

12th International Young Scientists Conference on Computational Science

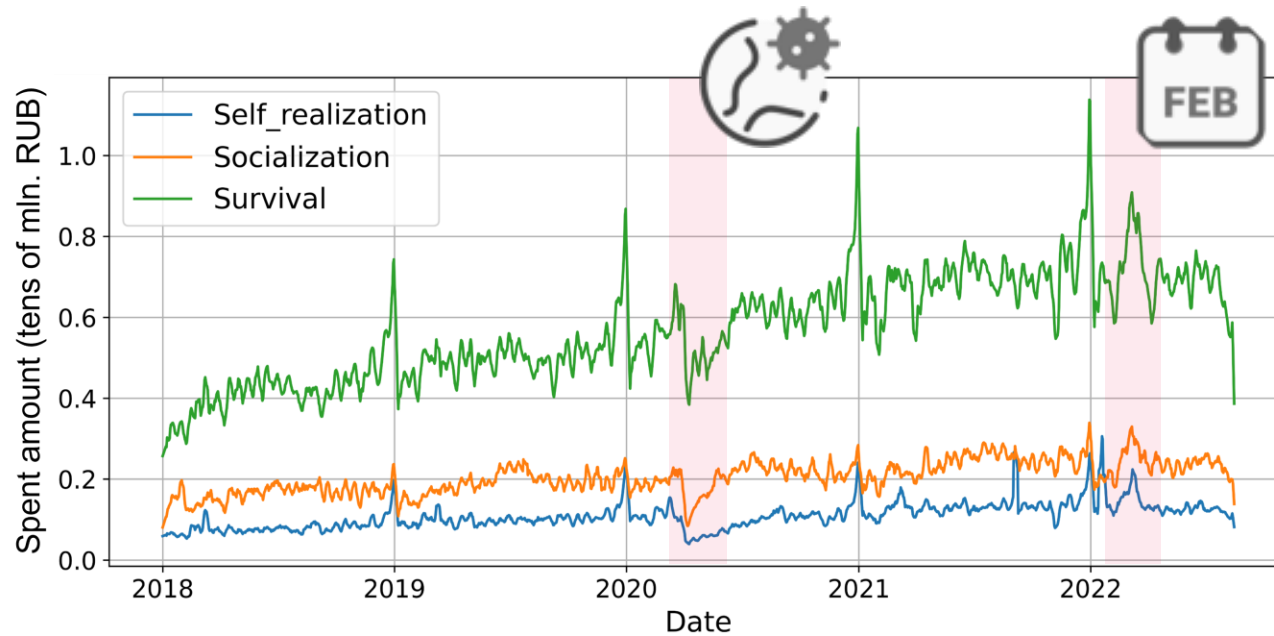


Crisis Behaviour Strategy Recognition Using Transactional Data

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Task: Customer activity forecasting



Problem:

