The Path to Kina Convertibility:
Study of the Foreign Exchange Market of Papua New Guinea

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Overview of Talk

- Definitions
- Recent forex market conditions
  - Forex rationing
  - Stocks and Flows
- Reasons for forex shortage
- Twin Deficits: link between fiscal policy and forex Market
- Economic Policy Objectives (Internal Balance (IB), External Balance (EB))
- Theoretical Model
- Empirical Analysis
  - RER overvaluation
- Effect of a Depreciation on PNG Economy
- Policy Recommendations

Study: Forex Market of PNG

- Objective
  - in-depth analysis of the foreign exchange market in Papua New Guinea
  - Recommend foreign exchange market arrangements to facilitate the return to full convertibility

- Economy is integrated system of markets (forex is but one)
- Cannot consider forex market in isolation
  - Linkages between forex, goods and money markets
  - monetary and fiscal policy also matter
  - Full convertibility: appropriate mix of monetary/exchange rate and fiscal policies.

Exchange Rate Definitions

- Nominal Exchange Rate (e)
  - *e* = rate at which convert Kina into USD = number of Kina per USD

  $\uparrow e \rightarrow$ depreciation

  $\downarrow e \rightarrow$ appreciation

- Real Exchange Rate (RER)
  - rate at which convert PNG goods into foreign goods

$$RER = \frac{eP^*}{P}$$

$\uparrow RER \rightarrow$ depreciation P = PNG price level, P^* = trading partners price level

$\downarrow RER \rightarrow$ appreciation

- Change *RER* by changing *e*

$$\uparrow e \rightarrow \frac{eP^*}{P} \rightarrow \text{depreciation of RER (holding } P \text{ and } P^* \text{ constant)}$$
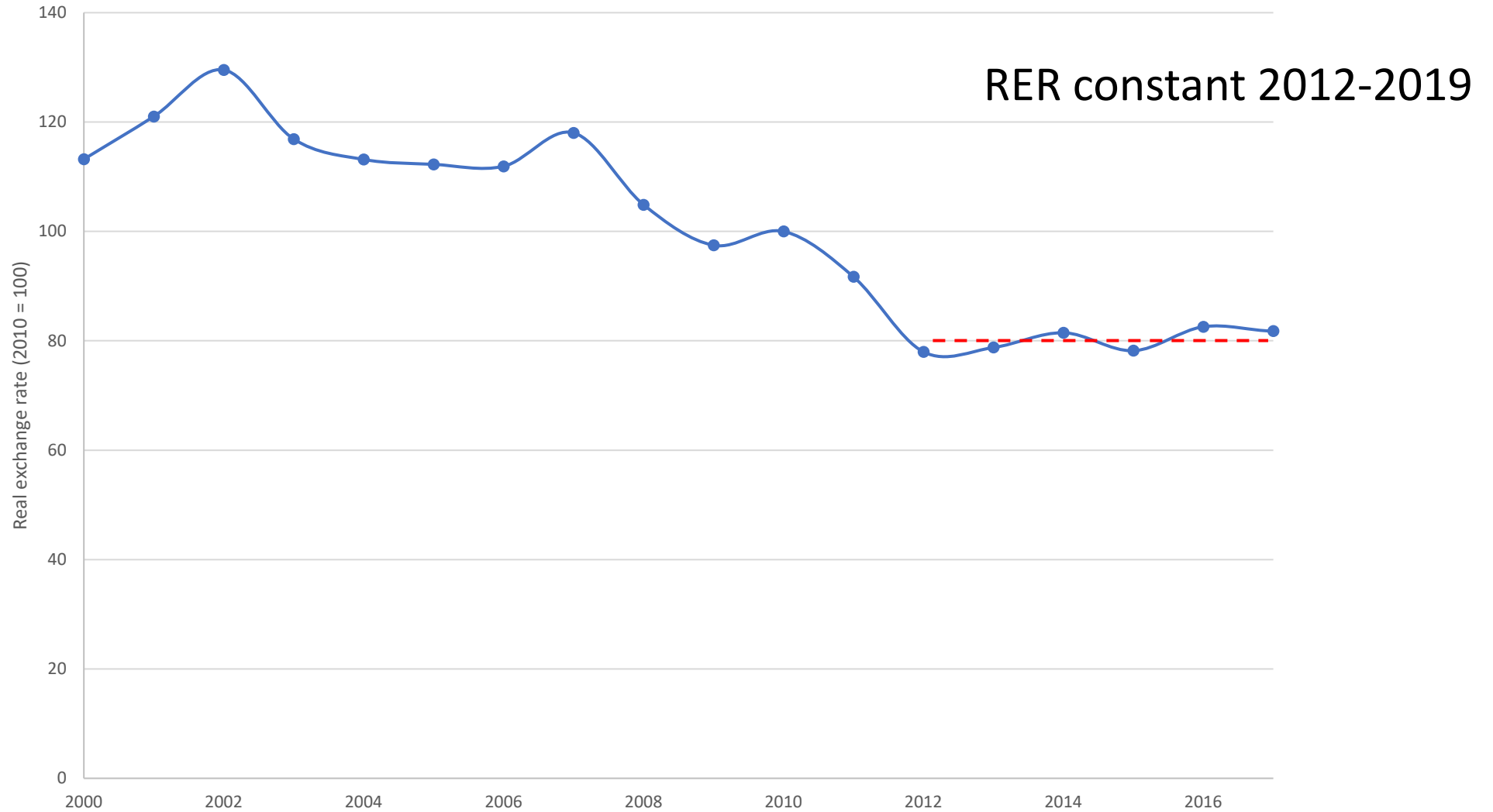
Depreciation of nominal exchange rate causes depreciation of RER (P and P^* constant)

Currency convertibility: market participants able to buy (or sell) their desired quantity of foreign currency at the price prevailing in the foreign exchange market.

Nominal Exchange Rate: 2000-2019 (PGK per USD)
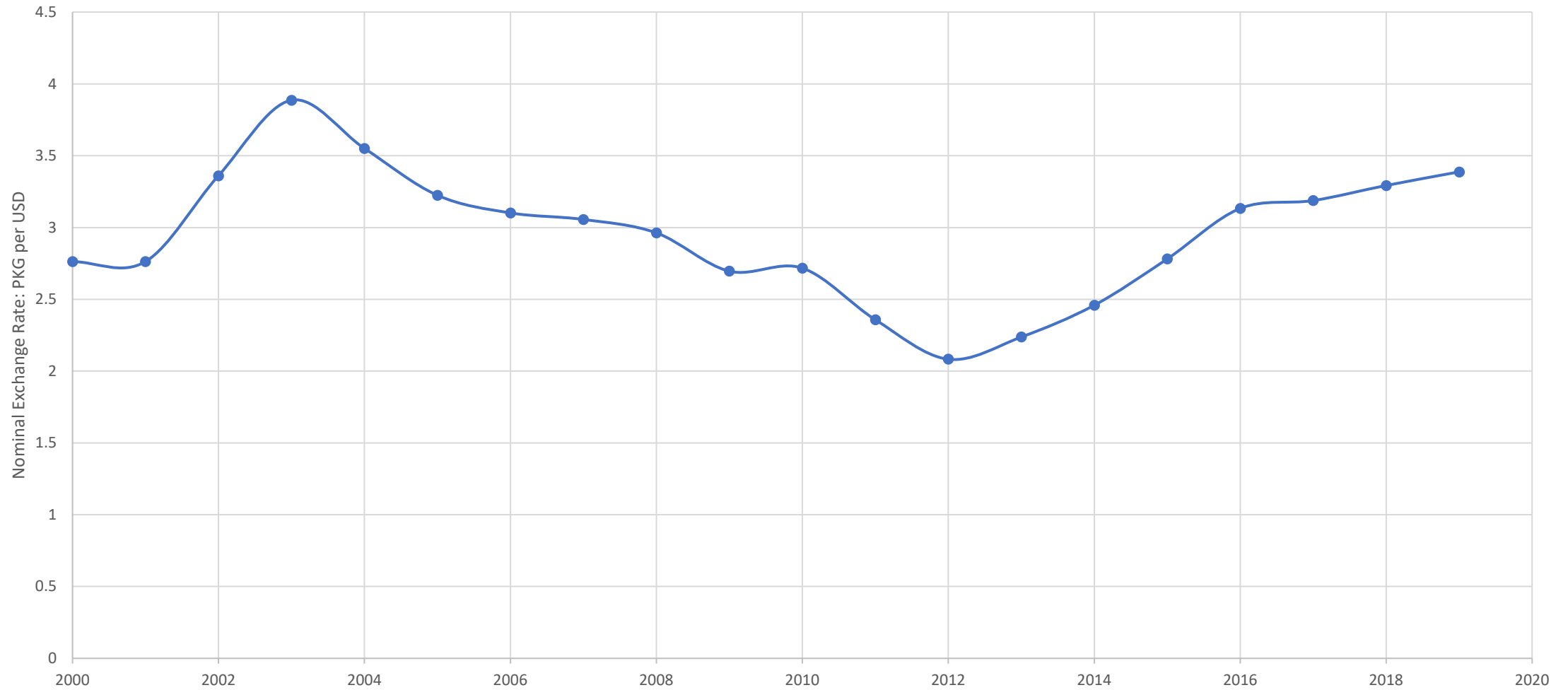
Real Exchange Rate: 2000-2019

