

Global Rates and FX Primer

Forecasting G10 FX: An update

Primer

Forecasting the most important price

We discuss how we put together our G10 FX forecasts. We start with equilibrium estimates and then assess what explains deviations and how long it will take to return.

Valuation: determining the FX equilibrium

We estimate the equilibrium for G10 and then assess misalignment. We use alternative models, but our preferred is a Behavioural Equilibrium Exchange Rate (BEER) model.

Explaining deviations from equilibrium

Forecasting involves determining why FX is away from equilibrium, what it will take to converge back and how long it will take. We look at exogenous shocks and responses to policy, internal balance, external imbalance, and the macro policy stance.

Commodity markets: essential FX shorthand

We discuss how demand and supply commodity shocks can have different FX implications. The correlation is also changing over time.

Structural shifts and lack thereof

Structural shifts can change the FX equilibrium. We discuss examples in recent history, including US energy independence, the eurozone debt crisis, de-dollarization, and Brexit.

Flows and positioning

Flows and positioning are usually more important FX drivers than valuation in the short term. Liquid Cross Border Flows is a one-stop weekly report on flows and positioning.

Quant

We estimate a number of models with a short-term horizon in our weekly FX Quant Insight: Option Flow Signals, Technical Matrix, CARS model, Interactive Time Zone.

Vol

The vol market can provide insights about the latest consensus and positioning, as well as their change. We use an FX Vol Dashboard, including: vol, changes, term structure, risk reversals & carry, butterfly analysis, correlations.

Technicals

We also take technicals into account to double-check and sometimes adjust forecasts. Our approach is to use all the available tools and focus on our strongest signals.

Connecting the dots and the path to equilibrium

The above is the science behind our forecasts, but connecting the dots is the art. We assume that FX moves to equilibrium in three years or earlier, with the timing and path based on our judgment for the relevance and importance of all these inputs.

02 May 2023

G10 FX Strategy
Global

John Shin
FX Strategist
BofAS
+1 646 855 9342
joong.s.shin@bofa.com

Athanasios Vamvakidis
FX Strategist
MLI (UK)
+44 020 7995 0279
athanasios.vamvakidis@bofa.com

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Timestamp: 02 May 2023 06:15AM EDT

Forecasting the most important price

The exchange rate is the most important price in an open economy. In the US domestically, the stock market and energy prices are more prominent and politically sensitive. American consumers can get by without keeping track of exchange rate developments, because they are residents in the country that controls the globally dominant currency. Indeed, the Treasury is delegated foreign exchange (FX) policy, separately from the Federal Reserve's monetary policy decision-making. In contrast, for every other central bank, the exchange rate is a crucial transmission and feedback mechanism for monetary policy. For policymakers, FX and monetary policy are almost two sides of the same coin.

However, corporations certainly must stay focused on FX, given where their suppliers and production are, where their customers are, and where their financing and investors are. And investors certainly need to stay focused on FX, both as an asset class as well as its powerful transmission mechanism of macro policies.

In what follows, we discuss how we put together our G10 FX forecasts. Every month, we publish our views in one publication in our World at a Glance monthly (for example, see ["World at a Glance: The inflation fight in a slowdown,"](#) 26 April 2023), which includes our quarterly forecasts for the next two years (in addition to G10 FX, our publication also includes forecasts for major developed market rates, EM FX, and commodity prices). In this report, we discuss the analysis and judgment calls that lead to our forecasts for G10 FX.

There are certainly more quantitative elements to such forecasts, but ultimately, any forecast is highly subjective. Our starting point is the more objective, quantitative parts. But of course, there must be more subjective questions about how the macro picture also evolves. Even for the skeptical, FX forecasts can provide a useful benchmark that can be an information input for investors (usually risk takers) and corporates (usually risk managers) when they consider their decisions in the months and years ahead.

Like in any market, developing such forecasts is particularly difficult during times of crisis. The Coronavirus pandemic has been the biggest disaster from an economic and markets perspective since the Great Depression. The Global Financial Crisis left a lasting imprint on markets. But global markets have had to deal with existential crises at an increasingly frenetic pace over the past few years. The potential dissolution of the euro during the various European debt crises was a period of possible financial existential risk. The US Debt Limit Ceiling crisis of 2011, where there was a genuine risk of a deliberate risk of default on Treasuries, is another example. Russia's invasion of Ukraine does not have any apparent near-term possibilities for resolution. And the most recent turmoil in the banking system, both in the US and in Europe, as well as the upcoming debt limit ceiling challenges in the US provide a reminder that crises environments appear to be here to stay.

Longer-term equilibrium, shorter-term macro dynamics

To summarize our approach, we start with estimates of the equilibrium valuation for each currency. Such values are usually longer-term forecasts, as they represent where currencies should be over the longer-term, based on theory. Then, we assess what could explain any deviations from equilibrium and how long it will take and with what possible triggers to go back to it. We assess the internal and external equilibriums for each economy and their monetary and fiscal policy stance, as key determinants for FX equilibrium. In the past few years, a variety of other factors have altered the long-run FX picture. The role of trade policy in the US played a more prominent factor during the Trump administration. Structural shifts such as Brexit have had profound impacts on the GBP. More recently, the surge in inflation, terms of trade shocks, financial stability concerns from policy tightening, as well as geopolitics from the war in Ukraine and deteriorating US-China relations have also affected FX markets and beyond.

Ultimately, most of our forecasts have some sense of levels mean reversion in the long-run for G10 FX, which does not apply to other markets. Given that the exchange rate is a relative price, mean reversion reflects how G10 countries have had relatively similar, low, stable inflation rates over long periods of time in the past. The recent surge in inflation has been global in nature, and in most cases, G10 central banks (with the notable exception of the BOJ) have aggressively tightened monetary policy in response. As long as central banks remain credible in their inflation fight, we would still expect mean reversion in FX, although it may take more time than usual, and the path can be volatile.

In theory, assuming markets are efficient, FX forwards should provide the best possible forecasts. But tests in practice show that this is not the case. Empirical evidence shows that uncovered interest rate parity does not hold. The evidence is better for covered interest rate parity, but also finds deviations because of differences in the business cycle, overall market volatility, transaction costs, capital controls, taxes, liquidity differences, and other non-economic factors and risks. Recent evidence also suggests a weakening of covered interest rate parity since the 2009 global crisis (see “Deviations from Covered Interest Rate Parity”, NBER WP 23170, February 2017, Wenxin Du, Alexander Tepper & Adrien Verdelhan).

Relationships to other markets, particularly commodity markets, but also equity and credit markets play a crucial role in our forecasts as well. Commodities play a specific role directly for USD, but also for “commodity currencies” such as NOK, CAD, AUD and NZD. Conversely, commodities also play an inverted role in ‘anti-commodity’ currencies, such as JPY and CHF. While commodities are arguably more crucial for a broader swathe of emerging market currencies, they play a crucial role in G10 FX as well.

Valuation: determining the FX equilibrium

Our starting point for our forecasts is valuation. We estimate the equilibrium for each G10 currency and then we assess the misalignment from this estimate. This exercise can provide some insights of why each currency is away from its long-term equilibrium and how long it could take to get back. Although estimating equilibrium exchange rates includes substantial challenges (see [A primer on G10 equilibrium exchange rates 29 August 2019](#)), this is still a good benchmark, in our view, as a starting point. Often our view of equilibrium usually represents one starting point for longer-term forecasts (for the latest update using alternative methodologies, please see [Updating G10 FX equilibrium 20 April 2023](#)).

Simplest: real effective exchange rates

The most basic sense of equilibrium is in expectations of mean reversion for real effective exchange rates (REER) – indices of a currency’s strength, often trade-weighted against a basket of other currencies and adjusted for differences in inflation to account for real purchasing power. A REER is a broader generalization to purchasing power parity (PPP) measures of one currency relative to another, with inflation adjustments. In the longer-term, there is a strong sense that REERs are mean-reverting over long periods of time for G10 currencies. If they were not, then eventually one country’s currency could be used to buy the real assets of another at a cheaper and cheaper price.

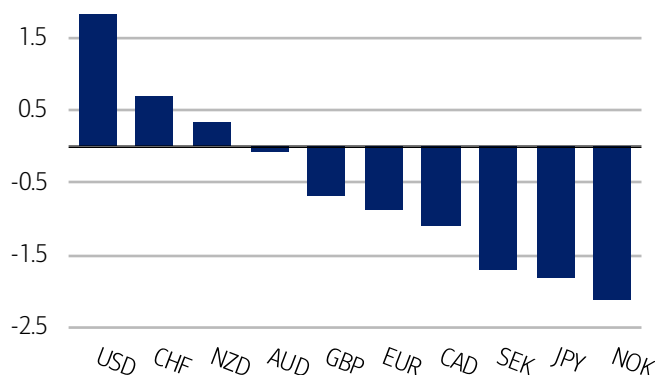
However, such an assumption implies that inflation is generally low, stable, and similar among those G10 currencies. And such expectations of mean reversion do not generally extend to emerging market REERs, as EM economies have often had considerably extended times of higher and volatile inflation. We would also expect lengthy times of currency appreciation for EM economies during their development process, as consumers look for higher purchasing power of imports as part of rising living standards.

