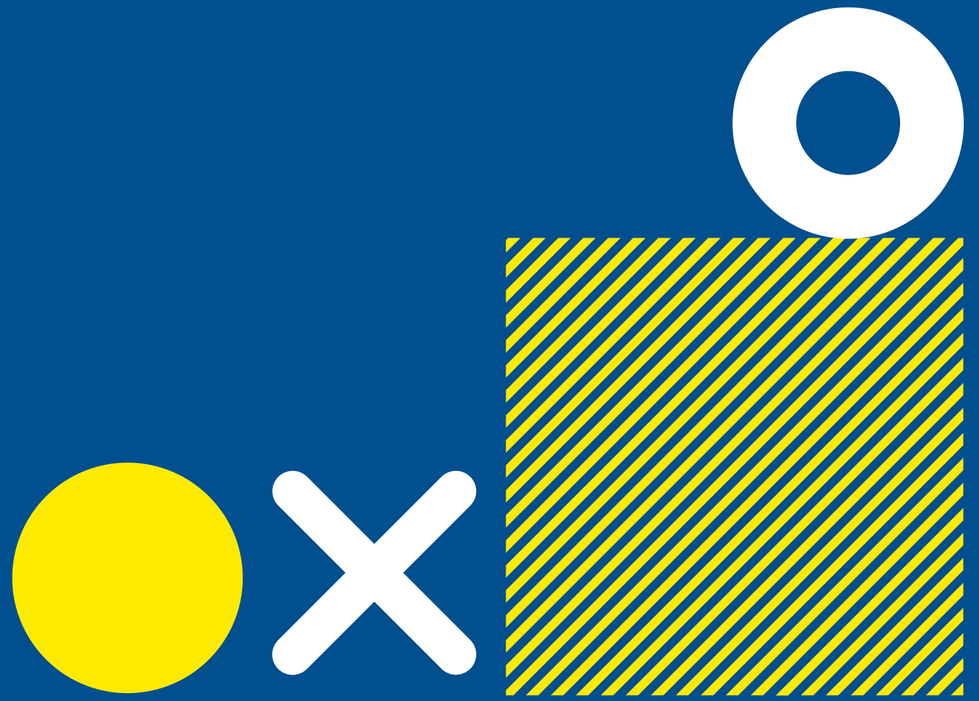
The Great US Sneeze

Team Beatrice

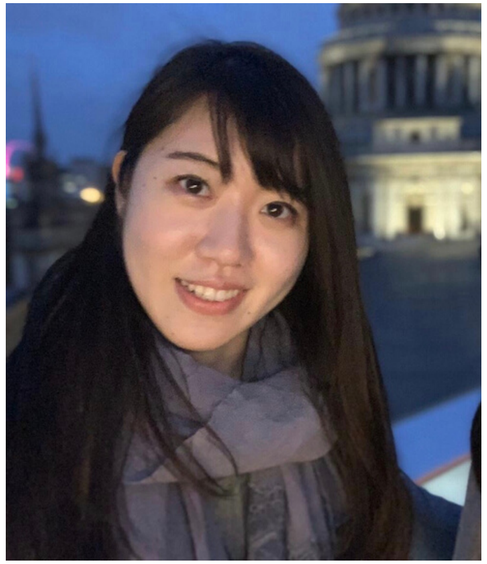
Infosys Coding Challenge 2020



Outline

1. Introduction
2. Data Exploration
3. Our Model
4. Evidence
5. Reflection

Women in Data Science



Rina Nishio

MSc Theories and History of International Relations
Public Sector in Japan
Data visualisation

Wingyan Yip

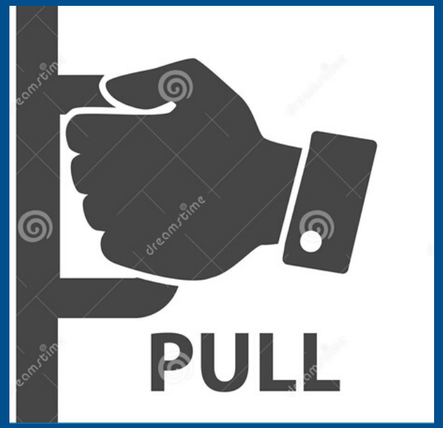
MSc Local Economic Development
Business Intelligence in Singapore
Macroeconomics

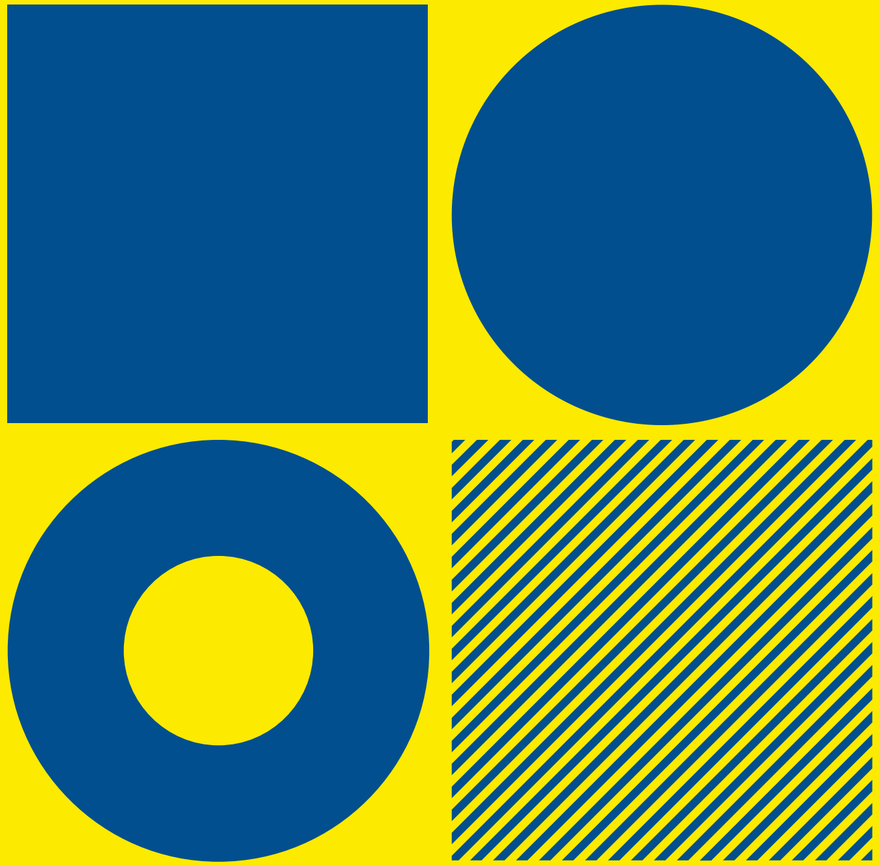
Zhiyang Zhao

MSc Quantitative Methods for Risk Management
Fintech in London
Coding

Premise

The appreciation of the USD during the 2007-2008 crisis is a demand side phenomenon.





