

## Country Risk Report 2022

December 2022

(Data as of November 2022)

**Creating Opportunities** 

## Summary

#### SOVEREIGN RATINGS AND SPREADS:

- Agency's ratings have remained stable or changes have been positive in Advanced Economies (AE), despite the negative impact of the war in Ukraine and the monetary policy tightening. On the contrary, rating changes have been mostly negative for Emerging Economies (EE), although mainly due to idiosyncratic factors.
- On the contrary, sovereign spreads have widened strongly across the board after the start of the war and after the Central Banks response to the surge inflation in both AE and EE. Spreads in EE have surged in most cases above the levels reached after previous stress episodes such as the COVID outbreak, the taper tantrum in 2013/14 and the Chinese deceleration in 2016.

#### FINANCIAL, FISCAL AND PRIVATE VULNERABILITIES:

- **Macroeconomic vulnerabilities have worsened across the board** after the upsurge in inflation and the consecutive shocks to economic activity (Ukraine war, energy crisis, China's deceleration, etc.)
- Government balances have improved substantially with respect to last year (in part thanks to higher inflation), but public leverage continues to be deteriorated and still constitutes one of the main risks across both AE and EE.
- On the private sector side, debt gaps levels (outstanding debt vs. estimated equilibrium) have decreased overall in 2022 thanks again to higher inflation and higher nominal GDP levels, but still remain elevated in several AE and China.
- Housing prices grew strongly during the first two quarters of 2022, especially in AE, but they have started to cool down after the fast rise in interest rates across the board. The highest disequilibrium levels continue to be seen in northern Europe and the anglosphere (e.g. Canada, Australia, New Zealand)
- The decline in private debt ratios has eased debt disequilibria and the vulnerability of several banking systems. The most vulnerable systems continue to be located in AE (including core Europe and US) and China in EE.
- Currency tensions have surged mainly due to the tightening of the FED. In contrast to previous episodes, tensions have been somewhat stronger this year in AE rather than in EE and we expect this to continue in the coming months.

## Summary

#### SPECIAL TOPIC: DEVELOPING AN EARLY WARNING SYSTEM (EWS) OF FISCAL STRESS

- We have developed an Early Warning System (EWS) of fiscal stress events and estimated the main determinants of such type of crisis among a large number of possible indicators
- According to the estimated results the most important determinant of fiscal stress is, as expected, the level of
  Public Debt as a percentage of GDP. However, the most important determinant of annual changes in the probability of
  fiscal stress is the growth rate of per capita GDP. Institutional quality is also an important determinant of fiscal stress, but
  differs between AE and EE: the Rule of Law is more important in EE whereas government effectiveness is more important
  in AE.
- The estimations indicate that fiscal vulnerability has strongly improved after the COVID shock to public finances. However, public debt levels remain elevated, which keep several countries in Latam and Africa & MENA with a warning. Within AE, our EWS identifies Belgium, Cyprus, Italy, Greece and UK as the most vulnerable to a fiscal stress episode

#### SPECIAL TOPIC: EFFECT OF COVID ON HOUSING PRICES

- Our model for real housing prices suggest that prices in AE in 2021 could have been (on average) around 10% higher than what their fundamental determinants would indicate (and up to 8% in 2020), and around 5% in EE in 2021 (and 7% in 2020).
- Moreover, we find a significant relationship between the price levels observed in 2020 and 2021 and some proxies for remote working and covid restrictions in a sample of 59 countries, suggesting that the effects of COVID were substantial in the surge of prices observed in the last couple of years, between 5% and 16% in AE, and between 4% to 12% in EE in 2021.
- Despite the limitations implicit in any empirical estimation, these results imply an important risk of a negative adjustment in both nominal and real prices if those effects observed during the COVID period were only temporary (and not due to an structural change in demand), which could exacerbate the downside risk coming from the global tightening of interest rates



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## 01 Sovereign Markets and Ratings Update

Evolution of sovereign ratings Evolution of sovereign spreads by country

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## Sovereign markets and rating agencies update



#### **MEDIAN SOVEREIGN RATING INDEX 2015-2022**

- Agency's ratings have remained stable or changes have been positive for AE, while the rating cycle has been mostly negative for EE, although mainly due to idiosyncratic factors
- During 2022 and among AE, Ireland and most of the peripheral UE countries were upgraded by Standard & Poor's and Fitch
- LATAM's ratings were downgraded, with the exception of Uruguay, Brazil and Colombia, where the latter two remain below investment grade
- **Türkiye, Peru and especially Russia** are among the countries with the biggest downgrade. Russia went from being above investment grade to CC rating
- In emerging Europe and EM Asia, there were no changes except for Croatia which was upgraded two notches

Sovereign Rating Index: An index that translates the three important rating agencies ratings letters codes (Moody's, Standard & Poors and Fitch) to numerical positions from 20 (AAA) to 0 (default). The index shows the average of the three rescaled numerical ratings. G5 is the G7 Group without Canada and Italy Source: BBVA Research by using S&P, Moody's and Fitch data

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## Sovereign markets and rating agencies update