Ultimately, we look at the deviation from the historical average REER as one measure of valuation, often comparing the current REER with averages over the past few years. We can use the Bank of International Settlements (BIS) broad-based time series for this exercise, which are readily available. The results in Exhibit 1 suggest that USD and CHF are historically strong, while NOK and JPY are historically weak, in real effective terms.



Exhibit 1: Deviation from 20-year REER average (z-scores)

USD and CHF the strongest in G10 in real effective terms, NOK and JPY the weakest

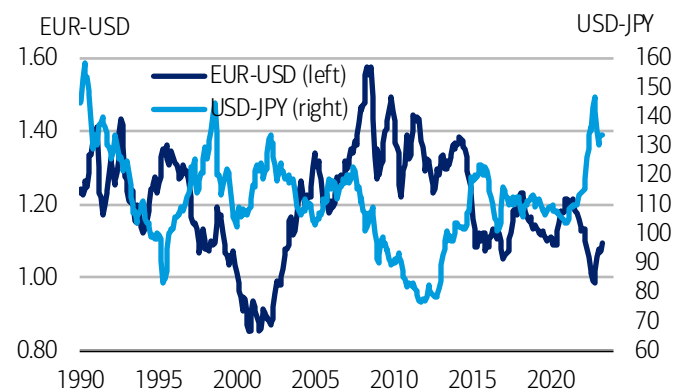


Source: BIS and BofA Global Research

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Exhibit 2: EUR and JPY are at similar levels as they were in early '90s

EUR-USD and USD-JPY spot since 1990



Source: Bloomberg and BofA Global Research

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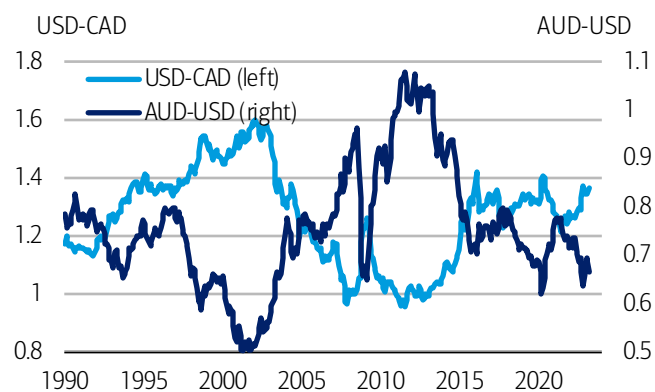
Even simpler in G10: looking at bilateral exchange rates

Although REERs provide a simple way to look at longer-term valuation, even simple nominal averages of G10 crosses are a surprisingly reasonable first step for gauging misalignment. Again, the crucial reason is that all G10 central banks essentially took on a broad inflation targeting approach, at low levels, starting in the early to mid-1990s. And even with the inflation surge that has taken place over the past few years, the rise in price pressures has taken place across most economies at the same time, indicative of the global nature of the inflation shock.

Consequently, G10 FX is generally at comparable nominal levels as they were a generation ago. EUR and JPY have moved a great deal, but are at similar levels today as in the mid-90s (Exhibit 2). The same goes for commodity currencies such as CAD and AUD (Exhibit 3). Indeed, EM currencies with similarly stable and low inflation levels are also at similar rates as they were over the same time frame as well, but many EM countries have experienced considerably high inflation over this time. So in contrast, for currencies such as BRL or MXN, high inflation eliminates FX mean reversion (Exhibit 4). However, the longer-term history of JPY, going back to the US moving off gold, reminds us that the converse is true – relatively lower inflation in Japan, compared to a US with regularly higher inflation, led USD-JPY lower over the decades (Exhibit 5).

Exhibit 3: AUD and CAD also at largely the same levels as in '90s

AUD-USD and USD-CAD spot since 1990

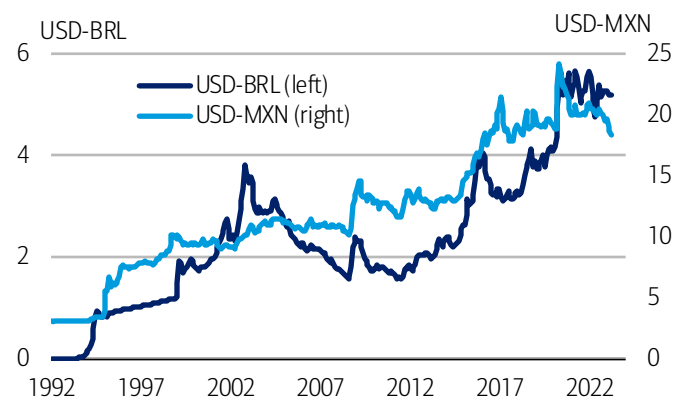


Source: Bloomberg and BofA Global Research

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Exhibit 4: BRL and MXN down massively on secular basis

High inflation eliminates FX mean reversion



Source: Bloomberg and BofA Global Research

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Behavioural Equilibrium Exchange Rates (BEER)

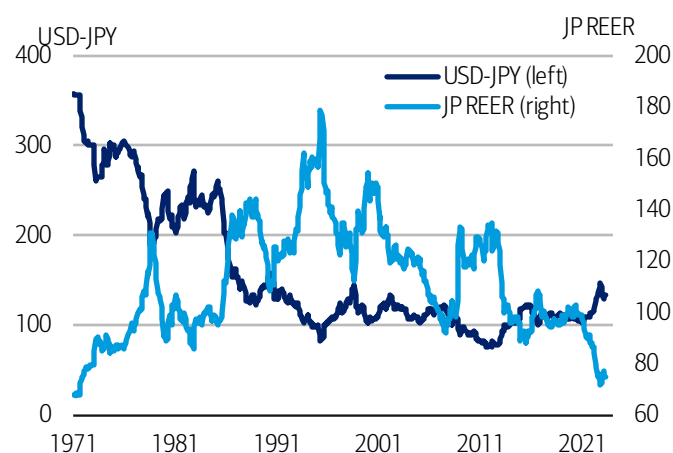
Of course, the idea that the exchange rate revolves around a fixed average can be unappealing. Our own preferred equilibrium model is a Behavioural Equilibrium Exchange rate (BEER) model (see [FX Value: We prefer BEER 23 January 2018](#)). BEER models assess the behaviour of the exchange rate in terms of relevant economic variables, which allow us to directly model exchange rates using timely macroeconomic data and other market prices, and offer a fairly intuitive interpretation of output.

The BEER methodology explains econometrically the REER based on a set of variables, which includes interest rate differentials, plus fundamental factors that should in theory drive the exchange rate in the medium and long term, but do not necessarily have to be at their equilibrium levels. It is effectively an uncovered interest rate parity equation, with fundamentals added.

Instead of trying to estimate a long-term exchange rate equilibrium, BEER focuses on fundamental factors and their changes that could explain changes in the REER in the short term, based on historical patterns. The forecasted values from the model are then compared with the latest REER level.

Exhibit 5: USD-JPY and JP REER since the 1970s

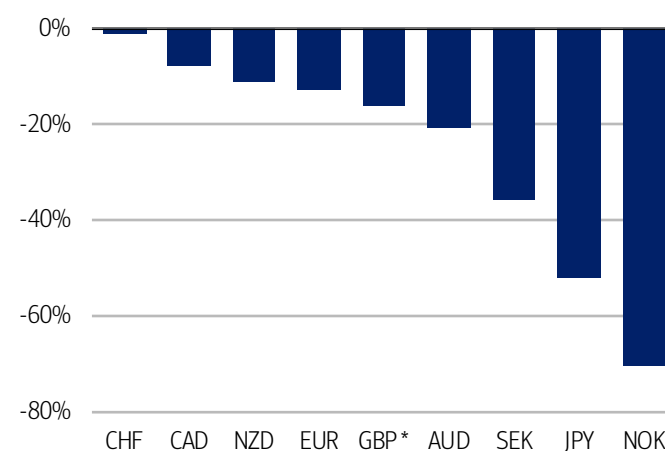
Nominal JPY has been higher over decades



Source: Bank of International Settlements, Bloomberg and BofA Global Research
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Exhibit 6: Misalignment against USD from BEER

USD and CHF overvalued, NOK and JPY undervalued



Source: BofA Global Research

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In our version of the BEER, we estimate our model using a panel regression, including only G10 economies, or including both G10 and EM economies. This methodology assumes homogeneity in the relationship between fundamentals and the exchange rate across economies. We begin our estimation in 1995, and estimate a rolling regression of the regression with an expanding window.