Our Main Arguments

1. US-related variables explain more than country fundamentals
2. The capital outflow in a country depends on the kind of exposure it has with the U.S.
3. The exited capital mainly flows to US treasury bonds

Data Exploration

a Data sources

b Comparison by income level

c Comparison by region

d PCoA Analysis

e K-means Clustering

a. Data sources

Global Financial Database

IMF databank

World Bank database

UNCTAD stat

OECD Data

Euromonitor passport

Euro Area Statistics

ECB Statistical Data Warehouse

Taiwan Statistical Yearbook

The Bureau of Foreign Trade, Ministry of Economic Affairs of Taiwan

Eikon

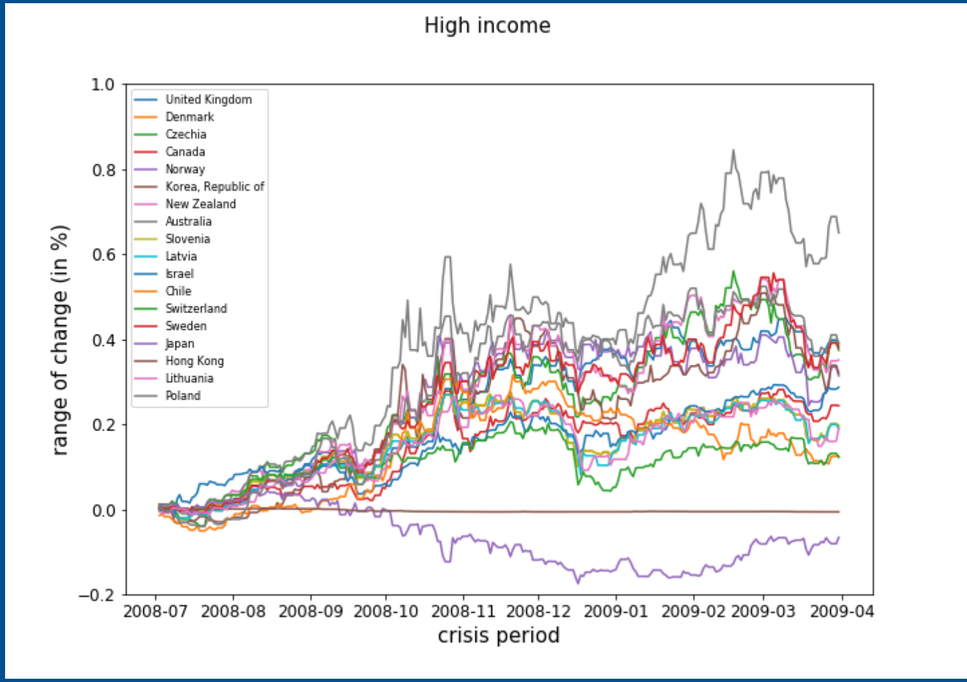
The International Country Risk Guide (ICRG)

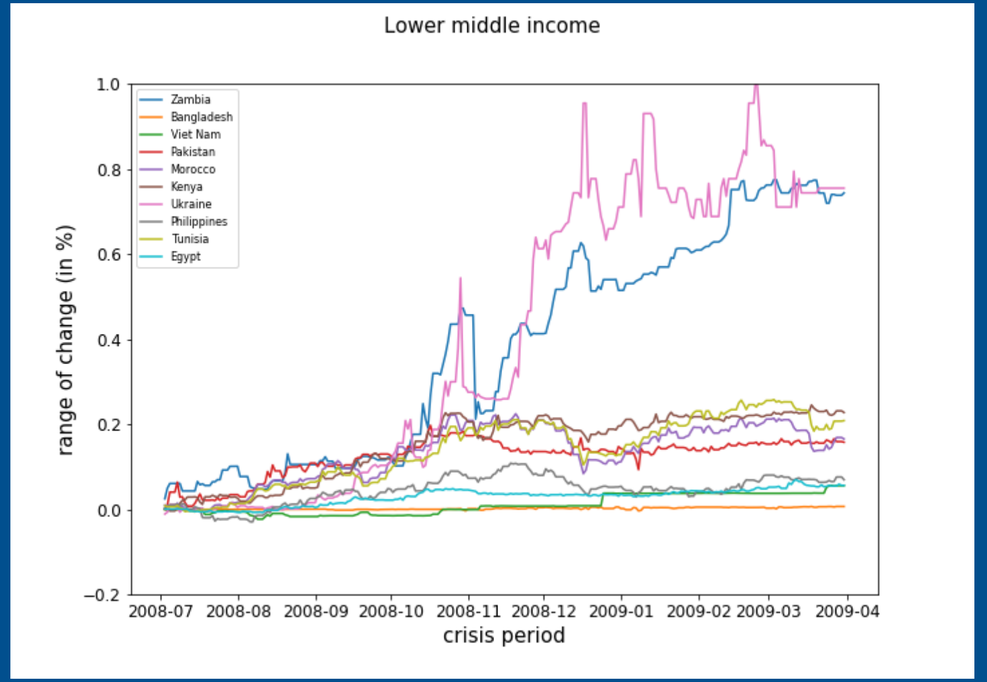
Eikon by Thomas Reuter

Many thanks to LSE Datalibrary!

b. Comparison on income level difference

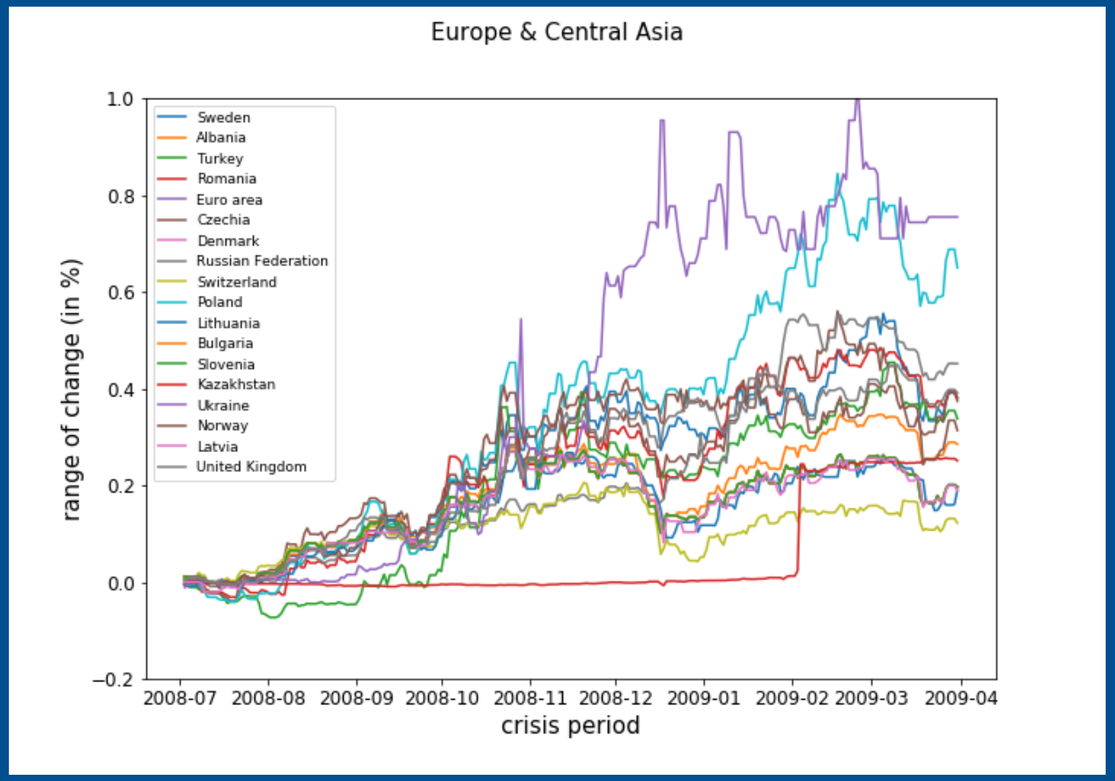
- No specific pattern
- Some lower middle income countries depreciate significantly
- July 2008 - May 2009

