RESERVE BANK OF AUSTRALIA

MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy

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Modelling at the RBA

- Modelling framework prior to 2016
  - Multi-sector DSGE model
  - Single-equation forecasting models

- Pagan & Wilcox forecasting review 2016
  - Replicate analysts' models / thinking as closely as possible
  - Improve our understanding of how forecasts fit together
  - Produce scenarios to quantify risks
  - Extend forecasts beyond usual 2-to-3-year horizon
  - Complement existing forecast procedures

Who is MARTIN?

MAcroeconomic

Relationships for

Targeting

INflation

What is MARTIN?

- Old-style reduced-form macroeconometric model
  - Flexible; fits data; advocated by Blanchard and Wren-Lewis
  - Equations are not structural
- Features over 30 behavioural equations for:
  - Expenditure-side of national accounts, labour market, inflation, cash rate and exchange rates
- Model estimation
  - Error-correction framework
  - Estimated equation-by-equation
  - Calibration of some parameters
  - Estimation period varies for each equation

MARTIN’s structure

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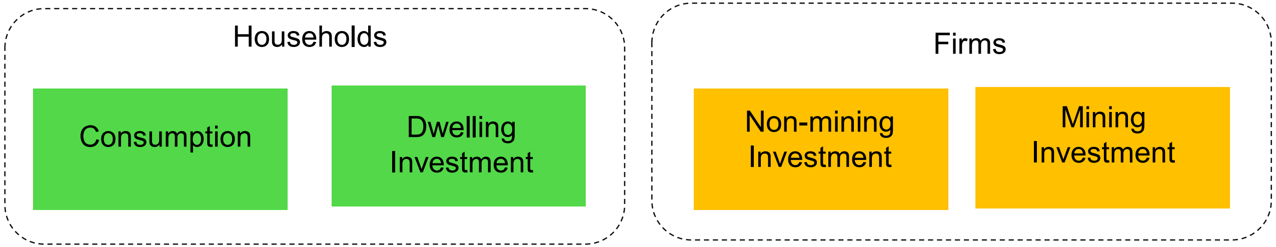

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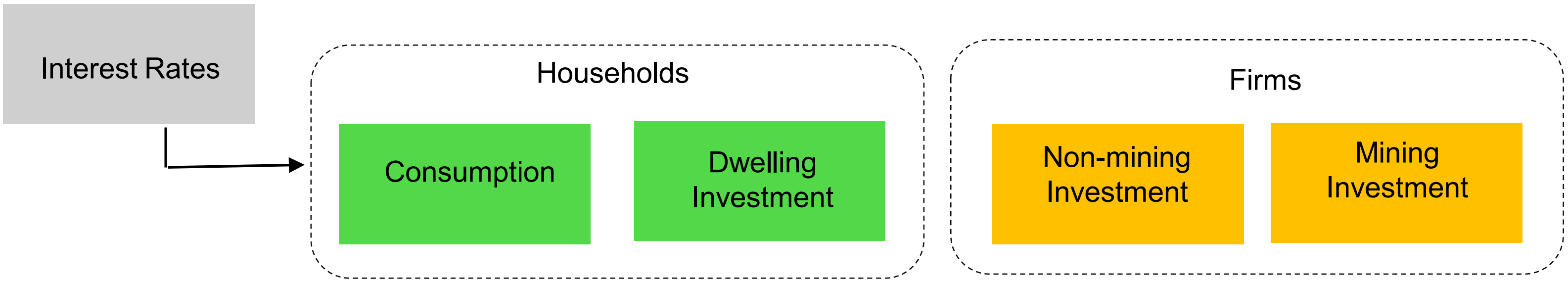

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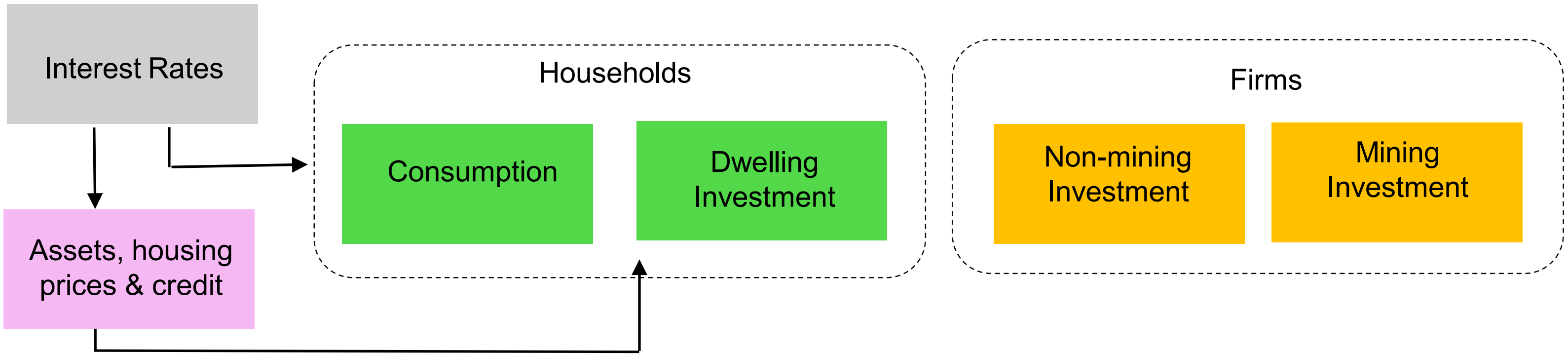

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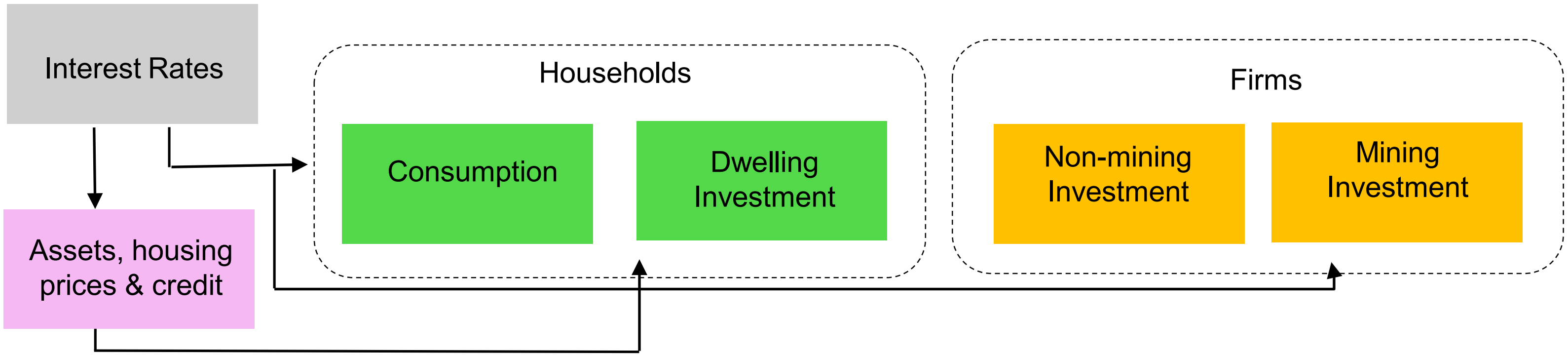

