



## Is the rand at fair value?

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## Abstract

This paper assesses whether the rand has been misaligned relative to its economic fundamentals compared to the dollar. Using a Bayesian regime-switching Vector Error Correction model that allows for the drivers of exchange rate movements to change over time, we show that the historical dynamics of the value of the rand can be explained by a small number of macroeconomic fundamentals.

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## 1 Executive Summary<sup>1</sup>

One should discount pronouncements by economists about the currency moving sustainably in a certain direction based on their prediction of a single macroeconomic variable. Currencies are the most flexible prices in the economy as they are immediately affected by shifts in financial markets. This means that, despite what economists on news programmes might claim, simple heuristics just do not explain their dynamics very well. Currency drivers, and their statistical relationship to the currency, are complex and time-varying. For this reason, one should beware of economists bearing single variable forecasts.

The good news, as we show, is that a relatively small number number of economic drivers can explain movements in the currency if one models the statistical properties of the currency and allows these drivers to change over time. Using a Bayesian regime-switching Vector Error Correction model that allows for the drivers of exchange rate movements to change over time, we show that the historical dynamics of the value of the rand can be explained by a small number of macroeconomic fundamentals.

## 2 Purchasing Power Parity-implied fair value

There are many theoretical frameworks that can be used to define the underlying equilibrium value of the exchange rate (FX) at different horizons. A rule of thumb when thinking about the long-term fundamental fair value of a currency is that you will get as many different estimates as the number of models you use. But that does not mean that models are not useful. Different models are useful for different purposes and help to shed light on how drivers of currency movements might be changing over time.

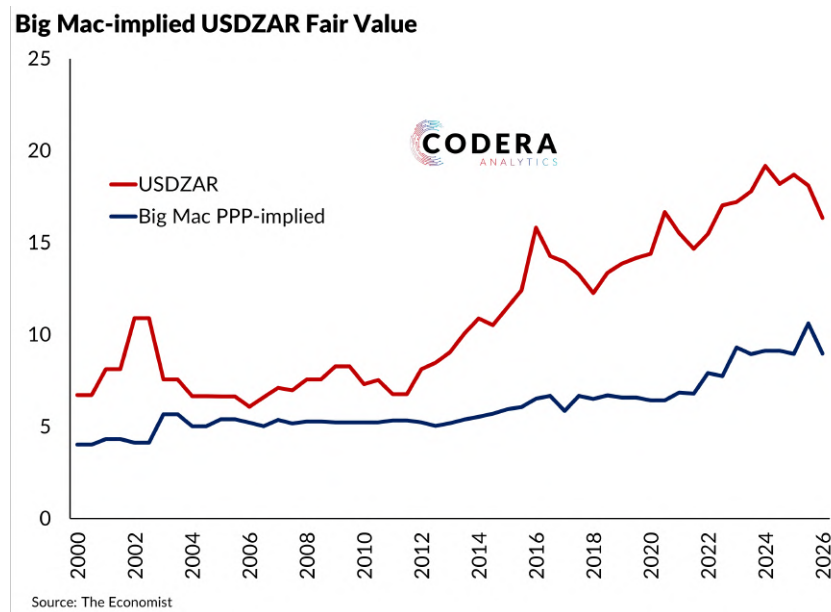
The simplest fair value model that is commonly used is based on purchasing power parity (PPP). PPP assumes that similar goods should cost the same across countries if priced in the same currency. One commonly cited example is the Big Mac Index. The rand's recent appreciation has seen the gap between the value of the rand and the Big Mac-implied fair value shrink (Figure 1). Despite the rand's large appreciation over the last year, this still implies a 45 percent undervaluation. The figure shows that deviations from the Big Mac fair value have been persistent over the last two and a half decades. This makes it clear that Big Mac-based USDZAR forecasts have not historically been good forecasts.

But the Big Mac is just one good. Is the ZAR still undervalued when considering the prices of other goods and services? Figure 2 plots historical implied fair value estimates from a model that incorporates South African and United States inflation data. Although the exchange rate has persistently deviated from PPP-based estimates of its fair value, it has cycled around its PPP-implied equilibrium over the long term. At present, these estimates imply the rand is now actually below fair value. Nevertheless, it is clear from the simple PPP model that such models tend to struggle to detect mean reversion in exchange rates. As a result, in practice, fair value models generally incorporate other explanatory factors that can explain deviations from PPP.

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<sup>1</sup>We thank Byron Botha for script development that supported this project.

