Models for Monetary Policy Evaluation in Low-Income Countries

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A bit of skepticism to start off

- Tough assignment: speak for 10 minutes on *"the state of the art in academic research on optimal monetary policy in less developed countries".*

- Given the focus on low-income countries (LICs), there are problems with 3 keywords:
  - state of the art (?)
    - monetary theory and policy in low-income countries more of a niche field, without much of a frontier
  - academic research (??)
    - not exactly conducive to lots of acceptances in Econometrica
  - optimal monetary policy (???)
    - I guess in the sense of a (heavily) constrained, second-best (or third-, or fourth-best) optimum

Nevertheless, an outline

- Remind me again, what is the academic paradigm for optimal monetary policy in advanced economies?
  - A few slides on, uhmm, DSGE models
- And, can we export this paradigm to less-developed countries?
  - Maybe. With some re-plumbing
  - A new acronym and a top ten list
- An application: a model of inflation targeting in Ghana

Monetary policy evaluation: the principles…

- Whether by simple or optimal rules, monetary policy evaluation is conducted in the context of a representation of the economy and a policy framework
  - Positive dimensions: a model of the economy
    - set of relations that describe agents' behaviors (households, firms, government) and their interaction
    - a characterization of policymakers' behaviors, typically but not necessarily in the form of a policy rule that describes how the setting of the policy instrument changes in response to fluctuations in the target variables (e.g., Taylor rules, outcome-based rule, forecast-based rule, first-difference rule…)
  - Normative dimensions: a loss function that describes the social costs attached to deviations of certain variables from their desired levels

…and the best (only?) game in town

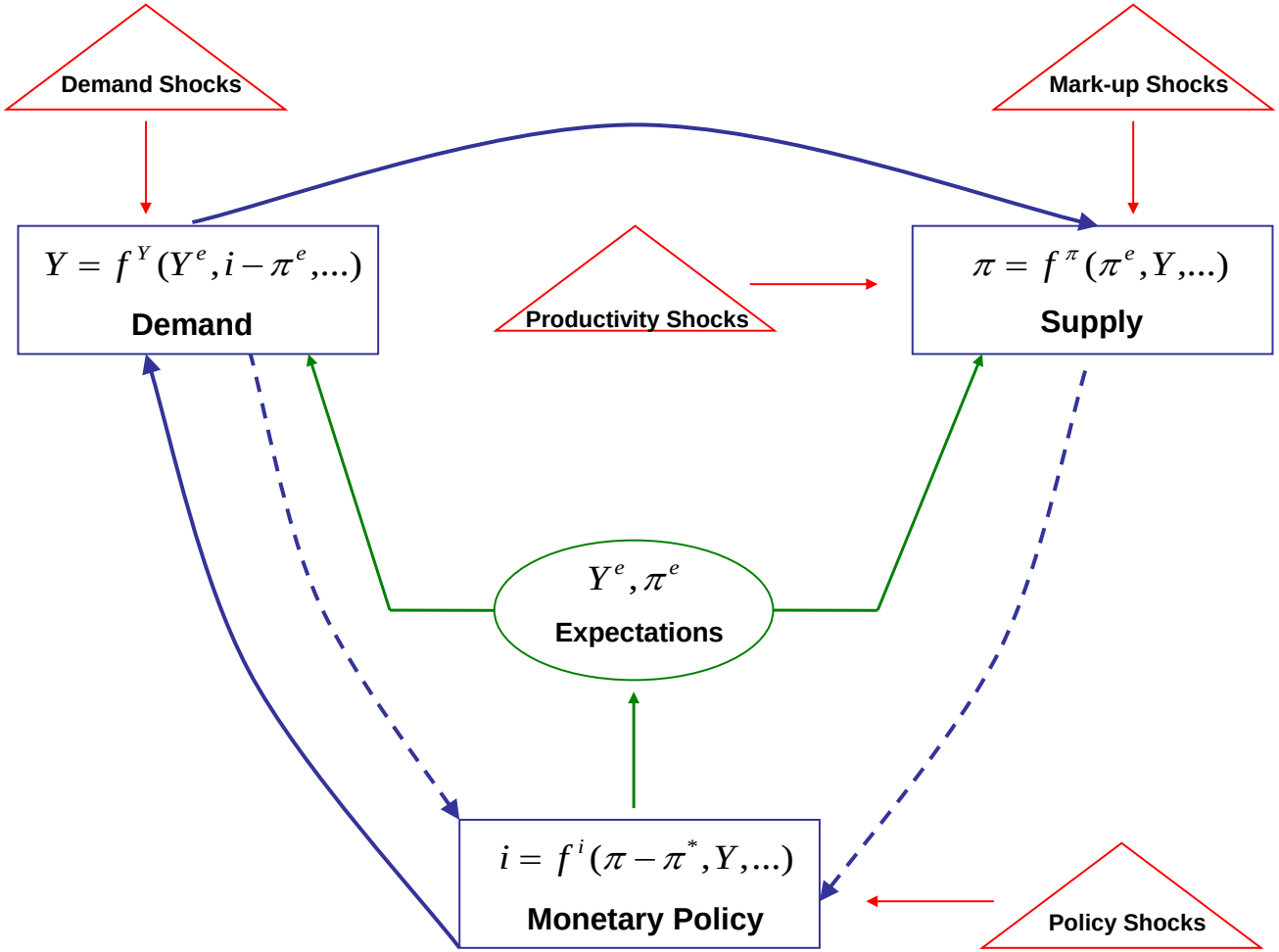
- Models reflecting the standard approach in modern monetary theory usually labeled as:

  Dynamic, Stochastic, General-Equilibrium

  - **D**ynamic → choice-theoretic optimization under intertemporal budget constraints, expectations formation modeled explicitly
  - **S**tochastic → economy driven by shocks to preferences and technology
  - **G**eneral **E**quilibrium → endogenous interactions and interdependencies, affecting economy-wide behaviors and prices

- Most common are 'New Keynesian' DSGE models with nominal (price and wage) rigidities
  - Aggregate demand plays a central role in short-run fluctuations
  - Countercyclical monetary (and fiscal) policy can dampen the economic cycle

Diagram of the canonical DSGE Model



From positive to normative

- Policymakers aim at maximizing a welfare criterion
- In many cases the welfare criterion can be represented by a quadratic loss function, e.g.

$$E_t \sum_{t=0}^{\infty} \beta^t \left[(\pi_t - \pi^*)^2 + \lambda x_t^2 \right]$$

  where x is output gap and weights (λ) may be model-consistent (reflecting the parameters of the underlying structural model) or indicative of policymakers' preferences
- Given the structure of the model and exogenous disturbances,
  - one could use the metrics of the welfare criterion to rank the properties of alternative "simple" policy rules (to determine which rule performs better)
  - or one could find endogenously the optimal monetary strategy that maximizes welfare subject to the constraints of the model

Optimal monetary policy: the problem…

- Optimal targeting rule: The central bank chooses the path for the endogenous variables (output and inflation) to minimize the loss function
  - Under discretion, the optimization is period by period, taking as given the current state of the economy and agents' expectations
  - Under commitment, the optimization is for the current and all future periods, subject to the evolution of the economy

- Optimal instrument rule: The central bank chooses a form of instrument rule (ex. a Taylor-type rule) and determines optimal coefficients as those that minimize its loss function
  - In some cases we can find an instrument rule that implements the optimal targeting rule

…and the solution

- Under a canonical DSGE model and standard loss function, optimal policy can be expressed as an optimal target criterion

$$(\pi_t - \pi^*) + \alpha (x_t - x_{t-1}) = 0$$

- Possible to find an interest-rate rule that implements this optimal criterion e.g.,

$$i_t = r_t^n + \pi^* + (1+\phi)(E_t \pi_{t+1} - \pi^*) + \phi_1 E_t x_{t+1} - \phi_2 x_{t-1}$$

- Similar to standard Taylor rule: policy rate responds to inflation, output gap. Important differences
  - History dependence
  - Generally has time-varying intercept: natural rate of interest (reflects productivity, consumers' impatience, financial frictions)
  - Generally responds to expected future inflation and output gap
  - Coefficients different from Taylor's proposal

So far so good. But…

- … but do we need different models for monetary policy evaluation in advanced economies vs. low-income countries?
- Kind of.
- Evaluation models in advanced, industrial economies: DSGE
  Dynamic, Stochastic, General-Equilibrium
- But in low-income, less developed countries: DSGEDSGE (or DSGE^2)

Descriptive, Stylized Generalizations of Export-led, Debt-prone, Small, Government-driven Economies

Moving toward a DSGEDSGE

- Inflation-output gap trade-offs, nominal wage inertia, social loss minimization … All basic elements of monetary policy evaluation both in advanced and less-developed countries. But.