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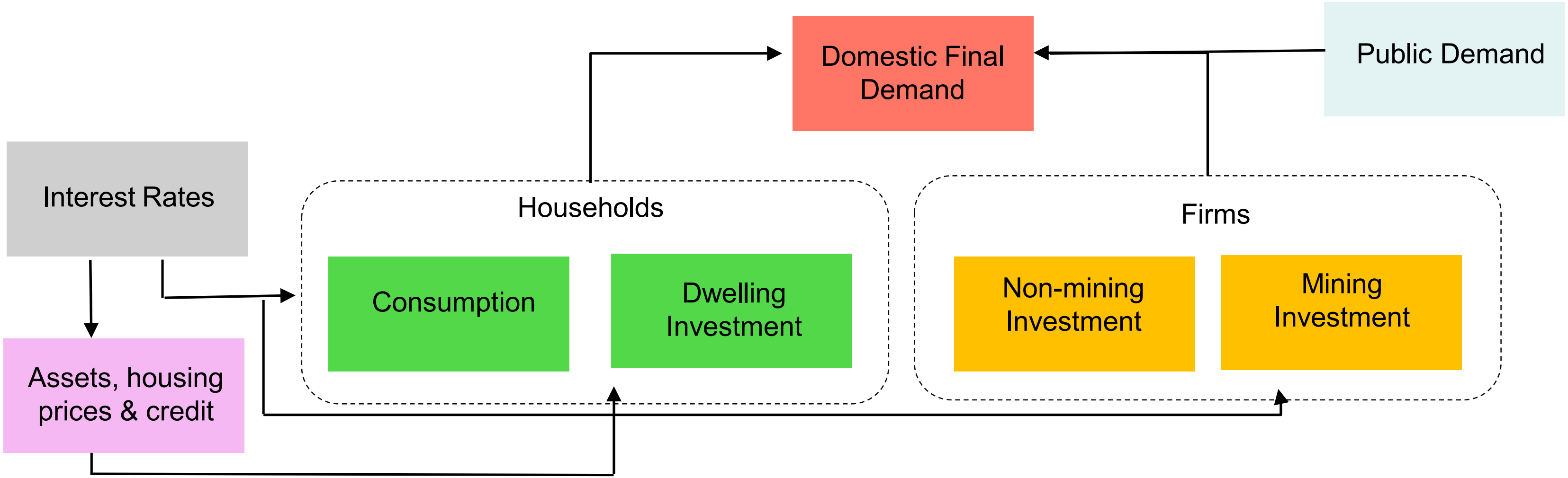

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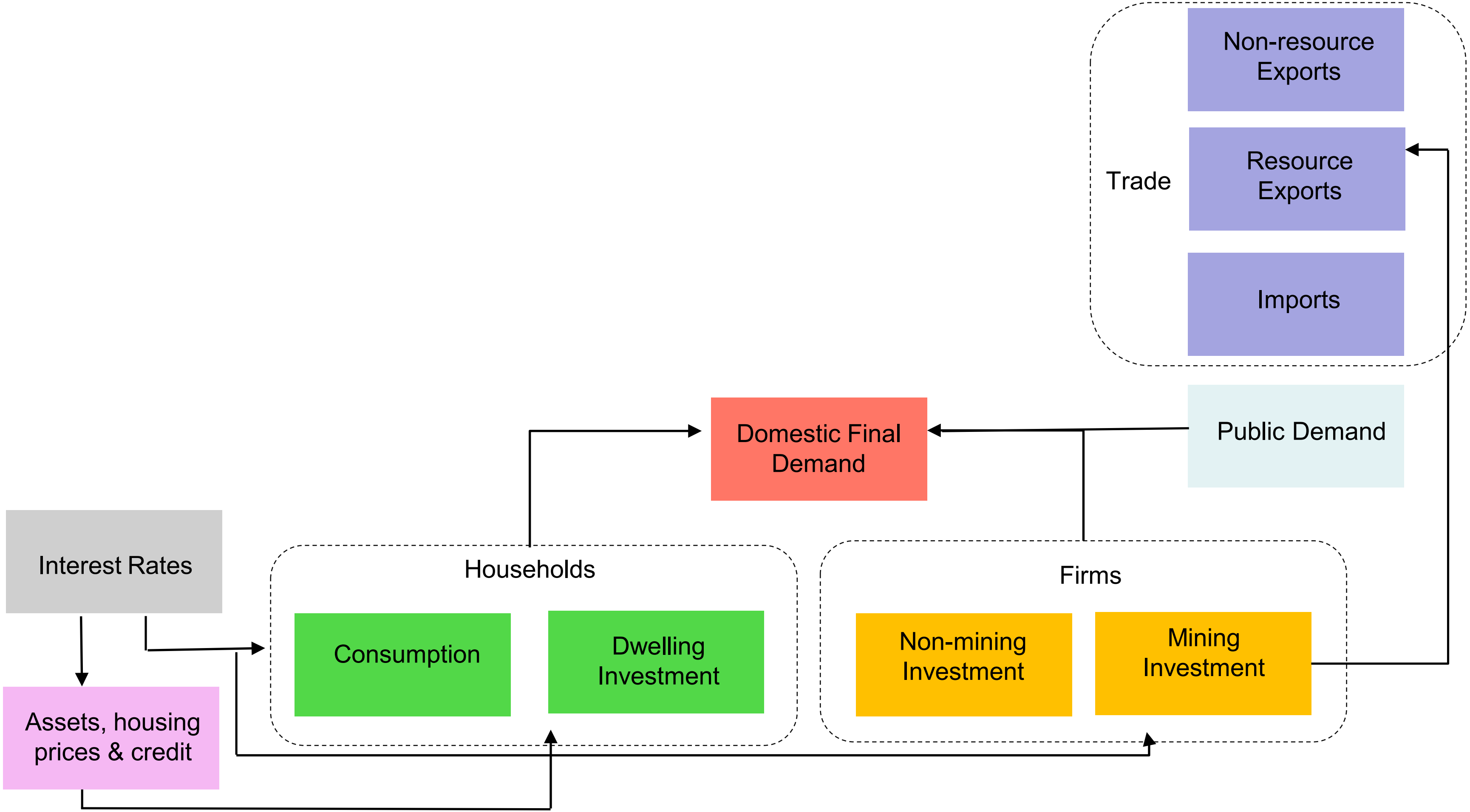