#### SOVEREIGN RATING INDEX 2015-2022: DEVELOPED MARKETS



O Downgrade O Upgrade SP: Standard & Poor's M: Moody's F: Fitch

Source: BBVA Research

## Sovereign markets and rating agencies update

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#### SOVEREIGN RATING INDEX 2015-2022: EMERGING ECONOMIES



O Downgrade O Upgrade SP: Standard & Poor's M: Moody's F: Fitch

Source: BBVA Research

### **Sovereign spreads**

The war in Ukraine and the tightening of central banks as a result of inflationary pressures shifted the narrow spreads of the COVID period to a scenario of widespread widening, especially in emerging Europe. Spreads in Latam have also suffered significantly, while spreads in Asia EE remain relatively contained

#### SOVEREIGN SPREADS



Sovereign spreads have widened due to the economic consequences of the war in Ukraine and the tightening of central banks

Countries close to the Ukraine conflict saw their spreads widen the most. In Türkiye, inflationary pressures continue to widen its spread, with some easing in the last quarter

Spreads in Argentina and Colombia kept widening, while spread in Brazil and Chile narrowed

Spreads remained relatively stable overall in EE Asia, with the exception of Pakistan and Vietnam



## 02 Financial Markets, Financial Tensions and Global Risk Aversion

Global Risk Aversion Evolution according to Different Measures Financial Tensions Index

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Source: Bloomberg and BBVA Research

Global risk aversion indicators

Global Risk Aversion indicators picked up since the start of the war in Ukraine and the tightening of central banks (CBs), although less than in previous episodes. Likewise, corporate and sovereign spreads widened, especially the sovereign spreads as country risks rebounded

## GLOBAL RISK AVERSION INDICATORS: VIX & FINANCIAL TENSION INDEX (FTI)





#### GLOBAL RISK AVERSION INDICATORS: BAA SPREAD & GLOBAL COMPONENT IN SOVEREIGN CDS (Monthly Average)



\* The global component of sovereign CDS corresponds to the first component from a PCA Analysis on 51 CDS from both EEs and DMS Source: EED Detectioner and BPI/A Response.

Source: FED, Datastream and BBVA Research



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### **Financial stress map**

Financial Tensions picked up in 2022 across regions, in particular in Q1-2022 due to the war in Ukraine and in the second half of 2022 due to the hawkish approach of central banks. LatAm and EM Asia saw less tensions (and have been decreasing recently), but they are facing relevant domestic political risks



- Relevant peaks in tensions across most of the markets in USA and Europe due to the the start of the war in Ukraine. In the second half of 2022, the tightening of central banks fueled tensions across these markets, but in more limited than after the war outbreak.
- EM European countries are among the most stressed in 2022 by the conflict in Ukraine. Also, Türkiye is still impacted by exchange rate tensions
- LatAm was more stressed in the second half of 2022, affected more by monetary tightening and political risks
- FT in EM Asia remained relatively contained through 2022. China risks rebounded at the end of 2022 as the long-awaited relaxation of Covidrestrictions led to more flare-ups



## 03 Macroeconomic vulnerability and in-house regional country risk assessment

Vulnerability Radars by regions BBVA-Research sovereign ratings by regions

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#### **DEVELOPED MARKETS: VULNERABILITY RADAR 2022**

(Relative position for the developed countries. Risk equal to threshold=0.8, Min risk=0. Previous year data is shown as a dotted line)

**G7:** Fiscal balances have improved, but high public debt levels keep the region highly vulnerable to fiscal shocks. Macroeconomic vulnerability has increased due to high inflation. Housing prices and private debt gaps continue to be a high risk

**Core Europe:** Macro vulnerabilities have worsen due to high inflation. Financial vulnerabilities are further increasing due to the fast growth of housing prices **Periphery EU:** Fiscal balances are improving from previous very high levels, but debt levels remain the highest risk. Inflation has surged in line with the rest of advanced economies



Assets: (16) Private Debt Gap (%GDP) (17) Housing Prices Gap (%GDP) (18) Equity gap (%). Institutions\*: (19) Political stability (20) Corruption (21) Rule of law. (\*relative position of each group vis-à-vis the Developed/Emerging regions as a whole. Institutional

indicators are updated annually and last data corresponds to 2021)

Liquidity: (7) Debt by non-residents (%total) (8) Financial needs (%GDP) (9) Short-term External Debt (%). External: (10) External debt (%GDP) (11) RER appreciation (% deviation) (12) CAC balance (%GDP).

Private Debt: (13) Household (%GDP) (14) Corporate (%GDP) (15) Credit-to-deposit (%).



#### **EMERGING ECONOMIES: VULNERABILITY RADAR 2022**

(Relative position for the emerging countries. Risk equal to threshold=0.8, Min risk=0. Previous year data is shown as a dotted line)

**EM Europe:** Macroeconomic vulnerability is higher due to lower growth and very high inflation. Current Account balances has deteriorated mainly due to higher energy prices. Financial vulnerability is very low relative to other regions

LatAm: Macro vulnerabilities have worsened markedly due to low GDP growth and high inflation. Fiscal balances have improved. Real housing prices and equity markets have cooled down, decreasing financial vulnerability **EM Asia:** Fiscal vulnerabilities continue to be at high risk levels. Housing prices gaps and household leverage vulnerabilities have relaxed significantly, but public debt remain high and without changes



Private Debt: (13) Household (%GDP) (14) Corporate (%GDP) (15) Credit-to-deposit (%).

Assets: (16) Private Debt Gap (%GDP) (17) Housing Prices Gap (%GDP) (18) Equity gap (%).