- But there are a number of key dimensions specific to emerging and especially low-income countries that one cannot afford to overlook or treat as second-order complications.

- To start off the conversation, here is a…

Top Ten list of DSGE² deviations from basic DSGE

Top Ten list of DSGE² deviations from basic DSGE

No.10 Fasten your seatbelts, it's gonna be a bumpy ride

- DSGE techniques typically focus on small perturbations from non-stochastic steady state in (log-)linearized versions of the model
- But LICs subject to high volatility related to both supply and demand shocks
- There may be important theoretical non-linearities. Large movements in spreads and risk premia
- Use of higher-order approximations computationally tough

Top Ten list of DSGE² deviations from basic DSGE

No.9 I can see Russia from my house

- Canonical DSGE model has no (or limited) open-economy dimensions
- But the rest of the world is very visible from the house of a representative agent in a LIC
- Goods markets heavily exposed to international influences.
- Fast financial liberalization can fuel boom-bust cycles

Top Ten list of DSGE² deviations from basic DSGE

No.8 Everything is relative

- Relative prices play no role in canonical DSGE. Oil price shocks typically treated as “markup” or cost-push shocks
- For LICs, terms of trade fluctuations are pretty much “the” shocks
- Dependence on exports of agricultural and mineral commodities, forestry and fishing. Vulnerability to weather events domestically and price volatility in world markets
- LICs price takers in world markets even for standard tradable goods (labor-intensive manufactured exports)

Top Ten list of DSGE² deviations from basic DSGE

No.7 The joy of fx

- No (or very limited) role for the exchange rate in the canonical DSGE model
- For small, open, LICs exchange rate stability deemed to be necessary condition for price stability. High pass-through
- Choice of exchange rate regime key dimension of (broadly defined) monetary policy
- Policy reaction augmented with deviation of exchange rate from “target”. More generally, need to model costs and benefits of reserves accumulation
- Central bank intervention in fx market undermines exchange rate channel of monetary transmission

Top Ten list of DSGE² deviations from basic DSGE

No.6 Deprecating depreciations

- Standard DSGE models (when allow for open-economy effects) treat exchange rate devaluations/depreciations as expansionary stimulus
- But in emerging markets and LICs devaluations can have contractionary effects.
- Rapid pass-through to tradable goods reduces real incomes and consumption. Higher import costs raise production costs.
- Balance sheet effects from currency mismatches (liabilities denominated in foreign currency)

Top Ten list of DSGE² deviations from basic DSGE

No.5 Much depends on independence

- Canonical model (implicitly) assumes central bank conducts monetary policy with no outside interference, by buying and selling short-term securities in secondary market, without financing government deficits and refinancing maturing debt in primary markets
- Secondary markets tend to be poorly developed in LICs. Monetary policy instruments primarily Treasury bills in primary auctions.
- LICS central banks half as independent as those in emerging economies
- Reliance on seigniorage as a means of government finance

Top Ten list of DSGE² deviations from basic DSGE

No.4 Don't stop believin'. Hold on to the feelin'.

