

## Early Warning System for High Currency Volatility

### Summary:

- We constructed an early warning system that combines 11 variables in order to catch a possible high currency volatility period before it is realized.
- Our early warning indicator has given a signal with respect to the approaching currency crisis in the past. The distance between the peak level of early warning indicator and the peak level of currency volatility is roughly six months.
- If the early warning indicator is on a rising trend, it warns us to be vigilant for a currency depreciation.
- As of May, our early warning indicator shows diminishing risks for Lira.

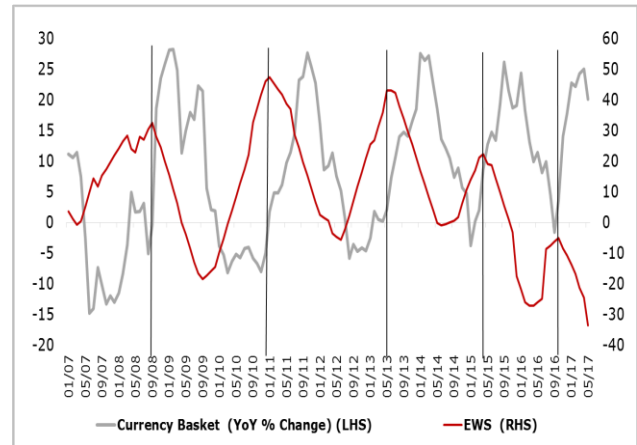
We constructed an early warning system (EWS) that **combines 11 parameters. Our aim is to catch a possible high currency volatility period before it is realized.** We used “real effective exchange rate, currency volatility, equity-bond purchases of foreigners, BIST-100 index, oil prices, election cycles, CPI inflation, banking sector real credit growth, money supply to FX reserve ratio, import to FX reserve ratio and manufacturing PMI” parameters in our EWS model. **One key reason behind our decision to select these parameters is that they are announced earlier than most of the other variables.**

The parameter selection criteria rely on 1) **Graphical outlook**, that is, the comparison between parameters and past high currency volatility periods and 2) **the explanatory power of parameters for past currency movements.** We define the explanatory power of parameters as “**signal to noise ratio**”. If a parameter has given a warning within 12-months before the beginning of high currency volatility, we call it “**signal**”. If signal has appeared earlier than 12-month, we call it “**noise**”. Therefore, “**signal to noise**” ratio shows the explanatory power of this parameter. Moreover, thresholds are also needed for every indicator to generate “**signal to noise ratio**”. We set the thresholds to get maximum “**signal to noise ratio**”. **High thresholds can lead to signals being missed while low thresholds can generate a lot of noise.**

There have been **five important high currency volatility** over the last decade and each of them resulted with roughly **25%-30% nominal devaluation in currency.** The first two, i.e. 2009 and 2011 crises, were economic crises and the EWS was quite accurate by warning about these crises. The 2013 currency crisis, however, was a mixed-type crisis that erupted with the tapering announcement of FED and then accelerated with the volatility in Turkish local politics. The last two, i.e. 2015 and 2016 crises, stemmed from local politics.

The red line in chart 1 is EWS that combines the mentioned 11 parameters. The grey line indicates YoY percentage change in currency basket consisting of half Dollar and half Euro. The turning points of the EWS seems to have given a good signal with respect to the approaching currency crisis (YoY percentage changes at the turning points can be seen in table-1). The distance between the peak level of EWS and the peak level of currency basket is roughly six months on average. Since it is difficult to track political crisis with economic indicators, the turning points of EWS in 2013 and 2015 were a bit late but still caught the currency crisis beforehand.

**CHART-1: Currency Basket (yoy, %) vs EWS**



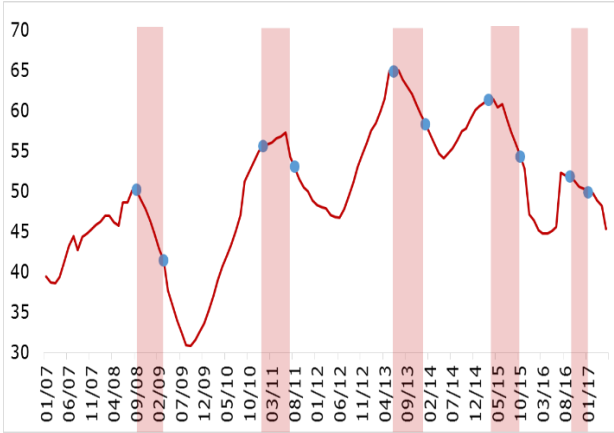
**TABLE-1: The Peak of EWS vs the Crisis**

| The peak of EWS date        | Sept'08 | Jan'11 | June'13 | Apr'15  | Oct'16 |
|-----------------------------|---------|--------|---------|---------|--------|
| Currency, at that date, yoy | -0.4    | +1.8   | +7.4    | +8.6    | +3.6   |
| Distance to peak of crisis  | 6m      | 9m     | 7m      | 5m      | 6m     |
| Crisis                      | Feb'09  | Oct'11 | Jan'14  | Sept'15 | Apr'17 |
| Currency at the Crisis, yoy | +28.2   | +27.7  | +27.6   | +26.2   | +25.1  |