Institutions\*: (19) Political stability (20) Corruption (21) Rule of law. (\*relative position of each group vis-à-vis the Developed/Emerging regions as a whole. Institutional indicators are updated annually and last data corresponds to 2020)



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### **BBVA-Research sovereign ratings by region**

Our estimated ratings are currently in line with agencies in G7, Core Europe and EM Asia. We are in line but expect an improvement in the coming years in EU Periphery, thanks to the expected recovery in GDP pc levels and a decline in public debt ratios. We have a more negative position on EM Europe and Latam

**AGENCIES' SOVEREIGN RATING VS. BBVA RESEARCH RATING AND MARKET'S IMPLICIT RATING** Median Agencies' Rating, BBVA's rating (+/-1 std. dev.) and CDS implicit rating



Latam includes: Argentina, Brazil, Chile, Colombia, Mexico, Paraguay, Peru, Uruguay and Venezuela. G7 Excludes Canada and Italy. Source: Standard & Poor's, Moody's, Fitch & BBVA Research



## 04 Assessment of financial, fiscal and external disequilibria

Private debt gaps by country Housing prices gaps by country Early warning system of banking crises by regions Early warning system of fiscal stress by regions Early warning system of currency crises by regions

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## Private debt gaps by country

Debt gaps (debt vs. equilibrium) levels have decreased overall in 2022 thanks to the increase in nominal GDP levels due to the high inflation rates seen this year, but remain elevated in some AEs and China

#### PRIVATE DEBT GAPS COLOR MAP (2006-2022 Q3)

Gap between private debt-to-GDP ratio and its long-term structural trend



- Private leverage gaps have clearly improved in the richest countries helped by the unusually high inflation rates. However, they remain high in Canada, Norway and USA.
- Sweden is currently the country with the highest debt gap, (which coincides with a high gap in housing prices). Netherlands and Italy are also showing worrying levels, while in the rest of EU countries, gaps have declined helped by inflation
- Gaps across EE Europe remain well contained. High inflation rate have helped Türkiye reduce its debt ratio to a level in line with equilibrium
- Debt gaps in Latam have remained contained and it has moderated significantly in Chile during 2022
- China's excess leverage remains high and it has picked up recently. It also remains high in Thailand, although it has started to decline



## Housing prices gaps by country

Housing prices kept growing rapidly during the first two quarters of 2022, especially in AEs, but they have started to cool down after the fast rise in interest rates across the board. The highest disequilibrium levels continue to be seen in northern Europe, Canada and Australia

Medium

Warning

Low Negative

**REAL HOUSING PRICES GAPS COLOR MAP (2006-2022 Q3)** Gap between housing prices and its long-term structural trend



\* https://goo.gl/xXj3Gm Source: BBVA Research, BIS, Haver and Oxford Economics Canada's gap continues to be extremely high, despite some correction of prices in real terms in the third quarter of 2022. Gaps are also very high HK and Norway, and have been increasing fast in UK and USA since last year

Within EU countries, Sweden has the highest disequilibrium, followed by Denmark. Meanwhile in the Eurozone, Austria, France, Netherlands and Portugal are also showing clear signs of excess

Gaps continue indicating excess levels in Czech Republic, and somewhat in Hungary and Slovakia. The gap has recently grown quickly in Türkiye, where real housing prices have started outgrowing the high inflation levels

Price gap remains high in Colombia, while it has declined in Peru, and remains mild in Mexico and the rest of Latam

Gap remains high in China and Malaysia. Real prices remain contained in other countries in EM Asia



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## Early Warning System of banking crises

The decline in private debt ratios has decreased the vulnerability to a banking crisis in several countries, but the increase in interest rates and the weak economic activity has kept the warning signal in several Advanced Economies (including US), while China's activity has weighed on by its strict Covid-restrictions

PROBABILITY OF A SYSTEMIC BANKING CRISIS (2001Q1-2024Q3)

(based on 8-quarters lagged data\*)



- A banking crisis in a given country follows the definition by Laeven and Valencia (2012), which is shown in the Appendix
- The complete description of the methodology can be found at https://goo.gl/r0BLbl and at https://goo.gl/VA8xXv
- The probabilities shown are the simple average of the estimated individual countries probabilities for each region. The definition of each region is shown in the Appendix

Very High Risk High Risk Medium Risk Warning No Risk

\* The probability of a crisis in Q4-2016 is based on Q4-2014 data. Source: BBVA Research



## **Early Warning System of fiscal stress**

Fiscal vulnerability has strongly improved after the COVID shock to public finances. However, public debt levels remain elevated, which keep some countries in Latam and Africa & MENA with a warning

### PROBABILITY OF A FISCAL STRESS EPISODE (2000 - 2026)

(Based on 1-year lagged data)



Source: BBVA Research

Very High Risk High Risk Medium Risk Warning No Risk

## This is the first time that we include a Fiscal EWS in our Country-Risk Report. The methodology used to estimate it can be found in Section 5 of this report.

- The Fiscal Stress Early Warning System EWS estimates the probability of a fiscal crisis or stress, which is defined as one of four different events: Public default or restructuring, a large IMF-Supported program, a very high inflation rate (implicit default) or a extreme spike in the sovereign spread.
- The probabilities shown in the table are the simple average of the individual countries probabilities for each region.