- Standard DSGE always converge to steady state with desirable properties and price stability (thanks to Taylor principle). Also no dispersion of beliefs. Full information. No learning. No rational inattention
- In LICs policy credibility not a given. Lower central bank credibility reflects history of price instability, possibly including hyperinflation episodes
- Makes it less appropriate to model monetary policy in terms of credible rules under commitment

Top Ten list of DSGE² deviations from basic DSGE

No.3 I used to be a banker but I lost interest

- Banking plays little role in canonical model. Transmission from monetary policy to credit market is seamless
- In LICs, banking lending channel is dominant mode of monetary transmission. But imperfect competition in banking sector. Small number of banks, important role for government-owned banks, weak competition from nonbank financial intermediaries.
- This increases cost of bank lending to private firms.
- Also reduces effects of policy changes on market rates, as banks may not pass on changes in policy interest rates to their customers.
- Financial repression: legal restrictions on interest rates that banks can apply both to their liabilities and their assets

Top Ten list of DSGE² deviations from basic DSGE

No.2 Science friction stories

- Canonical model assumes no or limited financial frictions and efficient transmission mechanism (from Taylor rule to Euler equation)
- But weak institutions in LICs (lax regulatory environment, political instability, poor accounting and disclosure standards, weak property rights, inefficient legal system, widespread corruption) reduce role of securities markets
- Small formal financial sector. Larger role of informal financial intermediation. Small or absent equity markets. Poorly developed and illiquid real estate markets.
- Impairs traditional monetary transmission. Effects of monetary policy on bank loan rates have weaker impact on aggregate demand.

Top Ten list of DSGE² deviations from basic DSGE

No.1 Leave the gun. Take the canonical.

- Canonical DSGE model often criticized as whole aspects of the economy are left out. In particular, asymmetries in information and frictions in the transmission mechanism. Restrictions imposed by the model may be at odds with the data.
- But don't confuse the limits of the canonical model with the limits of the DSGE approach.
- Examples of what the canonical model is lacking but the literature is working on includes housing, unemployment, monetary-fiscal interactions, term structure, banking sector… Some of these developments are obviously crucial for policy evaluation models in LICs.

A representative paper

- Recent example of DSGE (or DSGE^2) for policy evaluation in a LIC:

- Alichi et al., “A model for full-fledged inflation targeting and application to Ghana”, IMF Working Paper WP/10/25, January 2009

An application: disinflation under inflation-forecast targeting

- Paper argues that IFT can deal with special difficulties that confront disinflation policy in a small, low-income economy modeled after Ghana
- Challenges faced:
  - High vulnerability to supply shocks
  - Inflation expectations are likely unstable, given past volatility of inflation
  - Inflation inertia is entrenched in wage setting
  - Rapid changes in the economy
- Questions asked:
  - What is an appropriate pace of inflation reduction?
  - How should monetary policy respond to unexpected events along the disinflation path?
  - What degree of flexibility is appropriate in execution of policy?

The model: equations…

- Adapts the canonical model to address the issue of implementing IFT in a low-income economy
- Equations for
  - Output gap as a function of the interest rate, exchange rate, external demand
  - Inflation (expectations-augmented Phillips curve), non-linear function of output gap
  - Exchange rate (relation embodying uncovered interest parity, variable risk premium, and long-run purchasing power parity)
  - Monetary policy objective function (loss function which weights deviations of inflation, output gaps and interest rate variability) in place of a Taylor rule

