

# Econometric analysis of competing theories of inflation in Sri Lanka

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Money supply or exchange rate?

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*EPOG+ Minor C3*

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# Sri Lanka's financial crisis

## Explainer: How Sri Lanka spiralled into crisis

By Devjyot Ghoshal and Alasdair Pal

July 13, 2022 3:13 AM GMT+2 · Updated 2 years ago



## Sri Lanka cancels school exams over paper shortage as financial crisis bites

Colombo unable to fund import of printing paper, leaving millions of students unable to take part in term assessments *Agence France-Presse*

Sun 20 Mar 2022 03.15 CET

## Sri Lanka down to last day of petrol, new prime minister says

17 May 2022

By Peter Hoskins, Business reporter



# Timeline of the crisis



- External debt
- Trade balance
- Forex reserves

## Supply shocks:

- 2019: COVID, Easter bombings
- 2021: chemical fertilizer ban

Jan–March  
2022

SL defaults on  
external debt

July  
2022

Peak year-over-  
year inflation  
> 70%

Q4  
2022

2021

2022

April  
2022

September  
2022

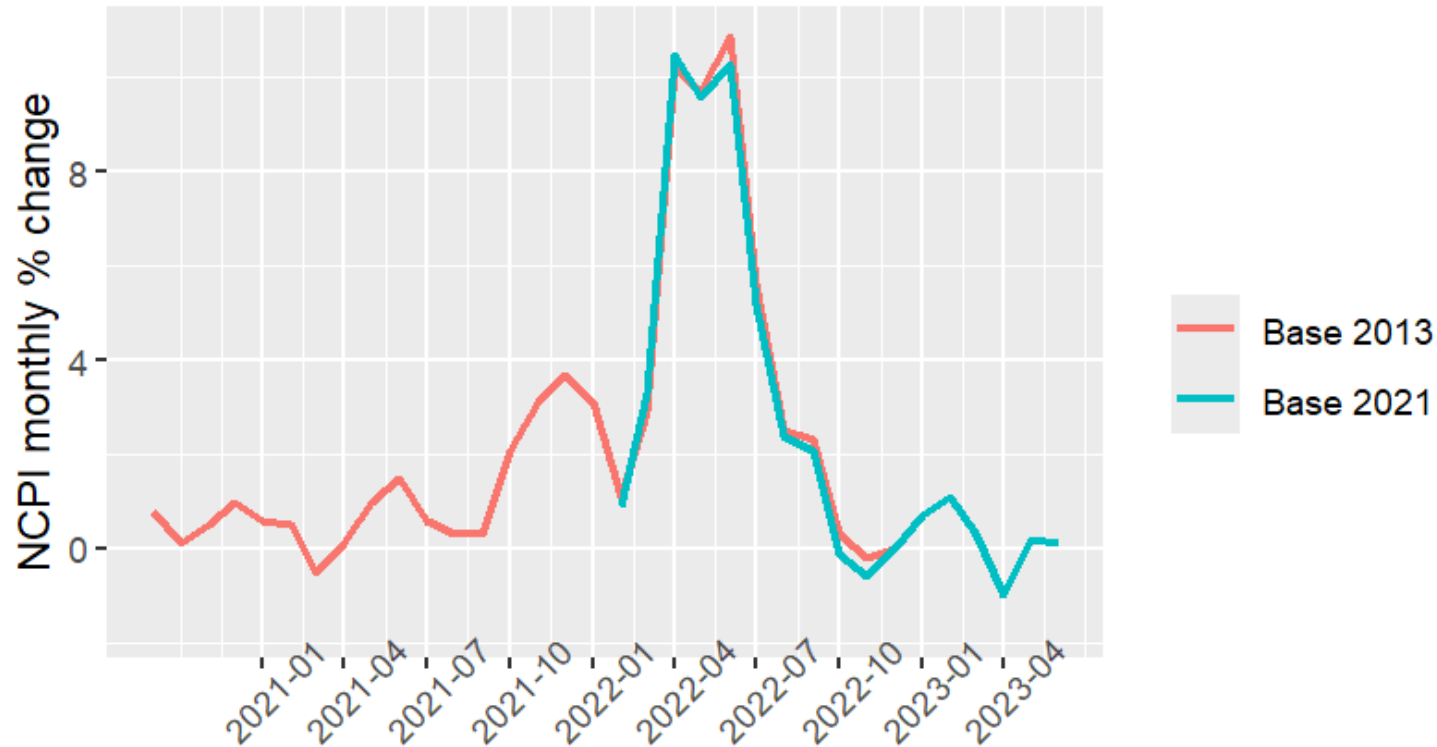
- Ukraine war, monthly inflation > 4%
- Acute shortage of essentials
- Political unrest