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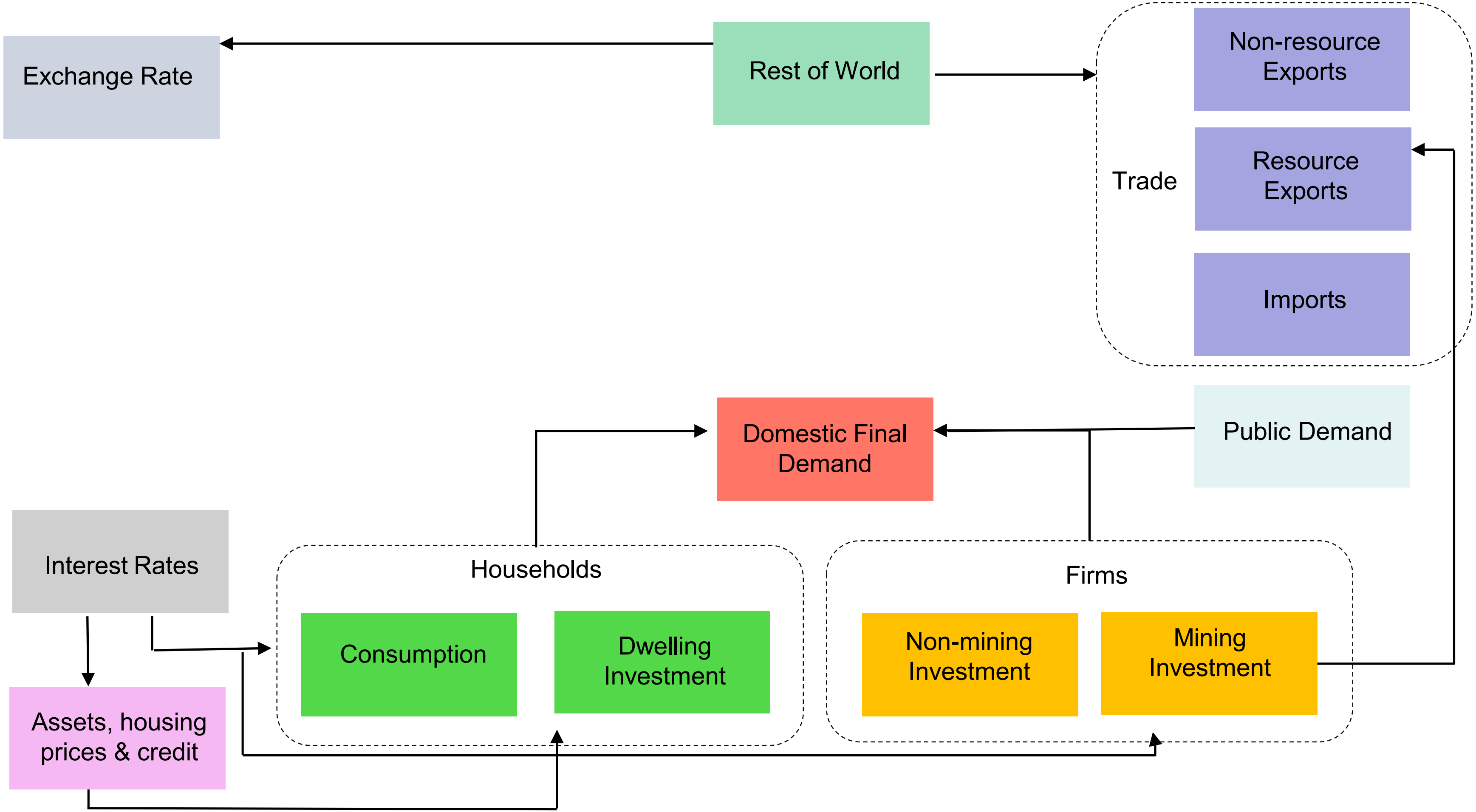

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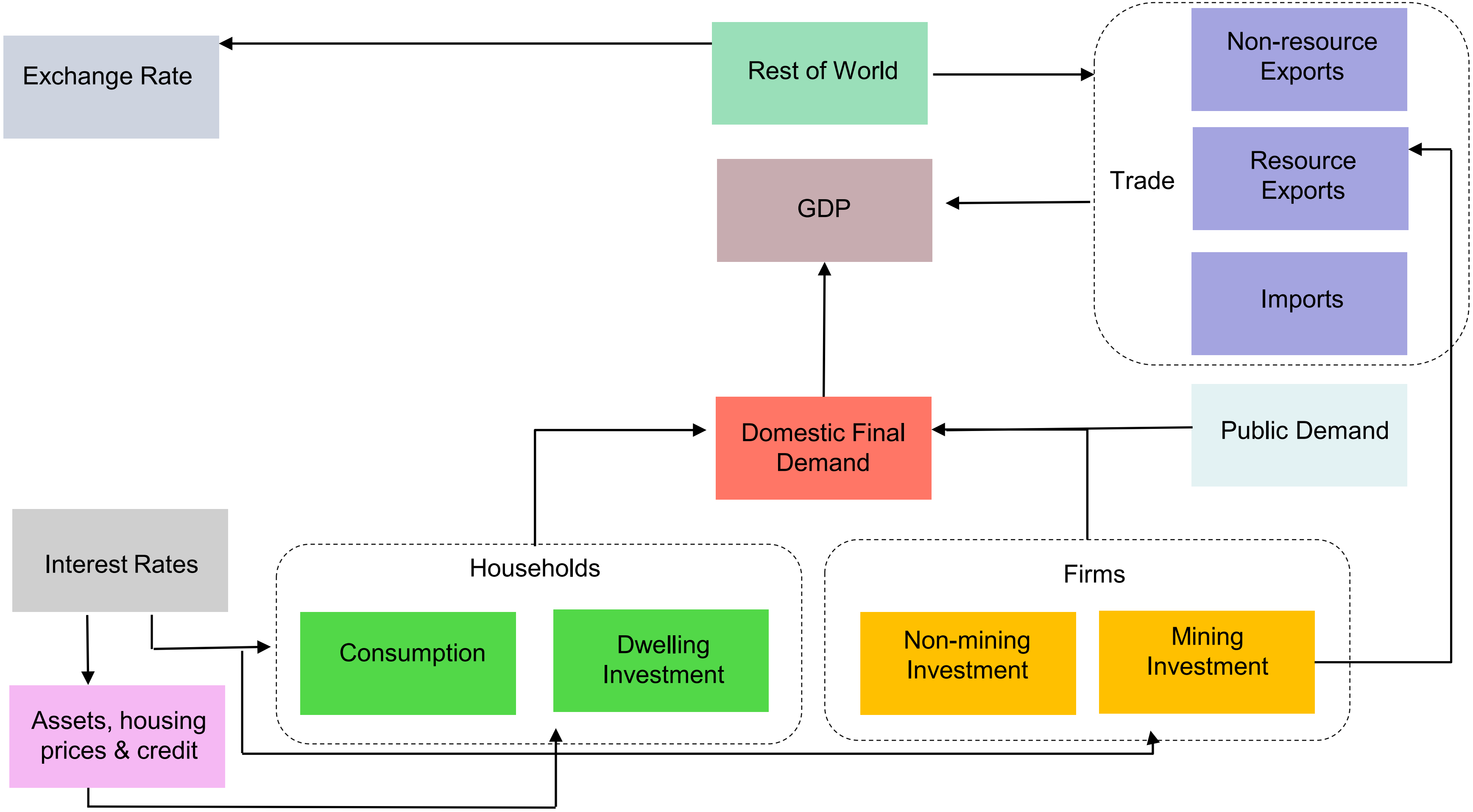