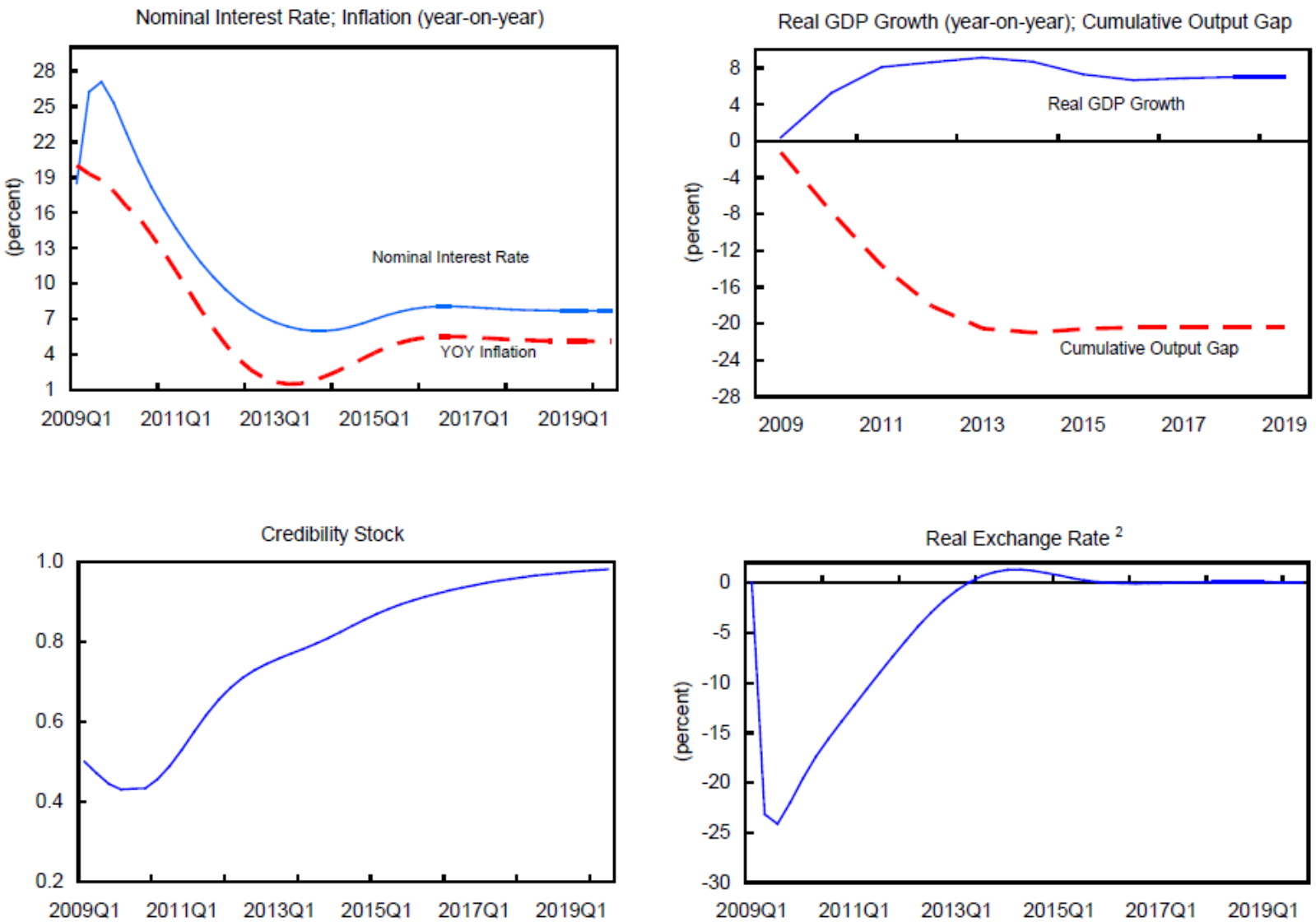
… and features

- Monetary policy minimizes loss function, subject to the constraints imposed by the structure of the model.
- Policymakers have choices with respect to the path towards the inflation target. This may be fast, if the cost of misses is high relative to the costs of output and interest rate instability. Or it may be slow, if the cost of targeting errors is relatively low.
- Endogenous credibility: people do not have 100 percent confidence that the central bank will achieve its announced objectives. In forming their expectations, agents give weight to recent history of inflation, and to the risk that policymakers might not have a commitment to a low-inflation agenda.
- Initial weights set at 0.5 on the announced low-inflation policy, and at 0.5 on the alternative possibility of a high-inflation policy. The central bank can move the low-inflation weight towards unity by steering inflation towards the official long-term objective.

Disinflation

- Apply the model to a hypothetical IFT program in Ghana. Ongoing declines in inflation needed to convince markets that the low-inflation target will be achieved
- The derived path of inflation reduction is smooth, but requires a steep interest rate hike in the first four quarters of the program. Putting off the increase only means a larger increase later.
- Supply shocks can have large impact on the desirable rate of disinflation.
  - A fortuitous supply shock, which reduces inflation, can help monetary policy, boosting credibility, reducing the necessary interest rate increase, and shortening the path to the long-run objective.
  - A harmful supply shock—e.g. an increase in world energy or food prices— requires large interest rate increases to prevent a self-propagating inflation spiral. Delay in tightening money eventually results in even higher interest rates, and a more prolonged period with output below potential.