- President Rajapaksa resigns
- Debt restructuring talks begin with IMF

- Trade balance improves
- Inflation eases

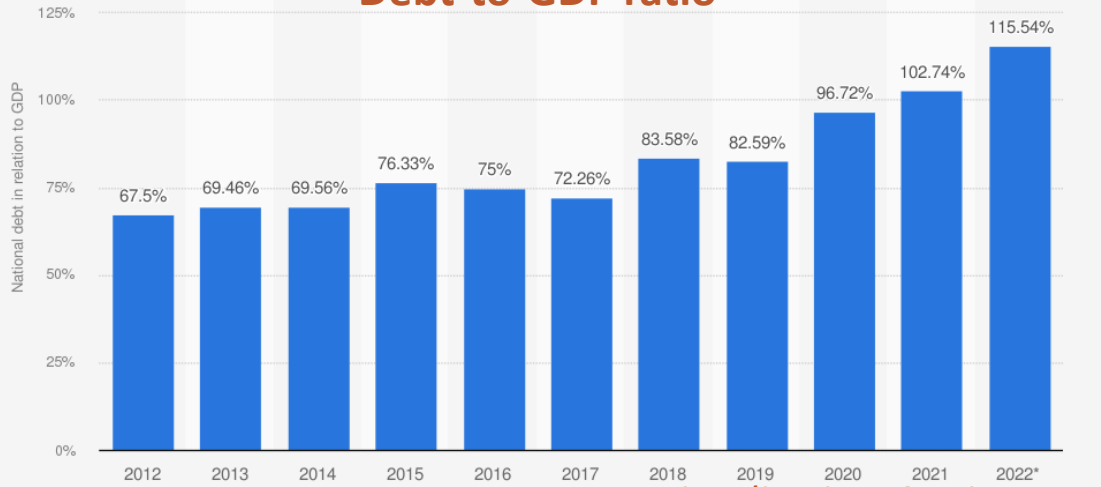


# Cost-price inflation



- Poverty increased from ~11% to almost 25%
- GDP contraction of 7.2%

## Debt-to-GDP ratio



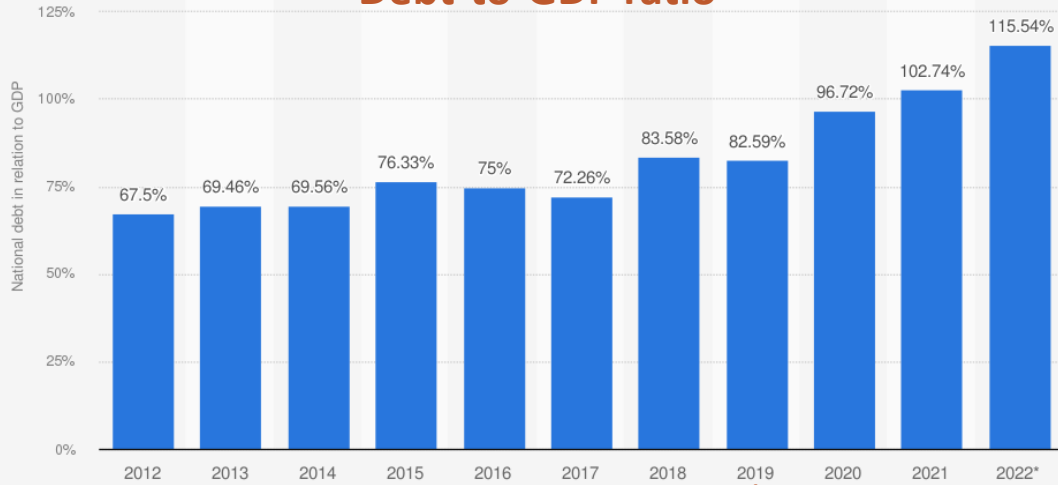
Visualization: Statista

# Data analysis: *The build-up*



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## Debt-to-GDP ratio



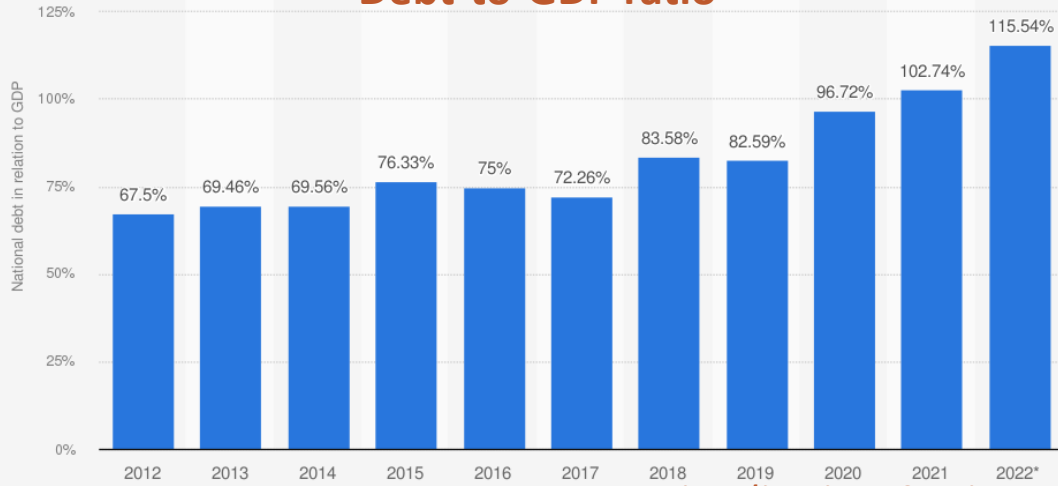
Visualization: Statista

## Aggregate supply & sectoral GDP

	2019	2020	2021	2022
GDP growth rate (%)	-0.22	-4.62	3.51	-7.82
Sectoral growth rate (%)				
Agriculture	0.45	-0.89	0.94	-4.57
Industry	2.92	-1.92	3.45	-2.01
Services	-4.09	-5.32	5.73	-15.95

	2019	2020	2021	2022
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Growth rate (%)				
Consumption	3.82	-5.76	2.64	-9.00
Government expenditure	6.56	0.01	-2.81	1.39
Investment	-12.07	0.16	4.47	-24.90
Net exports	18.85	-15.35	-9.27	101.14