RER constant 2012-2019

$$RER = \frac{eP^*}{P}$$

P* = foreign price level

P = domestic price level

Real exchange rate (2010 = 100)

% change in RER = % change in nominal exchange rate + % change in P^* − % change in P level

| 0 | = | 3 % | + | 2 % | − | 5 % |

Recent Forex Market Conditions

- Chronic shortage of forex (in non-resource sector) over past 7 years (since 2014)
- Backlog (stock of unmet orders)
  - waxed and waned
    - constant feature
    - estimates range (over time) between K1 Billion and K4.5 Billion
  - Underestimate

- Since around 2015 BPNG has engaged in forex rationing
  - directives to banks
    - prioritizing some types of transactions, discouraging/preventing others
  - Constrain country's access to forex

- Forex rationing leads to Import Compression
- Costs are significant
  - Reduction in investment ($\downarrow$I)
  - Increase in business costs
    - Reduce export opportunities ($\downarrow$EX)
    $\rightarrow$ lower growth
  - Reduces variety and availability of goods for domestic consumers
    $\rightarrow$ welfare loss

Foreign Exchange Market with Forex Rationing

bc = mismatch between D_{FC} and S_{FC}
    (true BOP deficit) at $\bar{e}$

Forex rationing shifts D_{FC} to the left to $D_{FC}^{Rationed}$

ac = forex orders accumulating in banking system
    and private sector balance sheets

ab = observed BOP surplus
(forex reserve accumulation by BPNG)

Exchange rate e

S_{FC}

Observed balance of payments surplus = observed excess supply of forex

Actual balance of payments deficit = actual excess demand for forex

$\bar{e}$

a b c

$D_{FC}^{Rationed}$ D_{FC}
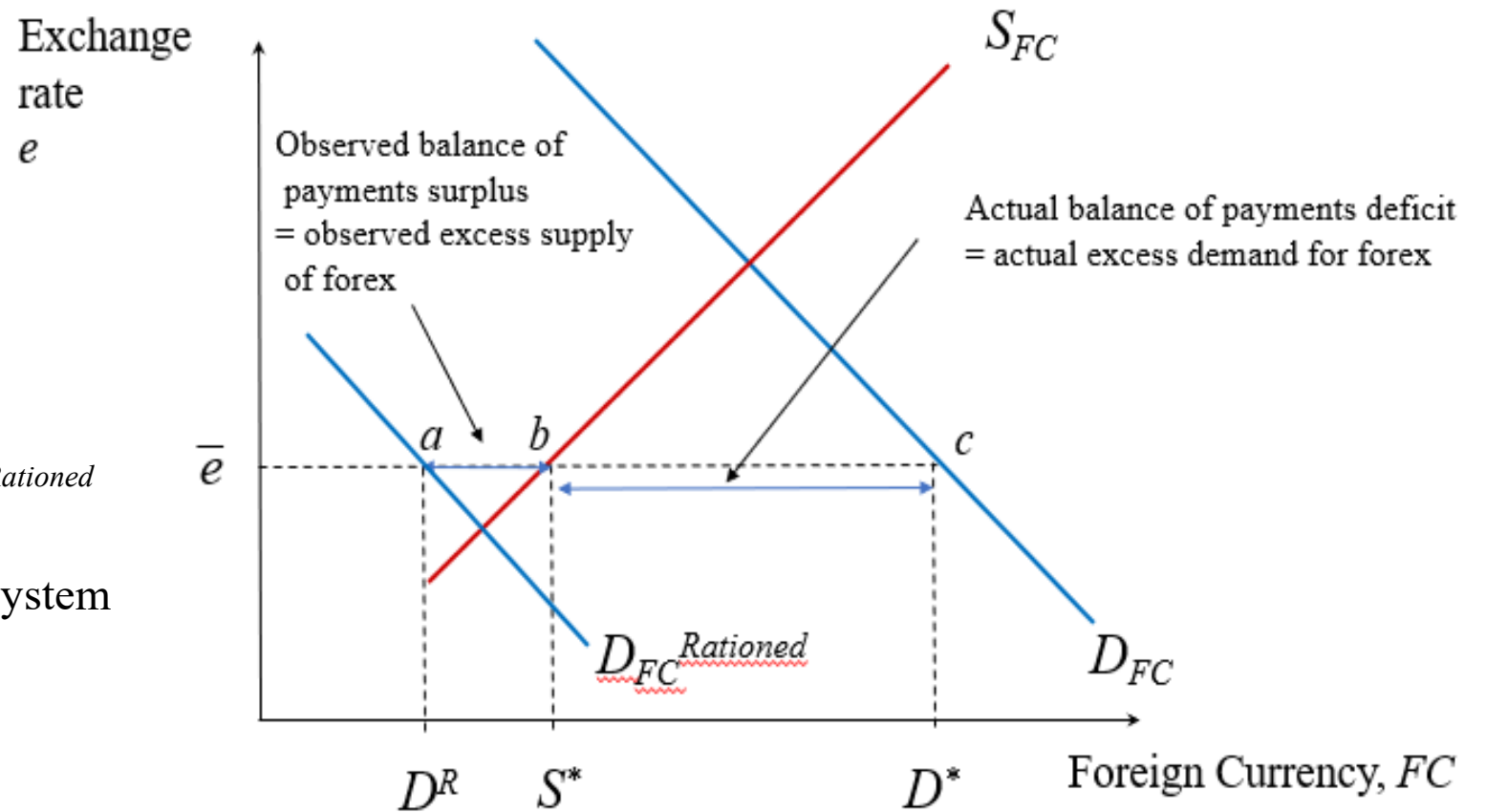
D^R S^* D^* Foreign Currency, FC

Diagram: PNG Forex Market: observed BOP Surplus, actual BOP deficit

Foreign Exchange Market: Stocks and Flows

Daily Demand for Foreign Exchange (flow in)

Stock of Outstanding Forex Orders

Daily Demand for Forex (water into tub)
exceeds
Daily Supply for Forex (water out of tub)
→
Stock of Outstanding Forex Orders (water in tub)
increases

Daily Supply of Foreign Exchange (flow out)

Reasons for Forex Shortage:

Chronic structural imbalance between demand and supply of forex:

- Low supply of Forex
    - Fall in Terms of Trade
        - 2011-2019: Terms of trade ↓ 27 percent
    - Fall in government take (share of rents (total revenue) accruing to govt)
        - 30 percent in 2011; 5 percent in 2018
    - Expectation of depreciation
    - Backlog of orders
        - Businesses delay / return minimum