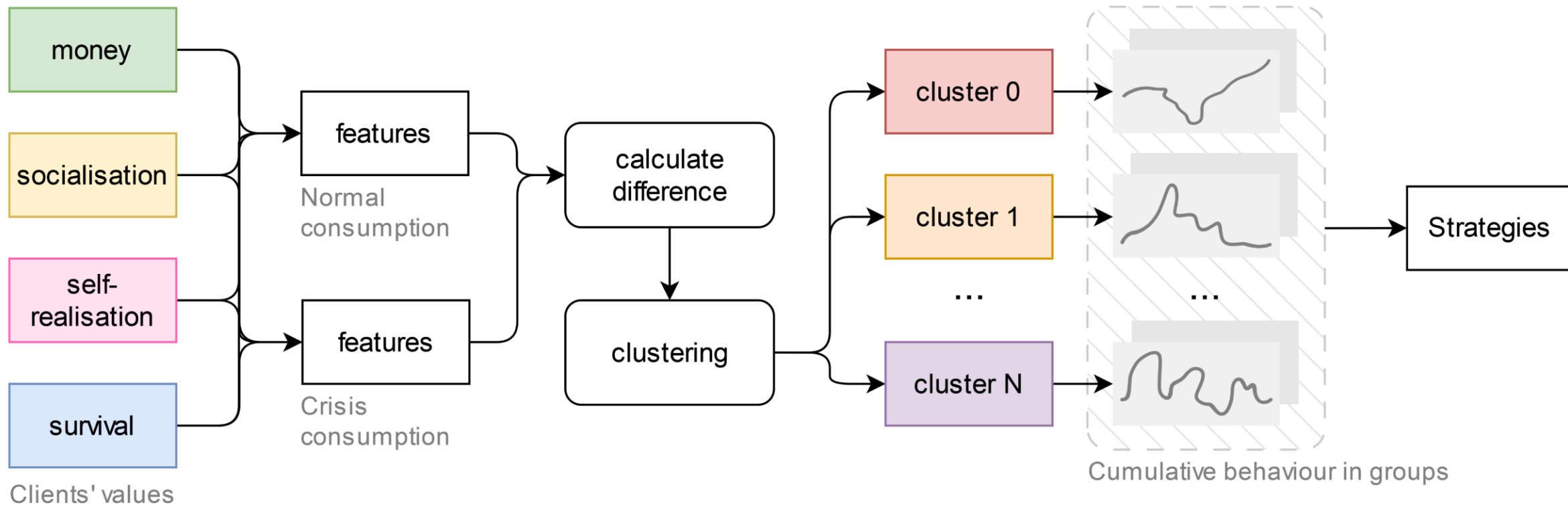
Crises

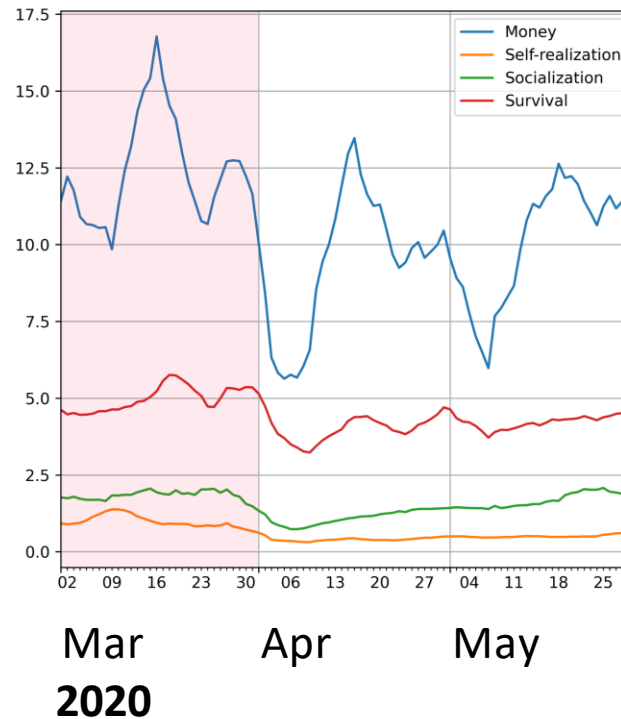
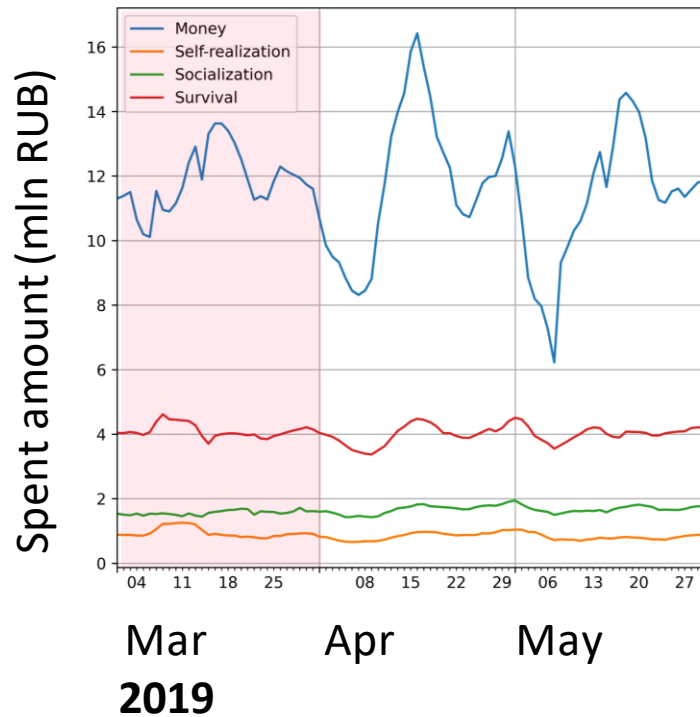
- Different causes
- “Abnormal” clients’ behaviour



