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Global Capital, the Exchange Rate, and Policy (In)Effectiveness

Biagio Bossone

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Biagio Bossone

E-mail: BBossone@WorldBank.org and Biagio.Bossone@Gmail.com

ABSTRACT

In line with JMK's liquidity preference theory, this article holds that in a world of highly internationally financially integrated economies the exchange rate between any two currencies is determined by the financial market views as to what its value is expected to be in the future. These views are influenced by the policy credibility that markets themselves attribute to the currency-issuing countries. After briefly reviewing the established theories of the exchange rate, the article proposes a very simple, aggregate model of equilibrium exchange rate determination based on market views and discusses its basic features and policy implications. It shows that whereas macro policy shocks in highly credible countries affect mostly real output with only a moderate impact on the exchange rate, the same shocks in poorly credible countries dissipate almost entirely in exchange rate movements. The exchange rate ultimately reflects the space that markets make available to national authorities for effective macro policies.

JEL Code: F41; F62; G15

Key words: Credibility; Exchange rate; Global investors and capital; Inflation; Macroeconomic policy

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1. INTRODUCTION[1]

This article is about the nature of the exchange rate as "conventionally" determined by global capital markets and as a reflection of the space that global capital markets make available to national authorities for effective macro policies.

Far from being anchored to fundamentals, and in line with JMK's liquidity preference theory (LPT),[2] in a world of highly internationally financially integrated economies the exchange rate between any two currencies is determined by the views prevailing within financial markets as to what its value is expected to be in the future. These views are influenced by the policy credibility that markets themselves attribute to the currency-issuing countries:[3] whereas macro policy shocks in highly credible countries affect mostly real output and only moderately the

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[1] I wish to thank Thomas Palley for encouraging me in attempting to extend Keynes's liquidity preference theory to the exchange rate., and I feel intellectually indebted to Charles Wyplosz for his emphasis on the importance of credibility for policy making in today's global financial context, which has inspired my recent work. Obviously, I am the only responsible for the opinions expressed in the article and for any remaining errors. As always, I am grateful to my wife Ornella for her unremitting support.

[2] For excellent illustrations of Keynes's LPT, see Bibow (2005) and Tily (2012).

[3] Based on the approach introduced in macroeconomics by Backus and Driffil (1985a, b), following the work of Kreps and Wilson (1982), throughout this article "policy credibility" as referred to a country government is defined as the extent to which economic agents believe government will carry out the macroeconomic policies it has promised to pursue. Importantly, this notion relates to both the will and ability of government to deliver on its promise. Market judgments on policy credibility, thus, draw on a country's past policy track record, its resolve to pursue pre-announced policy commitments and targets, and the adherence of its policy framework to what markets consider to be sound financial stability criteria (such as, typically, low inflation, stable asset prices, high liquidity and solvency of financial institutions, low leverage of key sectors, etc.).

real exchange rate (RER), the same shocks in poorly credible countries are reflected almost entirely in RER changes, with little real output effects (all else being equal).

While in my recent work on the *Portfolio Theory of Inflation*,[4] I have analyzed the microeconomics of global investor decisions and their impact on the exchange rate, in this article I focus exclusively on the macroeconomic impact of such decisions on exchange rate dynamics.

In the following, Section 2 briefly recalls the established theories of exchange rate determination; Section 3 delineates the proposed theory of the exchange rate as a "conventional phenomenon;" Section 3 illustrates the simple, aggregate model of equilibrium exchange rate determination underpinning the theory; Section 4 discusses the model's basic features; Section 5 evaluates its policy implications; and Section 6 discusses how the theory can be tested empirically. Section 7 concludes the article.

2. THEORIES OF EXCHANGE RATE: BIRD'S EYE VIEW

In orthodox theories of the exchange rate, the "law" of purchasing power parity (PPP) across countries holds as the value-anchoring fundamental of national monies – if not in the short run, certainly in the long run.[5] A positive rate of growth of the existing money stock triggers a proportional increase in the general price level (assuming the economy is at its "natural" rate of unemployment), and thus causes the nominal exchange rate (NER) (expressed as the number

[4] See Bossone (2019; 2020a, b; 2021a, b). Bossone (2021b) revisits the PTI and improves considerably on its original version, also correcting for some errors therein contained. While currently under publication, the latest draft of the article can be made available to interested readers on request.