- High Demand for Forex
    - High propensity to import by private sector
        - Capital goods, specialized inputs
    - High propensity to import by government
        - Public sector wages
    - Fiscal policy setting
        - historically high fiscal deficits (above 6 %): 2013 – 2016 (4 years)
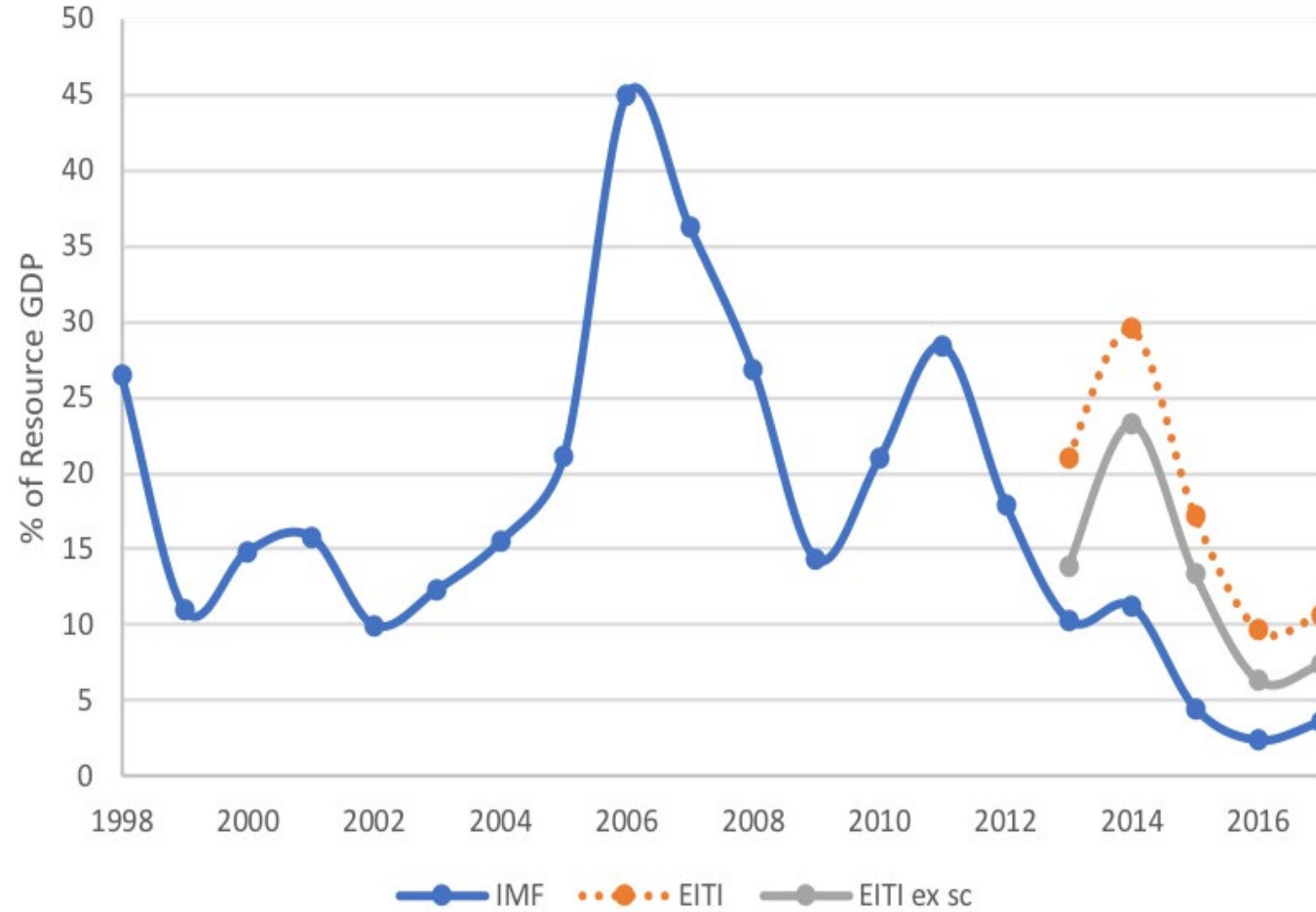
PNG's Terms of Trade: 2000-2019
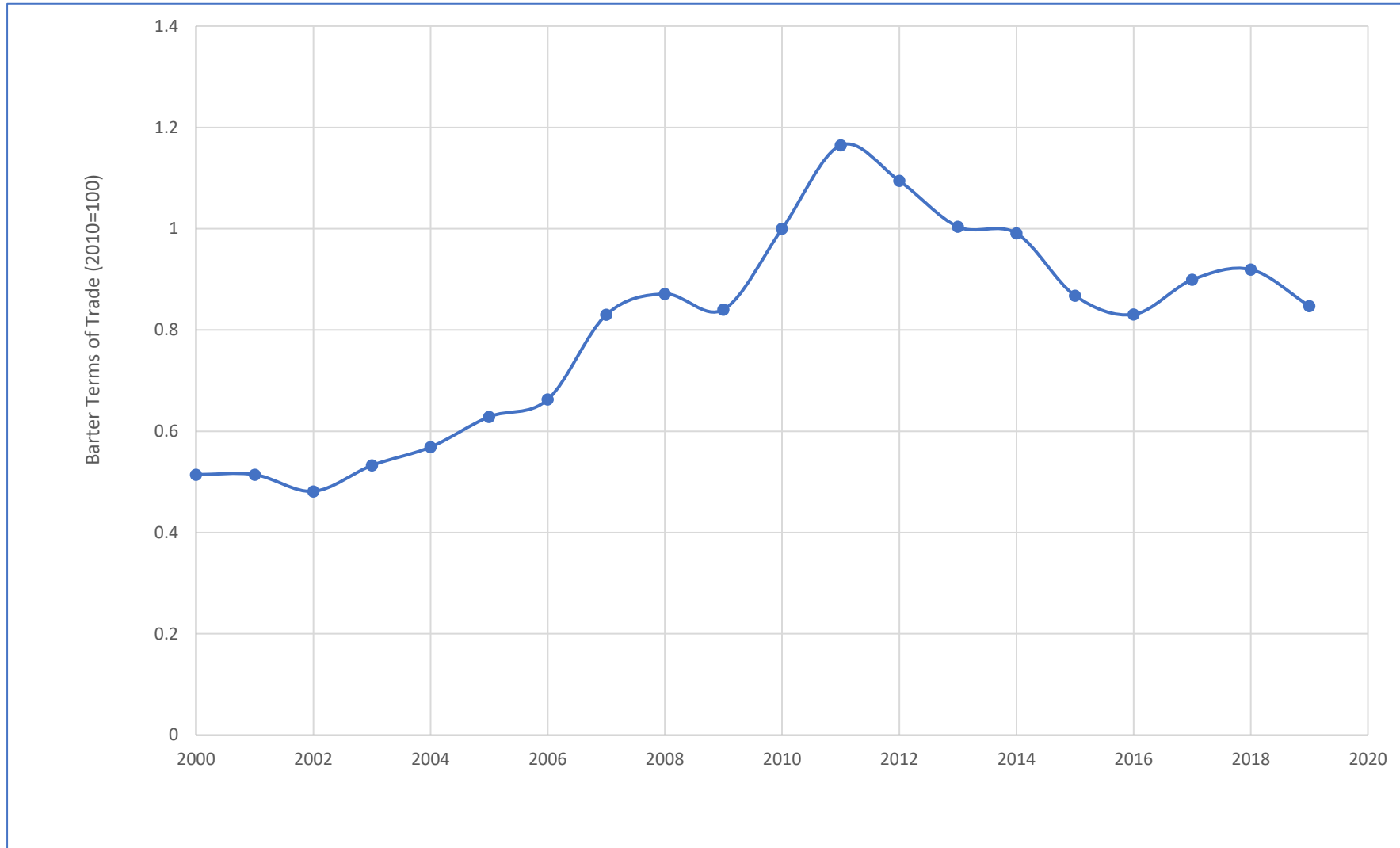
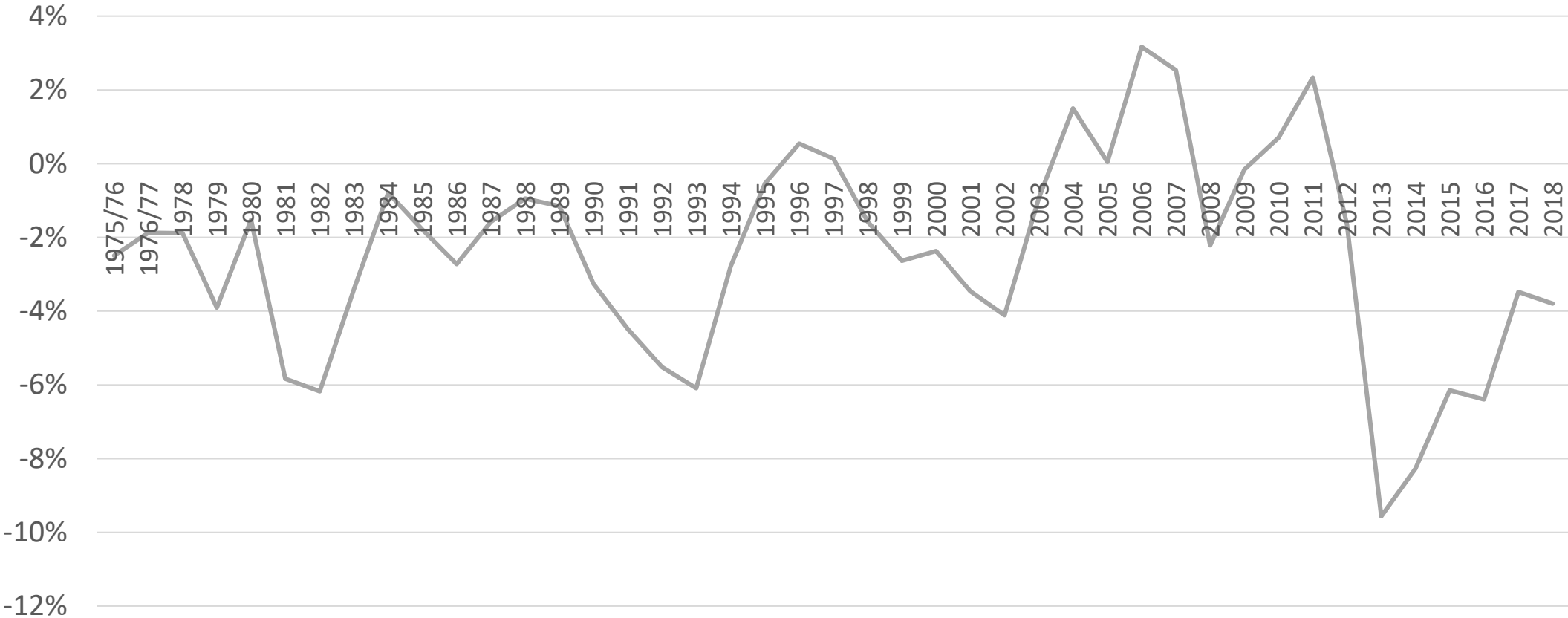Source: World Bank Net Barter Terms of Trade Index

PNG's Government Take: 1998-2018

Fall from around 30 percent in 2011 to 5 percent in 2018 (IMF measure)

Budget Balance as a percentage of GDP: 1975 - 2019

Goverent Budget Balance as a Percentage of GDP: 1975-2019

2013 – 2019: fiscal deficits are large in historic terms for PNG

Challenge: Dealing with the Stock Imbalance

- **Stock of Kina waiting to be converted into forex**
    - pent up demand for forex over an extended period of time
    - Part visible in the domestic banking sector
    - Part hidden in the balance sheets of domestic businesses and households.