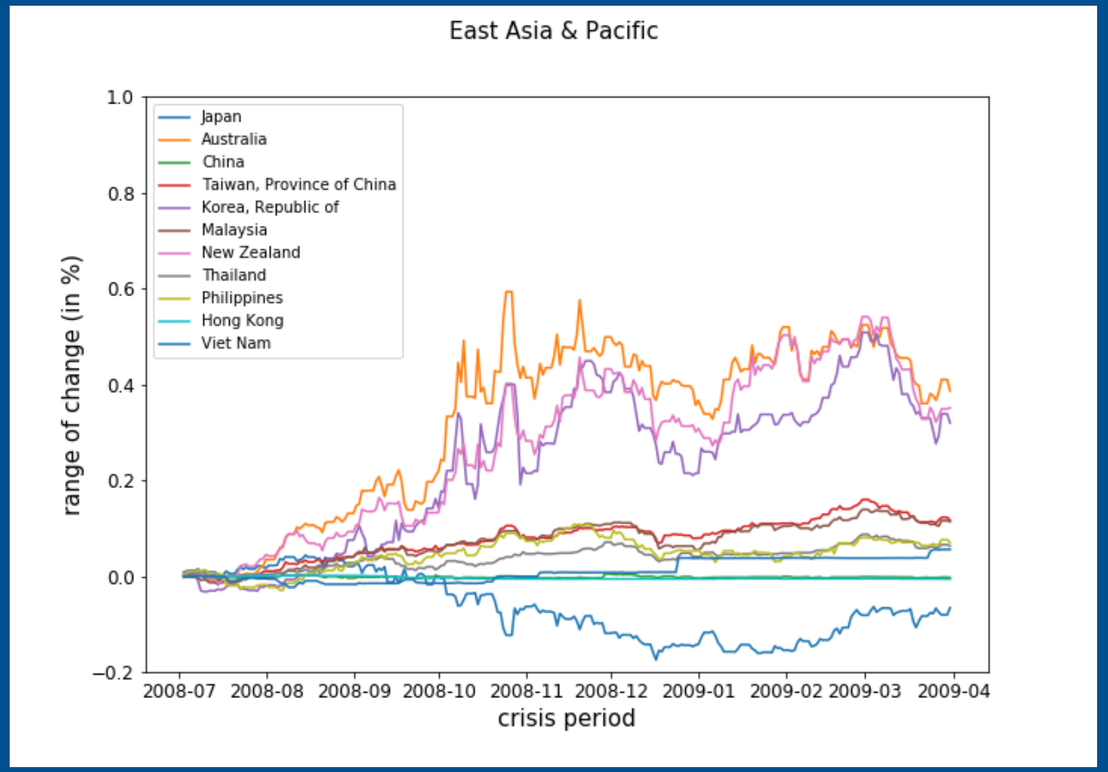




c. Comparison on regional difference

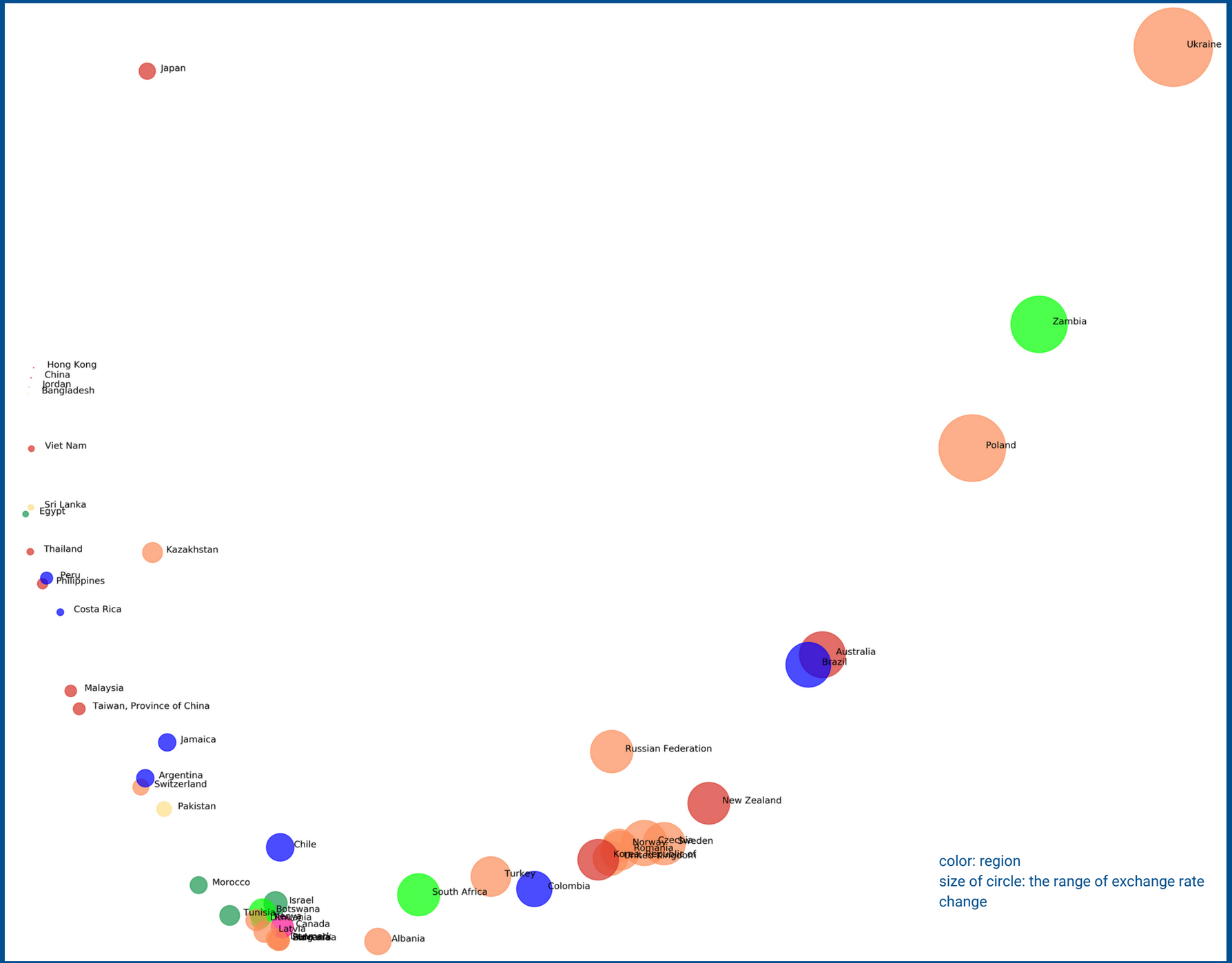
- No specific pattern by region





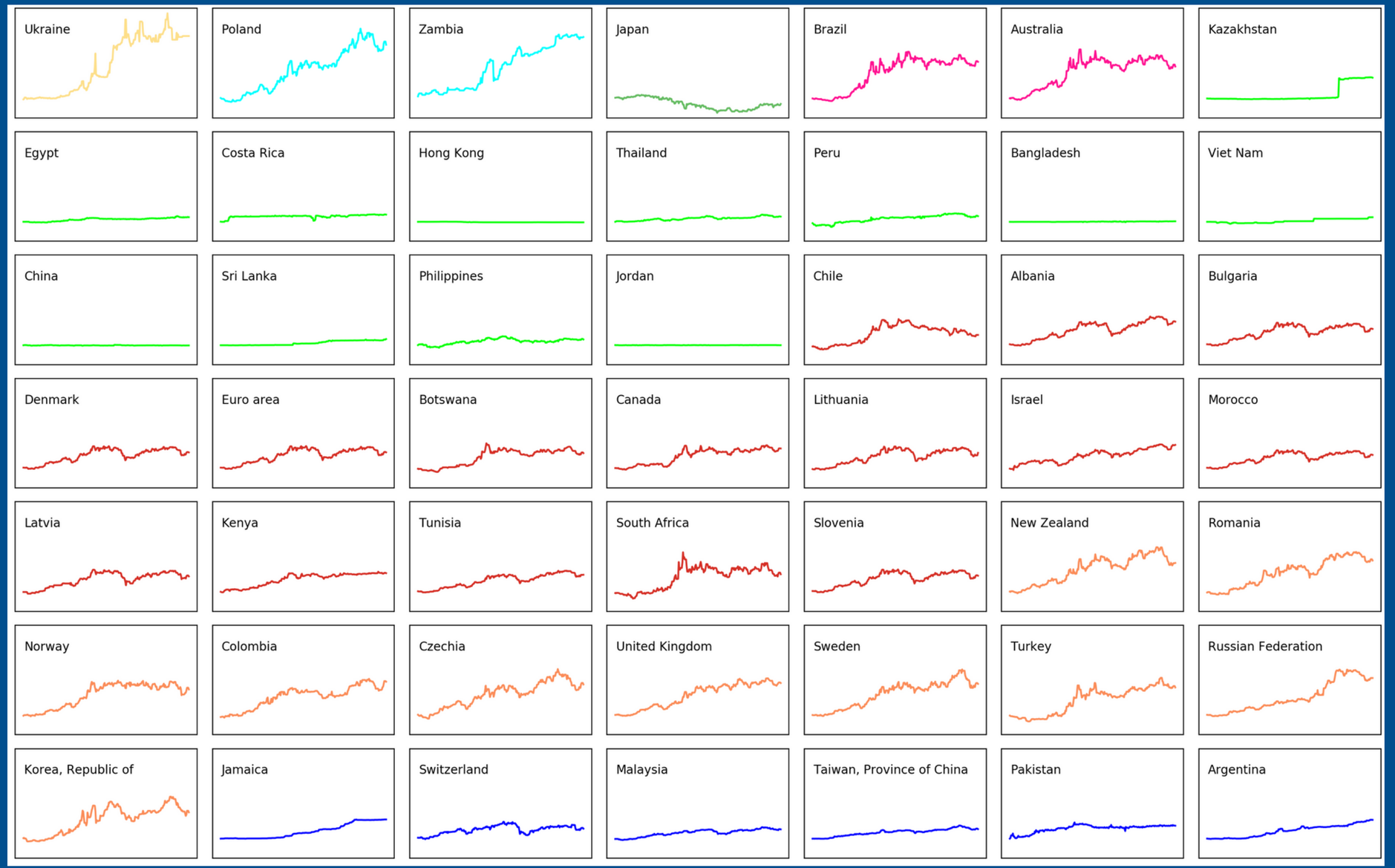
d. PCoA analysis

- Use PCoA (Principle Co-ordinates Analysis) to show the similarities of countries' exchange rate moving patterns on a 2-D dimension
- Close circles have similar size of change and pattern of the movement
- Countries having a similar economic structure seem to have similar pattern of the movement



e. K-means clustering

- Use k-mean clustering to understand the patterns of the movement more
- The same color signifies the same cluster
- Only Japan appreciates against the US dollars
- There are some countries which do not change at all



1. US-related variables explains more than country fundamentals

2. The capital outflow in a country depends on the kind of exposure it has with the U.S.

Our Method

Ordinary Least Squares Regression on cross-sectional data