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## Early warning system of currency crisis

Exchange rate tensions have surged this year due to monetary tightening of the FED and other CBs and the surge of geopolitical risks. In contrast to previous episodes, tensions have been somewhat stronger this year in AE rather than in EE and we expect this to continue in the coming quarters

#### PROBABILITY OF CURRENCY TENSIONS (2001Q1-2024Q4)

The probability of a crisis is based on 4-quarters lagged data, e.g. Probability in Q4-2016 is based on Q4-2015 data



- Our Currency-Crises Early Warning System EWS allows us to estimate the probability of a currency crisis, which is defined as a "large" fall in the exchange rate and in foreign reserves in a given country, according to certain predefined measures.
- The probabilities shown in the table are the simple average of the individual countries probabilities for each region. The list of the leading indicators used in the estimation of the probability and the definition of each region are shown in the Appendix.

Source: BBVA Research



## 05 Special Topic: Developing an Early Warning System of Fiscal Stress

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## What is a fiscal stress and how to define it?

We rely on the definition of fiscal crises used by Baldacci et al. (2011)\* and their database for 79 countries from years 1980 to 2010. Then we update the fiscal stress events for those 79 countries using Gerlings et al (2017)\*\* database, expanding the time span until 2015.

#### A fiscal stress event is defined as when any of the four the following events occurred:

| Event   | Criteria  | Advanced Economies  | Emerging Economies   |
|---|---|---|--|
| Public debt default<br>or restructuring             | Failure to service debt as payments<br>come due as well as distressed<br>debt exchanges | S&P definition  | S&P definition   |
| Large financing                                     | Large IMF-supported program   | Access to 100 percent of quota<br>or more                                   | Access to 100 percent of quota<br>or more                                      |
| Implicit/Internal<br>public debt default            | High inflation rate   | Inflation greater than 35% per<br>annum                                     | Access to 100% of quota or<br>more<br>Inflation greater than 500% per<br>annum |
| Extreme financing<br>constraint of the<br>sovereign | Sovereign yield pressure  | Sovereign spreads greater than<br>1000 bps or 2 s.d from country<br>average | Sovereign spreads greater than<br>1000 bps or 2 s.d. from country<br>average   |

\*Baldacci, E., Petrova, I., Belhocine, N., Dobrescu, G. and Mazraani, S., 2011. Assessing Fiscal Stress. IMF Working Paper, No. 100. \*\*Medas, P., Poghosyan, T., Xu, Y., Farah-Yacoub, J. and Gerling, K., 2018. Fiscal crises. Journal of International Money and Finance, 88, pp.191-207.

### **Examples of Fiscal Stress Episodes**

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EMERGING ECONOMIES

**ADVANCED ECONOMIES** 

Episodes of fiscal stress in EE have usually been more related to idiosyncratic factors, and therefore, they tend not to coincide over time. Meanwhile in AE they have been more concentrated around periods of global stress such as the global financial crisis or the european sovereign debt crisis

## Methodology: Multivariate regression of the determinants of fiscal stress and Early Warning System (EWS)

We want to estimate an Early Warning System (EWS) of fiscal stress events and to establish the main determinants of such events based on a logistic regression with the following structure:

 $Fiscal Stress Event_{i,t} = \alpha_0 + Global Finance_t + Fiscal_{it} + Activity_{it} + Price_{it} + External_{it} + Institutional_{it} + Demographic_{it} + Int.Rate_{it} + \varepsilon_{i,t}$ 

- Where "Global Finance" represents indicators related to global financial conditions such as US interest rates, or the median interest rates in developed markets or Europe, etc.
- "*Fiscal*" represents indicators related to fiscal conditions in each country and period t, such as Public-to-GDP ratio, Government Balance, Primary Balance, etc.
- "Activity" represents indicators related to economic activity such as GDP growth rates, unemployment rate, etc.
- *"Prices"* represents indicators related to inflation of prices such as CPI inflation, GDP deflator, etc.
- "*External*" represents indicators related to External imbalances such as External Debt-to-GDP, Current-Account-to-GDP, Short-term external debt-to-Reserves, etc.
- "Institutional" represents indicators related to institutional quality such as Rule-of-Law, Government-Effectiveness, GDP per capita, etc.
- "Demographic" represents indicators related to demographic situation such as population growth, Old-dependency ratio, working age population, etc.
- "Int.Rates" represents indicators related to local interest rates, such as nominal or real short-term interest rates.

The estimation method used is a Random-Effect Logit estimator using an unbalanced panel with annual data from 1980 to 2015.

## Methodology: variables and specification selection



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We have followed an iterative process in three consecutive stages in order to select the best indicators and the best specification that can be obtained from an original set of about 60 different variables.

- 1. In the first stage we regress each indicator of fiscal stress within 8 different groups or "topics" to test their individual performance. While testing for the performance of variables within each group, the algorithm uses one or more principal component for each one of the 7 remaining groups as control variables in order to minimize the omitted variable bias.
- 1. In the second stage we select the best specifications that can be obtained from combining the best individual indicators that were selected in the previous stage.
- 1. Finally, in the third stage we select the final specification by a fine-tuning process in which we evaluate the economic consistency of the best specifications found in the previous stage and we compare their performance against the ones obtained by introducing small changes that have not been tested before.
- 1. The final specification is not necessarily the one with the highest statistical performance, but the one with the best performance and also economic coherence, in terms of coefficient signs, statistical significance and contribution of each indicator.

