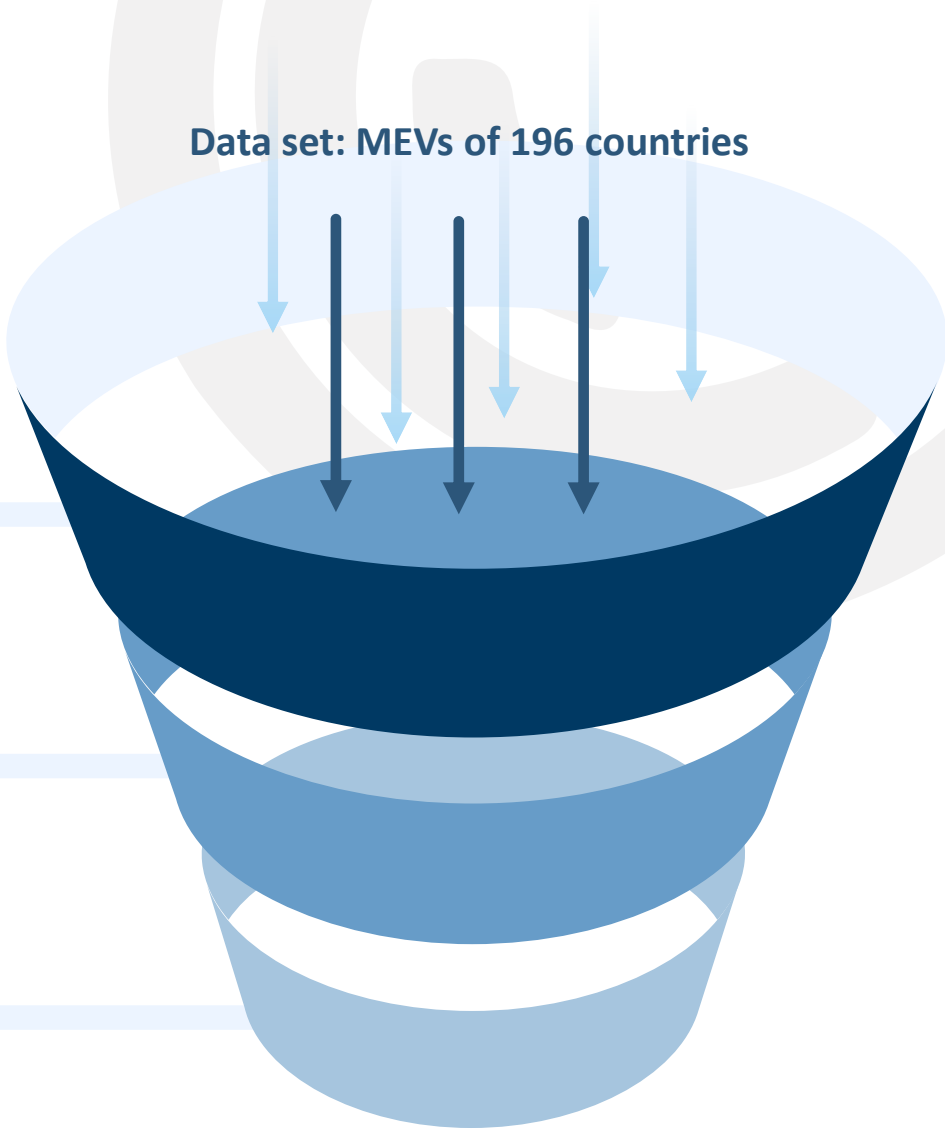
BEST APPROACH

Data set: MEVs of 196 countries



Group countries with similar **profile** and **trend**

1. Time-series clustering

Statistical tests to keep countries with **high predictive power**

2. Statistical validation

Combination of multivariate vector autoregression (**VAR**) and Facebook **Prophet**