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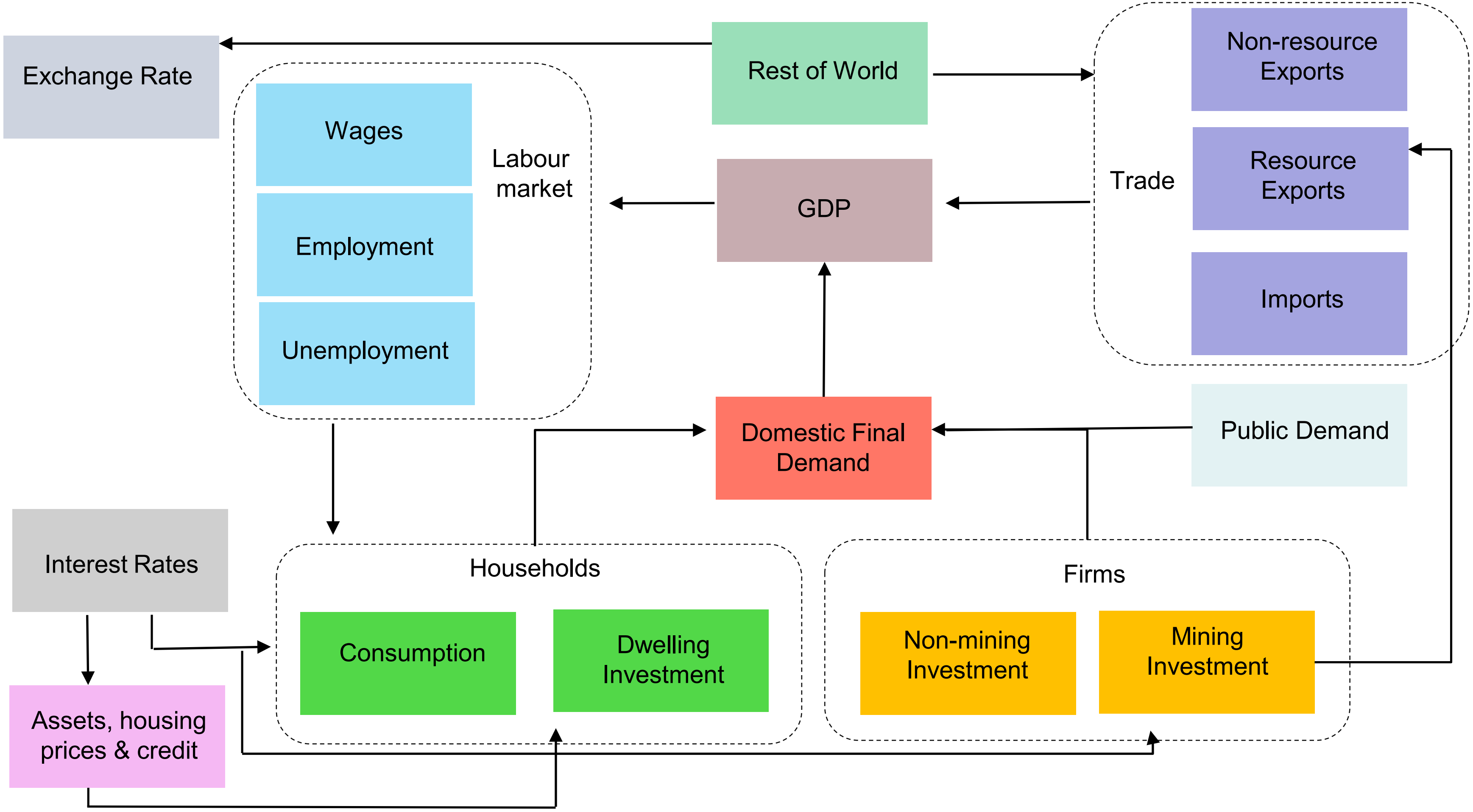

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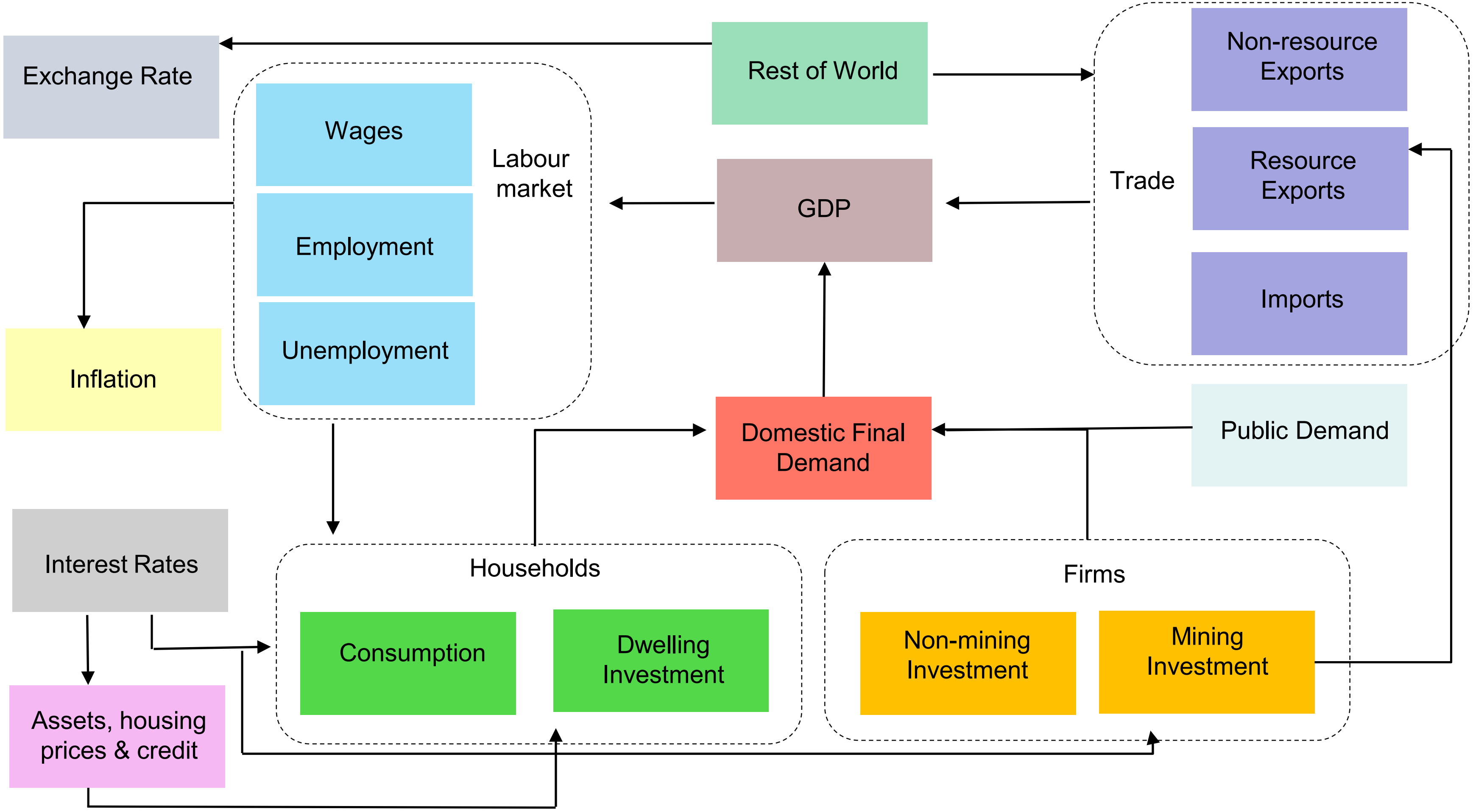