## Debt-to-GDP ratio



Visualization: Statista

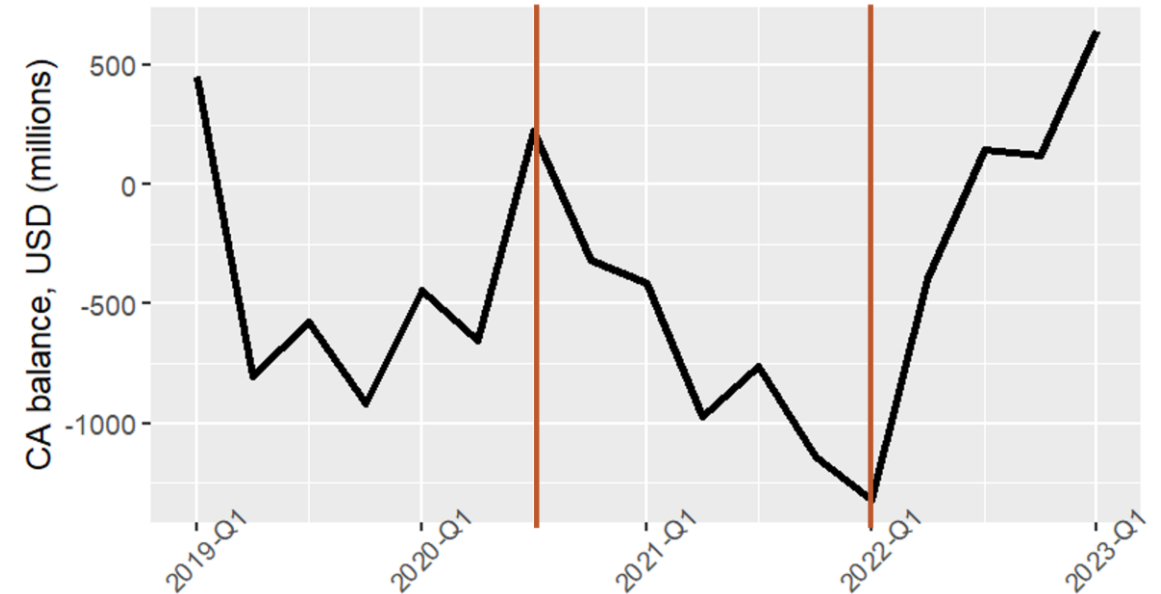
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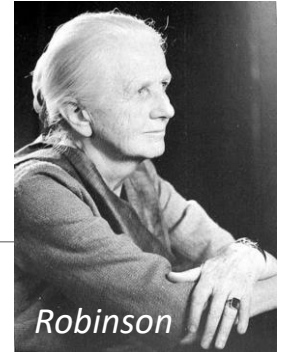
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# Data analysis: *The build-up*

## Current account balance



# Theoretical background



## Monetarist

Exogenous money

Monetary expansion causes inflation

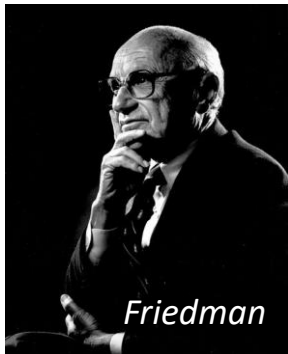
Open economy:

Money supply → inflation → currency devaluation

Supply-constrained economy

*“Inflation is always and everywhere a monetary phenomenon”*

*Milton Friedman*



## Post-Keynesian

Endogenous money

Distributional conflict + exchange rate dynamics cause inflation

Open economy:

Currency devaluation → inflation → money supply

Demand-constrained economy

*“Each rise in wages... precipitated a further fall in the exchange rate, ... [calling] forth a further rise in wages.”*

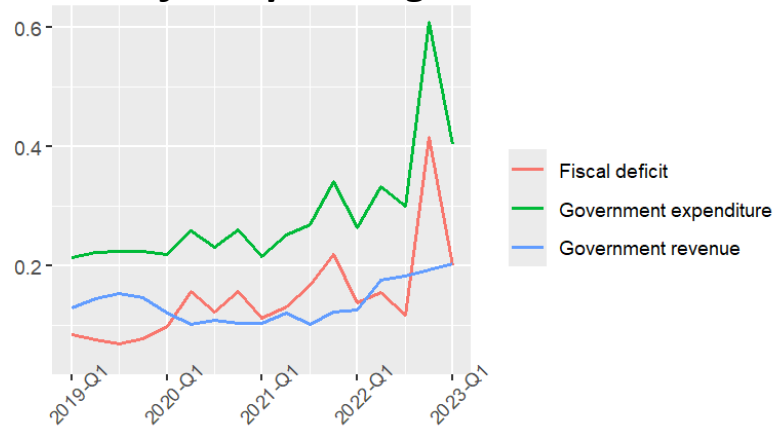
*Joan Robinson on the Weimar hyperinflation*