[5] For an exposition of these models, see Mussa (1984). For a comprehensive discussion of the concept of PPP and PPP-based theories of the exchange rate, see Officer (1976).

of domestic currency units per unit of foreign currency) to rise proportionally.[6] Thus, in such theories, PPP acts as an attractor toward equilibrium for out-of-equilibrium NER dynamics, and the real exchange rate (RER) stabilizes at its equilibrium value after the NER has adjusted to changes in cross-country relative price levels.

As international capital flows have increased enormously over the years by various orders of magnitude vis-à-vis trade flows between countries, a different exchange rate driver is assumed to operate according to those models that follow a portfolio approach and consider currencies as financial assets. The relative value of traded currencies changes in response to investors adjusting their portfolio compositions to changes in the risk-return profile of the assets supplied and demanded in the economies considered.[7] Changes in financial wealth and cross-currency interest rate differentials (incorporating risk premia and (expected) inflation rates) drive international capital flows until portfolios are rebalanced and, to the extent that asset holdings adjust, the RER continues to change until equilibrium is achieved; that is, until each asset market is in equilibrium.

Finally, post-Keynesian models portray several structural features of the economy that create space for positive effects of monetary policy on real output through exchange rate changes.[8]

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[6] Following Dornbush's (1976) classic article, a process of overshooting would follow a change to higher rates of money growth, due to the stickiness of the prices of goods relative to assets, but as the adjustment is completed, the real exchange rate returns to its equilibrium level determined by relative (domestic vs. foreign) goods prices.

[7] See Branson (1977), Branson and Henderson (1985), and Kallianiotis (2021) for references to the relevant literature on the portfolio balance approach to exchange rate determination.

[8] See the systematic work by Harvey (2007). Most recently, the role of institutional investors in determining the volatility of emerging market economies' currencies and affecting their policy space has been recognized by some post-Keynesian authors. See Prates (2020), and Ramos and Prates (2021). This article is much more in line with their conclusions and perhaps generalizes them.

These features typically include underemployment equilibria, uncertainty, the absence of a natural tendency toward balanced trade, endogenous money, bandwagon effects (and in general market participants' expectations guided by mental models that are shaped by social forces) and, above all, the driving role of demand in the economy. Post-Keynesian models do not assume PPP anchorage for the exchange rate, and the latter (under conditions of free flow of international capital) is determined by financial investor portfolio decisions based more on short-term (gain and loss) prospects than long-term economic fundamentals. Thus, higher rates of money growth push the economy toward full employment, and their effect are magnified by exchange rate depreciation led by interest rate differentials that help transit the economy more rapidly towards a better equilibrium.

Interestingly, even if markets take a "fundamentals" approach to the determination of the (long-term) equilibrium exchange rate as a benchmark for their currency trading strategies, when forming expectations on future exchange rate movements they seek to evaluate the extent to which (current or expected) country policies evolve consistently with the fundamentals, and consider the credibility underpinning those policies as a key factor guiding their analyses and investment decisions. Intuitively, and as discussed below, according to the theory proposed here, policies undertaken by a weakly credible country, which markets would deem to be inconsistent with fundamentals, would further weaken the country's credibility and reverberate on the external value of its currency (with limited or no impact on real output). Conversely, a highly credible country would benefit from wider margins of flexibility and enjoy a much larger policy space before markets consider its policies to be such as to weaken its fundamentals; as a result, the effect of those policies on the exchange rate would be moderate.

Drawing from Ca' Zorzi et al. (2020), and references therein, the exchange rate theories that, like those based on the PPP, look at fundamentals are the Behavioral Equilibrium Exchange Rate model (a.k.a. the reduced-form model, in IMF terminology) and the Macroeconomic

Balance approach. The former considers several possible alternative fundamentals: the first choice is per-capita GDP, whose rise leads to an appreciation of the real exchange rate; this is due (from the demand side) to the effect of rising wealth, which increases the demand for domestic non-traded goods and hence their relative price, and (from the supply side) to the widely known Balassa-Samuelson effect. The second choice is net foreign assets, whose rise increases the interest income on the current account and should hence be counterbalanced by a deterioration in the trade balance, which in turn leads to real exchange rate strengthening. The third choice is terms of trade, whose rise leads to higher wealth and an improved trade balance, and hence to real exchange rate strengthening.

The Macroeconomic Balance, on the other hand, requires solving a system of equations to find the level of the real exchange rate that is compatible with the dual goal of achieving internal and external balance. Here, the equilibrium exchange rate is defined as the rate at which the current account stabilizes at the level where output gaps at home and abroad are closed.