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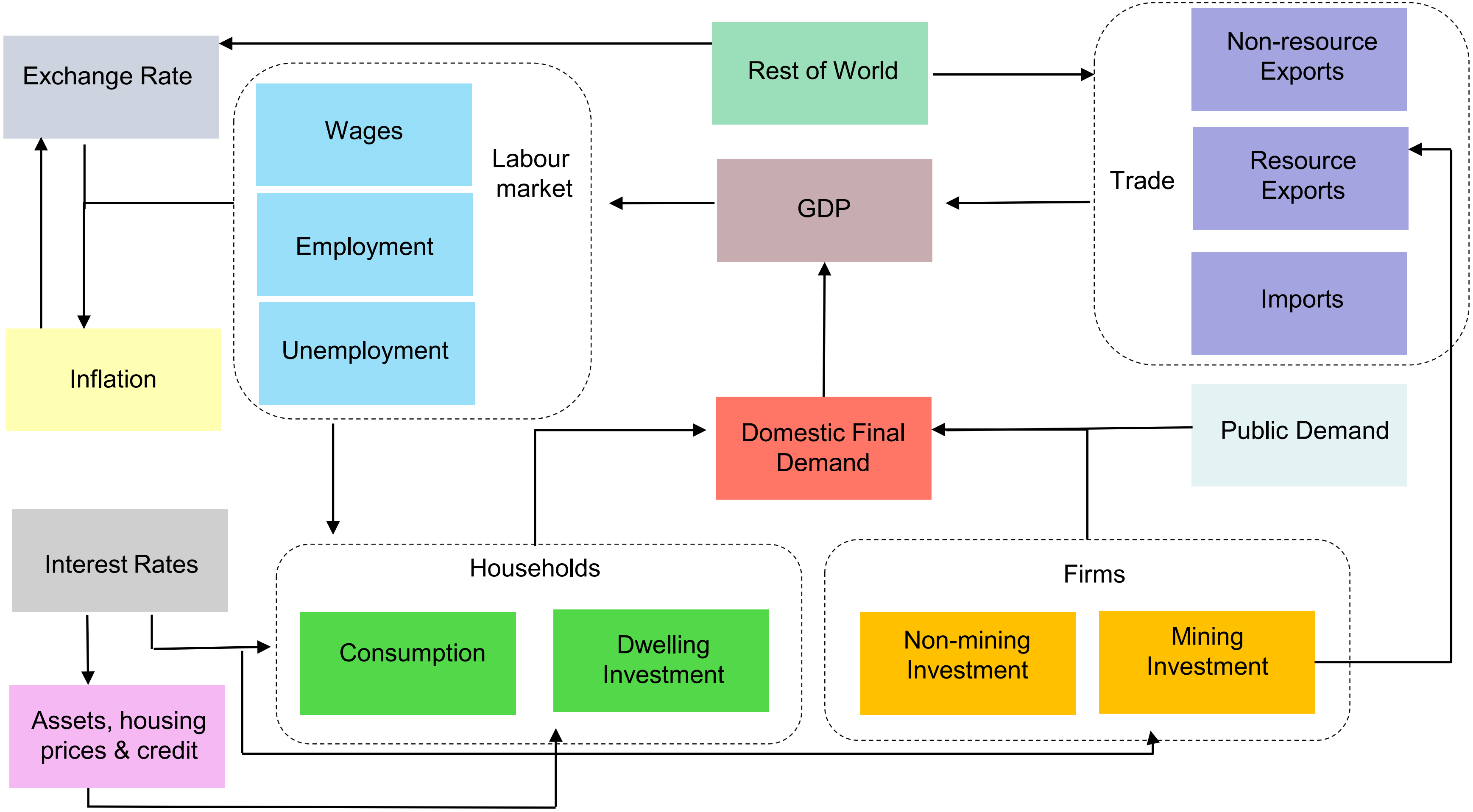