- **Stock of forex being held outside the country waiting to be converted into Kina**
    - Investors, domestic exporters who want to remit profits, and speculators
    - Won't enter the market until the exchange rate adjusts to a level consistent with their expectations
    - if convert now will suffer capital loss
    - Defer demand until e depreciates to their equilibrium estimates

- **Dealing with stock imbalance**:
- depreciate Kina to a level which is consistent with the beliefs or expectations of this group.

Model of Forex Market with a Backlog of Orders
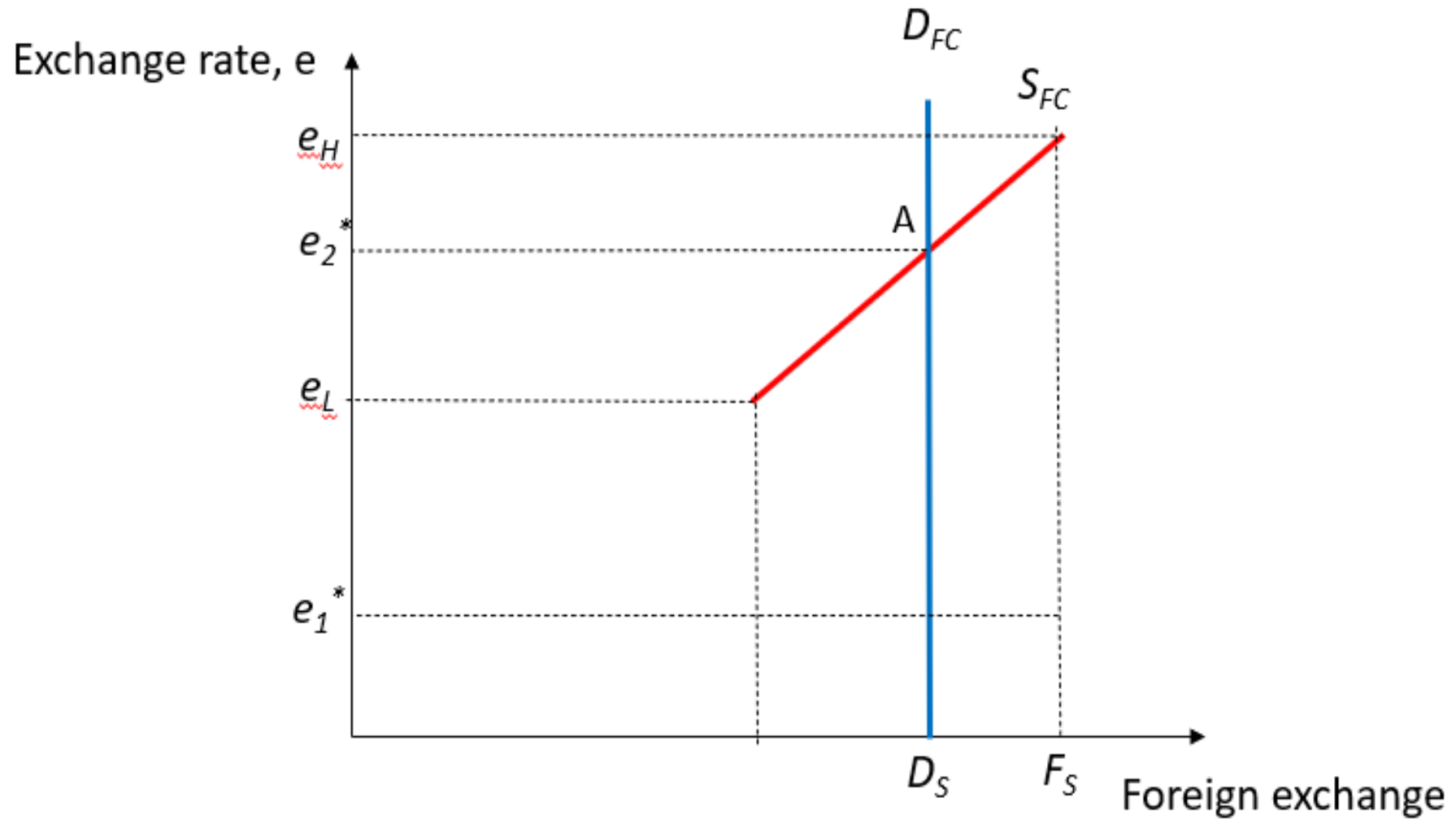
Link between Fiscal Policy and the Foreign Exchange Market: Twin Deficits

$$CA = (S - I) + (T - G)$$

Budget Surplus = T – G

CA = Current Account

Net Private Sector Savings = S – I

Twin Deficits:, ↓ *(T – G)* → ↓ *CA* (holding *S – I* constant)   (causal link)

An increase in the budget deficit causes the current account to deteriorate

$$BOP = CA + FA$$

FA = financial account

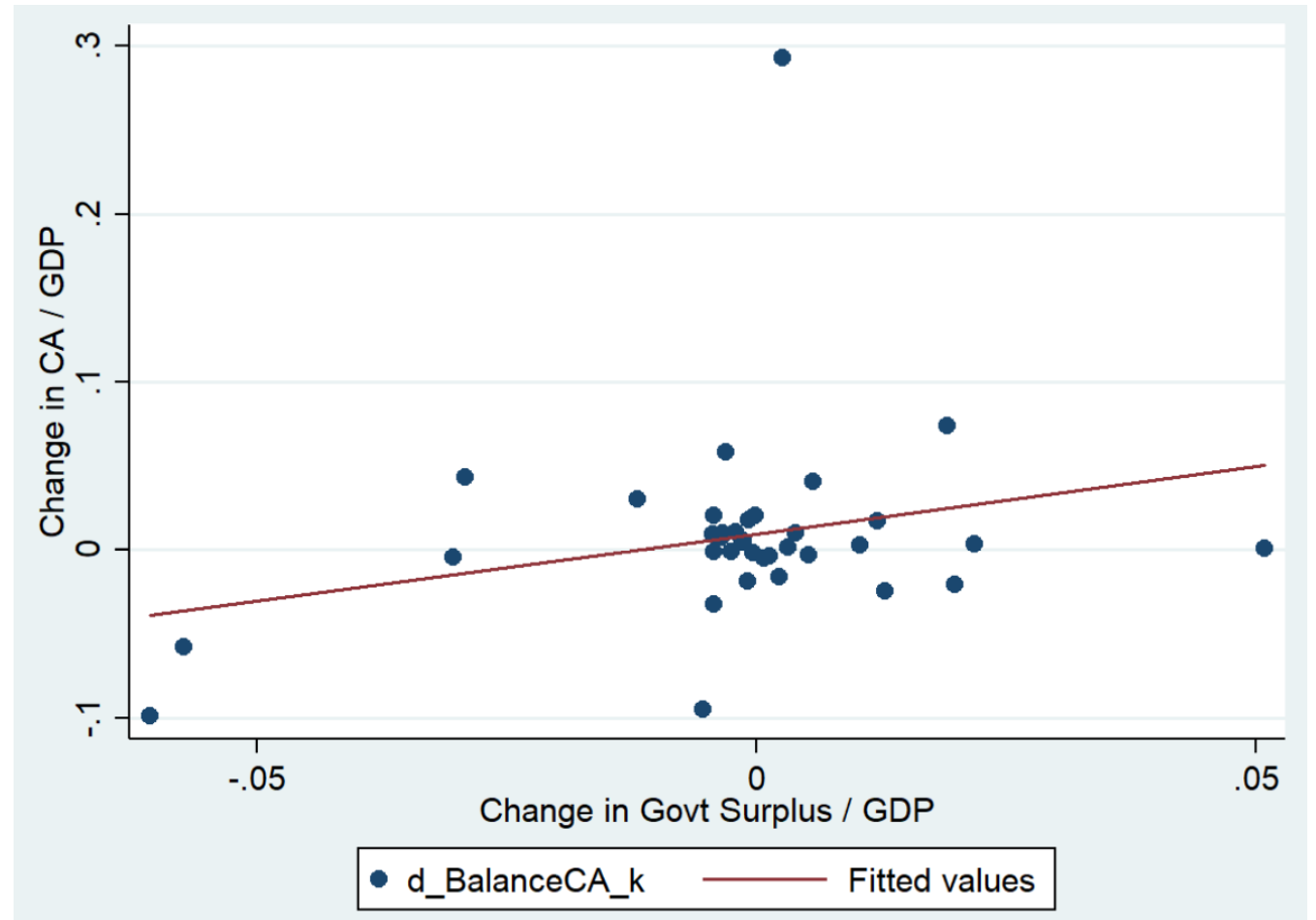↓ *CA* → ↓ *BOP (shortage of forex)* (holding *FA* constant)

Twin Deficits: Fiscal Policy matters

$$\frac{Trade\ Balance}{GDP} = 0.001 + 1.3\frac{(T-G)}{GDP}$$

Twin deficits
Causal link between budget deficit and CA deficit

PNG
One percent increase in the Budget Deficit/GDP
leads to a 1.3 percent decrease
the (non-LNG) trade balance/GDP

Bluedorn and Leigh (2010): 17 OECD countris, 1% increase in budget deficit/GDP leads to a 0.6% decrease in CA/GDP

Impact in Forex Market: BOP = CA + FA

Data: PNG database of the Development Policy Centre, ANU, 1989-2019

Economic Policy: Two Objectives

- **External Balance:** "the maintenance of currency convertibility at all stages of the international business cycle without recourse to external borrowings that are so large that their servicing requires reductions in average living standards at some future point in time." Garnaut and Baxter (1983, p. 56)

- **Internal Balance:** Internal balance refers to a situation of full utilization or full employment of resources in the domestic economy. For the labor market this means that all members of the working population that desire a job at the prevailing wage will have a job.