3. Forecasting

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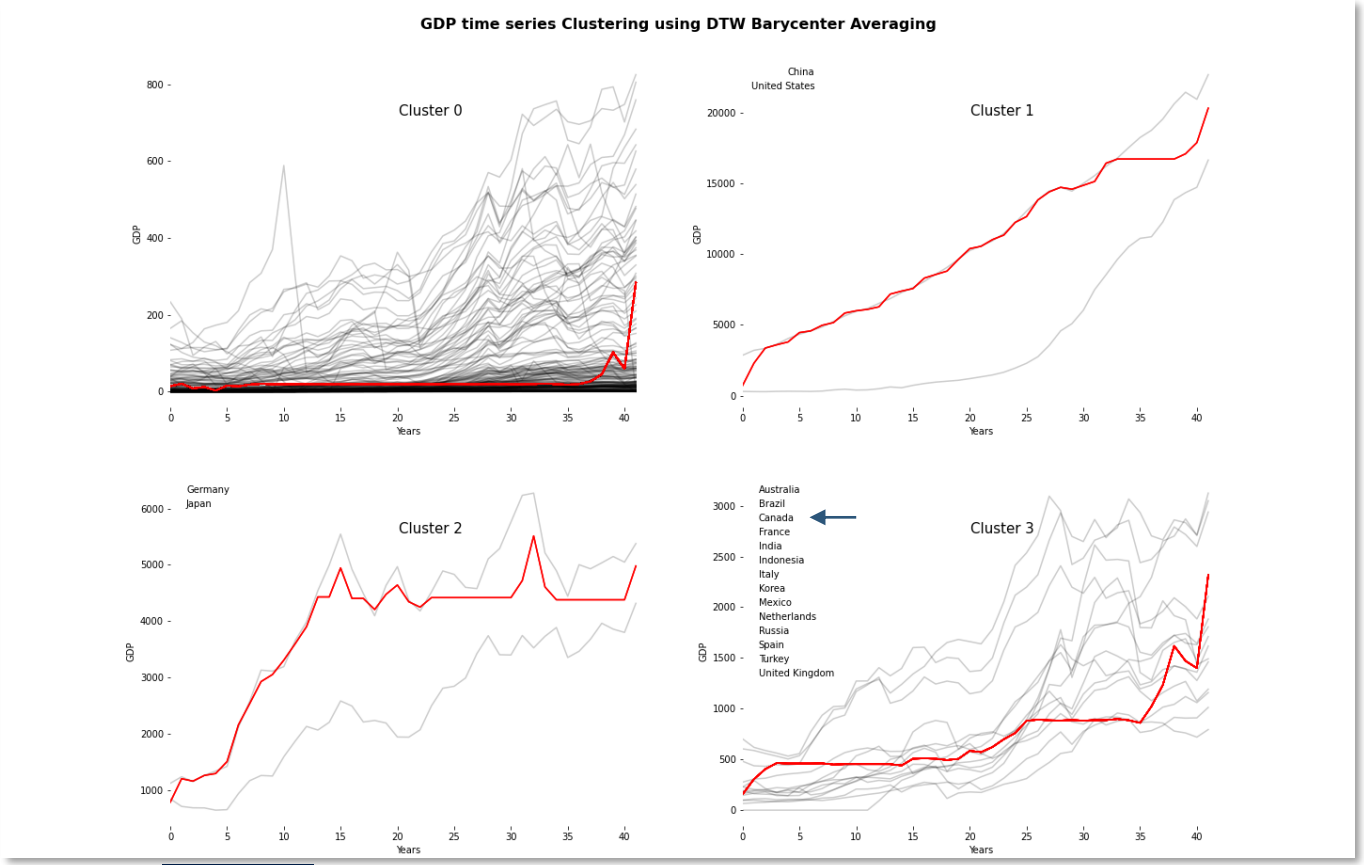
1. CLUSTERING AND STATISTICAL TESTS