Figure 1: Implied rand fair value from price of a MacDonald's Big Mac



### 3 Explaining the value of the rand over time

This paper assesses whether the rand has been misaligned relative to its economic fundamentals compared to the dollar. Since the drivers of exchange rate movements tend to change over time, it is useful to use a framework that allows the relationship between the rand and its key macroeconomic fundamentals to change at specific points in time. We update the estimates from [Steenkamp \(2019\)](#) of a Bayesian three-regime Threshold Vector Error Correction (VECM) model based on the approach of [Huber and Zörner \(2019\)](#). The framework allows a number of variables to affect and react to the dynamics of the ZAR at any given point in time. The model specification used includes short-term interest rates<sup>2</sup>, consumer prices, money supply and industrial production for South Africa and the US.

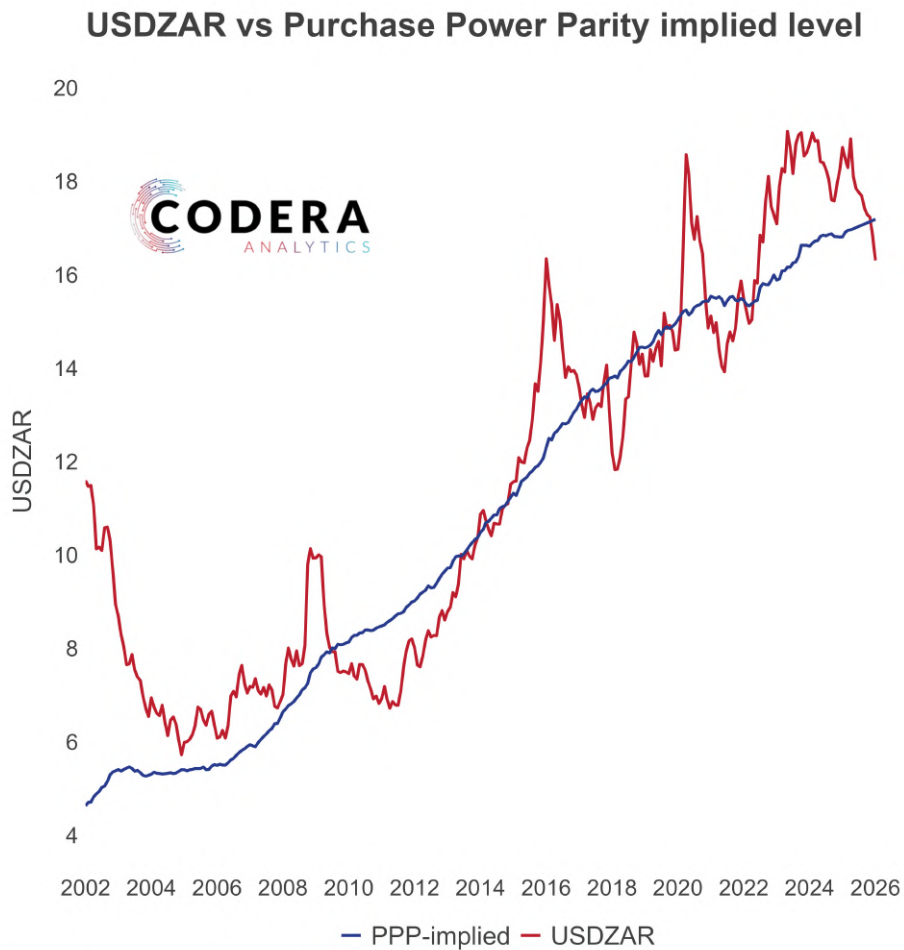
Figure 3 shows the deviations of the USDZAR from its 'explainable level' calculated as the percentage deviation in the rand from the fitted value from the model (depending on which of three regimes the currency is in at each point). The USDZAR is misaligned in the model if there are large estimated deviations from fundamentals. The ZAR is over (under)-valued if the posterior distribution (containing information from the priors imposed as well as from the data) of the threshold variable is below (above) the lower (upper) threshold. The estimates suggest that a large proportion of the dynamics of the rand can be explained at a particular point in time, even with a small number of fundamental determinants of the USDZAR rate. The rand has generally fluctuated within a 5 percent range around the level that can be explained by the model. Periods of large misalignment correspond to periods of significant depreciation in the late 1990s, late 2001, the global financial crisis and the COVID-19 pandemic. The model suggests the rand is currently near its explainable value.

Contrary to estimates from other frameworks, such as those used by the South African Reserve Bank ([de Jager, 2012](#)), the model suggests that there have been relatively few occasions when the rand has deviated substantially from levels consistent with the relative fundamentals of the economy.<sup>3</sup> The implication is that the rand tends to move in line with economic

<sup>2</sup>In [this](#) post we estimate how sensitive major currencies are to interest rate differentials.