Solution:

Recognise clients’ behaviour strategies during crisis





1. $\log_{10}(\text{Spent amount})$
 $10^0, 10^1 \dots 10^6$

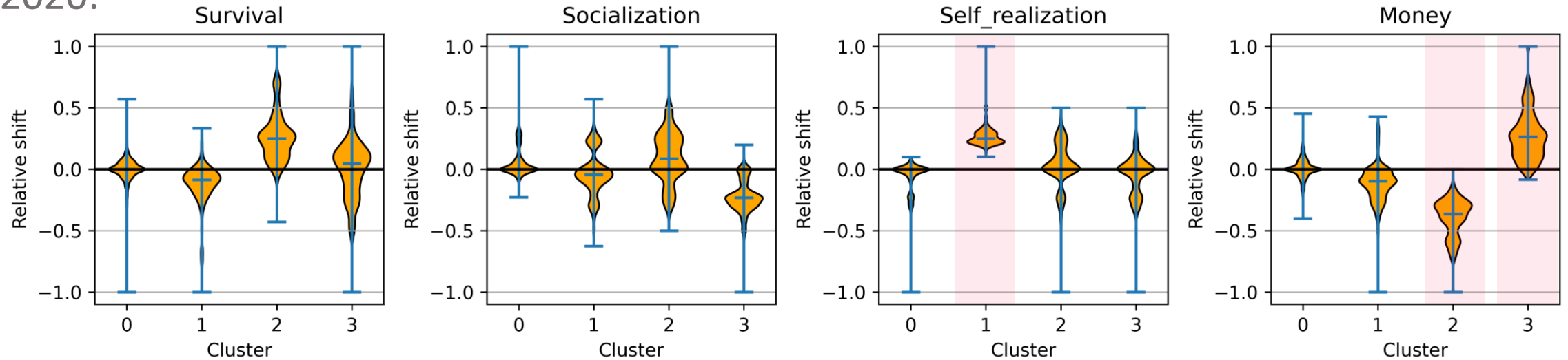
2. Group and normalise

	Money	Self-r.	Soc.	Sur.
Client 1	0.5	0.2	0.3	0

3. Difference between abnormal and normal months

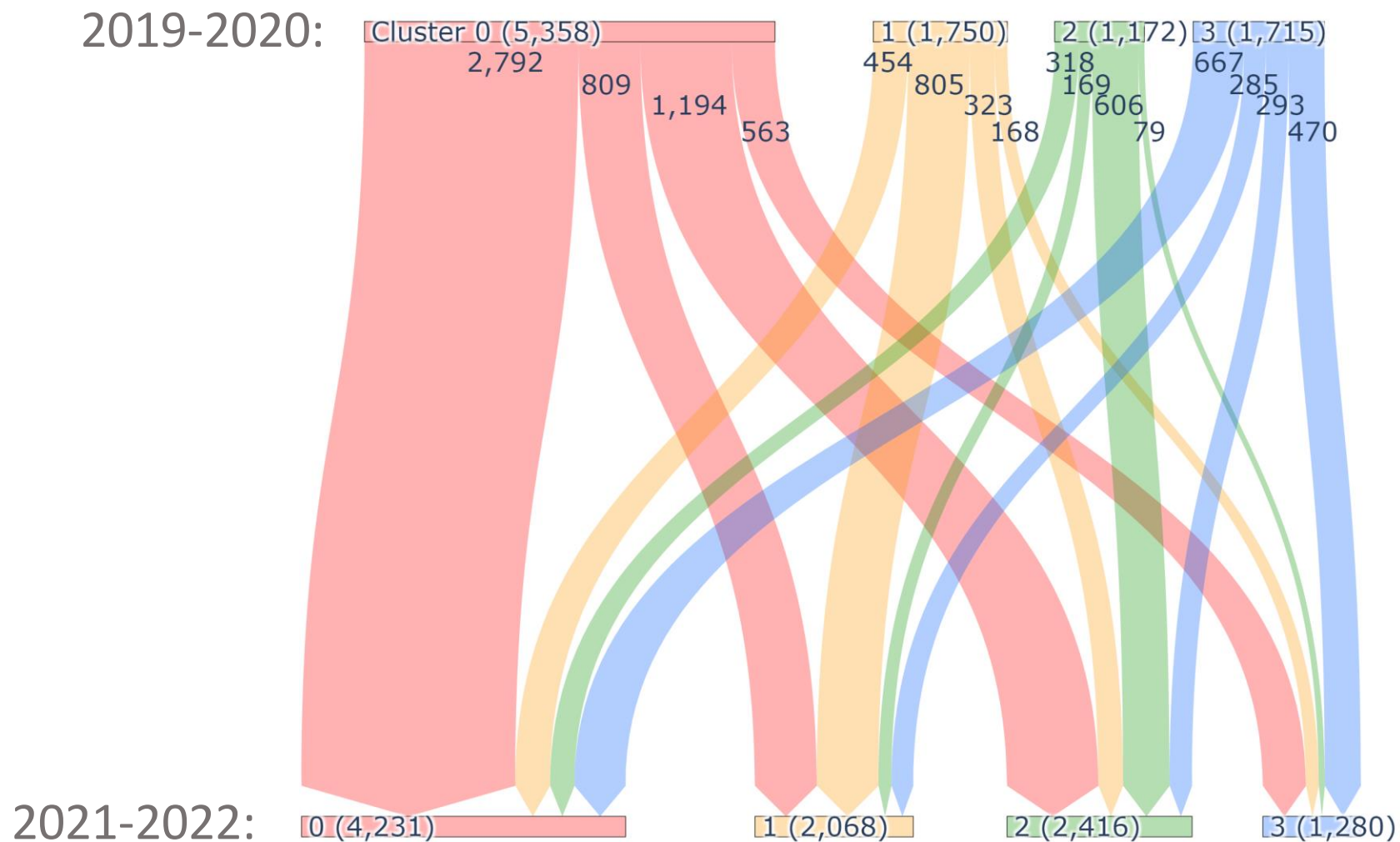
K-Means, 4 clusters

