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

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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
  • Laboritories
• 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)

<table>
<thead>
<tr>
<th>PAYMENTS MADE BY</th>
<th>Sectors</th>
<th>Factors</th>
<th>Households</th>
<th>Government</th>
<th>Accumulation</th>
<th>ROW</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intermediate Inputs</td>
<td>-</td>
<td>Private Consumption Expenditure</td>
<td>Government Expenditure</td>
<td>Investment Expenditure</td>
<td>Exports</td>
<td>Demand</td>
</tr>
<tr>
<td>Factors</td>
<td>Value Added</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>Income from ROW</td>
<td>Factor Incomes</td>
</tr>
<tr>
<td>Households</td>
<td>-</td>
<td>Distribution of Income</td>
<td>-</td>
<td>Transfers to Households</td>
<td>-</td>
<td>Transfers from ROW</td>
<td>Total Household Incomes</td>
</tr>
<tr>
<td>Government</td>
<td>-</td>
<td>-</td>
<td>Taxes</td>
<td>-</td>
<td>-</td>
<td>Transfers from ROW</td>
<td>Government Income</td>
</tr>
<tr>
<td>Accumulation</td>
<td>-</td>
<td>-</td>
<td>Private Savings</td>
<td>Government Savings</td>
<td>-</td>
<td>Foreign savings</td>
<td>Savings</td>
</tr>
<tr>
<td>Rest of the World</td>
<td>Imports</td>
<td>Income to ROW</td>
<td>Transfers to ROW</td>
<td>Transfers to ROW</td>
<td>-</td>
<td>-</td>
<td>Forex Outflows</td>
</tr>
<tr>
<td>Total</td>
<td>Supply</td>
<td>Use of Factor Incomes</td>
<td>Use of Household Income</td>
<td>Use of Government Income</td>
<td>Investment</td>
<td>Forex Inflows</td>
<td></td>
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Social Accounting Matrix

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- 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