Monthly variables are lagged by one month and quarterly variables by one quarter, with previous value interpolation for any variable that does not yet have a new observation at the time of estimation. Exhibit 6 shows our latest estimates of misalignment against the USD, suggesting that in theory, USD and CHF are overvalued, while NOK and JPY are undervalued.

In addition, we often look at other equilibrium models, to gain further insights. They included Purchasing Power Parity using a number of different price indices to measure inflation differences among different sets of goods, Fundamental Equilibrium Exchange Rates (FEER), IMF external sector assessment, and Bloomberg's REER model (see [Updating G10 FX equilibrium 20 April 2023](#)).

Explaining deviations from equilibrium

While we have focused on equilibrium points to which we think FX should gravitate, in practice, of course, FX is rarely at equilibrium. As we discuss in detail in [A primer on G10 equilibrium exchange rates 29 August 2019](#), currencies tend to be volatile in the short term but go over long cycles in the long term. An economy is rarely both in internal and external equilibrium. Moreover, the equilibrium exchange rate requires both the home country and the rest of the world to be in equilibrium, which rarely is the case, if ever.

Forecasting FX therefore involves determining why currencies are away from their equilibrium, what it will take for them to converge back and how long it will take for such convergence. More typical standard reasons included internal market disequilibrium, in the labour market and/or growth above or below potential, and disequilibrium in the external sector, such as current account or capital account imbalances.

Moreover, we need to assess the reasons for such disequilibrium/imbalances, such as one-off or permanent shocks and/or the policy stance and its changes, for more fiscal and monetary policies. The COVID episode offers an example. In addition, we must consider whether permanent shocks or structural changes have triggered a change in the equilibrium exchange rate. We discuss such considerations in more detail below.

Exogenous shocks and responses to policy

The most immediate and difficult part of course are forecasts amid exogenous shocks. The recent eruption of banking turmoil evoked memories of the 2008 financial crises. Forecasts will often revolve around views of risk. And to be sure, impacts are not immediate. Even during a crisis, FX reactions can be brittle.

Moreover, our forecasts are often focused on end points. Given the mean reverting nature of FX, even after the many crises of the past couple of decades, often the key determinant in the FX response is not as much the crisis itself as the anticipations of policy to fight a particular crisis, especially from the central bank.

Internal balance: Unemployment vs. natural rate, and growth vs. potential

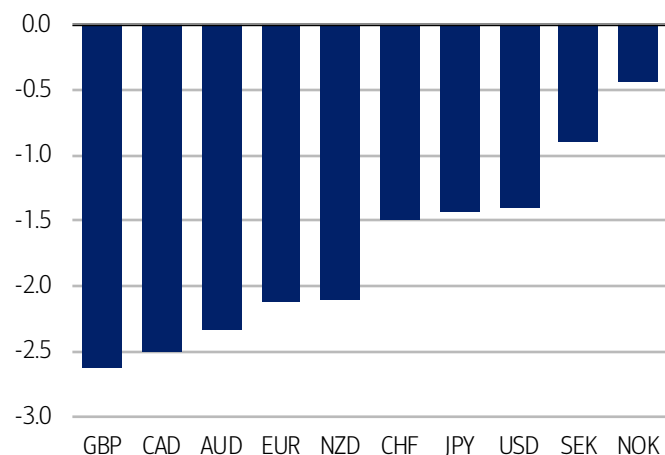
To assess whether an economy is in internal balance we need to form a view of whether unemployment is at its natural rate (NAIRU), above or below. This assumes we know the natural rate of unemployment, which is difficult to determine in the first place. In theory, we can assume that the NAIRU is the level that safeguards price stability. However, this raises the question of the definition of price stability.

Moreover, this assumes the presence of a Phillips curve – negative correlation between unemployment and inflation. The Phillips curve had almost disappeared in the years before the COVID pandemic, but it seems valid again in the last couple of years, as inflation has increased to a 40-year high, as unemployment has declined to a 40-year low.

In practice, to address these challenges for forecasting exchange rates, we make some simplifying assumptions. We take the Bloomberg NAIRU estimates for the natural rate of unemployment – the results do not change by much in most cases if we take the pre-COVID unemployment levels instead. Exhibit 7 suggests that the unemployment rate is currently too low in all G10 economies – well below NAIRU. This suggests that labour markets are stretched across the board in G10.

Exhibit 7: Unemployment rate - Natural rate of unemployment (NAIRU)

Unemployment rate well below the natural rate (NAIRU) in all G10

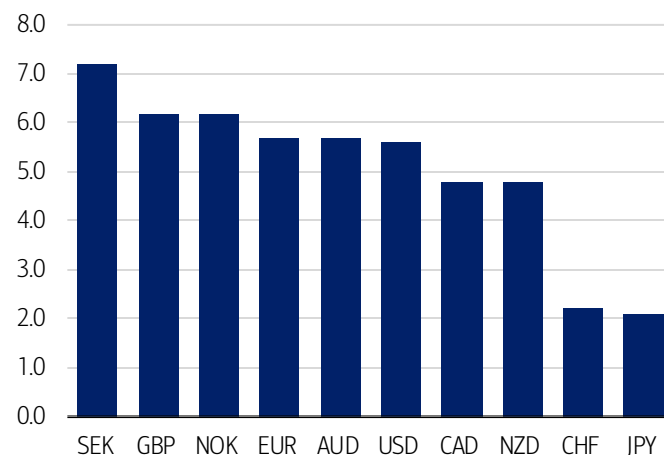


Source: Bloomberg and BofA Global Research.

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Exhibit 8: G10 core inflation rate

Core inflation above the 2% target in all G10 economies



Source: Bloomberg and BofA Global Research.

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For inflation, we assume that price stability is given by core inflation at 2%, which is the G10 central bank target in most cases. Based on this approach, Exhibit 8 shows that inflation is too high in all G10 economies, except in Japan and Switzerland. Therefore, very high inflation and very low unemployment suggest that G10 economies are not in internal equilibrium today.

Estimating potential growth is similarly challenging, but there are a number of well-accepted approaches in the literature. Standard statistical packages can provide such estimates, usually based on a filter – such as the Hodrick-Prescott filter. Alternatively, the IMF World Economic Outlook database provides such estimates for all its member countries, also using its long-term forecasts to avoid an end-point bias. The IMF also provides consistent estimates of the output gap for each economy.

Although we have used both these approaches in reports in the past to analyse various themes, our forecasts use the simple IMF approach. According to the output gap estimates in Exhibit 9 using this approach, G10 economies with the exception of Japan and Switzerland again, and maybe the Eurozone, have positive output gaps, suggesting overheating risks in some cases. This is indeed consistent with high inflation and low unemployment pointing to internal imbalances.

External balance: the current account and the capital account

The emergence of global imbalances has been a key theme, and according to the IMF one of the key causes of the global financial crisis. Not surprisingly, defining and estimating the equilibrium current account balance is challenging. Actually, the so-called Fundamental Equilibrium Exchange Rate (FEER) model uses estimates of the equilibrium current account balance to estimate the equilibrium exchange rate (see [A primer on G10 equilibrium exchange rates 29 August 2019](#) for details). This methodology assumes that the equilibrium current account balance is the level in which the savings and investment balance is sustainable. Putting it in another way, the FEER method asks what is the exchange rate that makes all current account sustainable in the long run. However, this is somewhat circular, as it is not straightforward what defines a sustainable savings and investment balance.

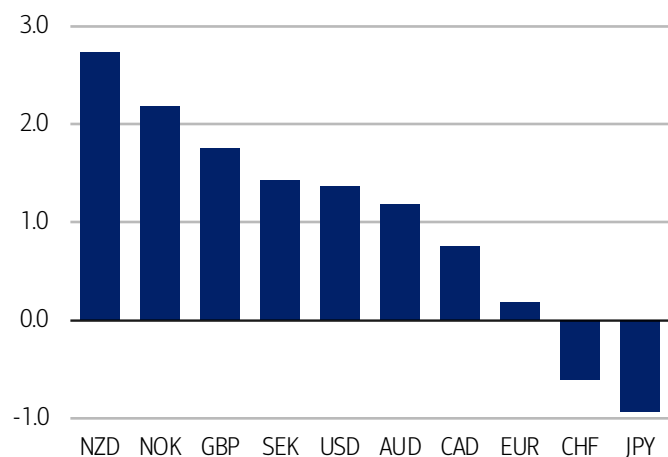
In practice we can do a number of things. Keeping FEER estimates always in mind, we can simply compare the latest current account balance with the historical balance – last 20 years – to see if there is a deviation, assuming that the historical average is a sustainable level. If FEER estimates and the historical average differ substantially, we have to make a judgement call for the reason(s) why and chose the best estimate or an

average. Another approach is to take the IMF World Economic Outlook forecasts for the current account balance in five years – the end of the forecast period – as where the current account is supposed to converge. These approaches should give similar results in theory.