3. GLOBALIZATION, POLICY SHOCKS AND THE EXCHANGE RATE

The theory proposed in this article follows a different route and considers the role of conventional beliefs in financial markets, which was at the core of Keynes's macroeconomic analysis under his *General Theory* and according to his LPT. It starts by noting that, with high international financial integration and the central role of professional financial investors as asset price setters, a persistently growing stock of money is sooner or later expected to exceed its optimal demand, *even if the economy is at less than its full employment output level.* This does happen sooner, rather than later, in countries suffering from relatively weaker policy credibility (defined at the outset), where the demand for assets denominated in domestic currency is dominated by the demand for assets denominated in foreign currencies.

The dominance of foreign asset preferences is even stronger where wealth is highly concentrated in the hands of a few holders and/or managed by professional investors, as both

types of agents are highly sensitive to risks and react fast to changes in risk perceptions. The rationale for these features is that, as money supply grows and circulates in the economy, it accumulates in the financial portfolios of powerful market actors, call them "global investors," who act either in their own interest as wealth holders or as professional investors and portfolio managers on behalf of ultimate wealth holders. Unlike the multitude of smaller local agents, global investors are not interested in spending money in local goods and services but rather diversify their money holdings across alternative assets (e.g., property, commodities, speculative financial securities, and foreign assets),

Notice that key in all this is the identification of the optimal demand for money for each country; this acts as the benchmark against which national "excess" money supplies can be measured. This issue is addressed in Section 3 and analytically in Appendices 1 and 2. The optimal money demand is critical since it lies at the heart of the credibility effect that guide global investor decisions on international capital allocation.

Foreign assets tend to absorb larger portfolio shares as money supply is expected to grow at higher rates and as the credibility attributed by the markets to the national policy authorities declines, since this will be read by markets as money supply growing in excess of its (optimal) demand. That is, even assuming that in principle, and based on local economic conditions, a larger money supply could be absorbed by a larger demand for transaction money balances (to be spent on additional output by local agents featuring a high average propensity to consume out of current income), the prospect of a persistently and unchecked growing stock of money supply push domestic large wealth holders and professional investors to substitute domestic with foreign money (or, more broadly, with assets denominated in foreign currencies), thereby neutralizing the real output effect of the money supply: the excess supply of domestic money incentivizes cross-currency arbitrage and triggers NER depreciation until equality between excess money supplies in real terms is established across countries. In the limit: no real output

effect materializes, while the impact of money growth dissipates entirely in NER devaluation (possibly followed by inflation via past-through effects).

4. A VERY SIMPLE AGGREGATE MODEL

Based on the above considerations, equilibrium in the international market for monies, that is, stability of the RERs, is achieved by the equalization of the rates of change of the "excess" money balances across countries. This condition can be formally represented as:

(1) $$\varepsilon = (\mu_d - p_d) - (\mu_f - p_f)$$

where all variables are expressed in rates of change; subscripts *d* and *f* stand for domestic and foreign, respectively; ε is rate of change of the NER (expressed as the number of units of country *d*'s currency per unit of country *f*'s international reserve currency); μ is the rate of change of excess money supply; *p* is the inflation rate. The excess supply of money is defined as

(2) $$M_j^S - M_j^{D*}, \qquad \text{with } j = d, f,$$

Where M_j^S and M_j^{D*} are, respectively, country *j*'s supply and optimal demand for money. The latter is derived in Appendix 1 and incorporates country policy credibility as a key parameter, discussed in Appendix 2:

(3) $$\frac{M_j^D}{P_j} = m(Y_j, i_j | \beta_j), \qquad \text{with } m'_Y, m'_i > 0, \text{ and } j = d, f,$$

where *Y* is real output and *i* is the convenience yield on money, conditional on credibility factor β. The similarity of Eq. (1) with traditional monetary models of the exchange rate is only apparent and should not hide their essential difference, as discussed in Section 5.

Eq. (1) sets a no-arbitrage condition. This condition also holds under full employment output levels, where the growth of excess money supply has limited or no effect on inflation. If Eq. (1) were violated, opportunities for "free lunch" gains arise whereby country *d* could create

money at will, which wealth holders and professional investors could convert into reserve currency *f* and either hold it as a safer and more liquid store of value or use it to buy any amount of country *f*'s output. In fact, any domestic or foreign agents could in principle borrow any amount of currency *d* and buy currency *f* at will at a constant NER: an impossibility. Markets would not allow this to happen, since they would immediately realize that the money supplied is being inflated and that "too much money" is circulating in the economy as a result.