- Over 2014-2021: PNG economy does not have either:
  - external balance (currency convertibility): shortage of forex (rationing), borrowing
  - internal balance (full utilization of resources): unemployment is high, growth in non-resource sector is stagnant (low/negative)

- PNG: Deficit – unemployment

Theoretical Modification of Internal and External Balance Model

Real exchange rate, θ

External Balance

New Theory incorporates:
i.   Large resource sector (25% of GDP)
ii. Resource sector an enclave
iii. Foreign ownership share in resource
     sector is high
→ Net factor income very negative in PNG
(around 10% of GDP → GNP/GDP = 0.9

Θ* - - - - - - - - - - - - **A**

PNG

Internal Balance (Y=Y$_f$)

Deficit - unemployment

**G***   **Government Spending, G**
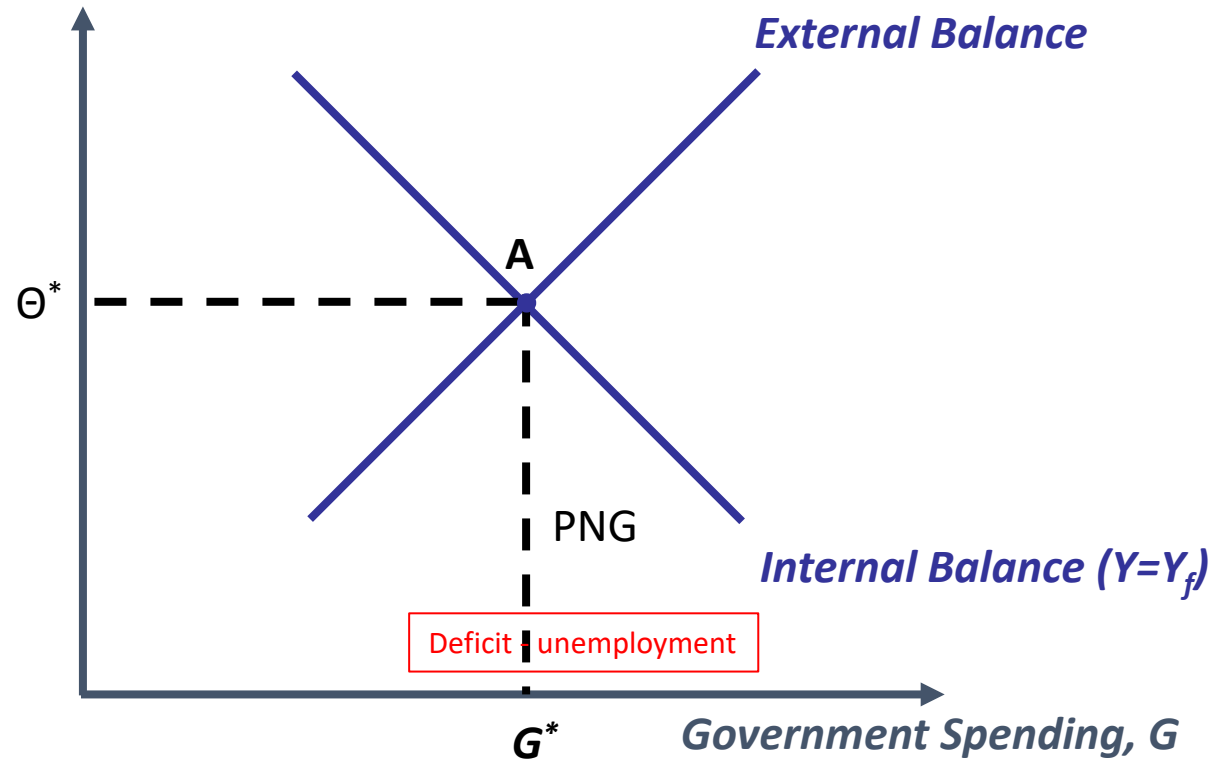
IB-EB: theoretical predictions

- Drivers of IB-EB
  - Terms of Trade (Price of Exports / Price of Imports)
  - Government Take (new theoretical model in this study)
  - Budget deficit

- To maintain IB-EB, real exchange rate should depreciate in response to
  - fall in the terms of trade
  - fall in the government take
  - increase in the fiscal deficit

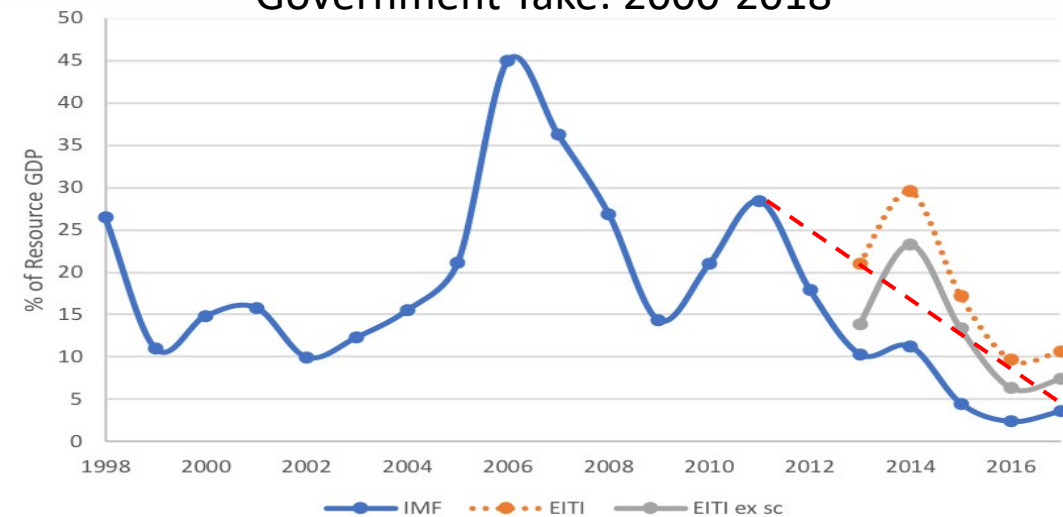# Terms of Trade, Budget Surplus, Gov't Take