Looking at the latest data in G10 in Exhibit 10 points to external imbalances in some G10 economies. Norway and, less so, Switzerland have large current account surpluses, compared with both their history and where they should converge. New Zealand and the UK seem to have large current account deficits according to both counts. The US and the Eurozone do not seem to be far from equilibrium.

Exhibit 9: Output gap in percent of potential GDP, 2022 (positive when above potential)

All G10 economies except of Switzerland and Japan have positive output gaps

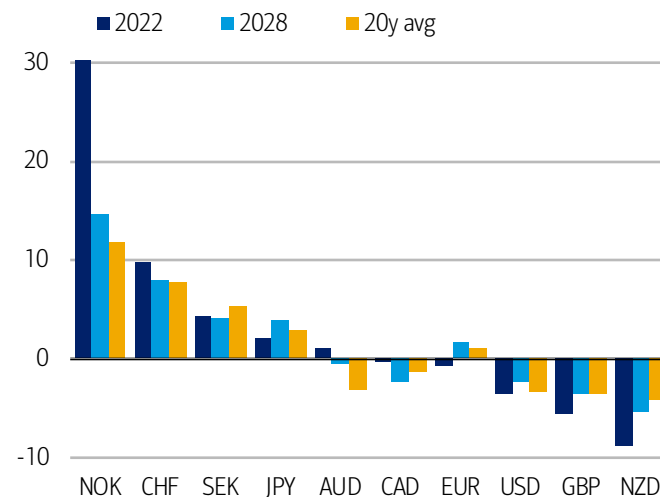


Source: IMF

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Exhibit 10: Current account balance/GDP

G10 external imbalances seem historically high



Source: IMF

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The current account balance on its own is not enough to assess potential moves in exchange rate, as we also need to know how the current account is actually funded. We therefore look at the current account balance plus portfolio and foreign direct investment (FDI) flows to determine whether a currency is likely to move in the next few quarters. We update this analysis quarterly and discuss G10 FX implications.

The policy stance: monetary policy

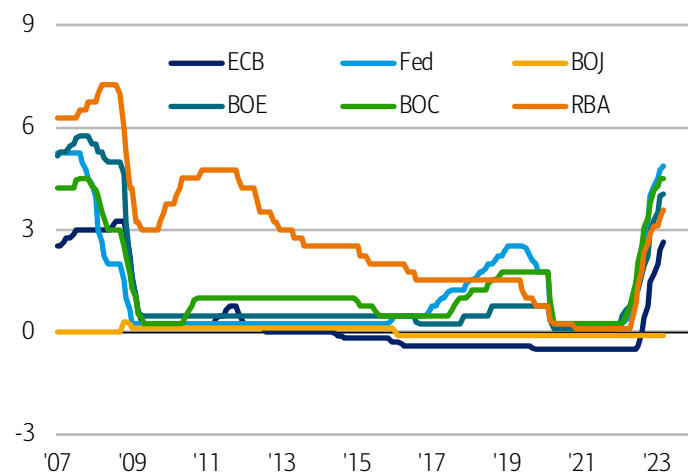
Diverging monetary policies and rate differentials often explain FX moves away from equilibrium. This is particularly the case the last couple of years, as inflation has increased sharply and G10 central banks had to tighten policies aggressively, starting from a very loose stance (Exhibit 11). We believe it will continue being a key driving force for FX, as inflation seems to be sticky on the way down and some central banks may face difficult policy dilemmas if they fail to meet their inflation target in the medium-to-long term.

A simple way to assess the monetary policy stance, in more normalized economic times, is the so-called Taylor rule. The Taylor rule is defined as the policy rate that a central bank should have based on the deviation of inflation from its inflation target and the output gap. There are many different variations in the literature, but all are derived from this simple form. Fortunately, Bloomberg provides real time estimates of the Taylor rule for all G10 and most EM economies. Bloomberg also provides the option to change/play with the formula. For simplicity and consistency, we use the Bloomberg estimates of the Taylor rule for our FX forecast. Sometimes we take the z-score deviation from the Taylor rule spread, to assess the monetary policy stance compared with its history in each central bank.

Looking at the latest Taylor rule estimates, all G10 central banks except the RBNZ still have loose monetary policies, despite aggressive policy tightening in most cases in the last two years (Exhibit 12). This should not be a surprise, as output gaps are positive, unemployment historically low and inflation still historically high. Of course, as monetary policy affects the economy with a lag, the Taylor rule spread may shrink over time, even if monetary policies have reached the terminal rate. In relative terms, The Taylor rule estimates suggest that the RBNZ and the Fed are the most hawkish central banks in G10, while the RBA and the Riksbank are the most dovish.

Exhibit 11: G6 Central bank policy rates since 2007 (before crisis)

Normalizing policy rates

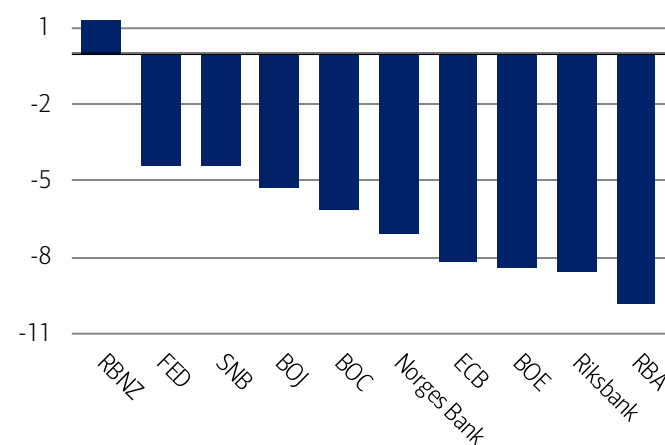


Source: Bloomberg and BofA Global Research

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Exhibit 12: Monetary policy stance: spread from a Taylor rule

The Taylor rule suggests the RBNZ and Fed most hawkish, RBA and Riksbank most dovish in G10



Source: BofA Global Research.

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Consequently, we also look at FX correlations with central bank balance sheets, in absolute terms and/or as a share of GDP. Indeed, changes in unconventional policies have been one of the most important triggers for sharp FX movements in recent years, with examples including: the three rounds of Fed QE as a result of the financial crisis, followed by the announcement of QE tapering, the ECB's Outright Monetary Transactions (OMT) program, negative rates and QE, and the Swiss National Bank (SNB) removal of the EURCHF floor. Getting these policies right was key for getting FX forecasts right and we would expect this to continue being the case for some time. During the COVID-19 crisis, central bank policy loosening and unconventional monetary policies have been used widespread, in both G10 and EM economies – however, sometimes they could support a currency by supporting the economy during a severe recession. Currently, most central banks have started QT (reducing their balance sheet through quantitative tightening), which should also affect their currencies, as it is policy tightening (Exhibit 13).

In addition:

- We look at indices of monetary conditions and their changes, defined as the weighted average of the change in the real effective exchange rate and the real interest rate.
- Indices of financial conditions and their changes, available in Bloomberg.
- Market pricing of central bank policies, based on implied rates from forward rates, also available in Bloomberg, compared with our calls for central bank policies.

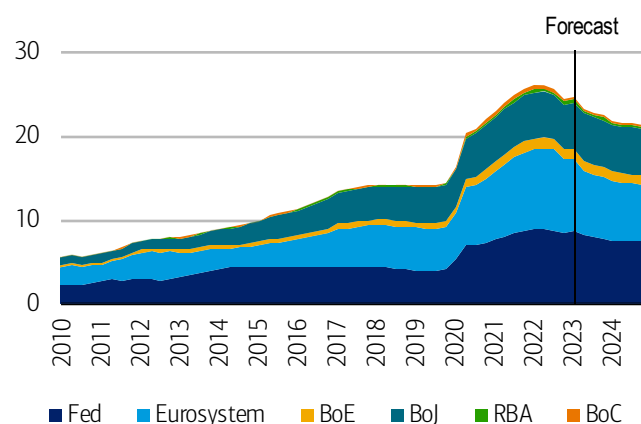
The policy stance: Fiscal policy

Assessing the fiscal policy stance, possible changes in fiscal policy and debt sustainability issues can also be important for FX in some cases. During the Eurozone crisis, debt sustainability of the periphery countries and their fiscal consolidation plans

were key drivers for FX markets and beyond. The discussion of whether Germany will agree to provide fiscal stimulus to support its weak economy and whether this will affect growth in the Eurozone economy as a whole, before the COVID-19 crisis, was very important for the EUR outlook. More recently, the size of the fiscal stimulus in response to the COVID-19 crisis, as well as its effectiveness during unprecedented challenges for the global economy, are key market drivers. Today, as inflation has increased to a 40-year high, we have been concerned that G10 fiscal policies are too loose, as the IMF has also recently argued.