# Model specification:

## *Monetarist*

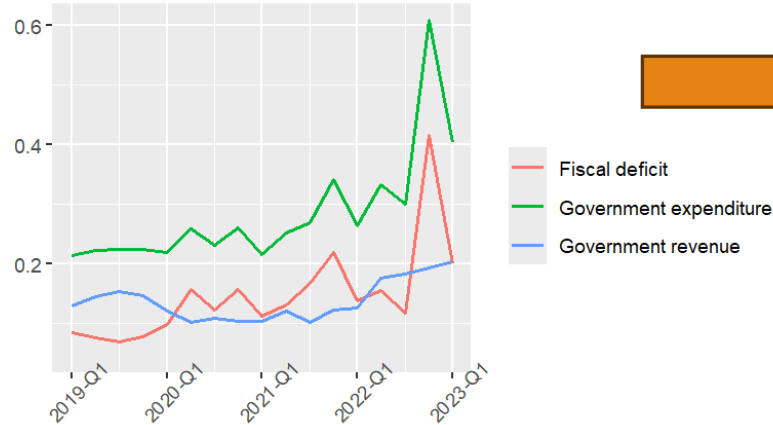
### 1. Deficit spending



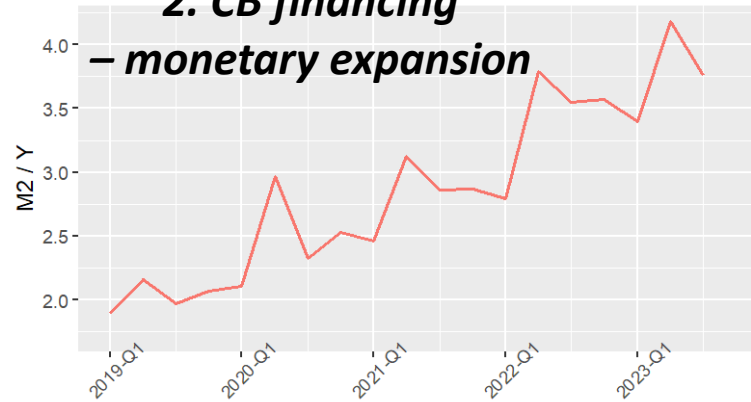
# Model specification:

## *Monetarist*

### 1. Deficit spending



### 2. CB financing – monetary expansion



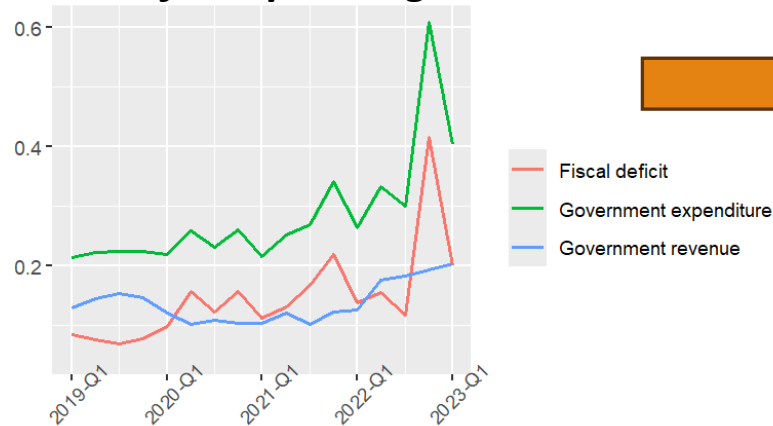
Official stance of Central Bank:

*'... tight monetary policy stance that commenced in August 2021 through 2022 in view of arresting inflationary pressures and possible de-anchoring of inflation expectations [was continued in 2022]...'*

Central Bank of Sri Lanka, Annual Report 2022: pp. 141

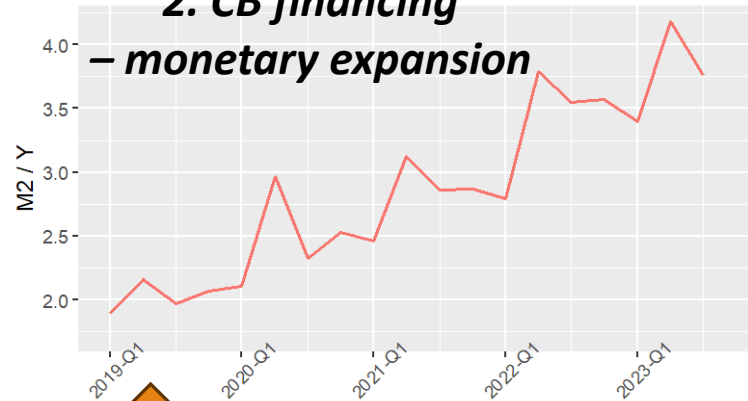
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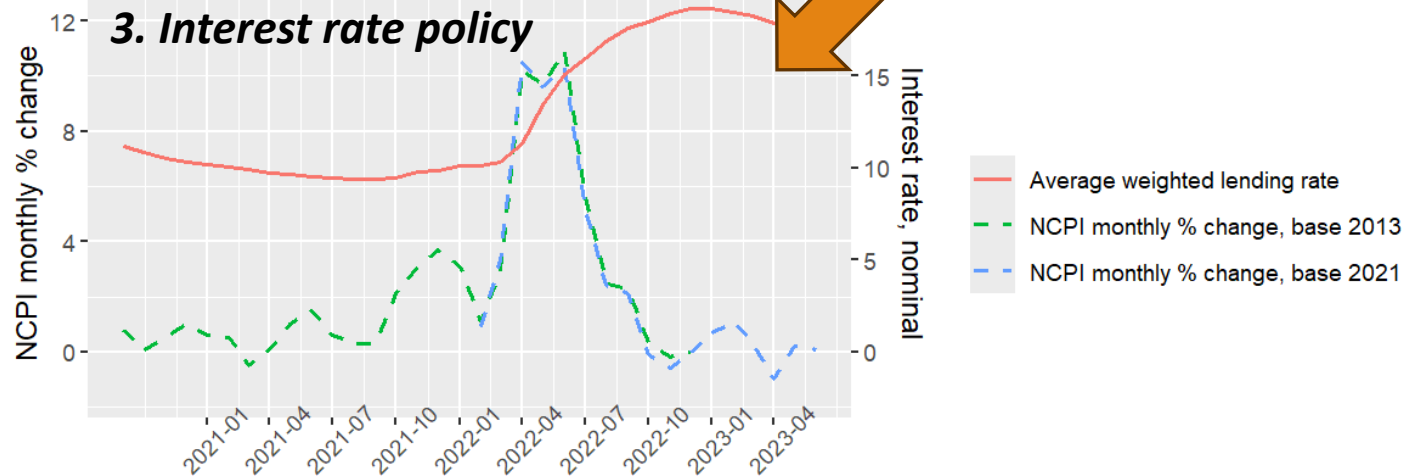