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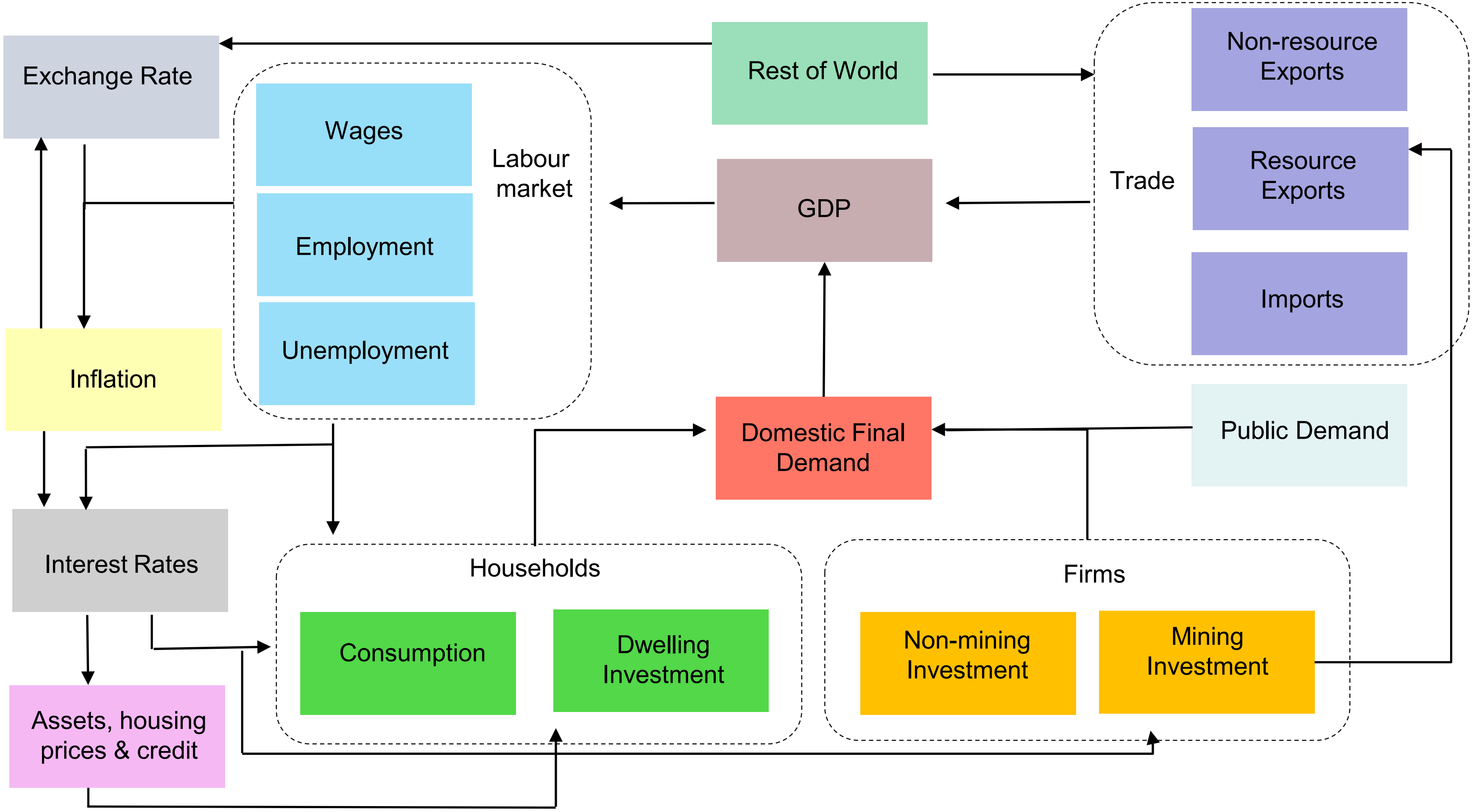

Additional model details

- Exogenous supply side ‘trend’ variables
  - ‘Latent’ variables, such as NAIRU, potential growth, trend productivity
  - Estimated using variety of state-space / filtering methods
  - Consistency with other forecasting teams important
- Limitations
  - Expectations
    - Limited treatment; exogenous inflation expectations
    - Some success incorporating a satellite VAR expectations model
  - No standalone financial sector
  - Limited coverage of GDP(I) variables
  - External and public sector balances not modelled

What do the equations look like?

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Example: Dwelling investment

$$C_t = (C_t^H)^{\alpha}(C_t^{NH})^{1-\alpha}$$

subject to:

$$C_t P_t = C_t^H P_t^H + C_t^{NH} P_t^{NH}$$

$$\Rightarrow C_t^H = \alpha C_t \left(\frac{P_t^H}{P_t}\right)^{-1}$$

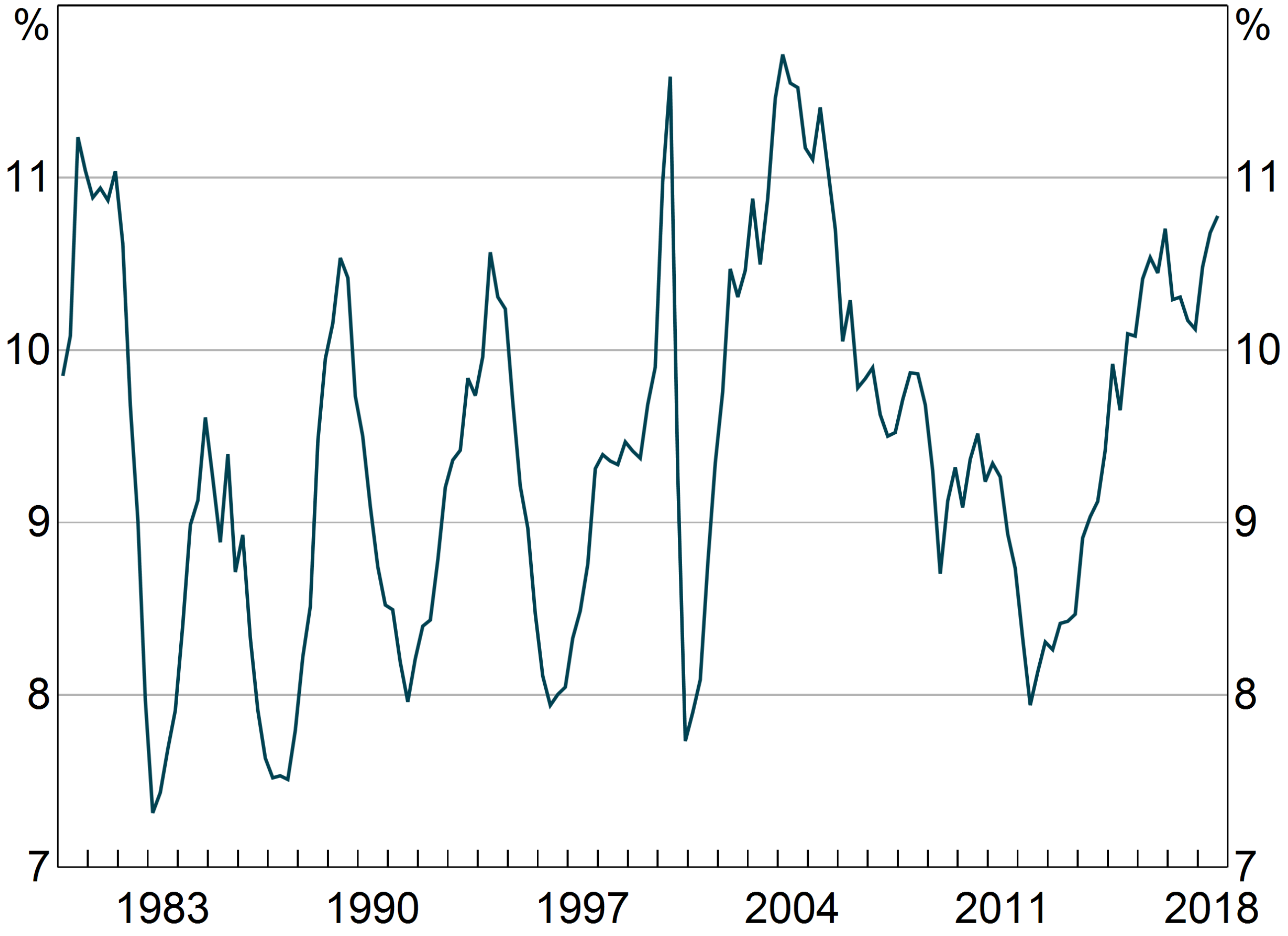
And suppose:

$$C_t^H \propto K_t^H \propto I^D$$

Then:

$$\frac{\overline{I^D}}{C} = \kappa \left(\frac{\overline{P^H}}{P}\right)^{-1}$$

Dwelling Investment-to-Consumption Ratio



Sources: ABS; RBA

What do the equations look like?