Exhibit 13: Aggregate G6 Central Bank balance sheet

Aggregate G-6 central bank balance sheet to decrease in 2023/2024

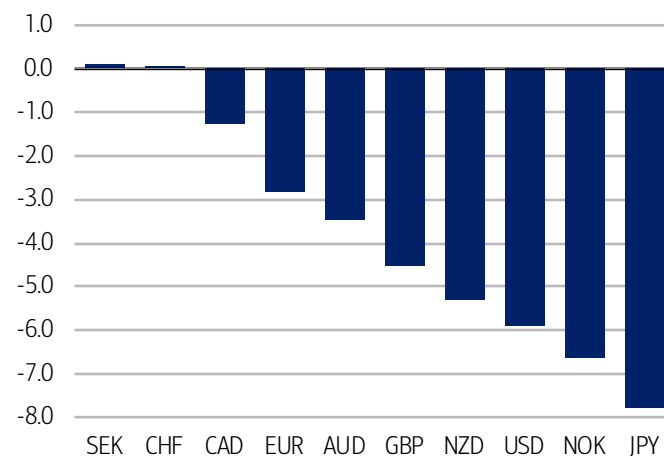


Source: Bloomberg and BofA Global Research. For more see [Central bank balance sheet monitor update](#)

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Exhibit 14: General government structural balance/potential GDP, 2022

Except for Sweden and Switzerland, all G10 have a structural deficit



Source: IMF

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To assess the fiscal policy stance, we would typically use estimates of the structural general government balance as a share of potential GDP. This is the fiscal balance adjusting for the business cycle. The IMF World Economic Outlook database provides such estimates, both historical and projections, which we use for G10 economies. For growth implications from changes in fiscal policies, BofA economists provide estimates based on fiscal multipliers that vary for each economy. Assessing whether fiscal policies will change or not, when and how, is often a judgement call from our side – eg. in 2017 when we argued that Trump will pass the tax reform, while we did not expect any meaningful fiscal policy stimulus in Germany before the COVID-19 crisis.

Looking at the latest G10 estimates of structural balances confirms our concerns about loose fiscal policies (Exhibit 14). With nominal GDP growth historically high, because of high inflation and the strong recovery from the pandemic, and the end of the massive pandemic fiscal stimulus, we would argue for structural surpluses as the appropriate policy stance. Instead, G10 economies, except Sweden and Switzerland, have structural deficits, large in most cases. This suggests that fiscal policy is offsetting monetary policy tightening and may be contributing to high inflation and stretched labour markets. This puts more burden on monetary policy, supporting in turn the currency but not necessarily for a good reason. It also increases risks that excessive monetary policy tightening may “break” something, eventually weakening the currency.

Debt sustainability is not currently a driver for G10 FX, despite the sharp increase in debt levels during the pandemic, primarily because high inflation is helping to bring debt ratios down. However, we do not believe this is sustainable. Either inflation will drop, or real borrowing costs will increase. Large debtors like the US and Japan, unlike emerging market countries which often get into trouble at high levels of indebtedness, only issue debt in their own currency. But as we noted above it was a key driver during the Eurozone crisis and it could matter more in the future. Moreover, it does affect the long-term FX equilibrium.

In the past, we have used the IMF methodology for debt sustainability, as applied for all its country members during its Article IV consultations, or during a formal lending program. This framework determines where the debt ratio will be during the next 20 years, assuming no policy changes, to determine whether it will be above or below a level that is considered to be sustainable based on past empirical evidence – usually 90 or 100 percent of GDP for advanced economies, 60 percent for emerging economies – and whether it is increasing or not. It is not unthinkable that G10 countries could require external assistance as a result of fiscal policy; the United Kingdom needed an IMF program in 1976.

Commodity markets: essential FX shorthand

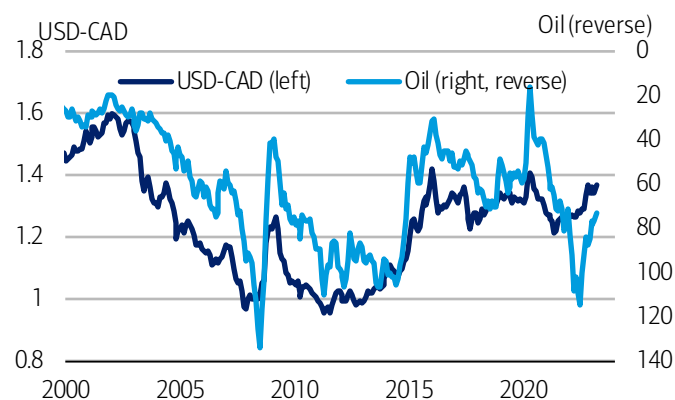
While we focus on FX, currency markets are only one of many markets and often reflect market drivers elsewhere. Every market was a function of credit markets during the Global Financial Crisis, for example. But on a more regular basis, FX often reflects moves in commodity markets, and typically oil can be a key driver for currencies.

In particular, the Dollar Bloc is the canonical set of commodity currencies. There are specific nuances to the nature of their commodities, since they are not all alike. Canada is a significant producer of oil, with major exports of energy particularly to the US (Exhibit 15). Australia actually has little oil, even though AUD appears to follow oil as well (Exhibit 16). In fact, Australia's commodity exports are primarily in industrial metals, which can be correlated with oil prices if both are driven by demand. And in New Zealand, the exports are more in the “soft” commodities, focusing on meat, dairy, and other agricultural products.

Meanwhile, outside the Dollar Bloc, the clearest commodity currency is NOK, with the importance of their own energy exports. And EM has a wide variety of commodity currencies as well. LatAm is filled with commodity currencies such as MXN with oil, CLP with Copper, or a mix of commodities with BRL.

Exhibit 15: CAD is an oil currency, for macro reasons

Canada's oil exports provide a link between CAD and oil

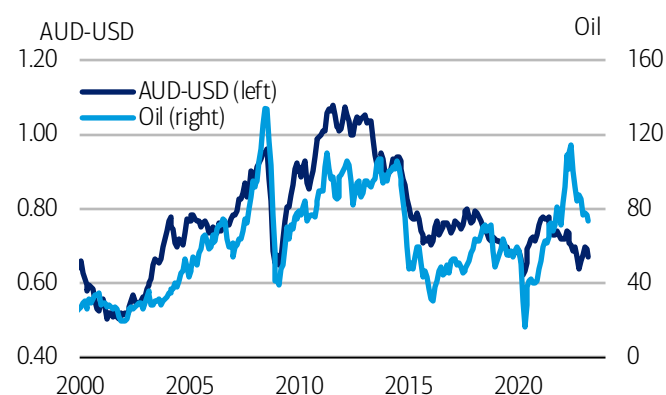


Source: Bloomberg and BofA Global Research

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Exhibit 16: AUD looks like an oil currency

AUD often moves with oil although metals are their key exports



Source: Bloomberg and BofA Global Research

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Commodity currency details: supply-induced commodity shocks, China

Of course, we generally look for higher commodity prices to benefit commodity currencies such as the Dollar Bloc. However, the connection between oil prices and commodities is typically not one-for-one. And last year, oil and energy prices erupted, but commodity currencies generally fell (Exhibit 17).

But the key reason for that perverse FX behaviour in response to soaring oil prices is that energy, in the Summer 2022 episode, rose not because of standard demand reasons, whereby a strong economy creates strong demand for oil, but rather because of supply reasons. Russia's invasion of Ukraine and fears of a deliberate reduction of supply was also part of a broader risk-off type event, which is typically USD-positive.

Geopolitics are unsurprisingly a big part of interpreting any oil shock. Another longer-term issue for commodities is that arguably the most important and voracious consumer of commodities is China. Ultimately, having a view on commodities is also implicitly having a view on the Chinese economy as well, as reflected in FX markets.

