Macro econometric modeling at Statistics Norway – the KVARTS model

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Some features of KVARTS

- Based on national accounts data – the core is an aggregated version of the QNA model

- Data are quarterly, seasonally unadjusted series that match published data on the SN web-site

- The Ministry of Finance gets a recalibrated model version at least every quarter

- In addition the model database includes updated figures for population, labour force data, stocks of financial assets …

- Satelite accounting structure to calculate GPFG and OASD to check that fiscal policy assumptions are in line with budget rule

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National accounts structure...

- When analysing fiscal policies, NA structure is useful in that it supplies you with a number of relevant channels and mechanisms. Take the SUT for each good

- $I_i + X_i = \sum_j d_{Mij} M_j + \sum_k d_{Cik} C_k + \sum_r d_{Jir} J_r + A_i + DS_i$

- $I_i = IS_i [\sum_j d_{MIij} M_j + \sum_k d_{CIik} C_k + \sum_r d_{JIir} J_r + DSI_i]$

- Parts of government spending/fiscal policy (M and J) are included in an obvious and consistent way

- Value added follows by definition of gross output (X) and material inputs by industry (M's)

- Note that government value added is mostly determined from the supply side in the national accounts. Government value added (part of GDP) by definition determines major components of government consumption contemporanously. It is only for the M and J that one can argue that the direction of «causation» runs from demand to GDP, cf. identifying restriction in VARs
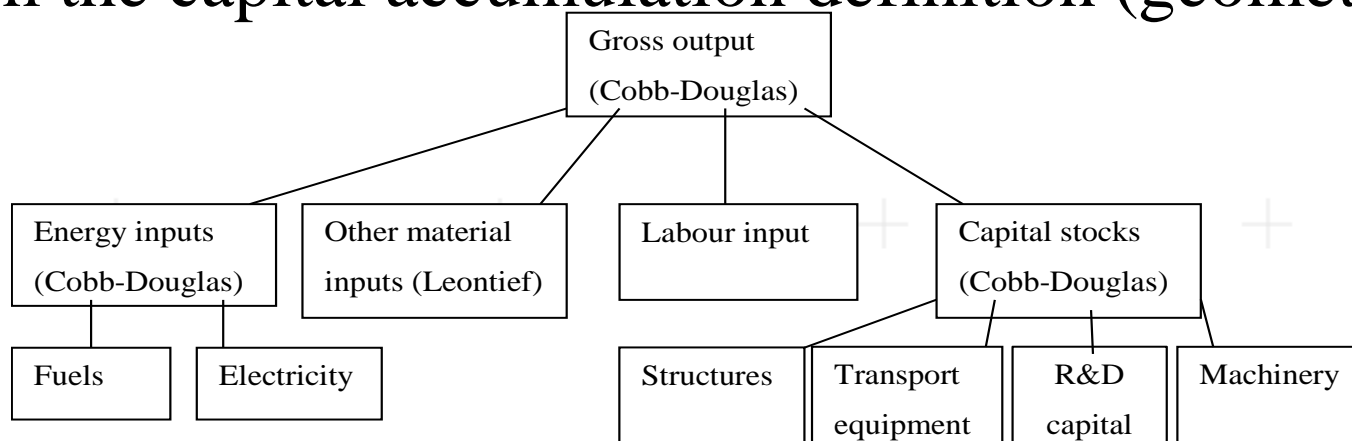
National accounts structure..

- Indirect taxation is identified in detail in the NA. Purchasing prices PM (as opposed to producer prices PH and import prices PF)

$$PM_j = \sum_i c_{ij} (1+VAT_{ij})[(1-is_0IS_i)P_{Hi} + is_{0i} IS_i P_{Fi} + b_{ji} ET_{ji} + c_{tmj} P_{TM}]$$

- VAT, excise duties on fuels, alcohol, sugar (!)…are easily included and their role for consumer prices are apparent. So are revenues that enter the government budget balance

- Domestic and foreign goods are imperfect substitutes so the import share $IS_i = CES(P_{iH}/P_{Fi})$ and there is mark up pricing

- $P_{ij} = m_{0i}^{1/(1+mi)}P_{Fi}^{mi/(1+mi)}MC_j^{1/(1+mi)}$; $i = H, A, j = $ industry

Supply structure

- Marginal cost (MC) by industry is derived from a KLEM structure included in the model in a consistent way

- Each KLEM is estimated taking cross equation restrictions into account and investment demand derived from the capital accumulation definition (geometric depr.)

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                    │  Gross output   │
                    │ (Cobb-Douglas)  │
                    └─────────────────┘
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Energy inputs (Cobb-Douglas)	Other material inputs (Leontief)	Labour input	Capital stocks (Cobb-Douglas)

| Fuels | Electricity | | Structures | Transport equipment | R&D capital | Machinery |

Financial accelerators

- While capital stocks follow standard neoclassical theory in the long run, there are effects of credit and financing conditions (stock market) in the short to medium run

- In the housing market housing prices, credit to households and housing investment are interrelated and feed backs are included. This matters also for consumer demand through the wealth term

- Otherwise a limited role for financial conditions in the model

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Consumer demand

- Macro consumption (disp. income, wealth and after tax real interest rate). Aggregate net wealth - no disaggregation

- Dynamic AIDS for determining consumption by category except housing – endogenous weigths in the CPI

- Housing consumption is motstly rents (actual and imputed). Rents accrue to households in the NA so there is contemporaneous correlation between income and consumption by definition. We exclude housing (20%) in our macro-function as housing consumption follows the capital stock of housing.

Labour market

- Labour demand from the KLEM systems

- Labour supply (logits) by gender and age with fairly low after tax consumer real wage effects on participation rates in line with microeconometric evidence

- Wage equations by aggregate industries to mimic the structure of pattern bargaining are based on the Layard-Nickell framework

- Non-linear effects of unemployment and immigration

Interest rate and exchange rates

- Simple Taylor-style rule for the short rate

- The Krone/Euro rate depends on interest rates and inflation (combining PPP and UIP)

- Both the oil price and expected inflation enter the model

Estimation

- Due to size, no overall estimation. 2000 accounting equations, 200 econometric

- System estimation (FIML) in various parts (Consumer demand, KLEM, housing block)

- VARs used extensively for analysing cointegration in small systems

- OLS/IV in many parts

- Focus on single equation evaluation of all equations using standard LSE school approach

What next?

- Move from CD to CES in the KLEM. Improve on the supply side effects of certain factors (R&D spillovers?)

- Improve and respecify the consumer block to test for a larger role of liquid assets not only total net wealth

- Keep testing for forward looking behaviour (now only in exchange rates). No «luck» using Euler-equation so far. Move towards the FRB/US-Muellbauer idea of generating forecasts based on an explicit forecasting model that agents realistically could have had (compared to REH). Problem: must use very high discounting rates for the model to be applicable?

- And not the least: cope with data shocks that hit us constantly. New system of generating wage and employment data in the NA has changed seasonal patterns (and possibly also some levels!)

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