2019-2020:



Cluster 0: unflappable
 Cluster 1: complacent
 Cluster 2: prudent
 Cluster 3: curmudgeons

Experiments: Clustering



Experiments: Forecasting

Amount spent by basic values (March 7 – April 15, 2022)

Rescale 39 days in 2020 with k :

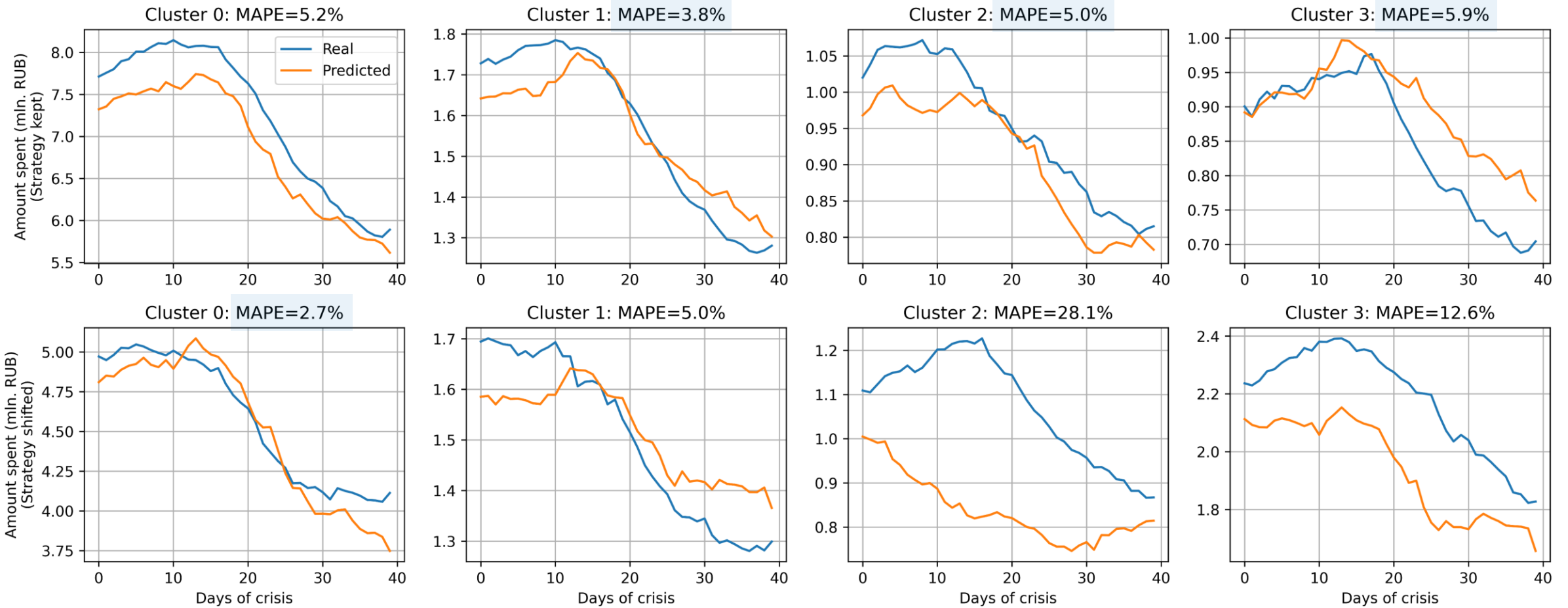
$$k = \frac{\sqrt{\sum_{t_2} X(t_2)^2}}{\sqrt{\sum_{t_1} X(t_1)^2}},$$