Notice that the main reason for NER adjustments in this model is not higher inflation or inflationary expectations, as in conventional monetary theories of the exchange rate, but the growth of the domestic money stock beyond what is deemed to be its optimal level and, hence, its diversification by holders into foreign currencies (and other assets, in a broader model). This causes the external value of domestic money to decline vis-à-vis other national monies. (The fact that this simplified model includes only monies as financial assets should not lead to misappreciation of the consistency of this result with the LPT.[9])

Under Eq. (1), growing excess supply of country *d*'s money require its NER to depreciate vis-à-vis country *f*'s money. With forward-looking expectations, NER adjustments follow in response to anticipated cross-country differential rates of excess money growth.

Notice that, if re-written as $\varepsilon = \mu_d - \mu_f + (p_f - p_d)$, Eq. (1) implies (counterintuitively) that, for any given differential rates of excess money growth across countries, any increase in foreign price inflation p_f, relative to domestic inflation p_d, requires a larger rate of NER depreciation

[9] If, as Tily (2012) notes, the essence of LPT is the balance between liquid and illiquid assets, this balance here applies to currencies held by investors who determine which of them faces the risk of becoming less liquid (or illiquid) due to policy mismanagement. Paraphrasing JMK referring to the interest rate (Keynes (1936), p. 213), according to the proposed model, the current exchange rate between two currencies depends on the strength of the desire to hold them coupled with the amount of the supply of one relative to the supply of the other.

of currency *d*. This result should not be read as establishing a causal relationship between foreign prices and the NER; rather, it is the necessary outcome of a market equilibrium condition, whereby the NER must act as a *rationing device* to reduce the demand for foreign currency by making its relative price higher and thus subdue the opportunities for free-lunch gains.

5. TURNING THE PPP LOGIC ON ITS HEAD

Based on Eq. (1), the dynamics of the RER are expressed by:

$$\overbrace{\varepsilon - (p_d - p_f)}^{\substack{Rate\ of \\ RER\ change}} \equiv \mathcal{E} = \mu_d - \mu_f + (p_f - p_d) - (p_d - p_f) = \overbrace{\mu_d - \mu_f}^{\substack{Cross-country \\ differential\ of \\ excess\ money \\ growth\ rates}} \quad . \tag{4}$$

According to Eq. (4), cross-country differential *excess* money growth rates are sufficient predictors of RER changes, and the variability of the RER between any two currencies is determined purely by the relative monetary dynamics that materialize (or are expected to materialize) in the currency issuing countries considered.

This conclusion is consistent with Keynes's LPT: at any time, the exchange rate between two currencies is established at the level where the desire for extra liquidity in any of the given currencies vanishes at the margin, and any attempt to supply more of any of the two currencies in excess of its own optimal demand does change the exchange rate forthwith (all else being equal).

The theory proposed and underpinning Eq. (4) differs in an essential way from the traditional monetary models of exchange rate determination: the latter are based on the PPP, and the country rates of inflation contained in their equations are derived from the quantity theory of money as differences between the rates of money supply and demand observed or expected in each country. More specifically, the typical monetary model equates inflation to excess money supply growth and derives a PPP-based equilibrium rate of RER change between any two

currencies as the difference between excess money supply growth rates in the two issuing countries.[10] On the other hand, in Eq. (4) above, excess money supplies do not determine inflation and RER changes are given by differences between NER changes and the country inflation differentials. Therefore, PPP is not necessarily satisfied by the solution to Eq. (4) and the rate of change of the RER may persistently diverge from the relative rate of inflation if excess money growth rates diverge across countries, that is, $\mathcal{E} \equiv \varepsilon - (p_d - p_f) \gtreqless 0$ if $\mu_d - \mu_f \gtreqless 0$. This is further discussed in Section 6.

Also notice the innovative role of money demand in the proposed theory, due to the key role that country policy credibility plays in it. Expectations of RER devaluation are stronger where the credibility of the country undertaking the monetary expansion is weaker, since a strong acceleration of money supply in these countries is more likely to exceed the demand, and vice versa in more credible countries where the national currency tends to be in high demand.

With expectations incorporated in the model, anticipations of future RER devaluation would accelerate actual devaluation; and, with rational expectations, anticipations of RER devaluation would fulfill themselves instantaneously. For instance, with expectations of unbounded money growth, which would hold under persistent monetization of fiscal deficits (say, *à la* Modern Money Theory), the RER would be in free fall in most countries adopting such policy stance.[11]

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[10] See, for instance, Eq. (6) in Mussa (1984). It must be noted, however, as admitted by Mussa himself, that the equation can be derived without explicit reference to PPP, and even allowing explicitly for divergences from PPP. The model represented by Eq. (4) above is indeed such a case.