→ **Time-series clustering:** group countries with similar MEV trend

→ **Granger causality test:** filter for countries with high predictive power



	Australia	Brazil	Canada	France	India	Indonesia	Italy	Korea	Mexico	Netherlands	Russia	Spain	Turkey	United Kingdom
Australia_y	1.000000	0.123400	0.002700	0.035900	0.006000	0.020000	0.046900	0.010700	0.000300	0.006500	0.010600	0.001800	0.167900	0.002600
Brazil_y	0.009100	1.000000	0.000200	0.003800	0.000600	0.001100	0.003600	0.009900	0.002400	0.000700	0.003500	0.000100	0.025900	0.000200
Canada_y	0.042900	0.017300	1.000000	0.175700	0.110700	0.002000	0.239900	0.004100	0.002900	0.032600	0.003600	0.666800	0.089400	0.018400
France_y	0.322100	0.015500	0.101400	1.000000	0.057200	0.205400	0.226000	0.038300	0.015900	0.163600	0.017900	0.040800	0.324700	0.000000
India_y	0.042500	0.005200	0.001600	0.037900	1.000000	0.667000	0.049800	0.000400	0.000200	0.003400	0.007300	0.008000	0.017800	0.000000
Indonesia_y	0.108900	0.080400	0.019400	0.022800	0.024800	1.000000	0.010900	0.002200	0.003600	0.009800	0.108500	0.002000	0.008700	0.000800
Italy_y	0.512100	0.121700	0.275000	0.216300	0.073100	0.404800	1.000000	0.105300	0.035000	0.268900	0.987100	0.184700	0.164200	0.003700
Korea_y	0.671500	0.074500	0.225300	0.097700	0.636000	0.359200	0.259700	1.000000	0.015500	0.353300	0.268700	0.243200	0.296700	0.041600
Mexico_y	0.186800	0.276100	0.116200	0.026100	0.156900	0.087600	0.012500	0.092600	1.000000	0.021600	0.331200	0.028900	0.335200	0.018000
Netherlands_y	0.314200	0.012200	0.103900	0.155500	0.025800	0.135400	0.826700	0.008200	0.003500	1.000000	0.066900	0.118300	0.160600	0.000000
Russia_y	0.001700	0.135400	0.003200	0.018400	0.005200	0.001100	0.021500	0.001800	0.026300	0.001400	1.000000	0.000300	0.137600	0.004300
Spain_y	0.234400	0.012500	0.361900	0.024800	0.079700	0.214900	0.184300	0.032400	0.008900	0.165800	0.044200	1.000000	0.226500	0.000600
Turkey_y	0.030100	0.144300	0.002200	0.012400	0.007000	0.014900	0.007300	0.040300	0.039200	0.008400	0.282900	0.003200	1.000000	0.015400
United Kingdom_y	0.269200	0.020200	0.213500	0.028200	0.157100	0.001700	0.442400	0.035300	0.489000	0.002300	0.065100	0.000500	0.051200	1.000000

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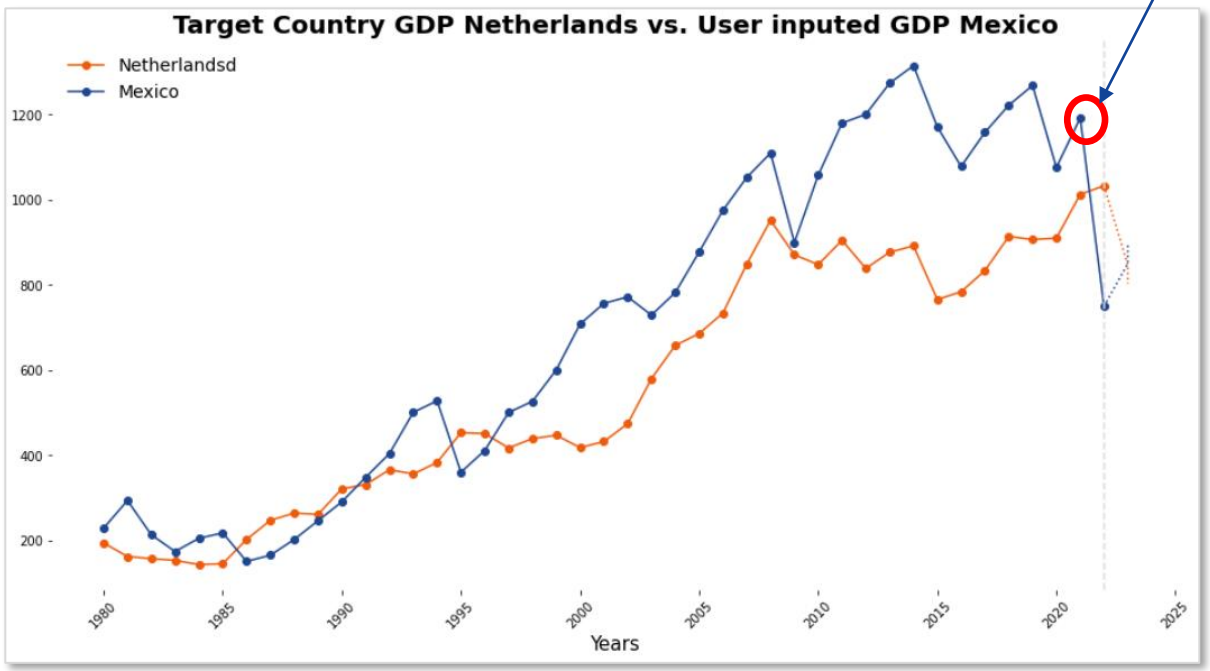
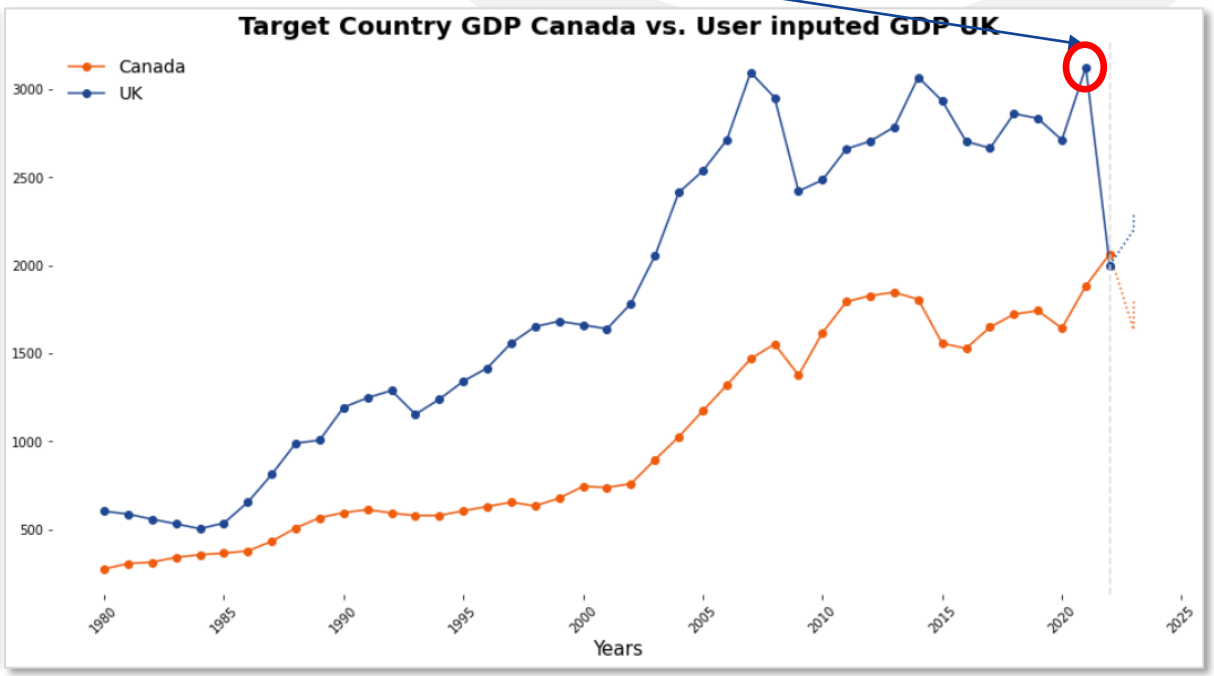
2. THREE-YEAR FORECASTING WITH SHOCK SCENARIO