t_2 : March 1 – March 7, 2022

t_1 : March 1 – March 7, 2020

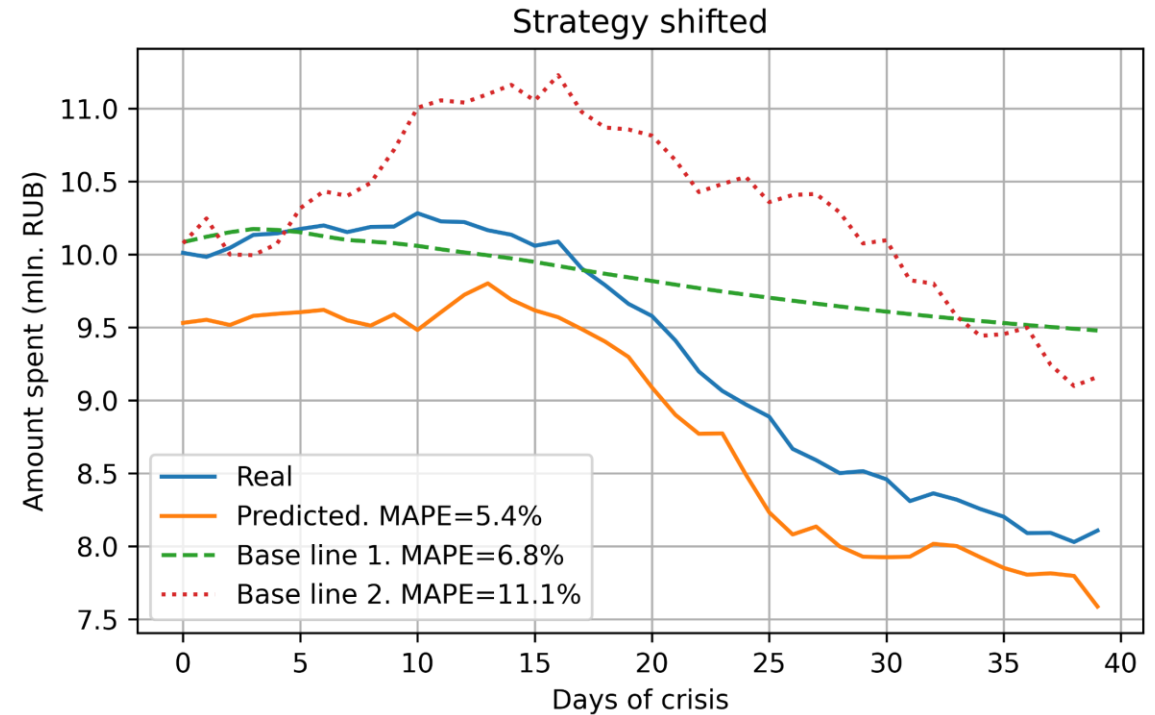
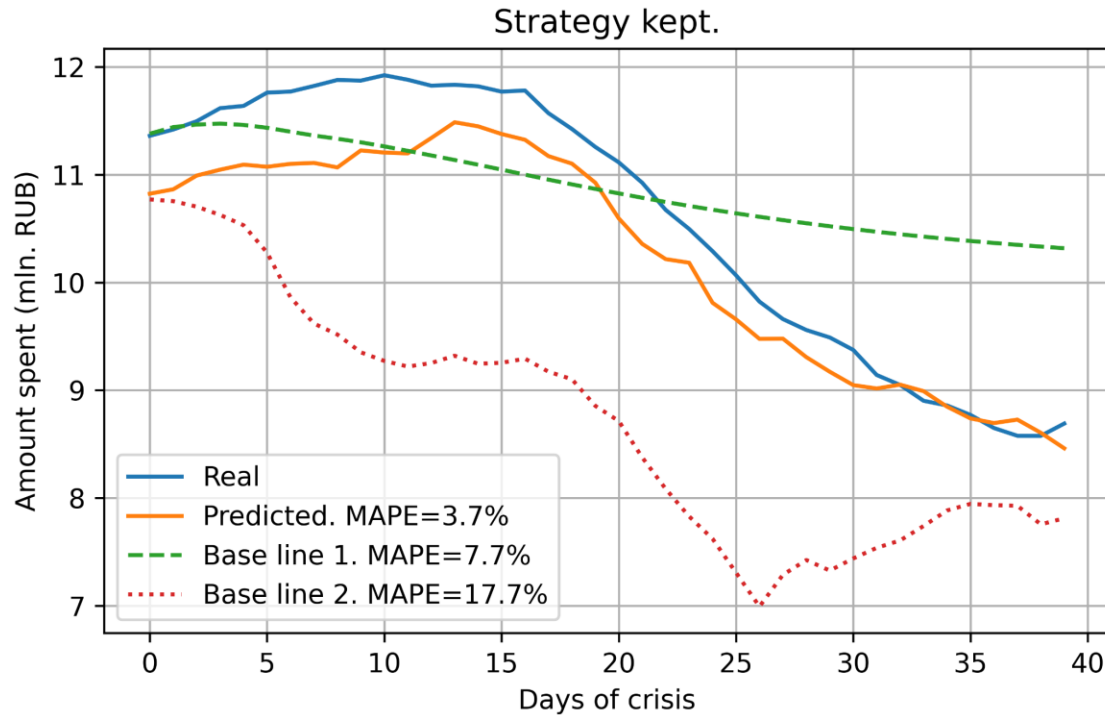
Cluster	Value	MAPE (%)	
		Kept strategy	Shifted
0 (unflappable)	Survival	2.56	1.93
	Socialisation	22.82	15.15
	Self-realisation	42.43	68.09
	Money	5.54	4.93
1 (complacent)	Survival	6.76	4.66
	Socialisation	19.16	17.15
	Self-realization	59.52	22.38
	Money	10.68	8.07
2 (prudent)	Survival	2.34	1.37
	Socialisation	37.87	51.05
	Self-realisation	21.34	85.75
	Money	8.23	68.71
3 (curmudgeons)	Survival	4.77	6.87
	Socialisation	16.35	72.56
	Self-realisation	28.20	69.13
	Money	14.98	6.55

Total amount spent (March 7 – April 15, 2022)



Experiments: Forecasting

Total amount spent for all clusters (March 7 – April 15, 2022)



Baseline 1 – Autoregression

Baseline 2 – Forecasting method of maximal similarity

Conclusion

- **4 strategies** (unflappable, complacent, prudent, curmudgeons),
- The majority **kept the same strategy** during another crisis,
- **MAPE** for spent amount prediction with a kept strategy is generally **lower** than with a shifted one:
 - cluster 0: 5.2% vs 2.7%, cluster 1: **3.8%** vs 5%,
 - cluster 2: **5%** vs 28.1%, cluster 3: **5.9%** vs 12.6%.
- Our method predicts spent amount with **lower MAPE**:
 - kept strategy: **3.7%** vs 7.7%, 17.7%,
 - shifted: **5.4%** vs 6.8%, 11.1%.

Thanks for your attention