We estimate a different specification for four different groups of countries:

- Global Model comprising 72 countries.
- Emerging Markets Model with 35 countries.
- Developed Markets Model with 29 countries.
- European Union Model with 16 countries.

## **Regression results after the selection process**

| Gobal Variables                                   | Global    | Emerging  | Developed | Europe    |
|---|-----------|-----------|-----------|-----------|
| 10-year Sovereign Rate US                         | 0.180***  | 0.140***  |           |           |
|   | (3.94)    | (2.58)    |           |           |
| 10-year Sovereign Rate Developed                  |           |           | 0.221*    |           |
|   |           |           | (1.66)    |           |
| 10-year Sovereing Rate Median EU                  |           |           |           | 0./14***  |
|   |           |           |           | (3.22)    |
| Idiosyncratic Variables                           | Global    | Emerging  | Developed | Europe    |
| Rule of Law                                       | -0.979*** | -0.699*** |           |           |
|   | (-4.95)   | (-2.50)   |           |           |
| Government Effectiveness                          | -0.447    | -0.564    | -2.068*** | -4.322*** |
|   | (-1.07)   | (-1.03)   | (-3.21)   | (-4.15)   |
| Inflation   | 0.026***  | 0.021***  |           |           |
|   | (3.21)    | (3.08)    |           |           |
| Real short-term interest rate                     | 0.021**   | 0.013     | 0.055     |           |
|   | (2.13)    | (1.50)    | (0.65)    |           |
| Public Debt to GDP (logs)                         | 1.356***  | 0.974***  | 1.233***  | 2.522***  |
|   | (6.14)    | (3.36)    | (3.07)    | (4.77)    |
| GG primary net lending/borrowing, % of GDP        |           |           | -0.058    | -0.090    |
|   |           |           | (-0.96)   | (-1.01)   |
| Current Account to GDP                            | -0.075*** | -0.060**  | -0.196*** | -0.219*** |
|   | (-4.10)   | (-2.54)   | (-4.07)   | (-3.33)   |
| External Debt (% of GDP) (logs)*                  | 1.563***  |           | 1.675***  | 3.063***  |
|   | (7.58)    |           | (3.19)    | (4.74)    |
| Debt Service, Short-Term External Debt (% of GDP) |           | 0.111***  |           |           |
|   |           | (3.47)    |           |           |
| Short-Term External Debt (% of Reserves)          |           | 0.002***  |           |           |
|   |           | (3.37)    |           |           |
| Unemployment Rate                                 | 0.012     | 0.030     |           |           |
|   | (0.54)    | (1.09)    |           |           |
| GDP pc YoY % change                               | -0.101*** | -0.060*** | -0.214*** | -0.241*** |
|   | (-5.05)   | (-2.58)   | (-3.99)   | (-3.25)   |
| Number of observations                            | 1,840     | 902       | 706       | 375       |
| Number of countries                               | 12        | 35        | 29        | 16        |

t/statistic in parenthesis. \*,\*\*,\*\* denotes statistical significance at 1%,5% and 10% respectively Source: BBVA Research

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- All indicators included in the final specifications have the theoretical expected sign and most of them are statistically significant. According to the estimated results the most important determinant of fiscal stress is, as expected, the level of Public Debt as a percentage of GDP.
- However, the most important determinant of annual changes in fiscal stress probability is the growth rate of per capita GDP pc, as it can be seen in the decomposition of probabilities and changes in probabilities in the next slide.
- Institutional quality is also an important determinant of fiscal stress, but differs between Advanced and Emerging countries. The Rule of Law is more important in Emerging economies and government effectiveness in Advanced ones

## Decomposition of determinants of fiscal stress for some countries

(Non-linear approximation, Levels (Left), Changes (Right))



## **Probability vs actual episodes**

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**ADVANCED ECONOMIES** 

### **EMERGING ECONOMIES**





## 06 Special Topic: Effect of COVID on housing prices

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## The COVID outbreak coincided with an extraordinary increase in housing prices in several economies, especially in advanced ones

Different explanations have been proposed to explain this fact:

- 1. There has been a shift in demand from small properties in city centers to larger properties in less densely populated areas due to the higher possibility of remote working
- 2. There has been a surge in savings that has driven an increase in the households' financial capacity
- 3. There was a housing bubble driven by low interest rates and high inflation: Most of the countries where prices have gone up faster are those where interest rates have been at very low levels for longer

In this section we make use of the same econometric model for real housing prices that helps us determining the equilibrium price level to estimate how large were the effects of COVID, stay-at-home restrictions, and remote working on real housing prices at different countries and regions

If there was any effect of COVID on housing prices and such effect was only temporary, there is a clear risk that it could be reverted on the future, pushing prices down to their previous levels

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### **Econometric analysis**

The dependent variable is the real price of residential properties in each country between 1990 and 2021. The data corresponds to the series in the BIS database that have the most generic characteristics, i.e., the price index must cover the whole country, all types of properties and all vintages (new and existing)

**Some of the explanatory variables are decomposed into two components**: a trend (moving average) and a cyclical component (deviation from the trend). The contribution of the trend components is the one that adds to the estimated equilibrium price level:

- GDP real or GDP real per household
- Bank Credit-to-GDP
- Short-term real interest rates (as a deviation from US Libor interest rates)
- US Libor interest rates
- Unemployment rate

Other variables are not decomposed into cycle and trend components:

- Households growth rate (%)
- Population between 25 and 44 years old growth rate
- Change in urban population

## **Estimation Results of Econometric Analysis**

|  | Random<br>Effects | GLS (Heter.<br>& AR) | Random<br>Effects | GLS (Heter.<br>& AR) |
|--|-------------------|----------------------|-------------------|----------------------|
| GPD real (cycle)   | 1.552***          | 0.887***             |                   |                      |
|  | (3.73)            | (11.58)              |                   |                      |
| GPD real (trend)   | 0.490***          | 0.438***             |                   |                      |
|  | (4.27)            | (11.48)              |                   |                      |
| GPD real, per HH, (cycle)                                |                   |                      | 1.450***          | 0.868***             |
|  |                   |                      | (3.41)            | (11.38)              |
| GPD real, per HH, (trend)                                |                   |                      | 0.553***          | 0.657***             |
|  |                   |                      | (3.63)            | (12.76)              |
| Credit-to-GDP (cycle)                                    | 0.135**           | 0.139***             | 0.183***          | 0.154***             |
|  | (2.21)            | (6.79)               | (2.74)            | (7.39)               |
| Credit-to-GDP (trend)                                    | 0.258***          | 0.318***             | 0.257***          | 0.269***             |
|  | (2.83)            | (9.00)               | (2.59)            | (8.51)               |
| ST Real Interest Rate (Dev. From US Libor) (cycle)       | -1.114***         | -0.130               | -1.248***         | -0.175*              |
|  | (-2.75)           | (-1.30)              | (-3.01)           | (-1.74)              |
| ST Real Interest Rate (Dev. From US Libor) (trend)       | -2.017***         | -0.592***            | -2.211***         | -0.829***            |
|  | (-4.08)           | (-3.54)              | (-4.35)           | (-4.97)              |
| Libor (US) (cycle)                                       | 0.130             | 0.403***             | 0.130             | 0.372***             |
|  | (0.35)            | (2.82)               | (0.32)            | (2.59)               |
| Libor (US) (trend)                                       | -5.444***         | -2.019***            | -6.431***         | -2.672***            |
|  | (-3.47)           | (-4.80)              | (-3.90)           | (-6.59)              |
| Unemployment (cycle)                                     | 0.024             | -0.030***            | 0.008             | -0.032***            |
|  | (0.51)            | (-2.71)              | (0.18)            | (-2.85)              |
| Unemployment (trend)                                     | -0.225***         | -0.273***            | -0.215***         | -0.264***            |
|  | (-3.88)           | (-18.75)             | (-3.61)           | (-17.66)             |
| Household growth   | 0.031             | 0.009                |                   |                      |
| -  | (0.79)            | (1.08)               |                   |                      |
| Population between 25/44 yrs old (Growth vs. Total Pop.) | 0.066***          | 0.019***             | 0.070***          | 0.019***             |
|  | (4.08)            | (3.53)               | (4.05)            | (3.51)               |
| Urban Population change                                  | 0.116             | 0.120***             | 0.133             | 0.116***             |
|  | (1.17)            | (4.65)               | (1.31)            | (4.41)               |
| Dummy for year 2020 - Advanced                           | 0.130***          | 0.083***             | 0.125***          | 0.076***             |
|  | (4.67)            | (7.85)               | (4.37)            | (7.32)               |
| Dummy for year 2020 - Emerging                           | 0.119**           | 0.072***             | 0.120**           | 0.067***             |
|  | (2.50)            | (4.78)               | (2.36)            | (4.38)               |
| Dummy for year 2021 - Advanced                           | 0.139***          | 0.114***             | 0.131***          | 0.100***             |
|  | (3.85)            | (7.75)               | (3.53)            | (6.89)               |
| Dummy for year 2021 - Emerging                           | 0.064             | 0.055***             | 0.063             | 0.046**              |
|  | (1.51)            | (2.73)               | (1.40)            | (2.28)               |

t/statistic in parenthesis. \*,\*\*,\*\* denotes statistical significance at 1%,5% and 10% respectively Source: BBVA Research

Some of the main results can be summarized as follows:

- The specification is highly robust to the variations of methodology and specification shown here, to different definitions of national income or income per capita or per households; (and other variations such as the use of GDP in PPP terms) in terms of the estimated sign and statistical significance, although the coefficients' size does vary across specifications
- GDP or GDP per household are the most important drivers of housing prices, both their short and longterm components
- All the long-term components of the explanatory variables have a significant effect with the expected theoretical sign, which is reassuring for the estimation of the equilibrium level. However, some of the short-term components are non-significant or have the opposite effect (US interest rate "cycle")
- The dummy variables for the years 2020 and 2021 are clearly positive and highly significant, suggesting that prices were on average somewhere between 5% and 14% (depending on the region) higher than what their fundamentals would indicate in 2020 and 2021

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## What was the average effect of COVID and remote working in housing prices?