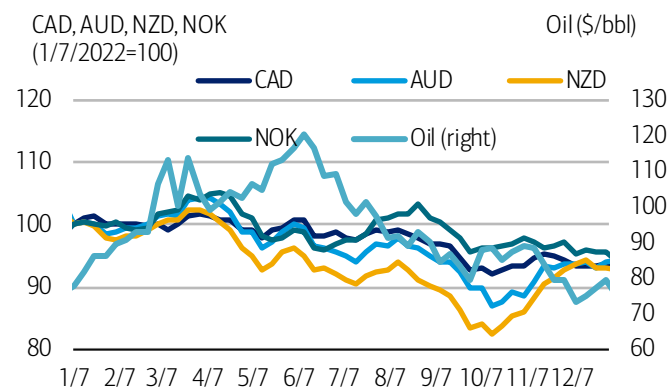
EUR, USD and oil

Oil also impacts the overall USD. For many years, FX markets often considered USD as an “anti-oil” currency, because of previous US dependence on imported oil (Exhibit 18). Going back to the financial crisis, the historic peaks for the euro (i.e. the nadir for the dollar) of 1.60 and the high for oil prices at \$140/bbl both took place in the Summer of 2008. Still, no clear line of causality really exists in terms of whether the weaker dollar pushed our oil prices or vice versa.

In contrast, the collapse of oil prices in the second half of 2014 was clearly a driver of FX, as the forces causing the decline in oil prices were exogenous relative to currency markets. The demise of OPEC was the result not of broad macro policies that would impact FX, but because of increased technological changes (fracking) that made the US the key marginal supplier of oil. The macro impact was enormous, however, and profound for FX. The resulting collapse in inflation into deflationary risk, given that the ECB put relatively more weight on total rather than core (ex food and energy) inflation, which at the time led to expectations of euro going lower. The Swiss franc gave up its long-held floor on EUR-CHF, and the USD would up soar higher against EUR.

Exhibit 17: High oil prices and low commodity currencies in 2022

Oil upside coincided with oil currency downside during Russia's invasion

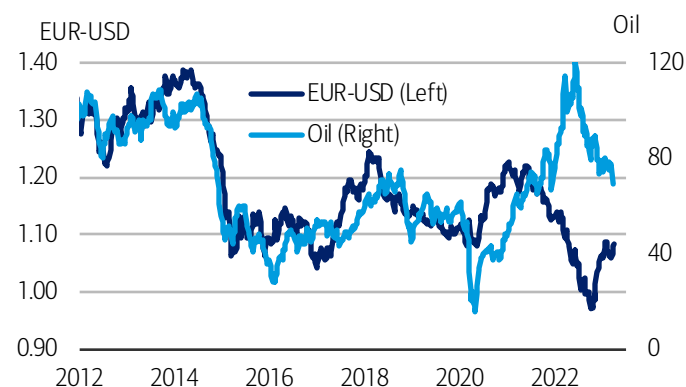


Source: Bloomberg and BofA Global Research

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Exhibit 18: EUR and Oil

USD has often considered an “anti-oil” currency, but with mixed results



Source: Bloomberg and BofA Global Research

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Clearly, oil has an important relationship in general to the dollar, but it is also hardly consistent. Just as with commodity currencies, relationships with oil have been perverse in the past couple of years, as massive rises in oil prices have been USD positive and euro negative. The risk-off Russia-war related reasons for surging oil prices have been USD-positive. And especially for euro, the eruption of natural gas prices last year were the factor that caused the euro to break parity in summer 2022, which had not happened in the financial crisis or even the worst of the pandemic (Exhibit 19).

But the other market factor that has changed has been that higher oil prices have helped feed higher inflation that has been recently USD-positive because that inflation has pushed the Federal Reserve away from zero rates and easing. Conversely, lower oil prices have been a factor in USD softness as headline inflation has cooled, albeit with still elevated all-important core inflation.

USD as the commodity-invoicing currency

One issue around commodities that does not play as much of a factor in our short or medium-term USD forecast, however, is the fact that oil, like essentially all commodity trading, is invoiced in USD. Often, there are questions around news stories that oil-

producing countries are going to move away from invoicing in USD. For example, most recently, Russia's attempts to perhaps settle oil trades with China in CNY have in part caused more discussion about USD losing its global currency dominance.

But such a possibility really does not play a role in our outlook. If oil-producing countries really did begin denominating oil trade in another currency than the USD in large quantities, there would be a potentially large effect. But such stories have been around for a long time. In late 2009, markets were roiled by a report that OPEC had already started to move towards invoicing away from USD. Of course, that story went nowhere. And dating back to the Iranian crisis of the late 1970s, Iran wanted to get away from USD as well (see Barry Eichengreen, "Exorbitant Privilege", Oxford University Press).

To be clear, many countries in general are not happy with being forced to use USD, especially for oil invoicing. But if anything, after the weakness of the euro from the last decade's sovereign debt crises, the USD role as the dominant commodity-invoicing currency has remained resilient.

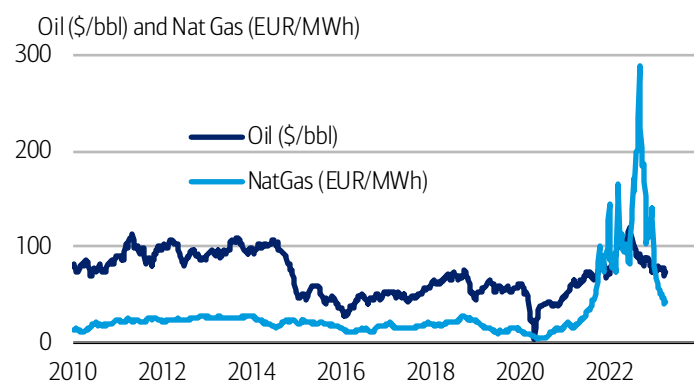
Structural shifts and lack thereof

Sometimes, structural shifts can change the equilibrium rate, which forecasts need to take into account. For example, the secular shift lower in oil prices since 2014 is an example of such a possible case, where US energy independence is likely to increase the long-term USD equilibrium. Or, to go back to emerging markets, the breaking of the USDCNY peg in 2005 signalled a new era for the renminbi.

The eurozone debt crisis and concerns around breakup risks, which really peaked around 2012, likely contributed to the euro going lower as well. Of course, a breakup would have been an existential issue. During the Eurozone crisis, we had estimated implications for the EUR under alternative scenarios, but we were dealing with a unique case, as one of the tail risk scenarios actually included the disappearance of the EUR.

Exhibit 19: Nat Gas prices were an enormous shock

Nat Gas in particular reflected the energy impact of war in Ukraine



Source: Bloomberg and BofA Global Research

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Exhibit 20: GBP structural shift with secular decline

EUR-GBP was regularly below .75 below the Global Financial Crisis



Source: Bloomberg and BofA Global Research

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In recent years, we have been writing about de-dollarization, which could reduce the USD equilibrium. We have found strong evidence that central bank reserve managers are gradually moving away from the USD, although from a very high level and at a very slow pace. The share of USD reserves has been reduced from about 70% to 60% in the last two decades. We would also argue that the use of the USD by the US in recent years for foreign policy purposes could increase incentives for countries to find alternative arrangements and move away from the USD in their international transactions, in turn reducing the long-term USD equilibrium.

Still, the USD remains the dominant reserve currency, especially given how it stands in front of the most liquid financial market in the world, the Treasury market. In our view, other competitors, such as EUR, CNY, gold, or cryptocurrencies, are unlikely to knock the

USD off its perch anytime soon since they do not stand in front of a financial market anywhere close to the size of the UST market. European debt markets cannot compete with the US Treasury market in depth, liquidity, and size, while common issuance has so far been limited and one-off. During times of crisis and “risk off”, such as the global pandemic, the USD still winds up strengthening. Strong demand for the USD in such cases leads to the Fed to activate swap lines to provide enough dollar liquidity to the global economy. If a crisis is expected, then usually USD should move higher, in our view.

GBP and Brexit as a classic structural shift

Arguably the clearest case for a structural shift was Brexit, beginning with the UK referendum vote in 2016. We have argued that Brexit has reduced the GBP long-term equilibrium, from above 1.50 to around 1.30 against the USD. And of course, GBP has been undergoing a much longer-term decline, amplified by the Global Financial Crisis (Exhibit 20).

Estimating a new exchange rate equilibrium in such cases can be challenging. In the case of the UK post-Brexit, we used our forecasts for key macroeconomic variables as inputs in our model, instead of current and historical values, to estimate a new GBP equilibrium. However, one could argue that our equilibrium estimate in this case depends on the extent to which our macro forecasts prove to be pessimistic or optimistic.

Flows and positioning

In the short term, flows and positioning are usually much more important than valuation as FX drivers. We may assume that currencies will eventually converge to their long-term equilibrium, but we typically assume this process takes 3-5 years. In the meantime, flows could drive currencies in either direction, while stretched positions can get squeezed.

Our Liquid Cross Border Flows report is a one-stop weekly report on flows and positioning that we publish every Monday morning and provides information that is a key input in our short-term forecasts (see [Liquid Cross Border Flows: new look, same content 26 May 2021](#) and [Liquid Cross Border Flows 17 April 2023](#)).