Terms of Trade Index: 2000-2019
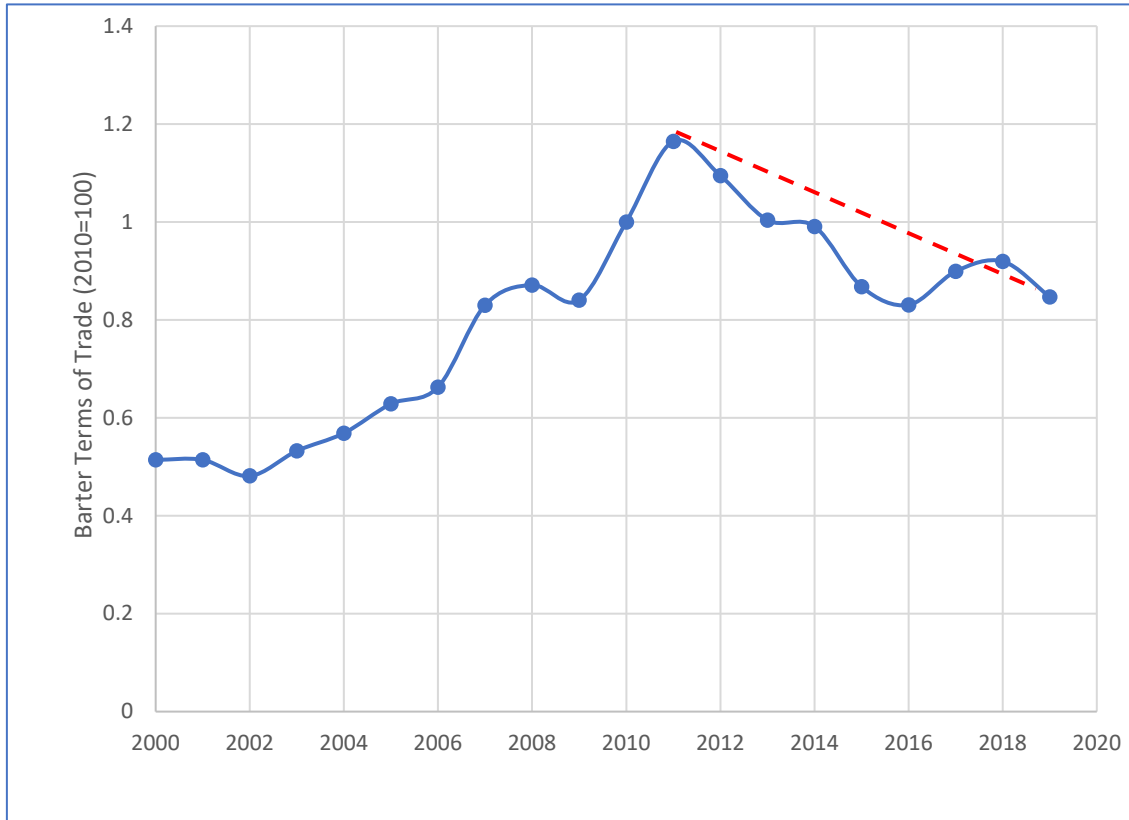
Budget Surplus: 1975 - 2019
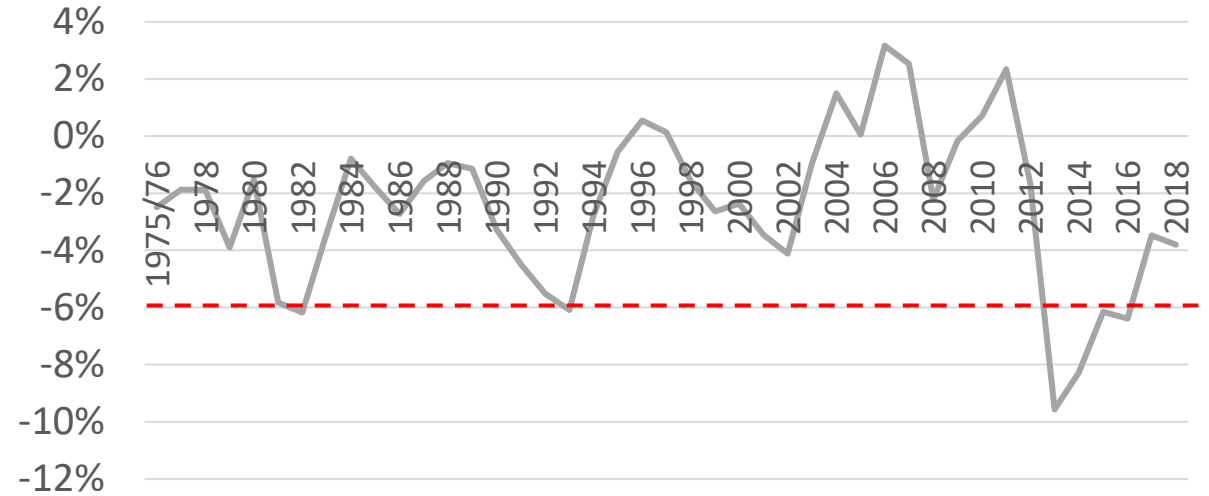
Government Take: 2000-2018

Empirical Analysis

- Estimate Equilibrium Real Exchange Rate (ERER): RER which attains both internal balance and external balance (at sustainable levels of relevant variables)

- ERER derived as a function of

  - Term of trade

  - Trade openness

  - Productivity differentials (between PNG and trading partners)

  - Government consumption

  - Net Financial Position (net indebtedness)

  - Government take

- Calculate ERER and compare with actual RER: allows determination of overvaluation of RER

Empirical Analysis: Results

Table 4: The long-run relationship between RER and fundamentals, trimmed sample period

Independent variable	(1)	(2)	(3)
Terms of Trade	0.09 (0.03)***	-0.07 (0.03)**	
Trade Openness	0.69 (0.08)***		
Productivity Differentials		-0.41 (0.03)***	-0.38 (0.04)***
Government Consumption		-1.21 (0.40)***	
Net International Indebtedness	0.27 (0.08)***		0.13 (0.06)**
Government Take	-0.81 (0.23)***		
L_c	0.40	0.65	0.59**
$\bar{R}^2$	0.68	0.85	0.80

Notes: ***, **, * denote the level of statistical significance at 1%, 5%, and 10%. Standard errors in parentheses. The dependent variable is the RER (natural logarithm). An increase in RER denotes depreciation. L_c refers to the test statistic for parameter stability and cointegration due to Hansen (1992). All specifications include a constant. The sample period is 1989–2014.

- Preferred specification is (1)
- Calculate *ERER* and compare with actual *RER*: allows determination of overvaluation of *RER*

Real Exchange Rate: 2000-2019

RER constant 2012-2019
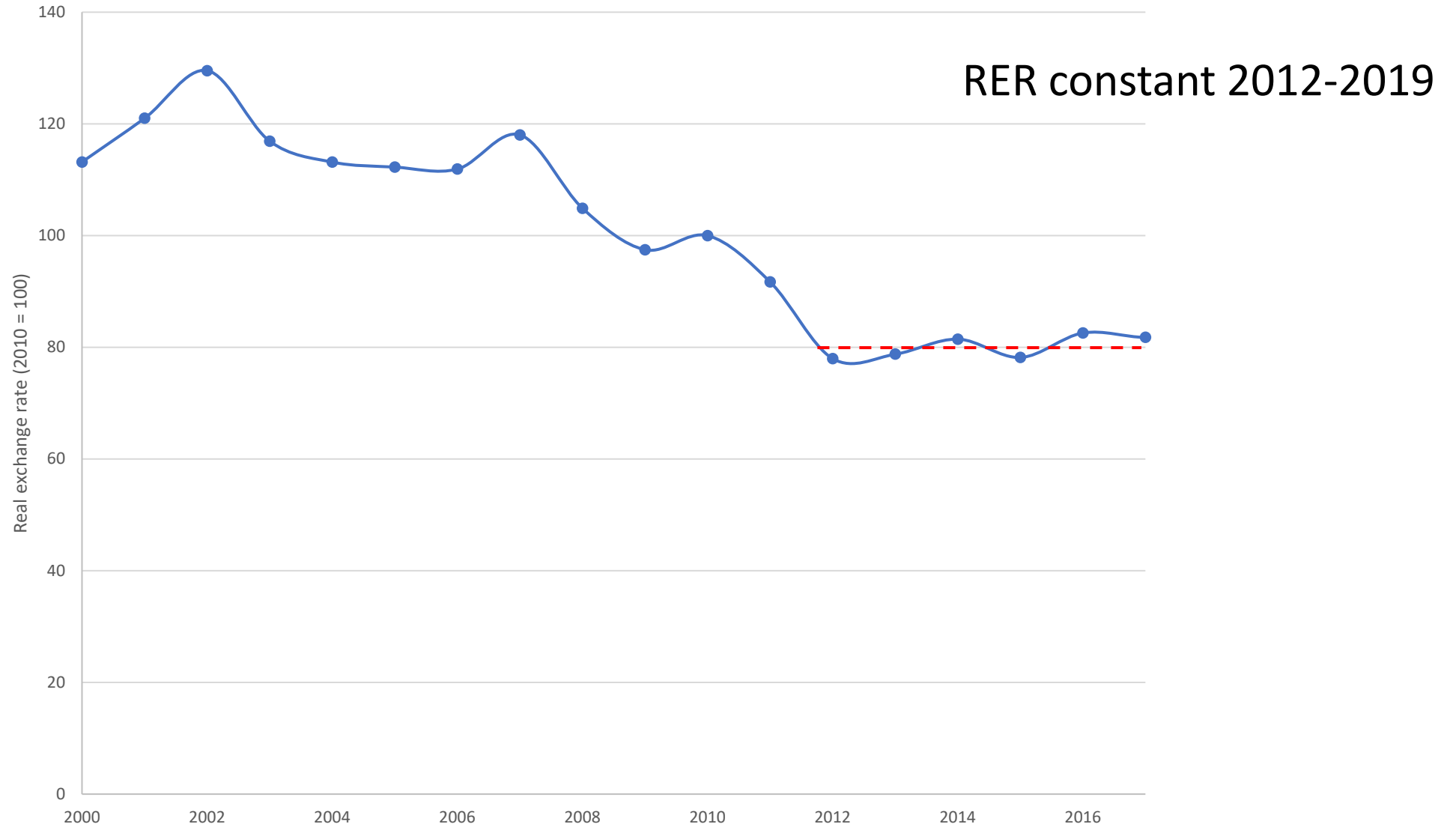
$RER = e.P^*/P$

P^* = foreign price level

P = domestic price level

Movement of ERER: 2012-2020

- Fall in Terms of Trade
  - Terms of trade fell 27 percent 2011-2019 → ↓ ERER

- Sequence of ↑Government Spending and associated large deficits
  - Budget deficit/GDP greater than 6 percent 2013-2016 (nearly 10 percent in 2013) → ↓ ERER

- Government Take has fallen
  - 30 percent in 2011; less than 5 percent in 2018 → ↓ ERER