## 2. CB financing

– monetary expansion



## 3. Interest rate policy



Official stance of Central Bank:

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Central Bank of Sri Lanka, Annual Report 2022: pp. 141

*Interest rate hike 'helped arrest the build-up of demand driven inflationary pressures and preempt the escalation of adverse inflationary expectations...'*  
(pp. 220)

# Model specification: *Conflicting-claims*

## 1. Debt repayment -> forex depletion



Official stance of Central Bank:

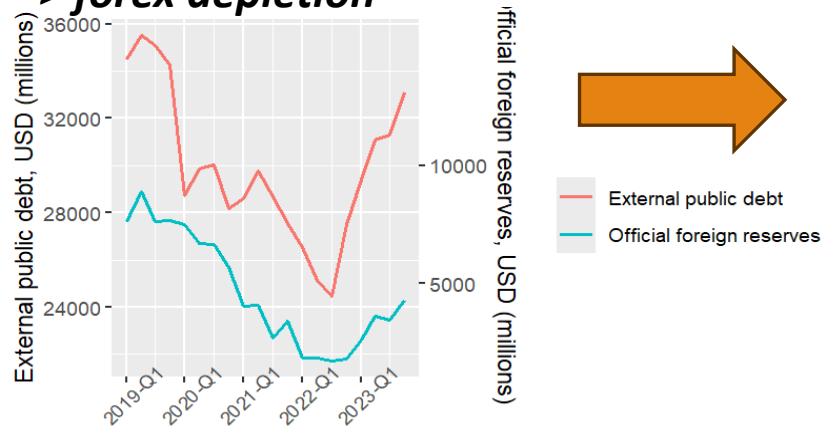
*'...[as] the government could not raise adequate liquidity..., the Central Bank continued to provide liquidity from the foreign reserves... during the period of 08 April to 22 June 2020... utilising the Central Bank's foreign reserves [emphasis added]'*

*Central Bank of Sri Lanka, 'Public Debt Management'*

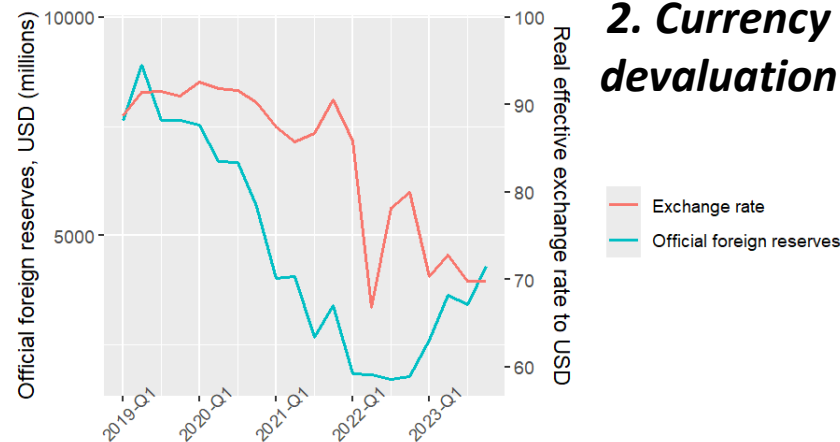
<https://www.cbsl.gov.lk/en/covid-19-public-debt-management>