The majority of the report is dedicated to presenting and discussing our proprietary FX flows, summarizing the flow across G10 and 21 EM currencies seen over recent weeks, across our global franchise. In addition, we augment our proprietary data using flows information based on publicly available and external sources, including CFTC, EPFR and central bank reserves. We connect the dots from all these sources to determine the latest trends in flows, to assess market positioning and to form a view on possible short-term FX moves, focusing in particular on whether recent trends look likely to continue or reverse.

We filter our data by customer type, specifically hedge funds, real money, corporates and official institutions. Since different client types trade FX for different reasons, disaggregating the data allows us to better understand and extract information from flow. We can see who is buying and selling, since when, or in response to which event, how much compared to history, and from what position. Juxtaposing flows to recent price moves, we can see who is joining the spot trend and who may be going against it.

Disaggregation also allows us to discuss recent market moves based on speculation, hedging or reserve rebalancing. During the COVID-19 market volatility, the analysis of these flows has been particularly insightful, providing real time information on market views. Similar was the case during the surge of inflation and central bank aggressive policy tightening in the last two years, and during the bank turmoil in March 2023. Exhibit 21 and Exhibit 22 are examples of heatmaps we use in the report to discuss flows and their strength, in G10 and EM economies.

Exhibit 21: Snapshot of G10 Flows (Z-score)

BofA proprietary G10 FX flows in the past four weeks

	Total				Corporate				Official				Hedge funds				Real money			
	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t
USD	0.28	1.45	-0.95	0.16	0.10	1.81	0.67	0.01	0.89	-0.55	0.86	0.10	0.00	0.95	0.22	1.50	-0.08	1.11	0.86	1.09
EUR	-1.03	2.03	0.35	0.51	-0.74	1.60	0.07	0.23	-0.39	0.74	0.16	0.44	1.56	0.28	0.33	-0.18	0.22	1.53	0.42	0.48
JPY	-1.27	-0.13	1.61	-0.79	0.08	0.80	1.36	1.01	-0.15	2.76	0.04	0.59	-0.08	1.01	0.68	4.00	-1.43	-0.42	0.86	1.53
GBP	1.18	-1.89	-0.15	0.20	0.55	3.46	0.45	-0.10	0.05	-0.53	-1.43	0.13	0.22	1.23	1.09	-0.09	0.91	0.05	0.43	0.32
CAD	-0.64	2.83	0.61	-0.30	-0.60	2.94	2.02	0.24	-0.63	2.24	-0.53	-0.51	1.25	2.24	0.26	-0.57	-0.54	-0.85	0.08	0.07
AUD	0.93	0.21	0.24	-0.58	0.44	0.34	0.33	0.05	-0.22	-0.38	0.76	-0.34	0.98	0.65	0.48	-0.46	0.21	0.95	0.11	-0.33
NZD	2.32	-0.65	0.43	2.30	1.47	0.84	0.52	0.60	0.22	0.59	0.19	0.35	1.94	0.21	0.18	3.11	-0.98	-0.49	0.17	0.86
CHF	-0.13	0.55	1.57	0.80	0.13	2.26	0.83	0.86	0.50	-0.44	0.40	-0.30	0.31	0.57	0.28	-1.14	-0.15	-0.24	2.20	0.86
NOK	-0.10	-0.21	-1.87	1.36	0.15	1.11	0.20	-0.15	-0.07	-0.07	-0.05	-1.47	0.10	0.35	0.17	-1.13	-0.24	-0.94	2.29	2.98
SEK	-0.93	-1.31	-1.00	-0.36	0.44	1.48	0.72	0.28	0.46	0.32	-0.04	0.03	0.59	1.18	0.17	0.20	-0.40	-0.57	0.50	0.23
G10-xUSD	-1.18	-1.55	1.18	0.03	0.52	1.59	0.42	0.06	-0.57	0.77	-0.72	0.09	0.77	0.95	0.67	-2.57	-0.45	-1.57	1.28	1.49
EM																				
Asia	1.29	-1.30	0.82	-0.49	0.53	2.03	0.98	-0.09	-0.55	-0.39	-0.31	-0.37	0.53	0.72	0.02	0.26	1.86	0.88	0.86	-0.95
EMEA	0.88	0.81	-1.22	0.02	0.29	-0.03	-0.08	0.10	0.17	0.25	0.29	0.24	0.20	1.68	0.38	-0.42	1.00	0.12	-1.50	0.21
LatAm	0.29	3.84	-0.21	1.60	0.85	2.08	0.19	0.22	0.24	0.22	0.51	0.41	0.97	2.62	0.77	1.05	-1.02	1.89	0.01	1.37

Source: BofA Global Research. Note: Note: The z-score is calculated as the weekly flow minus the 2-year average flow, divided by the 2-year standard deviation of flows. A positive (negative) number does not necessarily suggest buying (selling), as it is expressed relative to the 2-year average flow and depends on whether the latter is a positive or a negative number. Weeks with no flow are marked with '-'.
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Exhibit 22: Snapshot of EM Flows (Z-score)

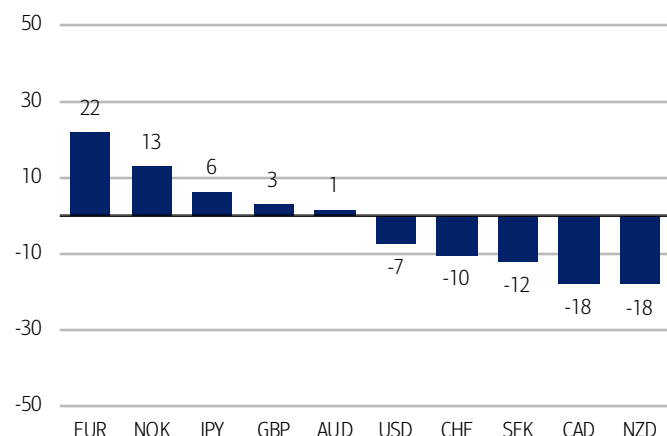
BofA proprietary EM FX flows in the past four weeks