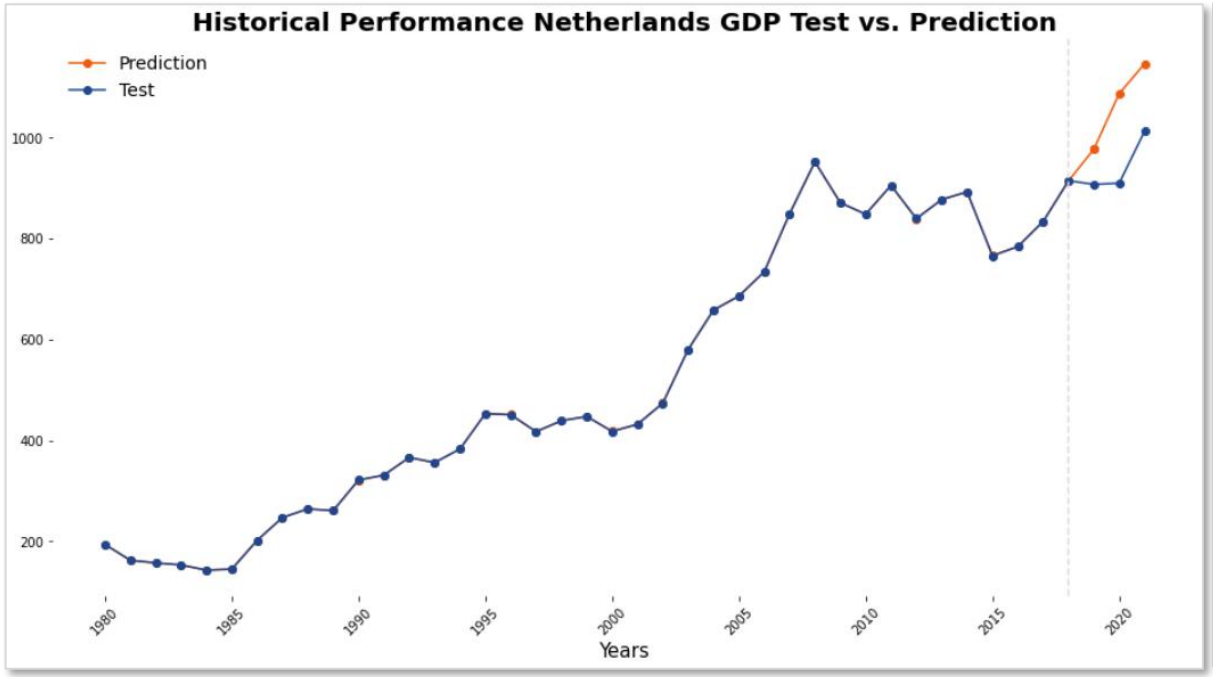
Downward shock on the GDP
→ predicted GDP decreases