IB-EB Diagram: ↓ToT, ↓Gov't Take → IB, EB shift up
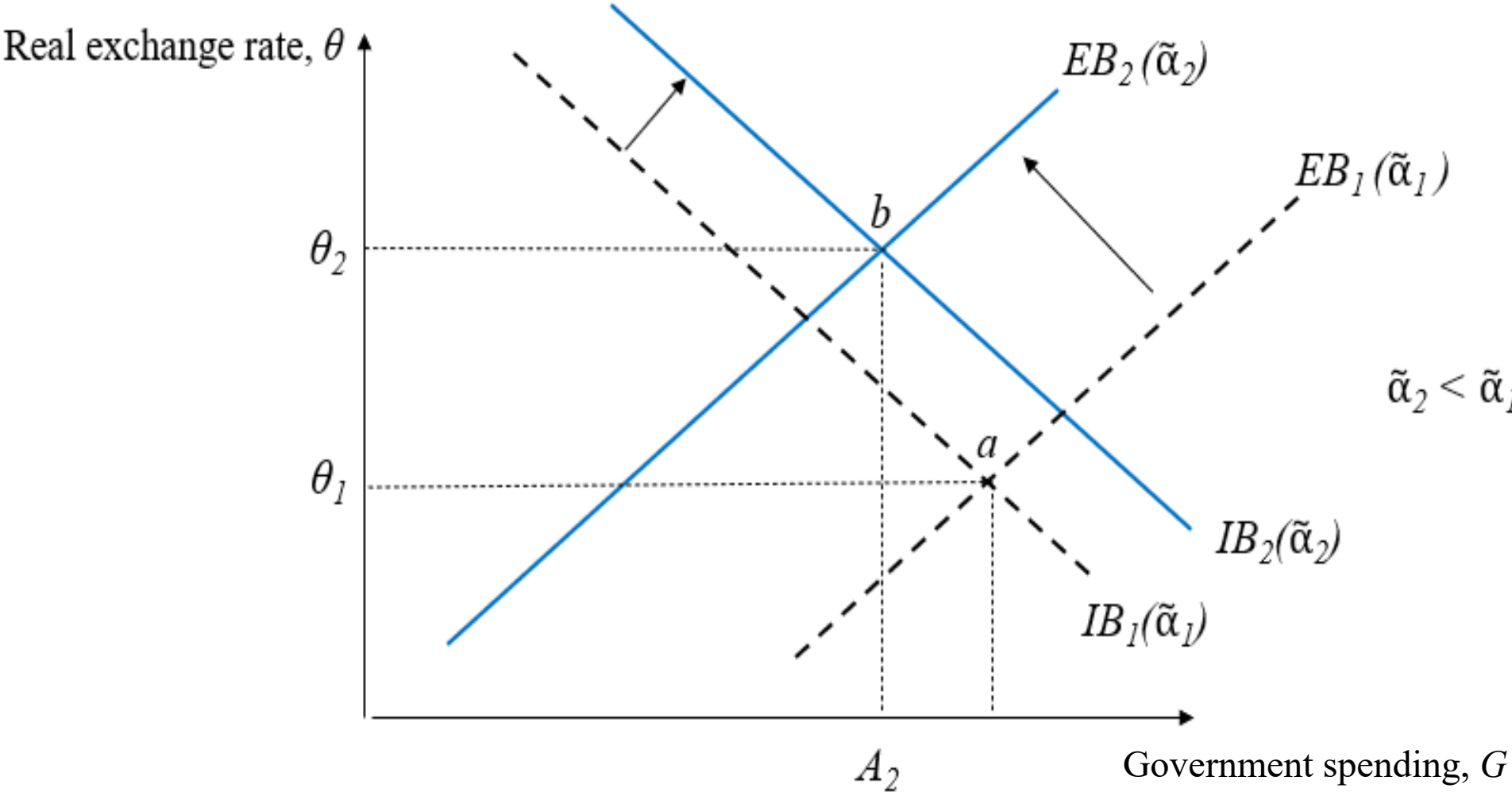
IB-EB Diagram: Overvaluation of RER
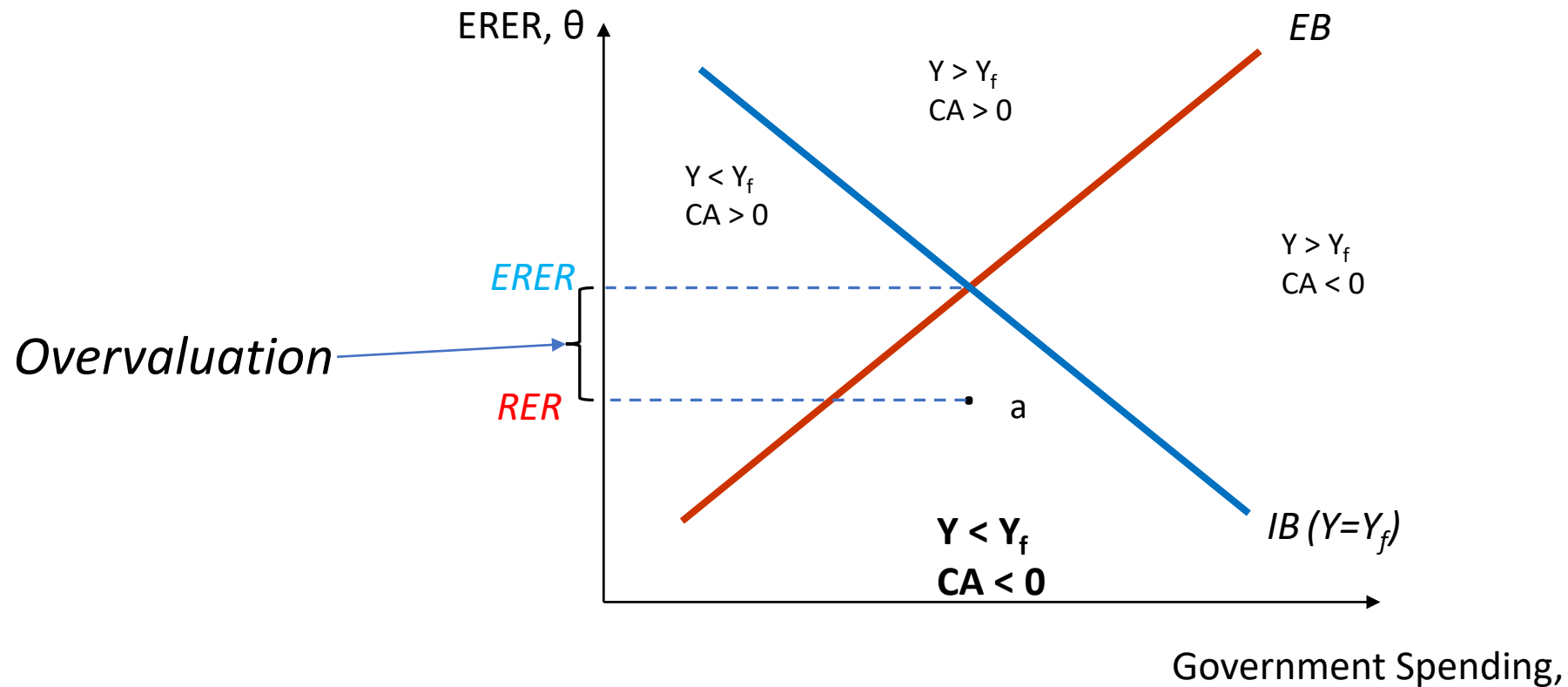
Overvaluation of RER leads to absence of currency convertibility and low/stagnant growth in economy

Figure: RER misalignment estimates, main results, 2000–2019.

Note: Positive values indicate RER overvaluation.
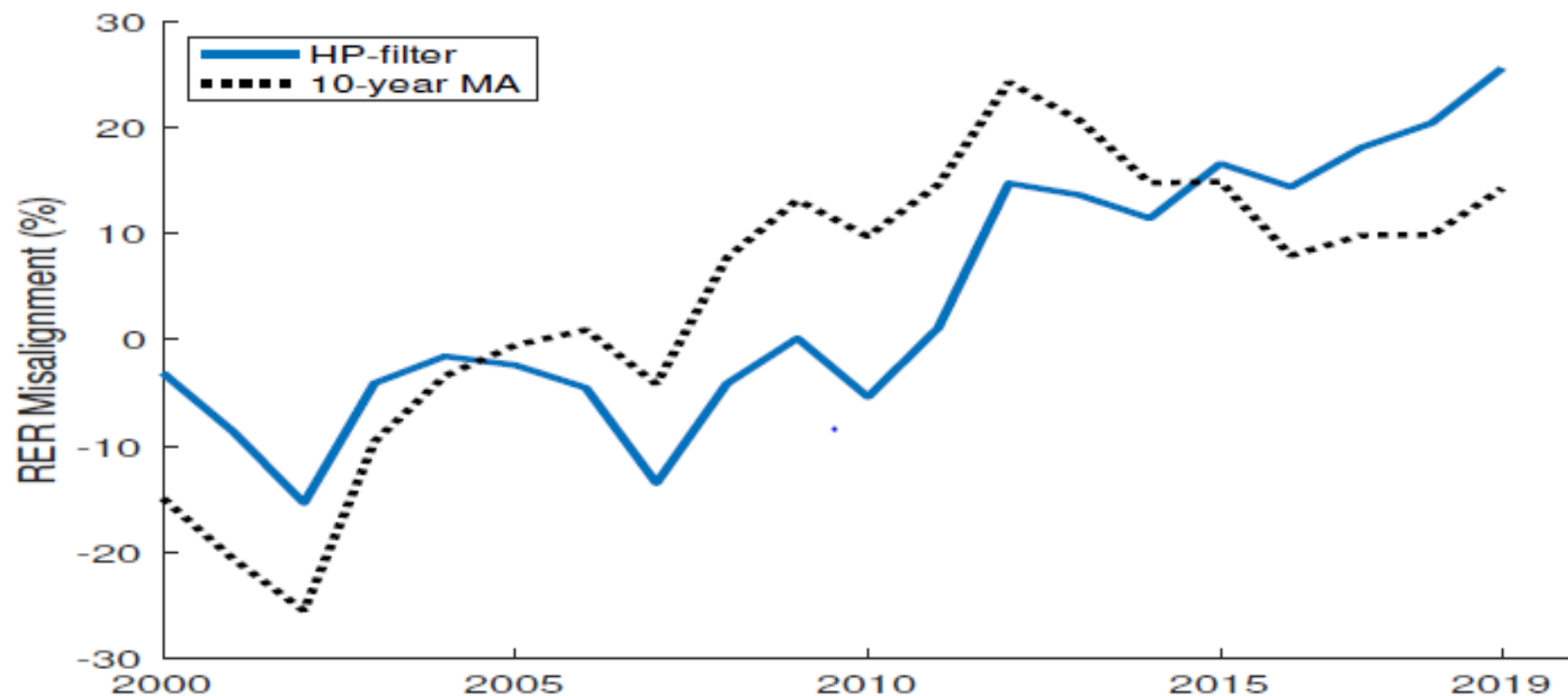*Source*: Authors.