We extend the previous models to estimate the effect of variables related to COVID restrictions and/or remote working on housing real prices, as a way to replace the dummy variables included for the years 2020 and 2021 that can only provide an estimation of all the "unexplained" factors occurring during those years. Therefore:

- We first introduce as an explanatory variable an index with the maximum level of "stay-at-home" restrictions of each country in the sample in the years 2020 and 2021 (and zero before that). The variable enters both with a contemporaneous term and with a lag (Source: https://ourworldindata.org/covid-stay-home-restrictions)
- We also test the effect of an indicator of the feasibility of remote working in a given country. We rely on the ILO / ISCO classification of workers and occupations, according to the distribution of occupation types that such country has. It is clear that occupations related to hospitality or manufacturing cannot be performed remotely. On the other hand, most professionals and technicians can work remotely more easily. So we use the share of workers in the first three categories of the ISCO-08 as a proxy of the likelihood of working remotely in a given country.

| Broad skill level    | ISCO-08   | ISCO-88  |
|----------------------|---|--|
|                      | 1. Managers   | 1. Legislators, senior officials and managers        |
| Skill levels 3 and 4 | 2. Professionals                                      | 2. Professionals                                     |
|                      | 3. Technicians and associate professionals            | 3. Technicians and associate professionals           |
|                      | 4. Clerical support workers                           | 4. Clerks  |
|                      | 5. Service and sales workers                          | 5. Service workers and shop and market sales workers |
| Skill level 2        | 6. Skilled agricultural, forestry and fishery workers | 6. Skilled agricultural and fishery workers          |
|                      | 7. Craft and related trades workers                   | 7. Craft and related trades workers                  |
|                      | 8. Plant and machine operators, and assemblers        | 8. Plant and machine operators and assemblers        |
| Skill level 1        | 9. Elementary occupations                             | 9. Elementary occupations                            |
| Armed forces         | 0. Armed forces occupations                           | 0. Armed forces                                      |
| Not elsewhere        | X Not elsewhere elsesified                            | X Net alcowhere alcosified                           |
| classified           |   |  |

## Comparison between the effect of year specific dummies vs. effect of "stay-at-home" restrictions



t/statistic in parenthesis. \*,\*\*,\*\* denotes statistical significance at 1%,5% and 10% respectively Source: BBVA Research

Stay-at-home restrictions are statistically significant when they are not included together with year-specific dummies. When included by themselves, they have, on average, a very similar effect than dummies alone

The results indicate that the effect of restrictions were as high as 15.5% in 2021 in AE with the maximum level of restrictions (3). In the case of EE that had the maximum restrictions, the effect was higher in 2020 (6.5%) than in 2021 (4.5%)

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## Estimated effect of our proxy for remote working



t/statistic in parenthesis. \*,\*\*,\*\*\* denotes statistical significance at 1%,5% and 10% respectively Source: BBVA Research

We find that the percentage of high skilled workers in a country was statistically and positively correlated to the level of real prices in 2020 and 2021, but not before that.

The results indicate that the effect of restrictions were as high as 16% in 2021 in AE with a large share of High-skilled workers (8% in 2020). In an EE with also a large share of high-skilled workers, the effect was around 13% in 2021 and 9% in 2020.