Dwelling investment error correction equation in MARTIN:

$$\Delta i_t^D = \alpha_0 - \gamma \left(\underbrace{i_{t-1}^D - c_{t-1} + p_{t-1}^{ID} - pc_{t-1}}_{\text{Long run from theory}} - \beta RMR_t \right)$$

$$+ \underbrace{f(\Delta hp_t, \Delta NMR_t, \mu_t)}_{\text{Short run empirically determined}} + \varepsilon_t$$

What if theory doesn't work?

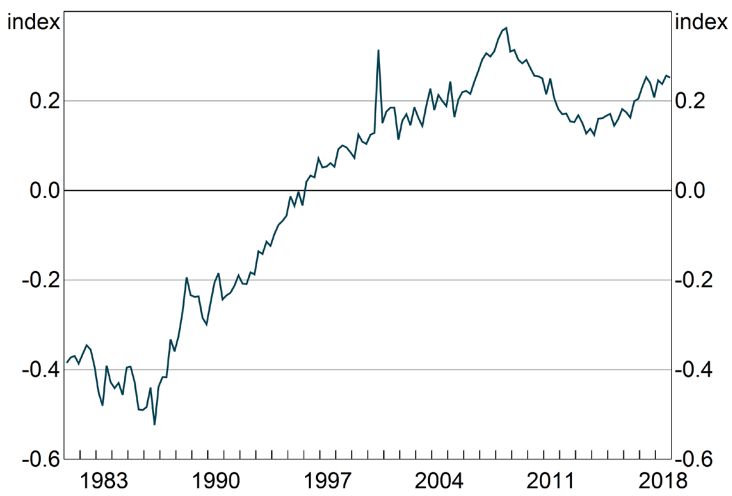
Example: Services Exports

$$X_t^s = \alpha \left(\frac{P_t^{xs*}}{P_t^*} \right)^{-\eta} Y_t^*$$

This provides a very poor fit for the data!

What's going on?

Services Exports Equation Residual*



* Residuals from long-run equation: log(xs)=μ+y*-0.4*log(RTWI)+error

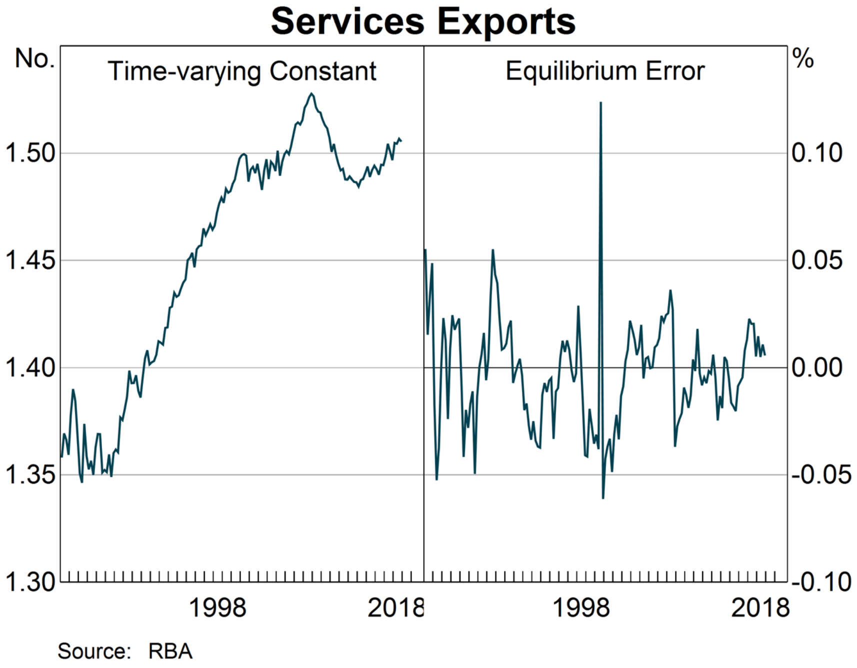
Sources: ABS; RBA

Solution: Time-varying parameters

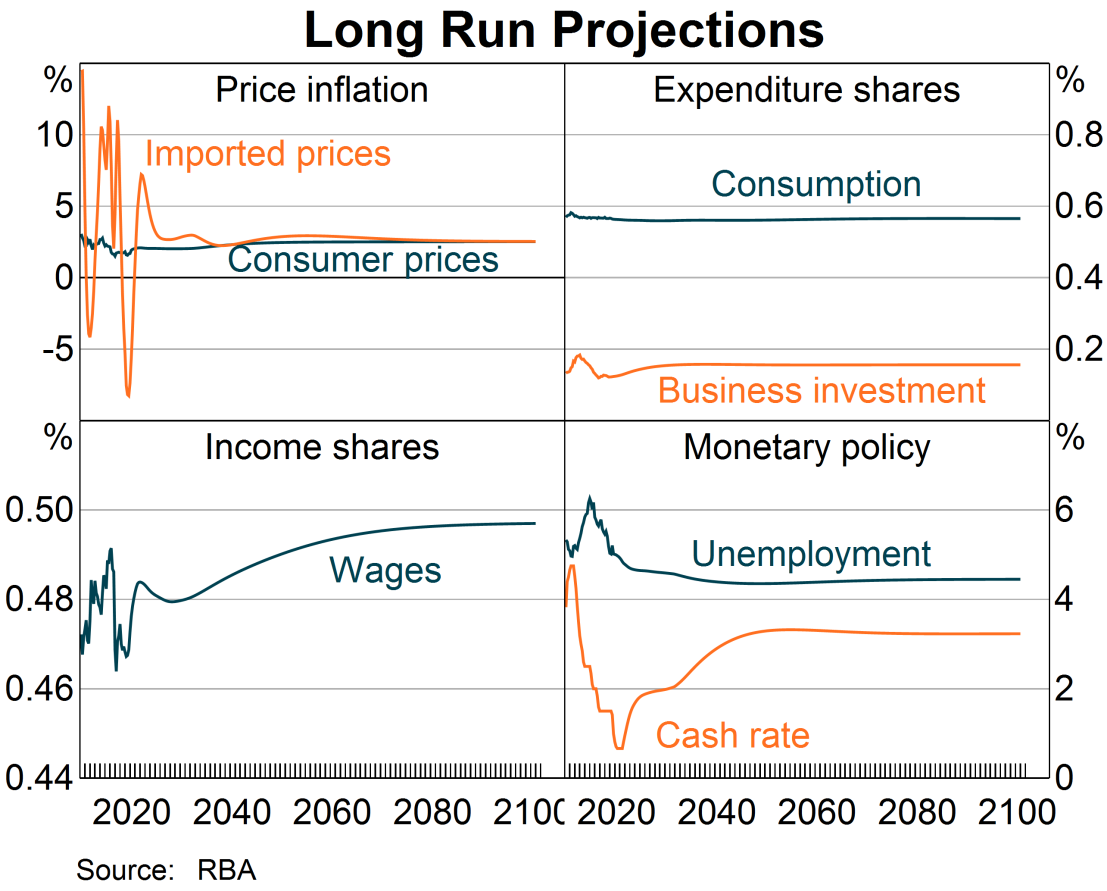
Suppose:

$$\Delta xs_t = \alpha_t - \gamma(xs_{t-1} - y^*_{t-1} + \eta(p^{xs*}_{t-1} - p^*_{t-1})) + f(.) + \varepsilon_t$$
$$\alpha_t = \alpha_{t-1} + u_t$$