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In order to get a better insight, we re-scaled our parameters between 0 and 100 and took the average of them to generate an EWS indicator. The averaging method smooths out our EWS indicator. If the EWS indicator is above 50 and on a rising trend it warns us to be vigilant for a currency depreciation. Positively, as of May, the EWS seems to be on a declining trend, suggesting diminishing risks (see chart-2).

**CHART-2: EWS and Currency Crisis**

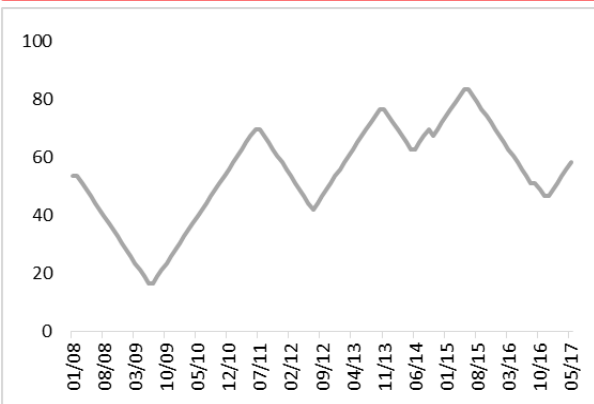


\*Blue dots and shaded areas represent time intervals of the defined crisis

In the charts below, you can track the effect of some parameters on EWS. Out of 11 parameters only 2 parameters, namely BIST-100 and inflation, are indicating an increase in the risk level currently (see chart-3 and 4).

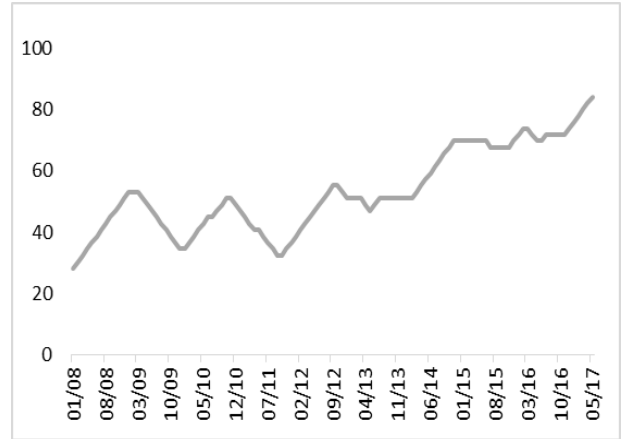
We saw a significant rise in BIST-100 since the beginning of 2017 and risk indication of BIST-100 is rising according to our estimates. However, its overall risk level is still well below the peak levels (see chart-3).

**CHART-3: Risk Indication of BIST-100**



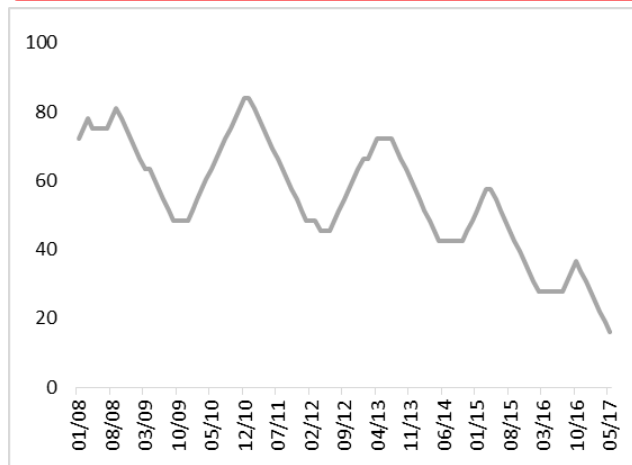
Although, CPI inflation parameter indicates a rise in risk level in 2017 (see chart-4), we expect the CPI inflation to decline gradually in the coming periods. Hence, we expect that the contribution of CPI inflation to EWS indicator will decelerate.

**CHART-4: Risk indication of Inflation**



The other parameters of EWS indicator are pointing to lower risk levels. For example, real exchange rate (REER, which has the highest weight in the EWS) shows a fall in risk level (see chart-5).

**CHART-5: Risk Indication of REER**



All in all, our EWS indicator suggests a strong TRY outlook. We will update our EWS every month and publish the results to evaluate the risk level of indicators and currency outlook.

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