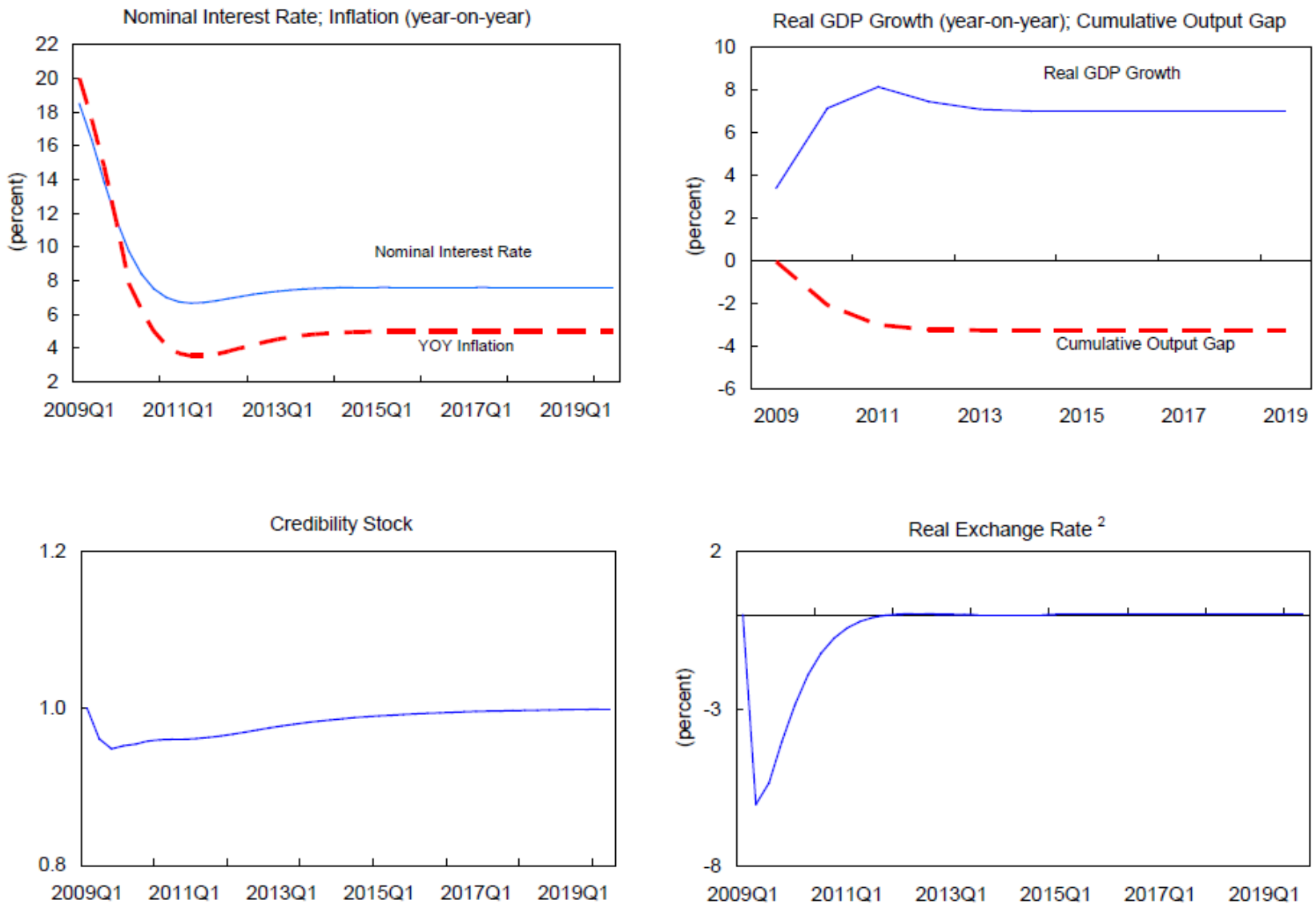
Figure 3. Ghana: Baseline IT with Imperfect Credibility, 2009-2019 [1]



Source: IMF staff calculations.

[1] All variables are quarterly, except for Real GDP growth, which is annual because quarterly GDP data are not reported in Ghana.

Figure 4. Ghana: Baseline IT with Full Credibility, 2009-2019 [1]



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