Modelling the impact of COVID-19 on the South African Economy

Rob Davies

Introduction

- Economy-wide modelling in the policy environment
- Illustrate with modelling the economic impact of COVID-19 on South Africa
- Begin with a brief overview of modelling and approach we used for COVID
- Then modelling and some results

Models in Policy

- Economists use models to simplify reality
- Many different models with their different uses
  - NOT one size fits all
- Models also used in policy formulation
- Different uses
  - Forecasting
  - Laboratories
- Need models of the whole economy, not simply of particular segments

Macroeconomic Models

- Macroeconomic models are economy-wide
  - May be too aggregated for some questions
  - May be inappropriate for shocks like the COVID pandemic
- Pandemic and government responses caused GDP to fall
  - Pandemic recession
- Macroeconomics deals with recessions
  - "top-down recessions"
- The Pandemic recession was a bottom-up recession
- Need an appropriate model for exploring bottom-up recessions

Economy-wide Models

- Policy analysts also use economy-wide models
- More disaggregated than macromodels
  - The economy is a system or network
  - Various parts interact with each other
    - Knock-on and feedback effects
- Appropriate for bottom-up recessions

Social Accounting Matrix

- Social Accounting Matrix (SAM)
  - Shows the circular flow of income in a consistent and disaggregated way
  - Economy divided into various accounts
  - SAM is a matrix that records all transactions between accounts
- Take a look at a stylized SAM.

A Stylised Social Accounting Matrix (SAM)

		PAYMENTS MADE BY						
		Sectors	**Factors**	**Households**	**Government**	**Accumulation**	**ROW**	**Total**
PAYMENTS RECEIVED BY	**Sectors**	Intermediate Inputs	-	Private Consumption Expenditure	Government Expenditure	Investment Expenditure	Exports	Demand
	Factors	Value Added	-	-	-	-	Income from ROW	Factor Incomes
	Households	-	Distribution of Income	-	Transfers to Households	-	Transfers from ROW	Total Household Incomes
	Government	-	-	Taxes	-	-	Transfers from ROW	Government Income
	Accumulation	-	-	Private Savings	Government Savings	-	Foreign savings	Savings
	Rest of the World	Imports	Income to ROW	Transfers to ROW	Transfers to ROW	-	-	Forex Outflows
	Total	Supply	Use of Factor Incomes	Use of Household Income	Use of Government Income	Investment	Forex Inflows	

Social Accounting Matrix

- Social Accounting Matrix (SAM)
  - Shows the circular flow of income in a consistent and disaggregated way
  - Economy divided into various accounts
  - SAM is a matrix that records all transactions between accounts
- Take a look at a stylized SAM.
- SAM is exhaustive
  - Covers the entire economy
- SAM is consistent
  - Incomings of each account must match their outgoings
- SAM must balance
- SAM disaggregation depends on purpose and data

The South African SAM

- For our modelling we constructed a SAM for 2019
- Same structure as SAMs used by National Treasury in recent years
  - 62 sectors
  - 104 goods and services
  - Capital
  - 4 types of labour (education level)
  - 14 household groups (consumption deciles with top split into 5)
  - Government
  - Direct and Indirect Taxes
  - Savings and Investment
  - Imports, exports and other international transactions

SAM Based Models

- SAM must balance
- SAM-based models specify how the SAM rebalances after a disturbance
  - Rules reflect modeller's view of how the economy works
- Two main types of SAM-Based Models
  - Multiplier models
    - Assume prices are fixed – quantity adjustment
    - Assume fixed proportions
  - Computable General Equilibrium (CGE) Models
    - Flexible prices
    - Substitution
- Both types add-up, so consistent with National Accounts
  - Reflects both macro and micro aspects of the economy

Tracing a shock through the SAM

- Can use the SAM to trace how a COVID shock might move through the economy
- Government declares restaurants non-essential
  - Restaurants lay off workers, reduce profits
    - Restaurants' contribution to GDP falls because of direct effect
  - But as restaurants' output falls they also reduce purchases of inputs from other sectors
  - Those sectors' outputs fall so they reduce their purchases of inputs
  - "Knock-on effects"
  - At the same time, the reduced employment reduces household incomes → so their expenditure falls
  - Aggregate demand falls, affecting other sectors
  - Etc etc
- So GDP falls, but by more than the direct fall caused by the closure of restaurants
- Multiplier

Macro and Economy-wide Multipliers

- All familiar with multipliers
- But generally macroeconomic
  - injections (government spending, investment and exports)
  - Leakages (savings, taxation and imports)
- The same macro multiplier operates here
- But the interindustry linkages provide further amplification
- In CGE model, the multiplier will be moderated by supply constraints and price changes

Models for COVID: Multiplier or CGE?

- Which type of economy-wide model should we use?

- COVID/Lockdown's immediate impact was on quantities
  - Government mandated fall in output
  - Changes in household expenditure patterns were not because relative prices changed
  - Speed of impact meant technology did not change

- Appropriate to use Multiplier approach
  - Some researchers used CGEs, but assumed responses to price changes were restricted

- For longer term recovery, CGE would be appropriate