$$Exchange\ Rate\ Drop = \alpha + \boldsymbol{\beta X} + \boldsymbol{\theta Z} + \varepsilon$$

X - Country Fundamentals
Current Account Balance (% of GDP)
External Debt (% of GDP)
GDP growth (%)
Inflation (%)
Official Reserves (% of GDP)
Openness (Trade as % of GDP)
Safe Asset Dummy

Z - US-related Variables
Interest Rates Differential (%)
Trade with US/ GDP (%)
Asset owned by US investors (% of GDP)

Y - Appreciation of the USD against the currency during July 2008 and May 2009

Choices behind the Model

Variables

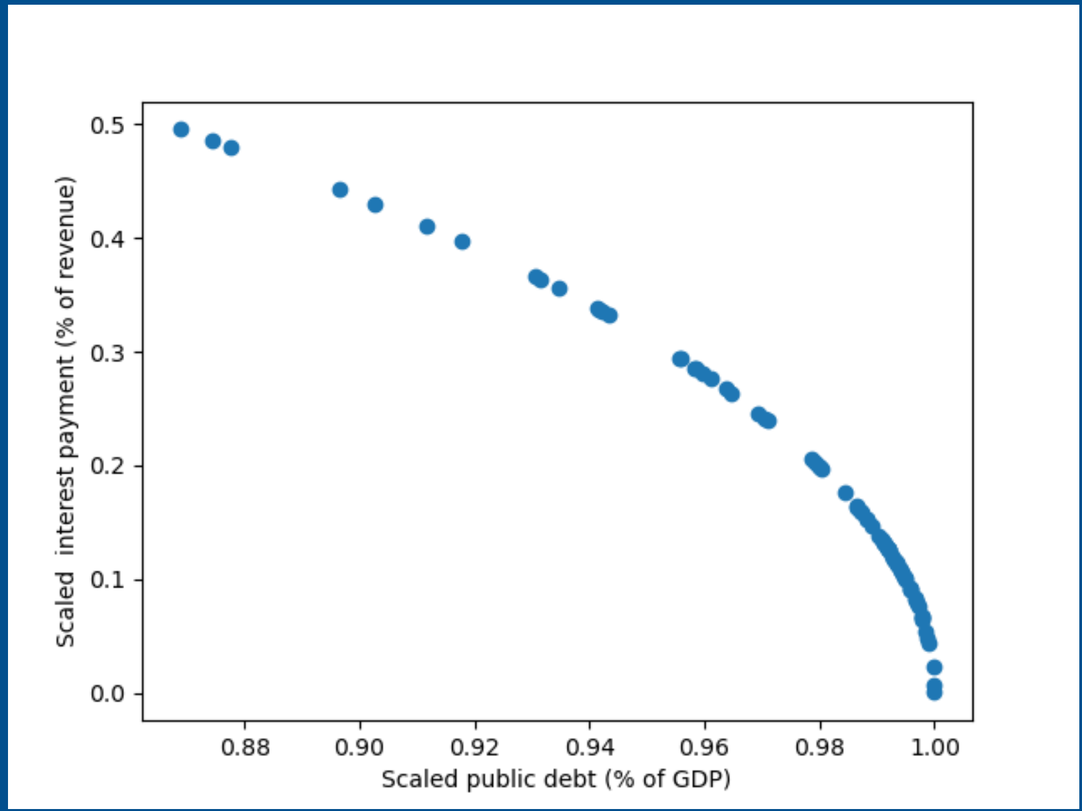
- Informed mainly by the ECB paper (Fratzscher 2009): fundamentals as determinant of capital outflow
- How we differ: A safe asset dummy (safe haven flows) + interest rate differential with US (carry trade)
- Averaged in the period before the crisis

Time Period:

- Pre-Crisis: 2005 Q1 - 2007 Q3 or 2005 - 2007 (depending on the frequency available)
- In-Crisis: July 2008 to May 2020