[11] With the exclusion, perhaps, of reserve-issuing countries or countries with very strong policy credibility, where other mechanisms (i.e., wealth effects) are triggered earlier on in the process, which prevent stock imbalances from growing to unsustainable levels and expansionary macro-policies to be effective (Bossone, 2021c).

Eq. (4) predicts RER changes to occur independently of the output gap, and thus even at less-than-full-employment output levels: RER changes are fueled by expectations of excess money growth against given perceptions of country credibility, but they are de-linked from the expected impact of money growth on price inflation since the negative output gap makes the economy's real resource constraint unbinding. Inflation eventually follows NER devaluations, due to exchange rate pass-through effects and independently of resource employment. Thus, unlike in traditional monetary theories of the exchange rate, according to the proposed theory, inflation is not the cause but the effect of currency depreciation, and PPP is not an attractor for the NER: the PPP logic is turned on its head (perhaps, not so much of a surprise as JMK's LPT is behind all this…).

Finally, notice that the theory proposed here does not need discriminating between models with New-Keynesian sticky versus flexible prices, or monetary versus (Real Business Cycles) productivity shocks, to explain RER departures from PPP. Even less does the theory need assumptions regarding financial market segmentation.[12] Quite the contrary: the theory builds precisely on global financial integration and the role of investors operating globally and without restrictions to international capital flows.[13]

6. POLICY IMPLICATIONS

The view of the exchange rate as a conventional phenomenon, which underpins Eq. (4), indicates that no real output effects follow mechanistically from expansionary monetary policy shocks even at less-than-full-employment output, and that these effects depend on the level of credibility attributed by the markets to the country undertaking them: whereas they are larger

[12] See, for instance, Itskhoki and Mukhin (2019).

[13] This is in fact the main change in macroeconomic modelling I am humbly trying to push forward with my PTI work, referenced above.

in more credible countries, where money growth increases output and is absorbed by transaction money demand, they are smaller in less credible countries, where excess money balances are diversified away by global investors.

To see this, linearize and differentiate the supply and optimal demand for money (Eqs. (2)-(3)) to obtain:

$$(5) \qquad d\mathcal{E} = \left\{dM_d^S - \left[m_Y dY_d + m_i d\left(i_d|\beta_d\right) + m_p dP_d\right]\right\} - \left\{dM_f^S - \left[m_Y dY_f + m_i d\left(i_f|\beta_f\right) + m_p dP_f\right]\right\}.$$

Following Appendix 1, and assuming monetary equilibrium in reserve-issuing country *f*, Eq. (5) can be used to show that a positive monetary policy shock, $dM_d^S > 0$, produces different outcomes, depending on the credibility of country *d* relative to country *f* and on how credibility affects convenience yield i_d when domestic money supply changes. Let's consider the extreme outcomes:

a) *Country d enjoys the same full credibility as country f.* In this case, domestic money supply and demand remain in balance, and no adjustment is required of convenience yield i_d. Thus, $\mathrm{d}\mathcal{E} = 0$, that is, the RER does not change, and the additional money supply is absorbed by the transaction demand for money at higher real output and price levels, $dY_d > 0$ and $dP_d > 0$, respectively.

b) *The credibility of country d is weak, and no adjustment takes place in convenience yield* i_d. In this case, global investors convert domestic into foreign currency, the domestic currency depreciates in real terms, and the demand for money does not absorb the money supply shock. There is a critical value of credibility factor β_d, at which the real depreciation of the currency dissipates the expansionary potential of the monetary policy shock, leading to $d\mathcal{E} = dM_d^S$, with no effect on real output, $dY_d = 0$. The

depreciation, however, might cause prices to rise (with a lag), $dP_d > 0$, due to exchange rate pass-through effects, and real output eventually to fall if no further monetary accommodation is effected to offset the fall in real transaction money balances.

c) *The credibility of country d is weak, and convenience yield i_d adjusts fully*. In this case, balance is restored between domestic money demand and supply growth, thus leaving the RER unchanged. However, there is a critical level of credibility factor β_d, at which the adjustment of the convenience yield just offsets the expansionary effect of money on real output and prices and no additional transaction money balances are demanded by the economy; that is, for $d\mathcal{E} = 0$, there $M_d^S - m_i d\left(i_d \,|\beta_d^{critical}\right) = m_Y dY_d + m_p dP_d = 0$.