	Total				Corporate				Official				Hedge funds				Real money											
	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t	t-3	t-2	t-1	t								
LatAm	0.29	3.84	-0.21	1.60	0.85	2.08	0.19	0.22	0.24	0.22	0.51	0.41	0.97	2.62	-0.77	1.05	-1.02	1.89	0.01	1.37								
BRL	0.03	1.60	0.68	1.18	0.31	1.14	0.10	-0.31	-	-	-	-	0.08	0.34	1.04	1.92	-0.33	1.54	0.30	0.94								
MXN	-0.59	2.47	1.13	0.15	2.04	2.75	0.39	1.30	-0.44	-0.95	0.18	0.37	0.66	1.56	-1.54	-1.78	2.23	0.45	-0.39	0.47								
CLP	1.08	1.56	-1.38	1.11	0.15	0.25	0.06	0.34	1.39	2.89	0.79	-0.26	1.11	4.00	2.19	0.70	0.54	-1.47	-0.28	0.83								
COP	1.27	4.00	0.78	2.60	0.60	0.08	-0.62	0.14	0.28	-	-	-	1.33	3.87	1.08	2.80	0.75	3.40	0.36	1.10								
PEN	-0.01	1.06	-0.46	0.33	0.03	0.67	0.29	0.41	-	0.17	-	-	-0.12	0.49	-0.75	-0.35	0.05	1.34	-0.10	0.25								
ARS	-0.06	-0.06	0.07	-0.08	0.36	0.37	0.36	0.34	-	-	-	-	0.02	0.02	0.02	0.03	-0.24	-0.24	-0.24	0.24								
Asia	1.29	-1.30	0.82	-0.49	0.53	2.03	0.98	-0.09	-0.55	-0.39	-0.31	-0.37	0.53	0.72	-0.02	0.26	1.86	0.88	0.86	-0.95								
CNY	0.37	-0.80	0.93	0.30	0.00	-0.54	0.71	0.58	0.21	0.20	0.20	0.01	3.75	-0.19	-0.24	3.26	0.06	-1.02	1.06	1.84								
CNH	0.42	0.14	-0.10	-0.43	0.41	0.45	0.09	-0.72	0.25	0.28	0.23	0.25	0.18	0.04	-0.07	-0.02	0.72	0.22	0.12	0.07								
INR	0.40	-0.06	0.21	0.01	1.09	0.54	0.64	-0.27	0.44	0.47	0.19	0.44	0.03	0.74	-0.51	-0.07	-0.11	0.36	0.39	0.68								
KRW	0.10	2.14	0.46	0.41	-0.35	3.17	0.43	0.43	1.96	-	0.21	0.17	0.04	0.20	-0.23	1.28	1.28	1.05	0.57	1.45								
IDR	0.19	0.56	0.67	0.99	-0.05	-0.80	0.52	0.08	0.00	0.07	0.01	0.01	0.32	1.69	-0.73	-1.03	0.08	0.56	0.88	0.60								
MYR	1.60	0.31	0.17	0.02	1.68	-1.41	0.10	0.49	0.06	-	0.93	0.75	-0.10	0.17	-0.09	-0.04	0.60	0.86	0.15	0.47								
SGD	0.35	0.11	1.32	0.89	1.62	0.09	0.00	-0.85	0.13	0.15	0.13	0.14	0.78	0.39	1.51	-0.81	0.31	0.60	0.09	0.02								
TWD	2.80	0.77	0.51	0.46	1.12	0.09	0.60	-0.04	3.20	0.15	-	1.17	0.16	0.90	0.19	1.21	2.69	-0.38	0.13	1.50								
THB	-0.38	0.39	0.68	0.70	0.45	3.55	-0.08	-0.32	0.84	0.09	0.81	0.11	0.02	0.27	-0.59	2.06	0.16	1.47	-0.02	1.15								
EMEA	0.88	0.81	-1.22	0.02	0.29	-0.03	-0.08	0.10	0.17	0.25	0.29	0.24	0.20	1.68	-0.38	-0.42	1.00	0.12	-1.50	0.21								
TRY	-0.48	-0.67	-0.76	0.75	0.45	-0.03	0.16	0.30	-	-	-	-	-1.82	-0.61	-2.90	-2.07	-0.19	-1.01	-0.24	0.89								
HUF	0.65	-0.24	-1.07	-0.37	-0.13	0.28	-0.93	1.04	-0.66	0.16	-0.19	0.16	0.63	0.36	-0.72	0.02	0.52	-0.52	-0.69	0.66								
PLN	1.75	1.46	1.63	1.15	-0.50	0.37	-0.48	0.50	0.29	0.26	-	-0.03	-0.10	0.18	0.53	0.49	2.34	1.54	2.23	1.01								
ILS	0.74	0.14	-0.88	0.38	0.26	1.23	-0.36	0.36	0.27	0.27	-	0.33	-0.34	0.34	-1.60	-1.13	1.36	-1.19	0.66	0.40								
CZK	0.75	0.97	1.02	-0.06	0.12	-0.43	0.40	-1.37	-	0.25	-	0.11	0.84	1.93	1.30	0.29	0.27	-0.16	0.02	0.42								
ZAR	-0.60	0.54	0.62	0.24	-0.07	2.38	0.17	-0.42	0.31	0.03	0.04	0.05	0.32	1.58	-0.40	-0.43	-0.90	0.18	-0.55	0.08								
RUB	-0.18	0.19	0.20	0.19	0.42	0.42	0.42	0.43	-	-	-	-	-0.03	-0.03	-0.06	-0.06	-0.28	-0.29	-0.28	0.27								
KEY:	Z > 2				2 > Z > 1.5				1.5 > Z > 1				1 > Z > -1				-1 > Z > -1.5				-1.5 > Z > -2				Z < -2			

The Liquid Cross Border Flows report also provides a positioning analysis. Our analysis takes into account a number of indicators: our hedge fund and real money cumulative proprietary flows, our monthly rates and FX sentiment survey and the TFF data. We construct an index of positioning for each DM and EM currency. Our report also compares the level and change in positioning with the strength of the trend in spot. Exhibit 23 and Exhibit 24 include our latest positioning estimates, for both G10 and EM currencies, using an index from -50 (extreme short) to 50 (extreme long). The results suggest that currently the market is long EUR and NOK and short NZD and CAD in G10, and long CLP, ILS, HUF, MXN and short SGD, TRY, ZAR, TWD in EM.

Exhibit 23: G10 FX market position (Index)

The market is long EUR and NOK and short NZD and CAD

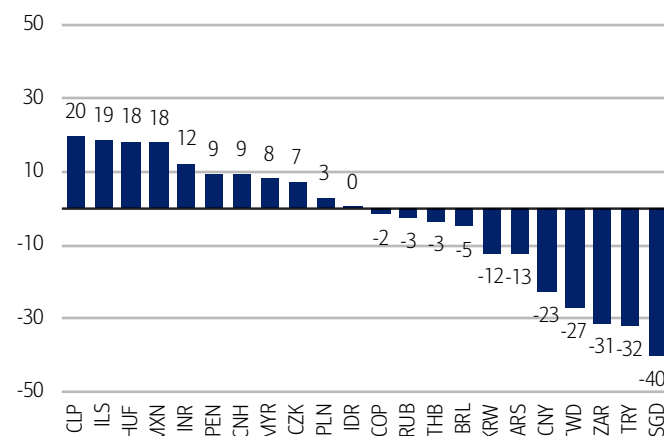


Source: BofA Global Research.

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Exhibit 24: EM FX market position (Index)

The market is long CLP, ILS, HUF, MXN, short SGD, TRY, ZAR, TWD



Source: BofA Global Research.

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Quant

In addition to our equilibrium model, which is relevant primarily for the long term, we estimate a number of quant models with a short-term horizon in our weekly FX Quant Insight report (see [Global Rates and FX Primer: FX Quant Insight: decipher weekly FX signals 07 September 2022](#)). The FX Quant Trader is dedicated to presenting and discussing our proprietary FX quant models, summarizing different approaches in analyzing G10 and EM currencies. We synthesize all these approaches to determine the latest trends in spot movements, to assess on-going market developments and form a view on possible short-term FX moves, focusing in particular on weekly trading signals.

Our quant models focus on:

- Option Flow Signals: weekly shifts of the FX vol curves and SDR (Swap Data Repository) data.
- Technical Matrix: BofA FX positioning analysis, ADX, Bollinger bands, support and resistance levels.
- BofA CARS model: cross-asset factors to make weekly predictions for G10 FX in a systematic fashion.
- Interactive Time Zone: historical cumulative returns at different hours of the day.

Vol

The vol market can provide important and interesting insights about the latest investor consensus views and positioning, as well as their change. Although vol does not directly

enter our FX forecast models, we do use such insights to inform our views and particularly our forecast path in the short term. Moreover, we have built analytical tools to help us summarize such information from the FX vol market, which we have also made available to our clients.

In 2021 we introduced the FX Volatility Dashboard, which we expended with a second phase in 2022 (for details, please see [FX Volatility Dashboard Primer 06 October 2021](#) and [FX Volatility Dashboard Primer – Phase 2 09 March 2022](#)). This is a visualization tool that provides daily end-of-day snapshot of the market dynamic for FX vols. The aim of the dashboard is to provide clear at-a-glance vol market update, as well as help clients identify the latest dislocations in FX volatilities across currency pairs and tenors.

We have currently six dashboards encompassing different aspects of FX vol, for both G10 and EM:

1. Volatility
2. Vol changes
3. Term structure
4. Risk reversals & carry
5. Butterfly analysis
6. Correlations

Technicals

Although we don't explicitly include technicals in our macro-based forecasts, we do take them into account, or at least use them to double-check our macro forecasts and sometimes adjust them if needed. If fundamentals and technicals point in the same direction, this increases our conviction on our forecasts. If they disagree, then this may affect the path of our forecasts towards equilibrium.

Our approach in technicals is to use all the available tools and point out our strongest signals. We believe that this avoids any biases and also allows the investor to choose the signals they like if they have a preference for a specific methodology. We will not go into detail in this report, but we have published comprehensive primers on technical analysis in the past (see [Technicals Explained: Get to know technical strategy 16 January 2020](#) and [Quantifying Technicals: Valuable Ichimoku Cloud signals 19 April 2023](#)).

Connecting the dots and the path to equilibrium

All the above is the “science” behind our forecasts, but connecting the dots is in a way the “art” of the whole exercise. Looking at all these inputs, we have to make judgement calls for each currency, on which of the above factors are likely to be the most important drivers in the short term and long term and what are the risks around our forecasts. Our house views on key macro variables and central bank policies are always key inputs and also enter directly in a number of the models we discussed above. We usually assume that G10 currencies will move to their equilibrium in three years or earlier, with the timing and path based on our judgment for the relevance and importance of all the above inputs.

For example, we currently assume that the USD will move back to its long-term equilibrium in the next two years, from being overvalued. In the last two years, we were expecting the USD to strengthen, seeing Fed policy tightening to address rising and persistent inflation – despite the Fed initially arguing that inflation was transitory. Indeed, the USD reached a 20-year high in nominal terms and a 40-year high in real terms last October. Although we now expect the USD to weaken in the medium-to-long term, and it has indeed weakened since the October extremes, we expect a slow and choppy path, as indeed has been the case so far, as sticky inflation forces the Fed to keep policy rates high for longer than consensus expectations. Moreover, we have been flagging stagflation risks that could lead to renewed USD strength in the short term.

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