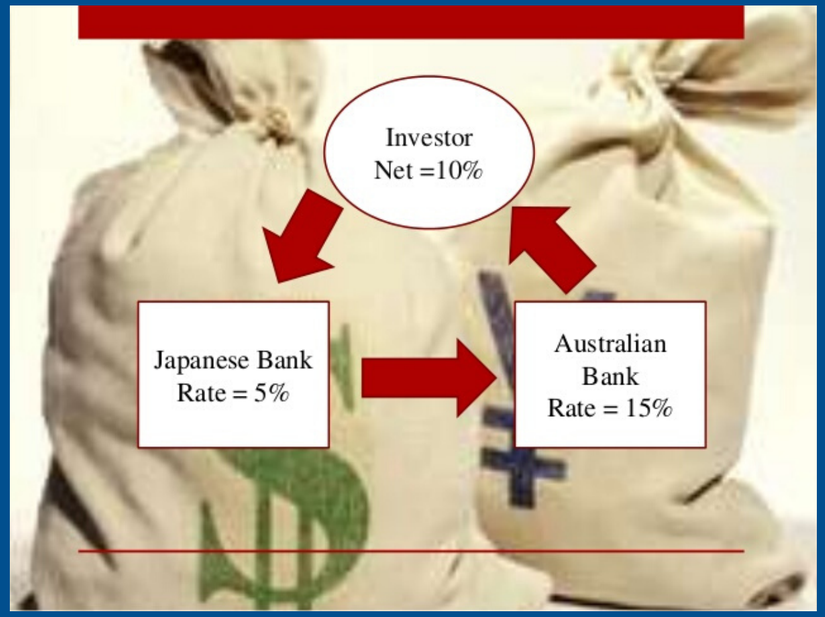
Safe Asset Dummy

- We determine this dummy based on what countries' treasury bonds investors think are safe
- Safe Asset Dummy = Public Debt (as % of GDP)/ Interest Payment (% of Revenue) > 12



Interest Rates Differential

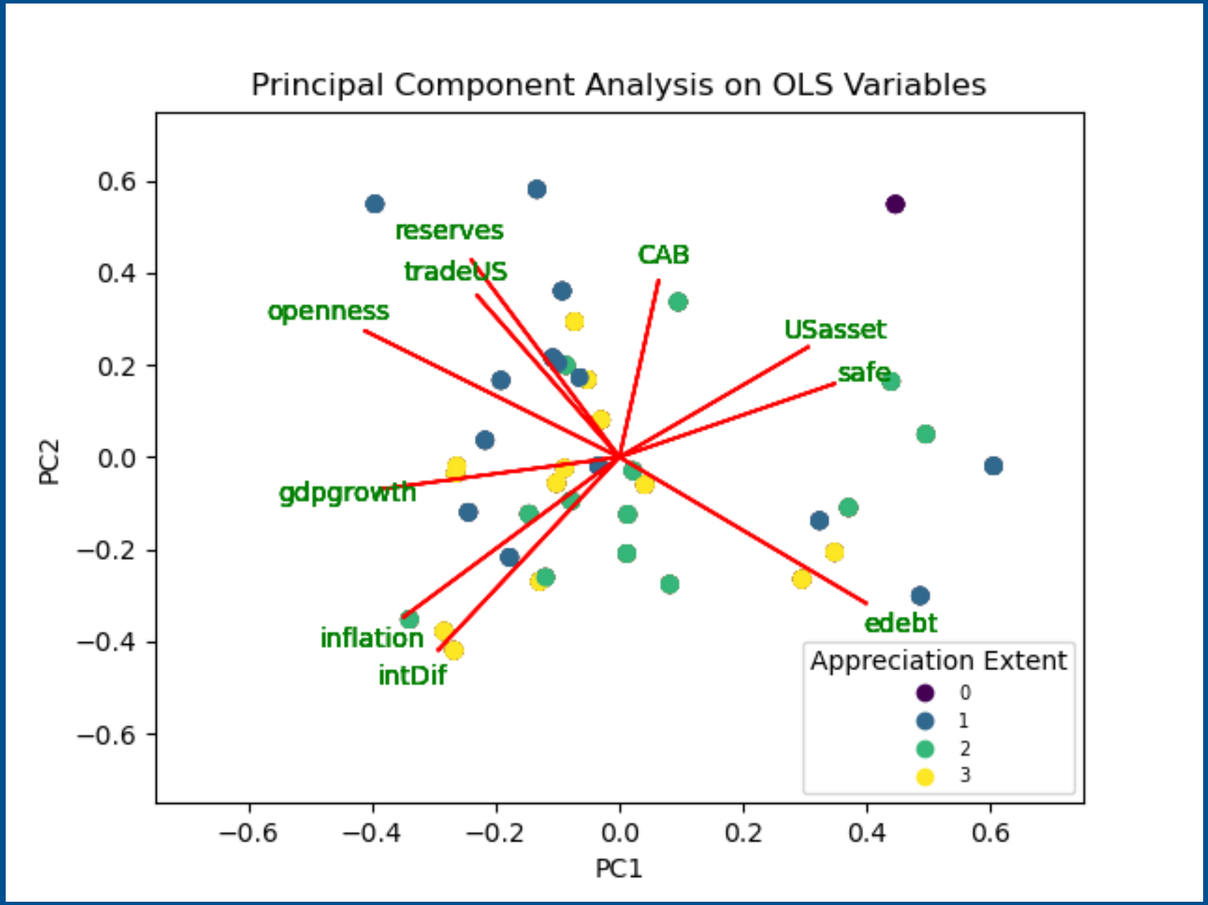
- Carry Trade is a trading strategy where an investor use the lower-interest-rate currency to fund the purchase of a higher yielding currency.
- Kohler (2010) argues that the unravelling of carry trade strategy exacerbates certain currencies' depreciation.
- Interest rates differentials = US interest rates - the country's interest rates



US exposure explain more than country fundamentals

	All Variables	Country Fundamentals	US Exposures
Intercept	-0.0027	-0.0010	0.0029***
	(0.0082)	(0.0100)	(0.0007)
current_account_balance_p1	0.0013	-0.0019	
	(0.0071)	(0.0084)	
edebt_p1	0.0030	0.0028	
	(0.0061)	(0.0074)	
gdpgrowth_p1	0.0239*	0.0085	
	(0.0138)	(0.0163)	
inflation_p1	-0.0323*	0.0092	
	(0.0174)	(0.0118)	
reserve_gdp_p1	-0.1151	-0.4280	
	(0.3909)	(0.4748)	
trade_gdp_p1	0.0054	0.0031	
	(0.0068)	(0.0083)	
intDif_p1	0.0584***		0.0341***
	(0.0185)		(0.0089)
exp_imp_p1	-6.5398**		-5.5468**
	(2.8562)		(2.3784)
US_asset_p1	4.7487**		4.9471**
	(2.2743)		(2.0702)
safe	-0.0030*	-0.0021	-0.0037**
	(0.0017)	(0.0019)	(0.0016)
Adjusted R-squared	0.3684	0.0352	0.3795
	0.5263	0.2040	0.4415
N	41	41	41

This might be because the US-related variables are correlated with other fundamentals