It might be argued that the real output effects of expansionary and contractionary monetary policy shocks are asymmetric, in that the latter strengthen country credibility and thus enhance policy effectiveness, while the former weaken country credibility and thus reduce policy effectiveness. Accordingly, where credibility is weak, one can realistically expect that the effect of negative policy shocks on real output should be larger (in absolute value) than the output effect of positive shocks of equal size (all else being hypothetically equal).

Yet, as Alberola et al. (2021) have shown, while a contractionary monetary surprise leads to currency appreciation in normal times, depreciation follows when the quality of the fiscal fundamentals deteriorates, and markets worry about country debt sustainability.

Thus, the market view prevailing among global investors ultimately determines the (in)effectiveness of macro-policies in individual countries. Simply put, in countries that are credible, expansionary macro policies are effective and thus real output grows at stable RER. On the other hand, in countries that are less credible, the effects of the same policies dissipate into RER depreciation with limited change in real output (at best). In the end, the credibility of

the policy regime underlying macro-policy decisions emerges in all circumstances as a critical determinant of policy (in)effectiveness: *the policy space available to national authorities is endogenous to how credible they are in the eyes of the market*.[14]

7. A THEORY IN SEARCH OF EVIDENCE

The above discussion implies some regularities that, if empirically detected, would offer *prima facie* evidence in support of the proposed theory. Considering RER changes in countries with different levels of policy credibility (proxied, say, by ratings), a high correlation should be observed in countries with lower credibility between RER changes and cross-country differential rates of money growth. This is because money demand is typically expected to match supply in the strongly credible reserve-issuing country, $\mu_f \approx 0$, whereas the occurrence of excess money growth is more likely to happen in countries with lower credibility, $\mu_d > 0$, where the growth of money supply is not as easily matched by an increasing demand for money. At the same time, and for the reasons discussed above, no systematic correlation should be observed between differential money growth rates and real output changes in the less credible countries, while this correlation should be positive in credible countries. On the other hand, RER changes in countries with high credibility should show a low correlation with differential money growth rates and a positive correlation with output.

A straightforward way to test the proposed theory is to estimate Eq. (4) using panel data on a sample of countries over a series of years, after having estimated for each selected country an

[14] This conclusion is fully in line with my recent work on the *Portfolio Theory of Inflation* (PTI), cited earlier. In fact, the model developed in this article is the reduced (and simplified) macroeconomic version of the micro-macro model underpinning the PTI. The PTI model is much more comprehensive that its reduced counterpart considered here, as it shows the exchange rate to depend on other variables than just money, including other portfolio assets beyond money and a host of other price and policy variables, including, explicitly, a country credibility factor.

independent demand-for-money function like Eq. (2), against which to calculate the excess net money supplies for all countries relative to that of a reserve-issuing country taken as benchmark.

This article does not attempt to test the theory, which will be a task for subsequent work.

8. CONCLUSION

Opposite to the theories of the exchange rate that anchor the latter to the economy's fundamentals, and beyond post-Keynesian theories of the exchange rate as determined by demand-driven models, this article holds – in line with JMK's LPT – that in a world of highly internationally financially integrated economies the exchange rate between any two currencies is "conventionally" determined by the views prevailing within financial markets as to what its value is expected to be in the future, and these views are influenced by the policy credibility that markets themselves attribute to the currency-issuing countries. The exchange rate ultimately reflects the space that markets make available to national authorities for implementing effective macro policies.

The exchange rate and the macroeconomic effects triggered by exchange rate dynamics are thus governed by the beliefs upon which financial markets take decisions on international capital allocation: if markets believe that the currency of a poorly credible country will depreciate following an anticipated policy shock, with no effect on real output, so will it be. By the same token, if they consider a country as highly credible, an anticipated policy shock engineered by its government will only have a less pronounced effect on the exchange rate and a large impact on output.

Markets will be proven right, but not because they possess superior knowledge about what will happen in the future, but because they can make happen what they believe will happen, simply by (re)directing capital internationally.

If supported by data, as will be tested in future work, this conclusion would indeed be a sober one, reflecting an unpleasant state of affairs, yet one that national authorities of financially integrated economies should consider carefully when designing their macro-policies and evaluating their constraints.

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APPENDIX I. OPTIMAL DEMAND FOR MONEY AND POLICY CREDIBILITY

This appendix develops a modified version of the Allais-Baumol-Tobin (ABT) inventory model for transaction money demand used in the article. The original ABT model is here modified to include the convenience yield that money delivers to its holders. The ABT approach was selected as a simple and

yet effective method to incorporate an optimal demand-for-money framework in the economy's model used in this article.