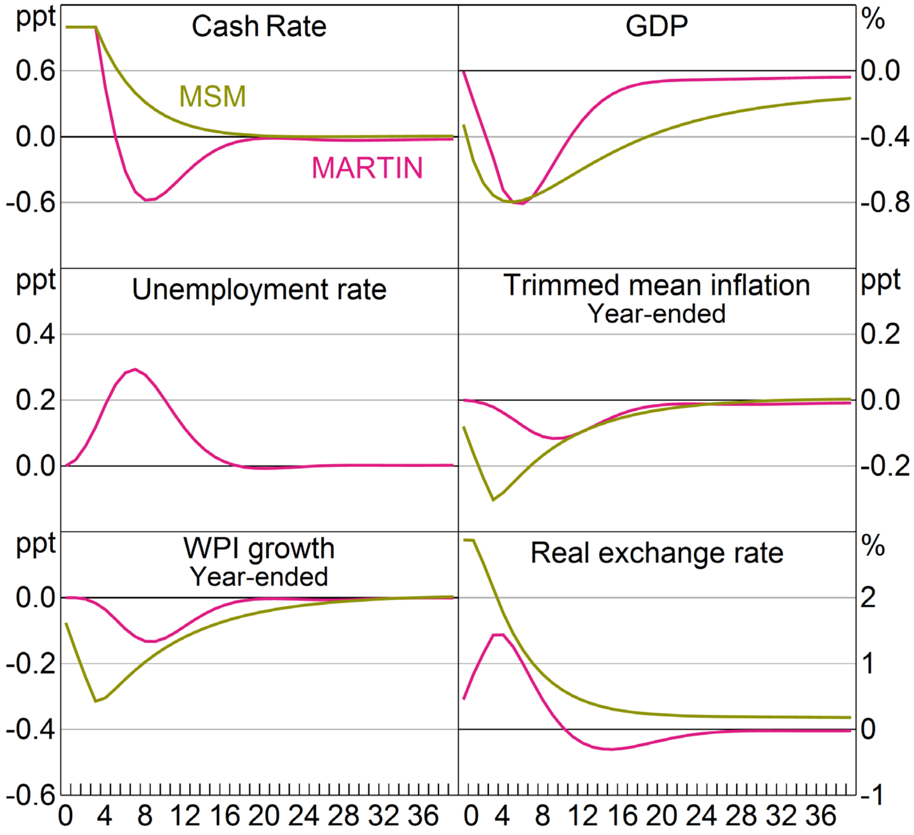
This works better →



Model properties: Long run



Scenario: Monetary policy shock



Sources: Authors' calculations; RBA

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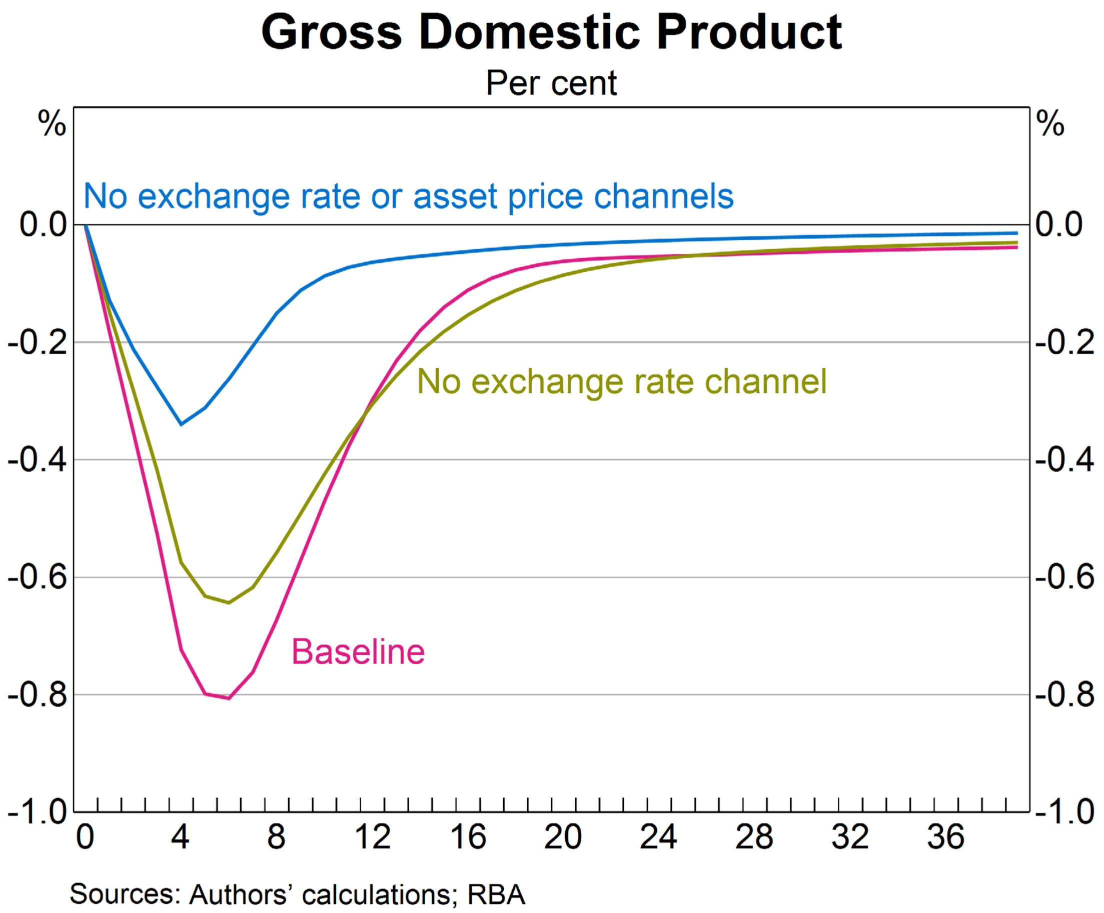

Conclusion

- Developed new macroeconometric model for forecasting and scenario analysis
- More closely aligned with staff forecasting models
- Ongoing development