<sup>3</sup>It is important to note that the definition of misalignment in this analysis differs from those used in the Reserve Bank's models. The VECM used by SARB is based on the difference between the equilibrium exchange

Figure 2: Implied rand fair value from relative prices vs US



Source: TwelveData, EconData, and Codera Analytics.

fundamentals, which suggests that the rand tends to absorb a large proportion of the shocks that hit the economy. As such, it plays a shock absorber role, shielding the economy from the effects of shocks. This is consistent with our findings in [Soobyah and Steenkamp \(2019\)](#) that suggests that rand deviations from fundamentals are generally not large when accounting for a large number of variables that affect exchange rate dynamics. Figure 4 confirms that the same is true for the value of the rand relative to other major developed market currencies.

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rate (i.e. the level consistent with the fundamental determinants of the exchange rate) and the current level of the trade-weighted real ZAR, while the semi-structural model of [Botha et al. \(2019\)](#) is used for creating narratives about the factors contributing to real effective exchange rate misalignments from equilibrium and inflation.

Figure 3: Deviation from explainable level (percent)

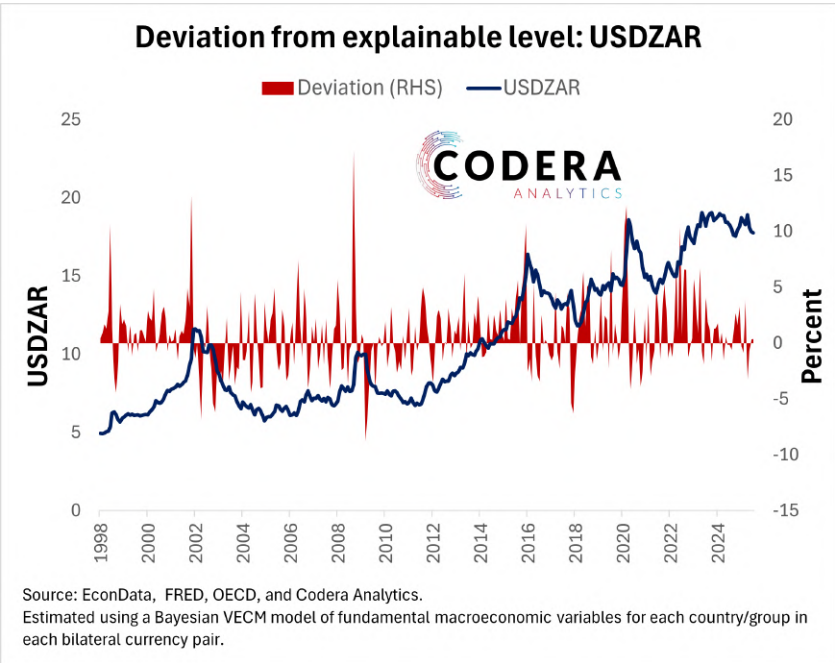
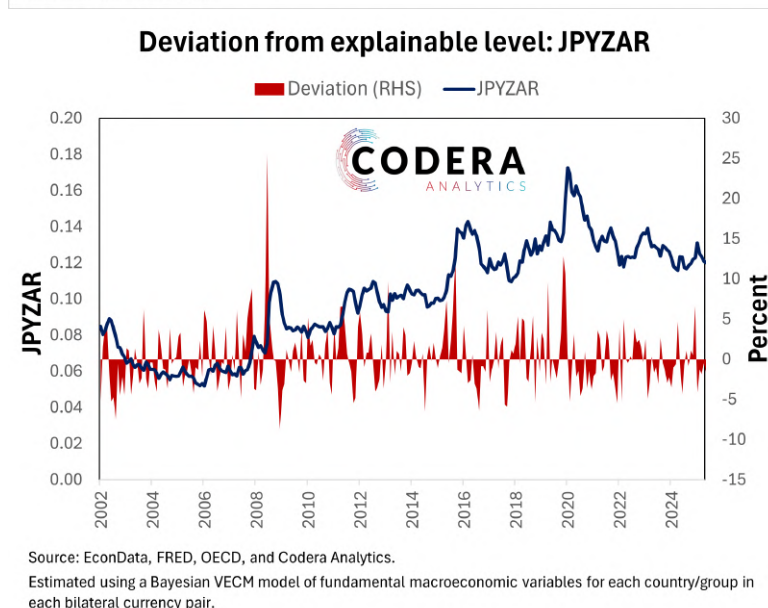
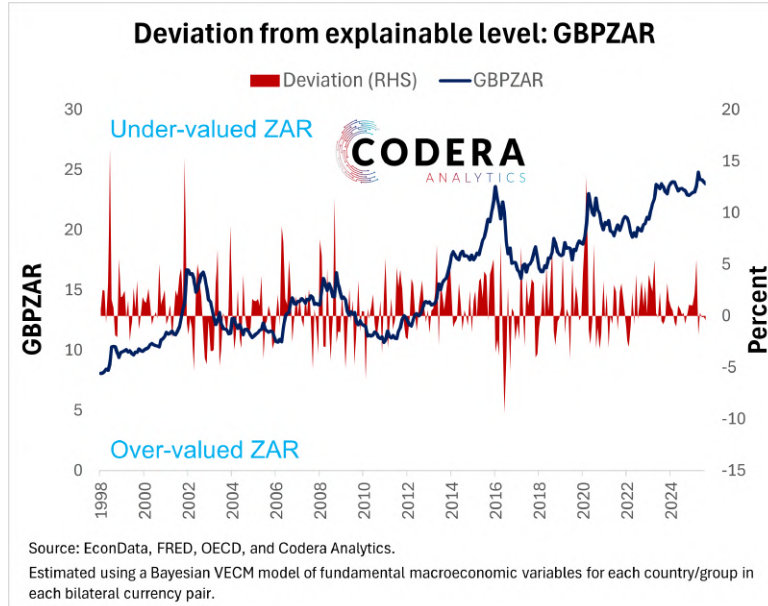
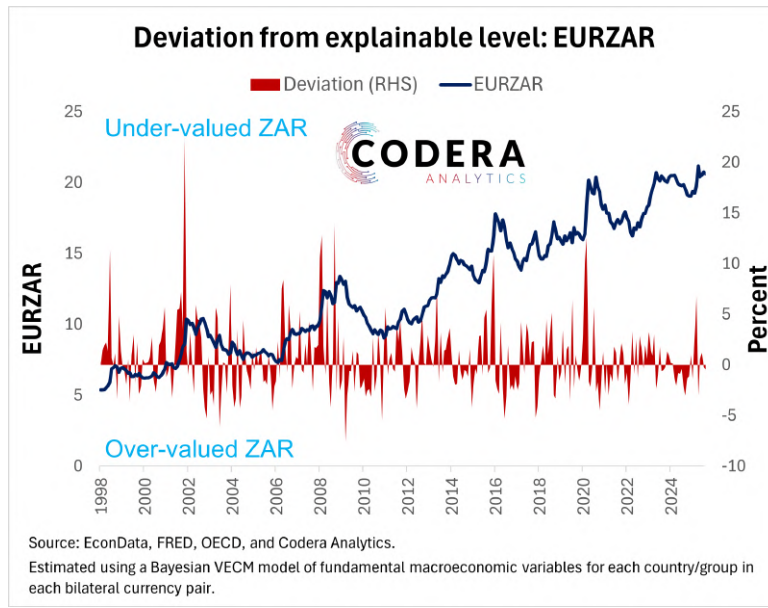