The extent of depreciation depends on the type of exposure with the US

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Adjusted R-squared	0.3684	0.0352	0.3795
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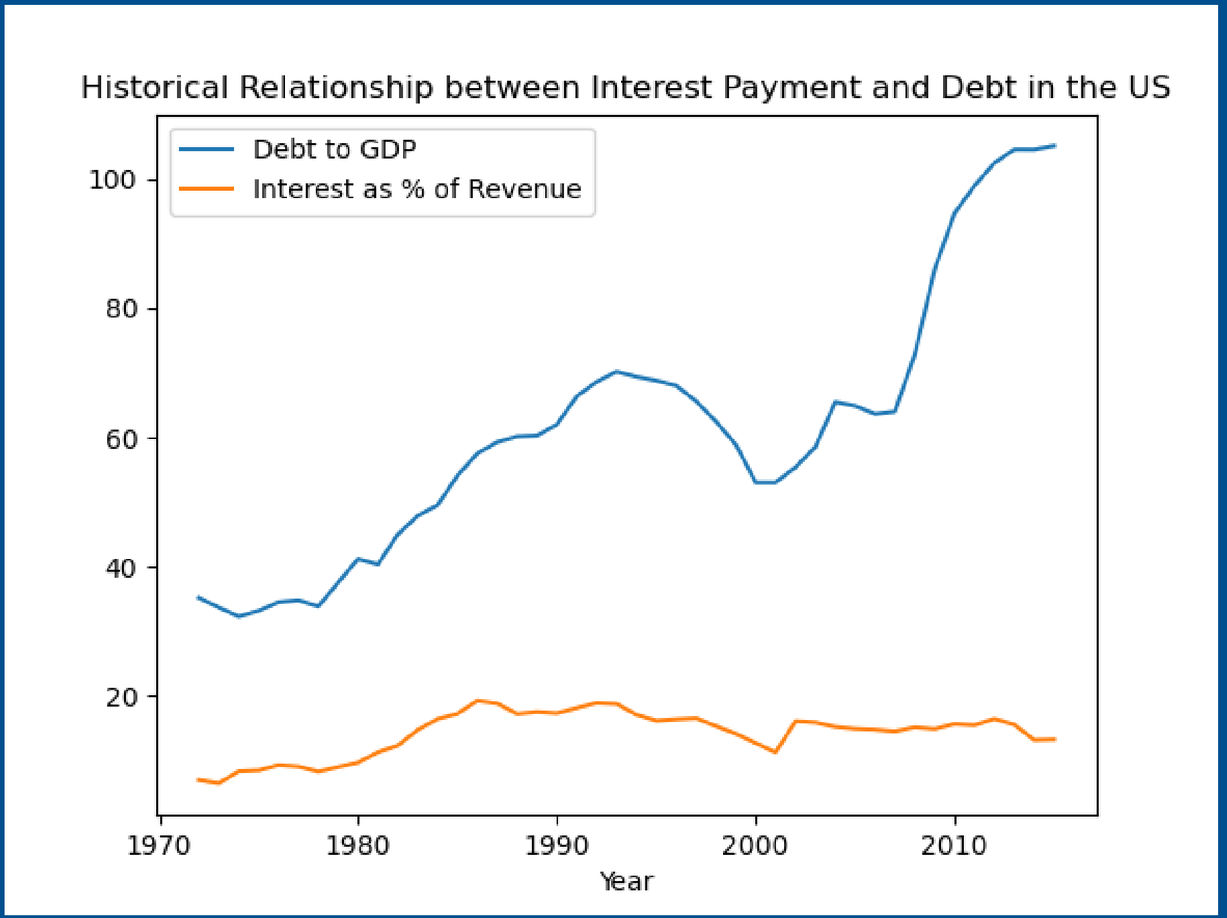
The crisis is so US-driven that when we regress the same set of variables on the current COVID-19 outbreak, all variables lose significance.

	All Variables	Country Fundamentals	US Exposures
Intercept	-0.0030	-0.0024	0.0007***
	(0.0027)	(0.0026)	(0.0002)
current_account_balance_p2	0.0001	-0.0007	
	(0.0041)	(0.0040)	
edebt_p2	0.0028	0.0024	
	(0.0019)	(0.0019)	
gdpgrowth_p2	-0.0092	-0.0051	
	(0.0065)	(0.0050)	
inflation_p2	0.0197	0.0092	
	(0.0113)	(0.0055)	
reserve_gdp_p2	-0.0497	-0.0339	
	(0.1108)	(0.0943)	
trade_gdp_p2	0.0028	0.0022	
	(0.0021)	(0.0021)	
intDif_p2	-0.0089		0.0068*
	(0.0081)		(0.0036)
exp_imp_p2	-0.3550		-1.2928
	(1.0494)		(0.8741)
US_asset_p2	0.2876		0.9973
	(1.0842)		(0.9613)
serious	0.0003	0.0002	0.0000
	(0.0004)	(0.0004)	(0.0004)
safe	-0.0003	-0.0000	-0.0001
	(0.0004)	(0.0004)	(0.0004)
Adjusted R-squared	0.1200	0.1369	0.0185
	0.4785	0.3926	0.2002
N	28	28	28