Suppose households receive nominal income PY at the beginning of each period and spend it evenly during the period. Average wealth is $PY/2$ and, according to the model assumptions, it is held in the form of money balances, *M*, issued by the domestic country *d* and delivering convenience yield i_d, and foreign asset balances, *FX*, issued by foreign country *f* and delivering convenience yield i_f, where the convenience yield is the implied return on holding money balances.

To finance transactions, households must first hold *M* balances; thus, before wealth held in the form of *FX* can be spent, it must be converted into *M* at cost *c* per transaction. Suppose each household divides the period into *n* subperiods initially placing PY/n in money balances and the rest in *FX*. At the end of each subperiod, *FX* balances are converted into *M* balances in $n - 1$ transactions of equal size PY/n. Thus, average money holdings over *n* subperiods will be $M = \frac{1}{n}\frac{PY}{2}$ and average holdings of foreign balances will be $FX = \frac{n-1}{n}\frac{PY}{2}$. The net gain, Γ, from holding wealth in both assets, considering the need to finance transactions, is given by:

(A1) $$\Gamma = \frac{1}{n}\frac{PYi_f}{2} + \frac{(n-1)}{n}\frac{PYi_f}{2} - (n-1)c$$

Maximizing Γ with respect to *n* requires:

(A2) $$\frac{\partial \Gamma}{\partial n} = \frac{-2n^2c + PYi_f}{2n^2} - \frac{PYi_d}{2n^2} = 0.$$

Therefore, the optimal choice for *n* is

(A3) $$n^* = \sqrt{\frac{(i_f - i_d)PY}{2c}}.$$

Replacing Eq. (A3) into the equation for *M*, the optimal demand-for-money equation is

(A4) $$\frac{M^*}{P} \equiv m^* = Y\sqrt{\frac{c}{2(i_f - i_d)}},$$

which shows that the demand for money varies positively with real income, the transaction cost, and the convenience yield on money balances, and negatively with the rate of return on alternative assets (in this case, foreign exchange).

Consider now that country *d* has lower policy credibility than country *f*, as proxied by a lower credibility factor β (see Appendix 2). Expectations that the government mismanages the money supply over the relevant future time horizon induce wealth holders, all else equal, to hold larger shares of their wealth held in currency *f*, as they factor into their portfolio choices the future expected (internal and external) value of money. They may fear the risk of excess money supply creation and government's inadequacy or unwillingness to react to threats of currency depreciation and inflation through appropriate policy action. This implies that $n_d^* > n_d^*$and, hence, $m_f^* < m_f^*$. Thus, in order to induce wealth holders in the country *d* and *f*, respectively, to hold the same level of excess real money $m - m_d^* = e(m - m_f^*)$, all else equal, it must be that $i_d(\cdot)|\beta_d > i_f(\cdot)|\beta_f$, that is, the required (equilibrium) convenience yield on county *d*'s money must be greater than its equivalent on country *f*'s money. Similarly, the change in the convenience rate required by a given rise of excess money balances will be larger in country *d* than in country *f*, and the difference will grow larger with the rise of excess money balances, that is, $i_d'(\cdot)|\beta_d > i_f'(\cdot)|\beta_f$.

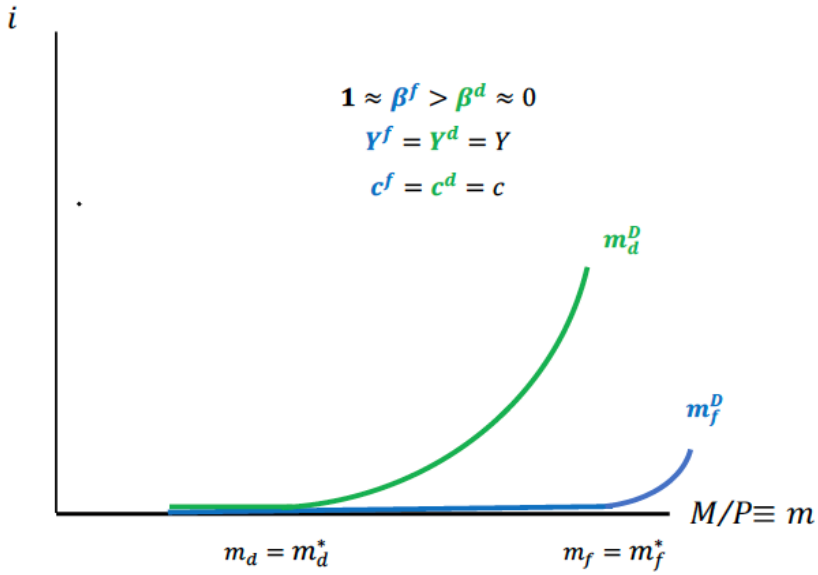
These relative differences in the yield adjustment will vary inversely with the difference in the level of policy credibility of the economies being compared, that is, the policy space available would be higher, the higher the level of policy credibility of the economy concerned). Formally, all these features are formally captured by the following equation for the convenience yield on money:

(A5) $i = i(m_j - m_j^*|\beta_j)$, with $j = d, f$ and $i_d|\beta_d > i_f|\beta_f > 0; i_d''|\beta_d > i_f''|\beta_f > 0; i_d'''|\beta_d > i_f'''|\beta_f > 0$,

where $m_j - m_j^*$ measures "excess" money in country *j*.

Eq. (A5) defines the position and shape of the optimal demand-for-money function and indicates that i) the required yield on money rises with excess money balances and ii) the height and steepness of the demand schedule in the $(i, m|\beta)$ space is conditional on the economy's level of policy credibility, all else being equal (Chart A1).

Chart A1. Stylized Demand-for-Money Schedules in Economies with Different Policy Credibility



Considering Eq. (A5), and dropping the country index, the optimal demand-for-money function given by Eq. (A4) can be written in implicit form as:

(A6) $$\frac{M_d^D}{P_d} = m\left(Y, i_d | \beta_d, c, i_f\right).$$

With *f* and i_f set exogenously and assumed to be constant (for reasons of simplicity but at no loss of generality), Eq. (A6) reduces to:

(A7) $$\frac{M_d^D}{P_d} = m(Y, i_d | \beta_d), \qquad \text{with } m'_Y, m'_i > 0,$$

that is, for a given stock of *M* and all else being equal, a higher transaction demand for *M* driven by an increase in output *Y* requires a decrease in the convenience yield on *M* balances, *i*, needed to keep the money market in equilibrium. Eq. (A7) appears as Eq. (3) in the text.

APPENDIX 2. CREDIBILITY FACTOR "β"

Credibility factor "β" condenses global investor views on the policy credibility of individual country economies. This factor can indifferently be thought of as an index that investors apply to the government

intertemporal budget constraint (IBC),[15] which scales its value up or down correspondingly, or as a probability measure that generates an expected value of the IBC, or else as a risk factor that adjusts the value of the IBC. All else equal, a lower β_j reflects larger expected losses on government debt (either via higher inflation or default) and translates into a tighter IBC for *j*'s government, thus requiring larger (and possibly more frontloaded) fiscal efforts to sustain a given debt stock.

The information set ω_t, at any time *t*, comprises all relevant information that global investors deem relevant to their decision-making process, including to assess the policy credibility of a country government (e.g., economic, political, and social factors, both internal and external to the country, which influence the achievability and sustainability of government's specific policy commitments). New factors or events that raised the investors' concerns that country *j*'s government might face future economic, political and social challenges (which would eventually induce the government to take such actions as defaulting on its future obligations, inflating its debt away, or even repudiating it) would be incorporated in a new information set ω_t^1 and cause β_j to fall ($\beta_{j,t}|_{\omega_t^{'}} < \beta_{j,t}|_{\omega_t}$), thus reducing the IBC elasticity accordingly. A fall of credibility might result in such a tightening of the IBC elasticity that investors would doubt the sustainability of the future primary surpluses and/or debt monetization required by the tightened IBC, until such a point where they might even stop buying and holding the country's debt altogether. This would cause the price of debt to collapse and, correspondingly, domestic interest rates to rise abnormally to levels where fiscal dominance would put pressure on the monetary authorities to monetize and inflate the debt away.

The relevant information set would also capture those developments (including, for instance, the evolution of local and/or global risks) that may induce investors to shift capital from lower-credible to higher-credible countries considered to be safer places for investment or issuers of safer liability instruments. In such instances, the credibility gap between countries (as perceived by the markets) may

[15] As commonly done in the literature, the IBC of a country government establishes that the current market value of government bonds *B* must equal the present discounted value of future primary surpluses and monetary financings by the central bank (if any).

change and cause different dynamics of credibility factors β_j and, hence, different IBC elasticities in different countries over time. All else equal, different IBC elasticities across countries are sufficient to make otherwise identical bonds imperfect substitutes of one another.