Effect of Depreciation: Prices and Economy Activity

- Prices of tradables goods (exports and imports)

$$P_{EX} = e.P_{EX}^* \qquad\qquad P_{IM} = e.P_{IM}^*$$

$\uparrow e \rightarrow \uparrow P_{EX}$ (increase in Kina price of exports)

$\uparrow e \rightarrow \uparrow P_{IM}$ (increase in Kina price of imports)

- Exporters better off: *get higher Kina prices*
- Producers of import-competing goods better off: *charge higher prices*
    - *Importers worse off: sell less*
- Stimulus to tradables sectors (resources move out of non-tradables sector)
    - like a subsidy but no cost to government
- $\uparrow$Trade balance = Exports($\uparrow$) – Imports($\downarrow$) $\rightarrow \uparrow$ receipts of forex

Effect of Depreciation: Urban and Rural Households

- Household real income

$$Real\ Income = \frac{Money\ Income}{Price\ level}$$

- $\uparrow e \rightarrow \uparrow$ Price level (since cost of imports rise: $\uparrow e \rightarrow \uparrow P_{IM}$) $\rightarrow \downarrow$ Real Income

- Effect on real income depends on

  - Share of income spent on imports (high for urban households)

  - Effect of depreciation on money income (indexation, exports)

Effect of Depreciation:Urban and Rural Households

- Urban Households

  - High share of income spent on imports

  - Limited ability to substitute away from more expensive food imports

    (no gardens, but local markets)

  - Wages not fully indexed to increase in cost of living

  Real income ↓

- Rural Households

  - Lower share of income spent on imports

  - Higher ability to substitute away from more expensive food imports

  - Cash crop producer → ↑money income

  - Wage earner → not fully indexed

  Real income ↑ ↓

- Transfer from urban to rural households

- Urban drift reduced

Effect of Depreciation: Inflation, Real Exchange Rate

- PNG: High dependence on imported consumer goods, business inputs, and fuel
- Inflation rate sensitive to exchange rate movements

- *Effect of depreciation on Inflation*
  - IMF: $\uparrow e$ by 10 percent $\rightarrow \uparrow$ *inflation* by 3 – 4 percent
    - Pass-through complete in 1 year
  - Sampson and Kauzi (2006): $\uparrow e$ by 10 percent $\rightarrow \uparrow$ *inflation* by 5 – 6 percent
    - Pass-through complete in 1 to 1.5 years
  - Central measure ($\uparrow e$ by 10 percent $\rightarrow \uparrow$ *inflation* by 4 percent, pass-through complete after 1 year)

- *Real Exchange Rate* $RER = \dfrac{eP^*}{P}$
- $\uparrow e$ by 10 percent $\rightarrow \uparrow P$ by 4 percent $\rightarrow \uparrow RER$ by 6 percent
- Nominal depreciation $\rightarrow$ Real depreciation

% change in *RER* = % change in nominal exchange rate – % change in *P* level

     6 %　　　　=　　　　　　　10 %　　　　　　　　　　–　　　　4 %

Effect of Depreciation: Trade Balance, Agricultural Exports

- Effect of depreciation on Trade Balance
- Nakatani (2017): 10 percent depreciation of RER will improve trade balance by USD 250 million per annum (*ceteris paribus)*
  - Marshall-Lerner condition holds: sum of export supply elasticity and import demand elasticity exceeds unity

- Effect of depreciation on Export Earnings in Agriculture
- 20 percent depreciation of RER → *real agriculture export earnings ↑33.4 %*
  - *Long run export supply elasticity for agriculture: -0.67 % (Nakatani, 2017)*

Effect of Depreciation: Government Debt

$$Kina\ Value\ of\ Foreign\ Debt\ as\ a\ proportion\ of\ GDP(\frac{Kina\ Value\ of\ Debt}{GDP}) = \frac{e. USD\ Value\ of\ Foreign\ Debt}{GDP}$$

- $\uparrow e$ by 10 percent $\rightarrow$ $\uparrow \frac{Kina\ Value\ of\ Foreign\ Debt}{GDP}$ by 10 percent
- BUT
- $\uparrow e$ stimulates economy $\rightarrow \uparrow GDP$
- $\uparrow e$ relaxed forex rationing and import compression $\rightarrow \uparrow GDP$ growth

- $\uparrow e \rightarrow$ economy moves towards External Balance
  - Less need to borrow foreign currency now and into future

Policy Recommendations

- primary issue: chronic structural imbalance in forex market + backlog → address this first

- 20 percent depreciation of the real exchange rate
  - estimate RER is overvalued by 20 percent (range: 14 – 26% in 2019)

- 20 percent $\uparrow RER$ will require 33 percent depreciation in nominal exchange rate
  - Front load: 20 percent nominal depreciation immediately
  - remaining 13 percent over next two years
  - on top of current required trend depreciation in e

- Why?
  - Backlog! stimulate forex inflows from overseas investors, domestic exporters
  - Kickstarts necessary adjustment in real economy
  - Credible signal of reform
    - Stimulates economic activity

Policy Recommendations

- Reduction in Absorption
  - Fall in government take requires fall in absorption (government spending)
  - Rising government salary bill does the opposite
  - Starting point: adhere to Medium Term Fiscal Strategy: keep gov't salary bill constant over next two years

- Longer term: stabilize government take
  - Falls in govt take require difficult adjustments (depreciation)
  - Borrowing constraints: difficult to smooth effect of large variations in take
    - Difficult to borrow against backloaded resource revenues
  - Front load resource revenues: greater reliance on output rather than profit-based tax instruments

Policy Recommendations

- 20 percent depreciation of *RER* will:
- Substantial improvement in trade balance & forex inflows
  - ↑RER of 10% → ↑forex inflows of USD 250 million p.a. (Nakatani, 2017)
- ↑ Agricultural export income by 33.4 percent
- Stimulate economic activity in tradables sector
  - → stimulus to non-resource sector
- Stimulate supply forex as it aligns exchange rate with market participants expectations
- Redistribution of income from Urban to Rural households
  - Fall in Urban income moderated by ↑non-resource sector activity
  - Reduce urban drift

Policy Recommendations

- More flexibility in adjustment of nominal exchange rate
  - In face of large shocks to terms of trade (ToT), e should be allowed to adjust
    - ↑ ToT → ↓ *e;* ↓ ToT → ↑ *e*
  - Not allowing adjustment → *divergence between RER and ERER*
    - Overvaluation: loss of currency convertibility; internal balance (low growth / stagnation in non-resource sector)
    - Result of resisting adjustment over past 7 years: currency not convertible; slow growth

- Coordination on lower levels of fiscal deficits
  - Tight link between fiscal deficit and Trade balance (twin deficits)
    - Large fiscal deficits of past 7 years have contributed to structural shortage in forex market
  - Rule in addition to M-T Debt Management Strategy e.g. rule to ensure intergenerational equity in allocation of resource wealth

Policy Recommendations

- Once convertibility re- established, establish inter-bank market and trade forex through daily auction
  - Efficient allocation of forex
  - Not currently feasible (BPNG currently setting price and quantity)

- If policies remain unchanged the shortage of foreign exchange is likely to continue.
  - Ongoing uncertainties caused by the Covid-19 pandemic
  - likely sluggish global recovery
  - falls in commodity prices, cessation of operations at Porgera
  - Unclear prospects for signing of new resource projects lowered expectations of a future increase in inflows.

But…Policy Recommendations….Part II

- Are we at the beginning of a new commodities supercycle?
  - Oil prices USD 75 per barrel (highest for 2 years)… oil futures are higher
  - Upward movement in other commodities prices
- If so, improvement in terms of trade
  - Likely to increase government take
  - Appreciates ERER