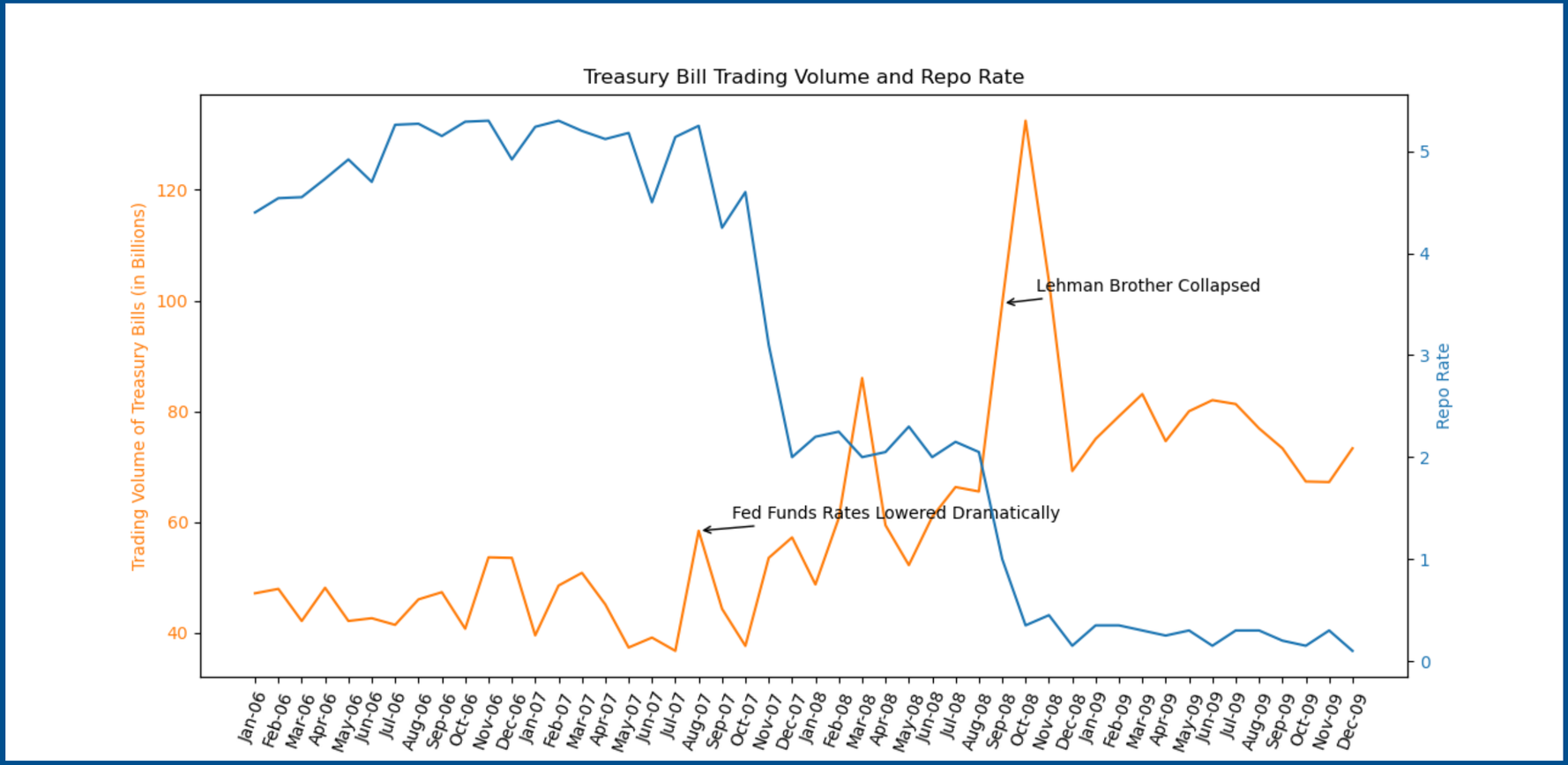
3

The exited capital mainly flows to US treasury bonds

Debt kept rising, but interest payment did not increase



The rush to treasury bonds has been persistent during the crisis period



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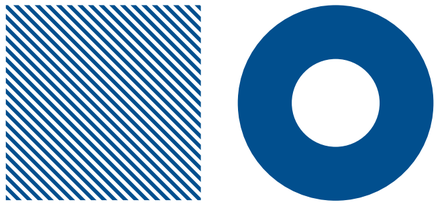
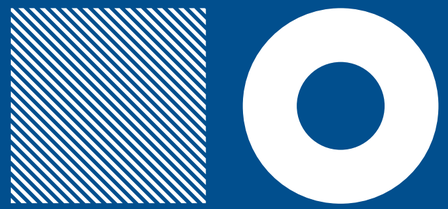
Limitations/ What would we have done more



1. Lack of observations because of lack of data
2. Expert Opinions
3. Not enough experience in time series
4. Historical comparisons

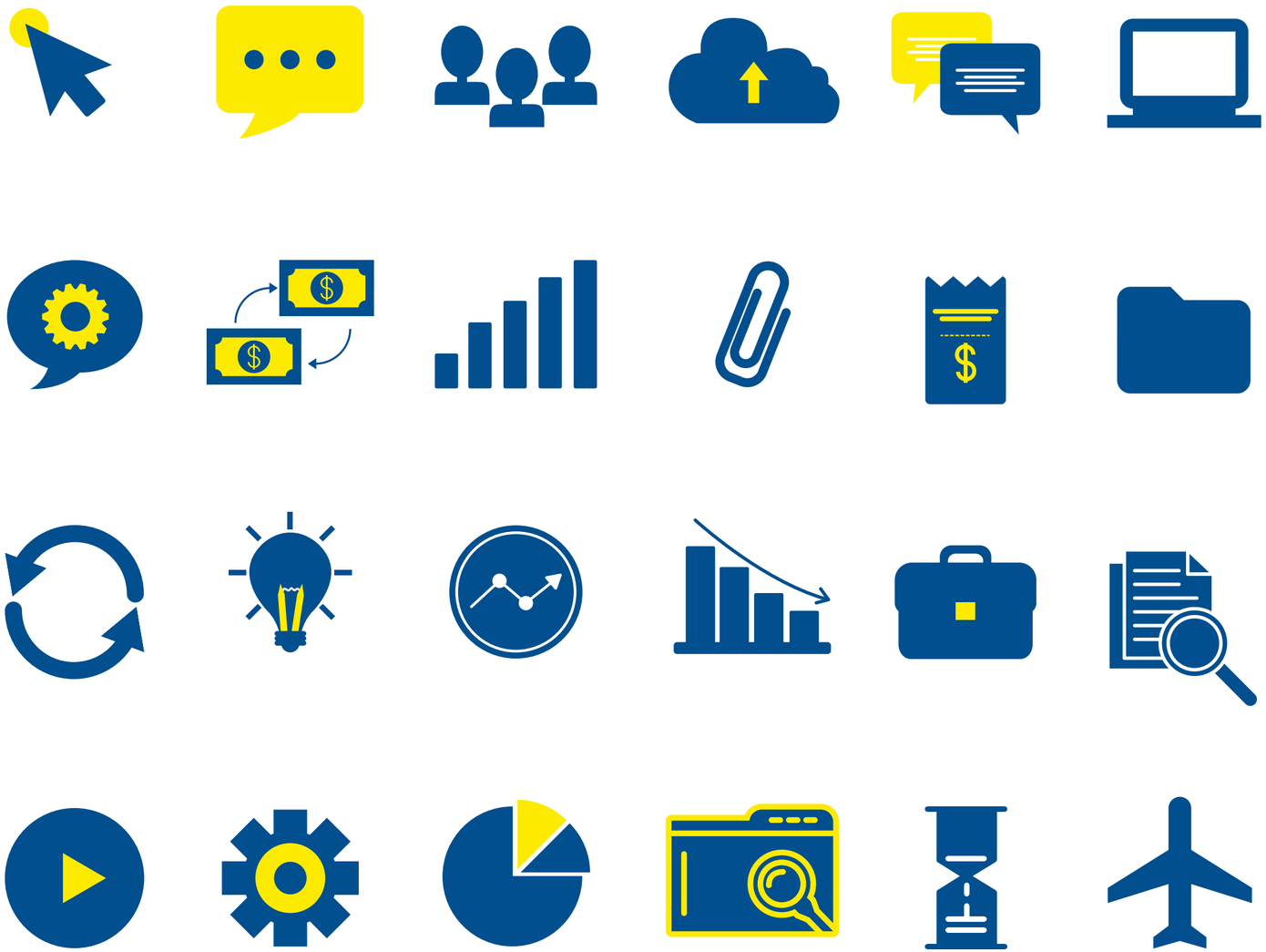
Teamwork to overcome challenges

1. Creative ways to visualize
2. Remote working
3. All beginners in Python



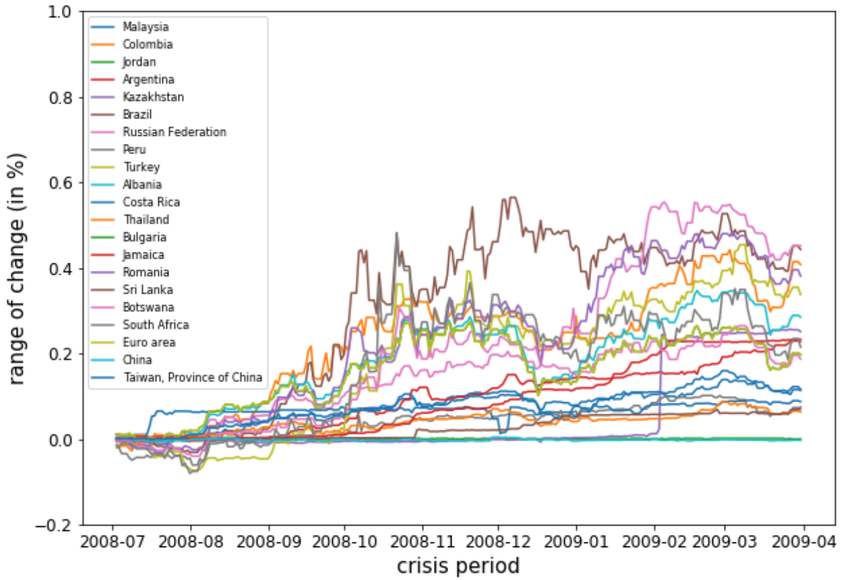
Thank you!