Figure 4: Deviation from explainable level (percent)



A challenge practitioners face is interpreting the drivers of model-based forecasts. In an exchange rate context, this can be particularly challenging given the volatility of currencies and the fact that currencies reflect changes in economic and financial fundamentals, as well as sentiment and expectations about the future. Fundamentals, sentiment and expectations are unobserved, so there is always uncertainty around whether these concepts are accurately measured. Decomposing model drivers into components may lend credibility to a model's view of the future, if the interpretation of the model accords with other frameworks and judgements about relationships in financial markets. The advantage of the approach we follow is that it provides good forecasts relative to typical benchmark forecasting models, see [Huber and Zörner \(2019\)](#).

Next, we illustrate how a relatively simple 'kitchen-sink' framework can be used to interpret what has been associated with changes in the trade-weighted value of the rand. The model combines Ordinary Least Square (OLS) models, by weighting up individual models using a Bayesian model averaging approach that assigns weights to models based on their ability to explain GDP while preferring models with a smaller number of explanatory variables. The approach allows us to assess the contribution of a large number of explanatory variables to the level of the real effective exchange rate (the trade-weighted value of the rand, deflated by relative prices), even with a relatively short history of data. It is worth noting that we have found this framework to be quite useful for GDP nowcasting: with this framework capable of out-performing both market analyst and SARB official forecasts, see [Botha et al. \(2021\)](#) for more details about the framework.