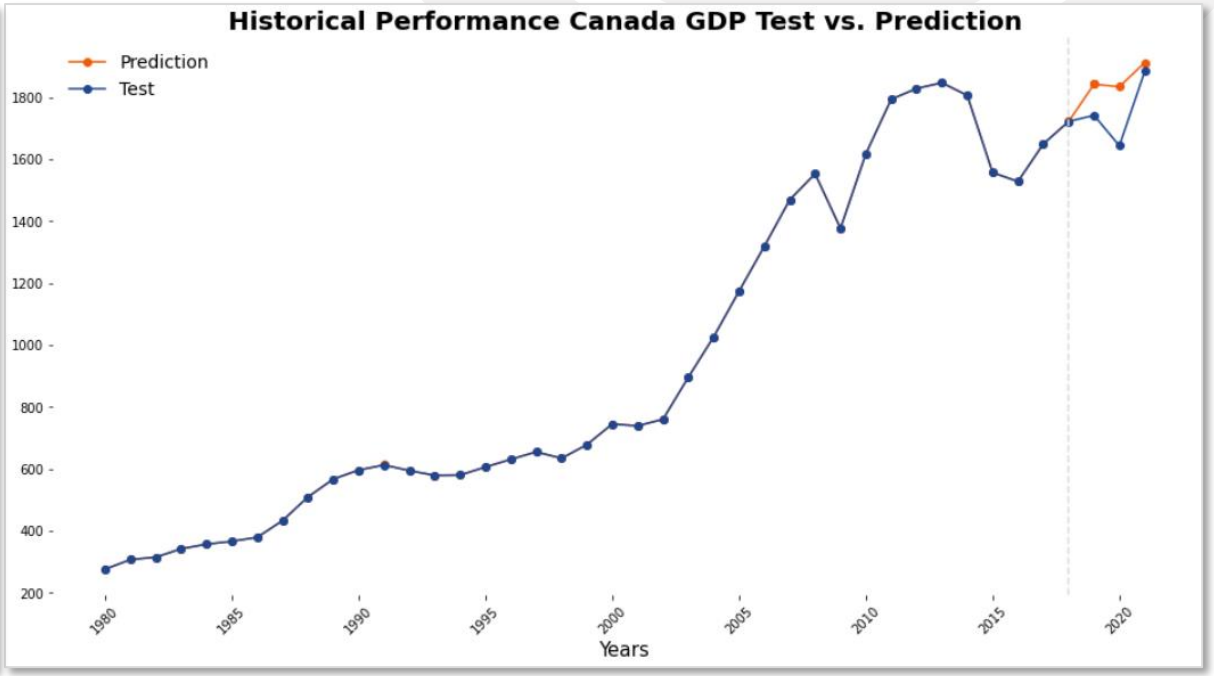




3. VALIDATING FORECAST ON HISTORICAL DATA

→ Testing the predictive power of the model by predicting MEV for the years 2019, 2020, and 2021





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CONCLUSION AND OUTLOOK

Conclusion

- ✓ Successful model to predict **MEVs**
- ✓ Best results: **Machine learning** and **statistical methods**
- ✓ Our approach considers **global interconnectedness** of world economies
- ✓ MEVs are influenced by **other parameters** (e.g., politics, wars, global pandemic)

Future steps

- ➢ Include **quarterly data** → models «learn» better → produce better results
- ➢ Include **non-economic variables** (e.g., health indicators)

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THANKS FOR YOUR ATTENTION

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