# Model specification: *Conflicting-claims*

## 1. Debt repayment -> forex depletion



## 2. Currency devaluation



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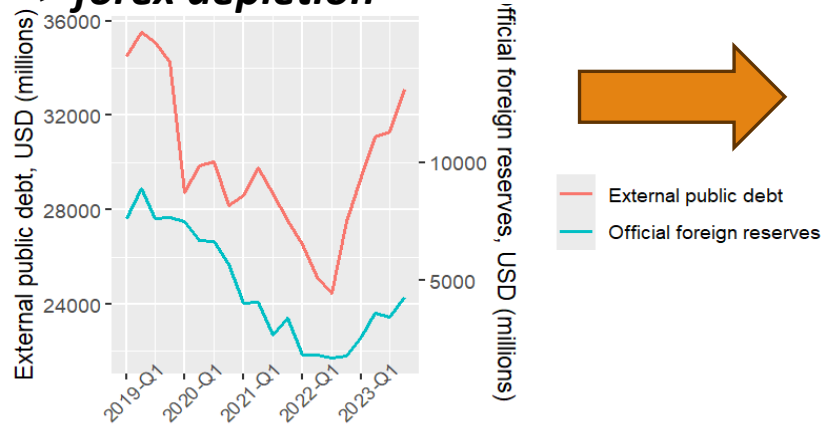
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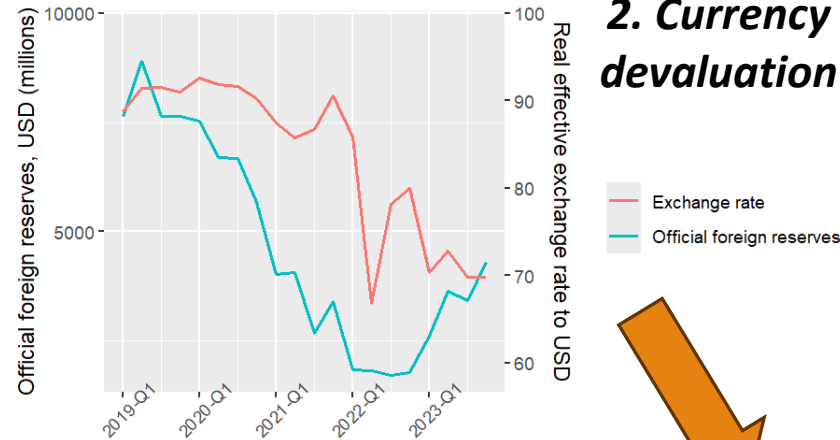
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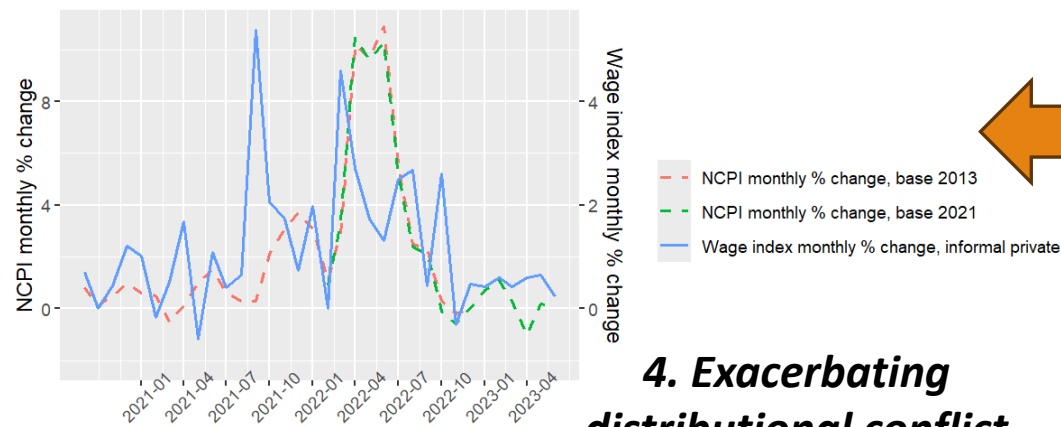


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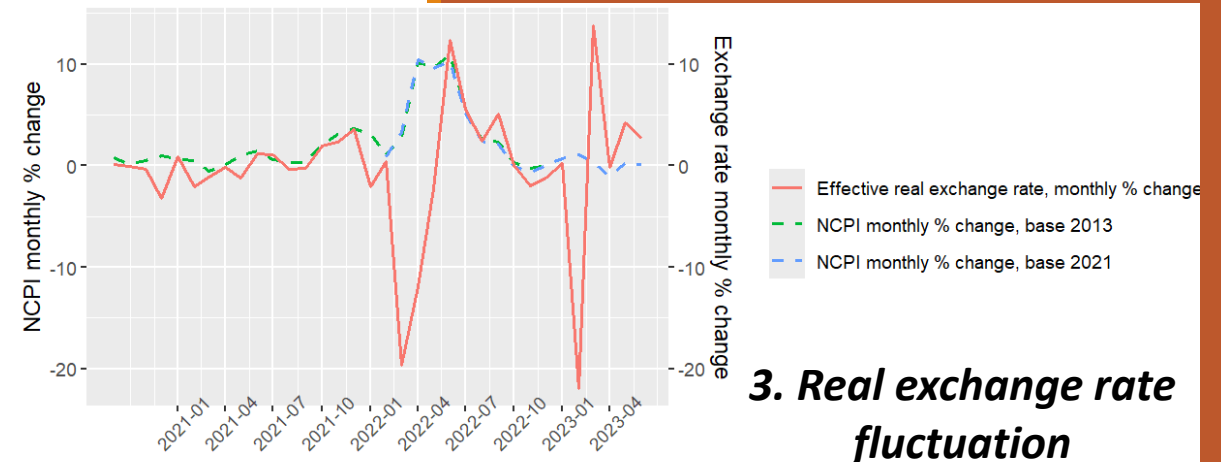


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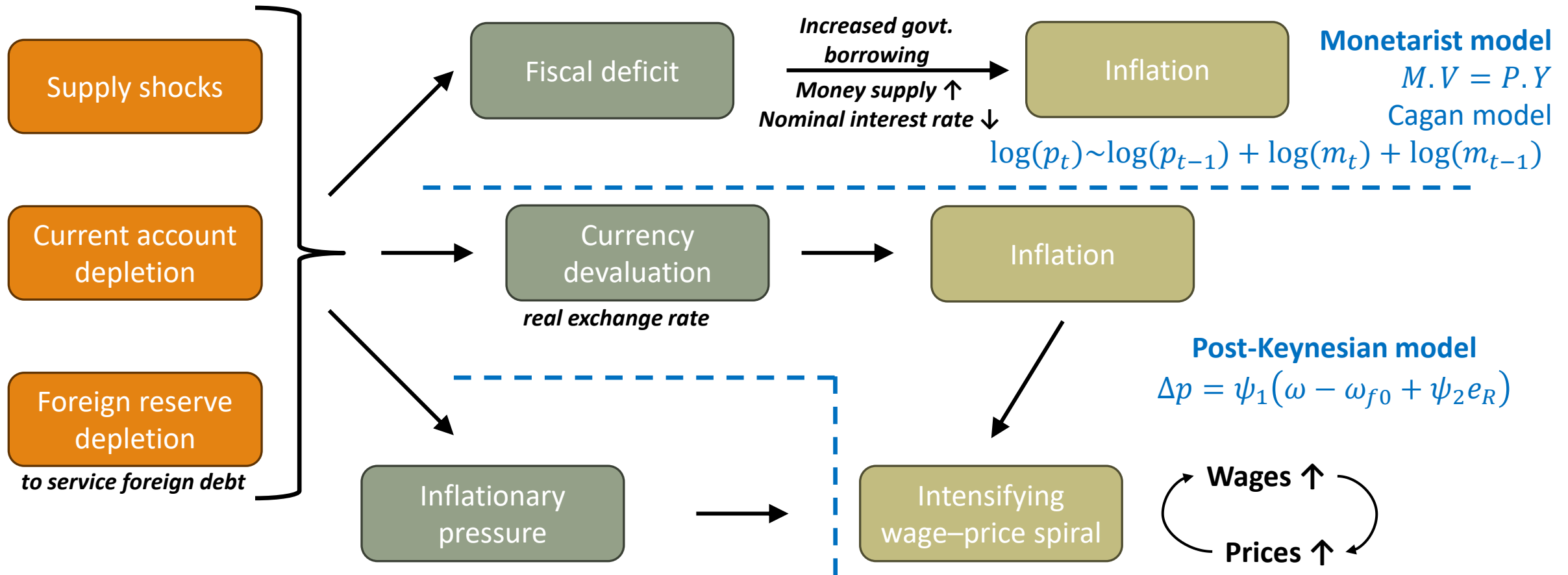
## 4. Exacerbating distributional conflict