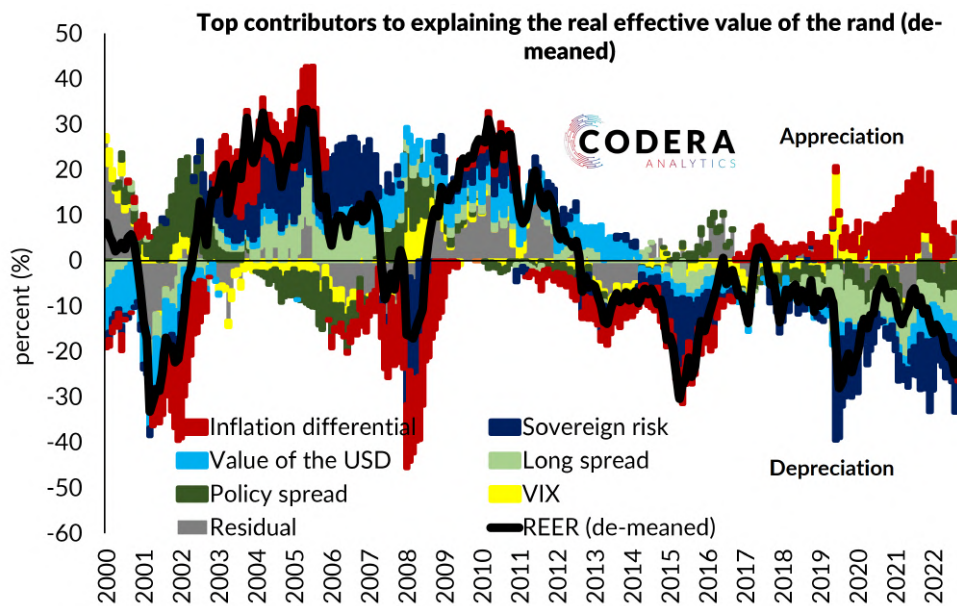
We consider a larger number of potential explanatory factors of the rand, including relative economic growth, relative long term interest rates, relative policy rates, South African sovereign risk, the VIX (a common-measure of US stock market volatility and market sentiment), relative inflation, and the relative strength of the US dollar.<sup>4</sup> Figure 5 shows that the model suggests that inflation differentials, sovereign risk and the value of the dollar have been the main contributors to the evolution of the effective exchange rate since 2000. South Africa's inflation differential declined after the COVID-pandemic, and the model suggests that this was associated with a stronger rand. Between late 2015 and 2023, on the other hand, sovereign risk and a strong dollar are estimated to have been associated with a weaker rand.

It is important to point out that this is still a very simple framework, focused on describing the correlations between variables, not the causal relationships between them. The model results are sensitive to the variables included and their measurement, as well as the effects of potential multi-collinearity between different financial and economic variables. Lastly, this is a fixed coefficient style of model, so it does not capture shifts in the relationships between the explanatory variables and the currency over time. One can also see that there is still a large unexplained component ('residual'), which at times has been as large as 10 percent of the de-measured value of the currency.

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<sup>4</sup>Another factor that improves rand forecast performance is the variance premium, which captures the compensation that investors demand for bearing FX volatility risk. As we showed in [Greenwood-Nimmo et al. \(2022\)](#), the average level of the rand variance risk premium is relatively high by international standards as it is strongly affected by global FX liquidity ([Olds et al., 2021](#)) and that the rand acts as a 'bellwether' emerging market currency ([Greenwood-Nimmo et al., 2025](#)). Many financial market analysts also use FX positioning data to make statements about likely future movements in exchange rates. In [this](#) post, we show that speculative positioning data are mainly useful for interpreting historical exchange rate changes, with their use as a predictor of exchange rates being rather limited.

Figure 5: Drivers of the rand



Source: Codera Analytics. The model is a combination of individual Ordinary Least Square models, weighted based on their ability to explain the exchange rate based on a Bayesian model averaging methodology of Raftery et al. (1997) and the Gibbs sampling estimation approach of Geweke (1993).

Although the performance of different models change over time, models can still be very useful in different contexts. Monitoring the performance of different models over time helps with selecting appropriate models for forecasting and storytelling at different points in time.<sup>5</sup> This paper shows that a Bayesian regime switching VECM approach can currently explain the value of the ZAR using a relatively small number of macroeconomic fundamentals.

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<sup>5</sup>One can also use the options market to extract market expectations of rand risk, see [here](#) for an example.

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