Hope you enjoyed our presentation!

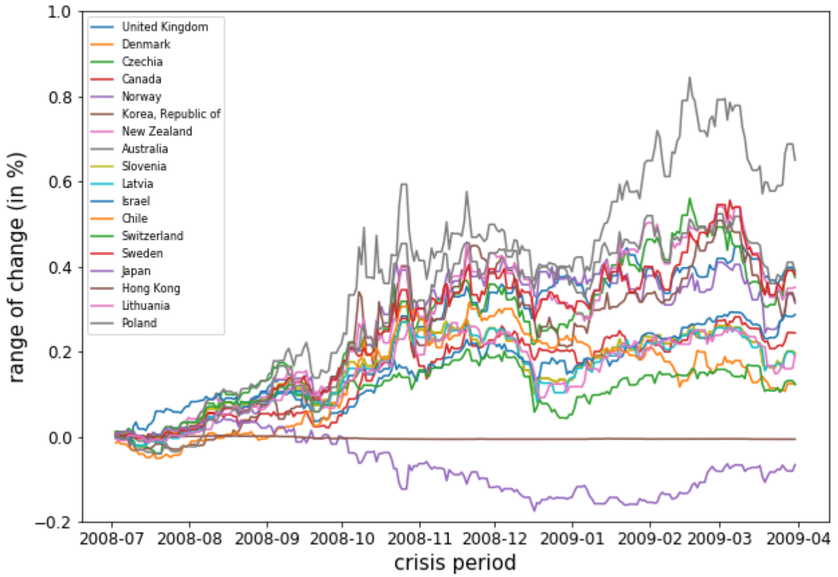


Appendix

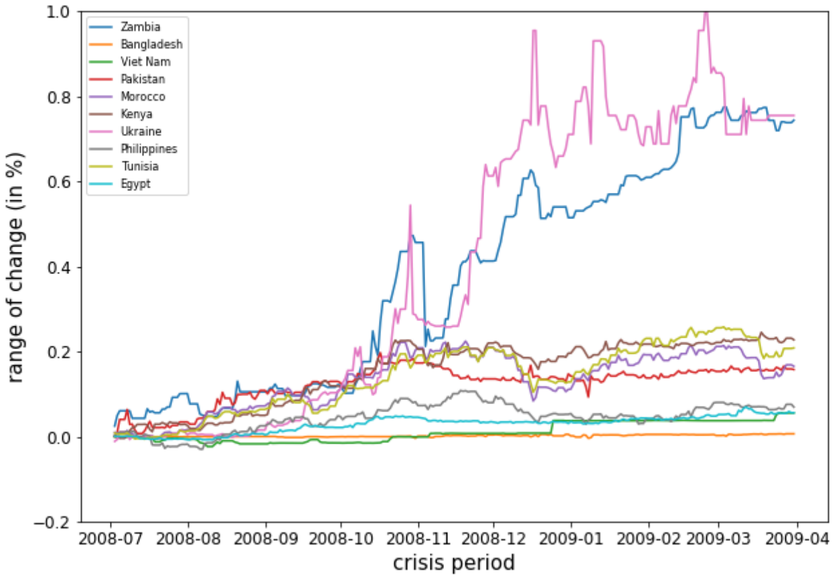
Upper middle income



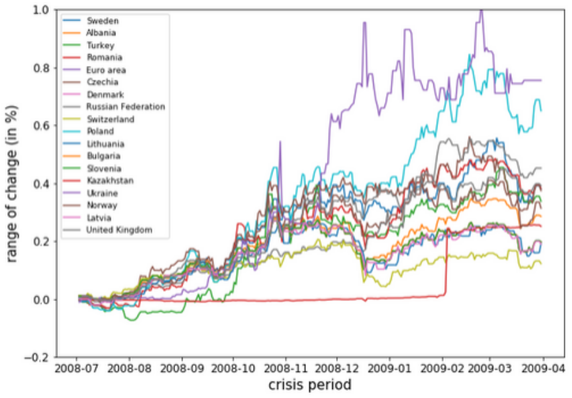
High income



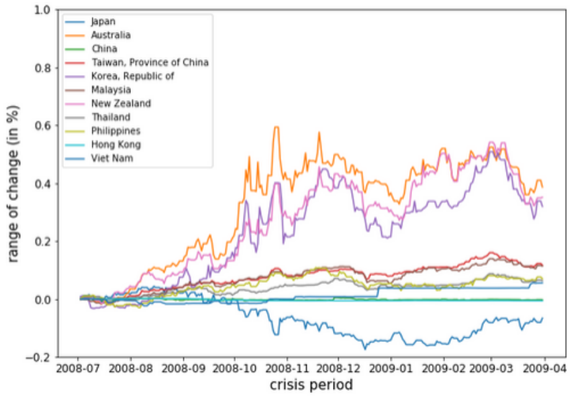
Lower middle income



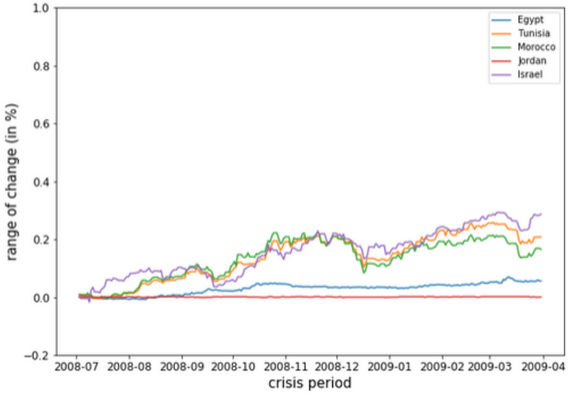
Europe & Central Asia



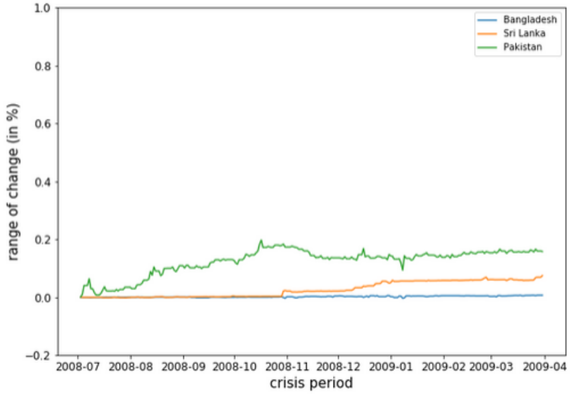
East Asia & Pacific



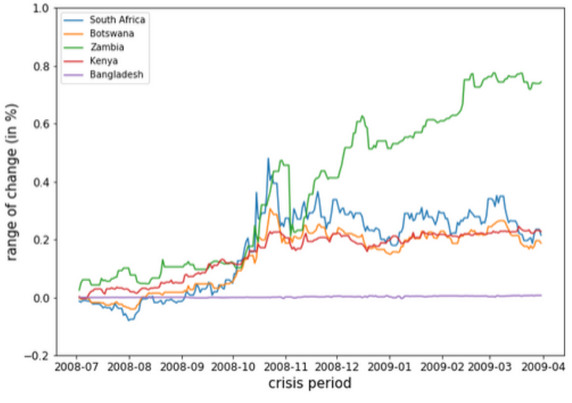
Middle East & North Africa



South Asia



Sub-Saharan Africa



Latin America & Caribbean