## 3. Real exchange rate fluctuation



# Model specification



# Econometric model evaluation

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Dependent	Independent	Controls
National consumer price index (NCPI) ↓ First difference (inflation), log transforms	Broad money M2	Real GDP Nominal interest rate $i$
	Real exchange rate $e_R$	Wage rate: ratio of wage index to NCPI

***Data series: 2014 -> 2023***

***N = 120***

# Stationarity tests

Stationary time series:

$$E(Y_t) = \mu \quad \text{for all } t$$
$$E(Y_t - \mu)(Y_{t-j} - \mu) = \gamma_j \quad \text{for all } t \text{ and any } j.$$

Stationarity tests (unit root tests):  
**ADF, PP, KPSS**

Variable	Order of integration
<b>Inflation (dependent)</b>	
Linear	$I(1)$ or $I(0)$
Log-transformed <sup>2</sup>	$I(0)$
<b>Broad money <math>M2</math> (independent)</b>	
Linear	$I(1)$ or $I(2)$
Log-transformed	$I(1)$
<b>Real exchange rate <math>e_R</math> (independent)</b>	
Linear	$I(1)$ or $I(0)$
Log-transformed	$I(1)$ or $I(0)$

*Ambiguous orders of integration*

*All variables don't have same orders of integration*

# Autoregressive distributed lag (ARDL) models

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$$y_t \sim \alpha + \underbrace{\sum_{i=1}^p \beta_i y_{t-i}}_{\text{'AR'}} + \underbrace{\sum_{j=0}^q \gamma_j x_{t-j}}_{\text{'DL'}} + \varepsilon_t$$

## Advantages

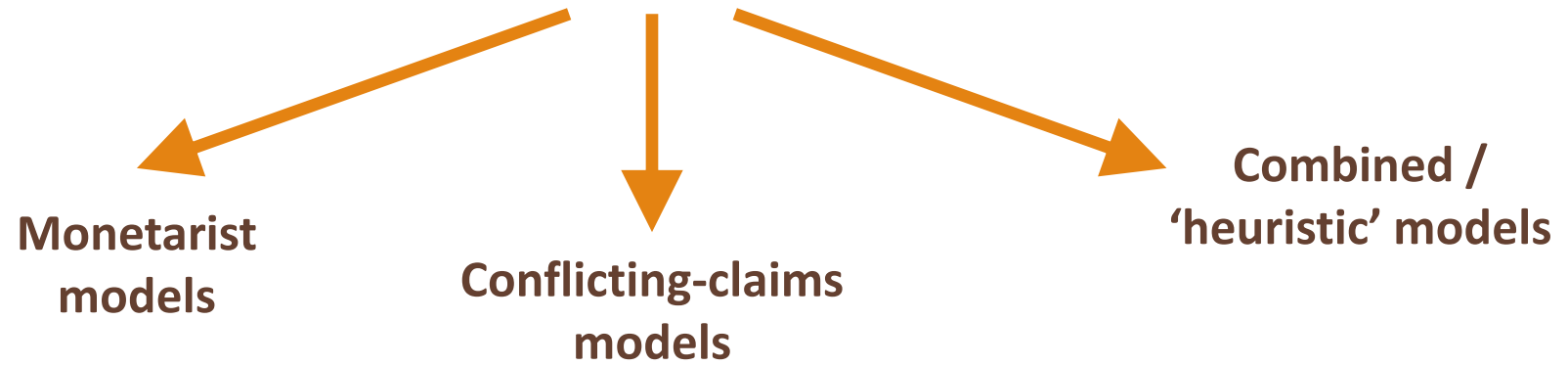
Variables need not be of same order of integration

Can handle endogenous regressors

*No time series should be  $I(2)$  or higher!!*

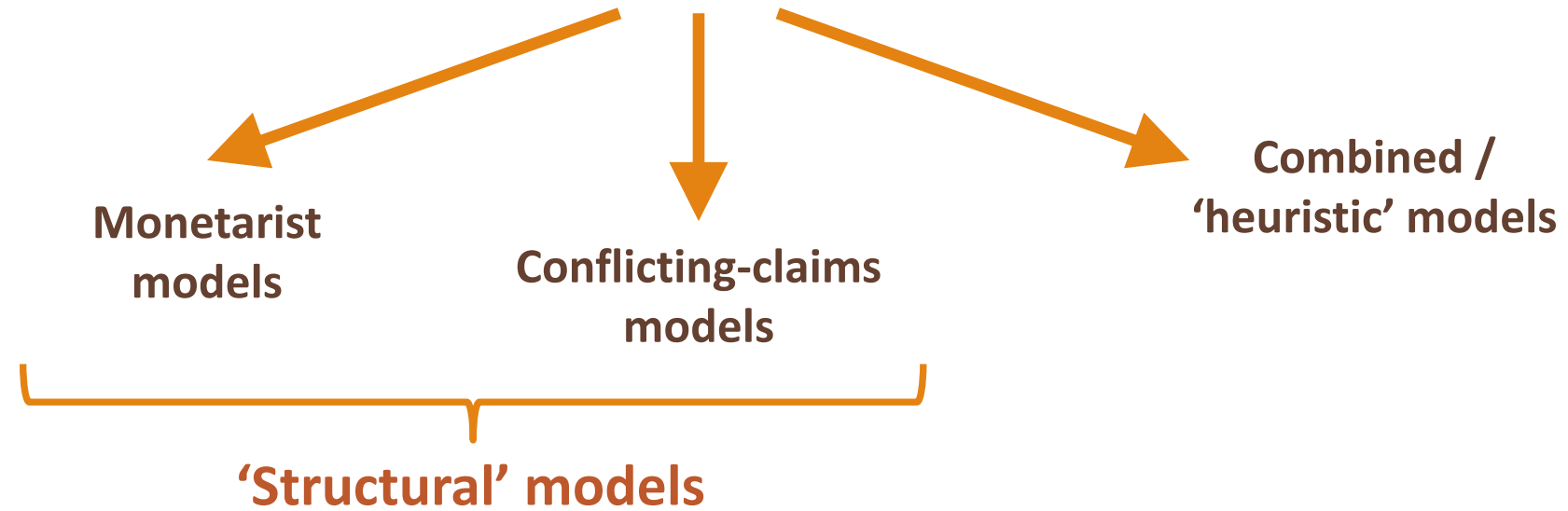
# Modeling strategy

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# Modeling strategy

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*Why? To test the underlying dynamics  
of each model separately*



# Results

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- Little support for money supply or exchange rate as significant determinant of inflation
  - Only one model concludes  $e_R$  is significant while satisfying most assumptions
- Normality condition not satisfied in any of the models
  - Shapiro–Wilk test has low power for small sample size (Razali & Wah, 2011)
- Small sample size and characteristics of data
  - Unclear order of integration of price series
  - Breaks in data series
  - Different from Charles & Marie (2020) – Bulgarian data – why? What is different about underlying processes?

# Next steps and conclusion

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- How to proceed with the regressions?
  - Higher lags and ARMA models
  - Structural breaks?
  - Non-parametric models + nonlinear ARDL
  - Finally, bounds testing for long-run relationship (after we understand what's happening in the short-run)
- Contributions
  - Proposed empirically founded competing models of inflation rooted in PE context of SL
  - Proposed alternative to dominant monetarist understanding of the inflation crisis
  - Provided first steps for econometric evaluation of the model

# References

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- Câmara, A., & Vernengo, M. (2000). The German Balance of Payments School and the Latin American Neo-Structuralists. In *Credit, Interest Rates and the Open Economy* (pp. 143–159). Edward Elgar Publishing. [https://EconPapers.repec.org/RePEc:elg:eechap:1783\\_6](https://EconPapers.repec.org/RePEc:elg:eechap:1783_6)
- Central Bank of Sri Lanka (2022). Annual Report 2022. Chapters 4 and 7. <https://www.cbsl.gov.lk/en/publications/economic-and-financial-reports/annual-reports/annual-report-2022>
- Central Bank of Sri Lanka (n.d.). *Public Debt Management*. <https://www.cbsl.gov.lk/en/covid-19-public-debt-management>
- De Silva, T., Commander, S., & Estrin, S. (2022, July 19). What lies behind Sri Lanka's collapse? *LSE Business Review*. <https://blogs.lse.ac.uk/businessreview/2022/07/19/what-lies-behind-sri-lankas-collapse/>
- Edmond, C. (2017). Cagan's Model of Hyperinflation. *NYU Stern School of Business*. [https://pages.stern.nyu.edu/~cedmond/ge07pt/notes\\_cagan.pdf](https://pages.stern.nyu.edu/~cedmond/ge07pt/notes_cagan.pdf)
- Friedman, M. (1968). The Role of Monetary Policy. *American Economic Review* 58 (1): 117.
- Hamilton, J. D. (1994). *Time Series Analysis*. Princeton University Press.
- World Bank. (June 20, 2023). *3 ways to make social protection work for Sri Lanka's poor and vulnerable*. Feature story. <https://www.worldbank.org/en/news/feature/2023/06/19/3-ways-to-make-social-protection-work-for-sri-lanka-s-poor-and-vulnerable> (Retrieved June 10, 2024)
- Lavoie, M. (2022). *Post-Keynesian Economics: New Foundations*. Edward Elgar Publishing.
- Mashal, M. (2022, July 13). Here is how Sri Lanka reached this moment of crisis. *The New York Times*. <https://www.nytimes.com/2022/07/12/world/asia/sri-lanka-president-protests-timeline.html>
- Jordan, S., & Philips, A., Q. (2019). Dynamic Simulation and Testing for Single-Equation Cointegrating and Stationary Autoregressive Distributed Lag Models. *The R Journal*, 10(2), 469. <https://doi.org/10.32614/RJ-2018-076>

Thank you!

Questions?