# Vulnerability Indicators table by country



#### Summary Index

## **Vulnerability Indicators Table**

#### **VULNERABILITY INDICATORS\* 2022: DEVELOPED MARKETS**

|               | Fiscal<br>sustainability |  | External<br>sustainability     |                                      | Liquidity<br>management |                                 |                                    | Macroeconomic performance               |  |                      | Credit<br>and housing    |                                |  | Private<br>debt                         |                                 |                | Institutional                  |                               |                                     |                                    |                          |
|---------------|--------------------------|--|--------------------------------|--------------------------------------|-------------------------|---------------------------------|------------------------------------|---|--|----------------------|--------------------------|--------------------------------|--|---|---------------------------------|----------------|--------------------------------|-------------------------------|-------------------------------------|------------------------------------|--------------------------|
|               | Fiscal<br>balance<br>(1) | Interest<br>rate GDP<br>growth<br>differentia<br>I 2022-27 | Gross<br>public<br>debt<br>(1) | Current<br>account<br>balance<br>(1) | External<br>debt<br>(1) | REER<br>appreciati<br>on<br>(2) | Gross<br>financial<br>needs<br>(1) | Short-<br>term<br>public<br>debt<br>(3) | Debt held<br>by non-<br>residents<br>(3) | GDP<br>growth<br>(4) | Consume<br>prices<br>(4) | r Unemploy<br>ment rate<br>(5) | Private<br>credit to<br>GDP gap<br>(4) | Real<br>housing<br>prices<br>gap<br>(4) | Equity<br>markets<br>gap<br>(4) | HH debt<br>(1) | NF<br>corporate<br>debt<br>(1) | Financial<br>liquidity<br>(6) | WB<br>political<br>stability<br>(7) | WB<br>control<br>corruption<br>(7) | WB rule<br>of law<br>(7) |
| United States | -4.0                     | ) -1.8   | 122.1                          | -3.9                                 | 95.3                    | 12.9                            | 31.7                               | 16.7                                    | 27.4                                     | 1.9                  | 8.0                      | 3.7                            | 30.7                                   | 15.2                                    | -11.6                           | 75.9           | 78.9                           | 50.4                          | 0.0                                 | -1.0                               | -1.4                     |
| Canada        | -2.2                     | 2 -1.9   | 102.2                          | 0.5                                  | 125.7                   | 0.2                             | 14.9                               | 11.4                                    | 23.1                                     | 3.3                  | 6.9                      | 5.5                            | 28.7                                   | 38.6                                    | -3.4                            | 102.9          | 124.3                          | 121.8                         | -0.9                                | -1.6                               | -1.6                     |
| Japan         | -7.9                     | -1.0   | 263.9                          | 1.4                                  | 100.0                   | -21.4                           | 52.8                               | 16.5                                    | 12.0                                     | 1.7                  | 2.4                      | 2.5                            | 13.6                                   | 2.2                                     | 3.3                             | 68.9           | 119.5                          | 46.3                          | -1.0                                | -1.6                               | -1.6                     |
| Australia     | -3.4                     | -2.2   | 56.7                           | 2.1                                  | 97.3                    | 4.3                             | 7.2                                | 4.2                                     | 32.4                                     | 3.8                  | 7.7                      | 3.7                            | 20.8                                   | 22.4                                    | -8.1                            | 115.2          | 64.1                           | 120.0                         | -0.9                                | -1.7                               | -1.7                     |
| Korea         | -1.8                     | -3.2   | 54.1                           | 3.2                                  | 35.7                    | -7.0                            | 4.4                                | 7.3                                     | 16.3                                     | 2.6                  | 6.2                      | 2.9                            | -13.8                                  | -18.8                                   | -18.0                           | 106.5          | 115.3                          | 101.4                         | -0.7                                | -0.8                               | -1.1                     |
| Norway        | 20.3                     | -2.5   | 40.3                           | 19.4                                 | 133.3                   | -1.4                            | -8.7                               | 8.1                                     | 53.4                                     | 3.6                  | 4.7                      | 3.2                            | 33.7                                   | 32.9                                    | 6.9                             | 78.7           | 117.3                          | 282.0                         | -1.1                                | -2.1                               | -1.9                     |
| Sweden        | 0.1                      | -4.8   | 33.5                           | 3.8                                  | 164.5                   | -4.1                            | 4.5                                | 10.3                                    | 16.0                                     | 2.6                  | 8.2                      | 7.2                            | 52.8                                   | 30.0                                    | -10.3                           | 90.1           | 167.8                          | 161.5                         | -1.0                                | -2.1                               | -1.7                     |
| Denmark       | 1.2                      | -2.0   | 31.8                           | 8.2                                  | 142.2                   | -1.2                            | 4.2                                | 16.1                                    | 23.3                                     | 2.6                  | 7.2                      | 2.7                            | 4.8                                    | 12.5                                    | 4.6                             | 93.6           | 108.0                          | 259.4                         | -0.9                                | -2.4                               | -1.9                     |
| Finland       | -2.1                     | -2.5   | 66.7                           | -0.8                                 | 201.2                   | -2.1                            | 10.4                               | 10.7                                    | 51.4                                     | 2.1                  | 6.6                      | 7.3                            | 24.6                                   | -7.9                                    | -11.0                           | 65.0           | 119.6                          | 126.1                         | -1.0                                | -2.3                               | -2.1                     |
| UK            | -4.3                     | -3.0   | 87.0                           | -4.8                                 | 297.4                   | -1.4                            | 10.2                               | 7.7                                     | 34.5                                     | 3.6                  | 11.3                     | 4.0                            | 13.0                                   | 17.0                                    | -9.0                            | 83.8           | 68.9                           | 53.2                          | -0.5                                | -1.7                               | -1.4                     |
| Austria       | -2.7                     | -3.2   | 78.5                           | -2.6                                 | 156.4                   | 0.4                             | 11.6                               | 8.4                                     | 63.2                                     | 4.7                  | 7.0                      | 5.0                            | -2.0                                   | 17.9                                    | -17.7                           | 50.2           | 99.7                           | 94.4                          | -0.9                                | -1.3                               | -1.8                     |
| France        | -5.1                     | -2.3   | 111.8                          | -1.3                                 | 250.8                   | -5.0                            | 16.3                               | 8.0                                     | 49.6                                     | 2.5                  | 6.3                      | 7.3                            | 10.4                                   | 9.2                                     | -4.7                            | 66.7           | 164.9                          | 100.2                         | -0.4                                | -1.3                               | -1.3                     |
| Germany       | -3.3                     | -3.1   | 71.1                           | 4.2                                  | 164.3                   | -0.2                            | 11.4                               | 8.9                                     | 42.7                                     | 1.5                  | 10.2                     | 5.6                            | 9.5                                    | 6.2                                     | -16.9                           | 56.2           | 73.0                           | 91.2                          | -0.8                                | -1.8                               | -1.6                     |
| Netherlands   | -0.8                     | -3.9   | 48.3                           | 7.5                                  | 396.7                   | 3.8                             | 6.8                                | 15.5                                    | 36.8                                     | 4.5                  | 12.8                     | 4.0                            | 24.3                                   | 19.5                                    | -8.8                            | 95.9           | 142.6                          | 92.6                          | -0.9                                | -2.0                               | -1.7                     |
| Belgium       | -4.7                     | -2.8   | 103.9                          | -2.2                                 | 247.7                   | 0.5                             | 15.6                               | 16.5                                    | 55.9                                     | 2.4                  | 7.9                      | 5.9                            | -1.1                                   | 0.9                                     | -9.4                            | 60.8           | 154.0                          | 61.6                          | -0.6                                | -1.5                               | -1.3                     |
| Italy         | -5.4                     | -1.1   | 147.2                          | -0.2                                 | 134.7                   | -2.0                            | 21.2                               | 14.9                                    | 28.8                                     | 3.2                  | 8.7                      | 8.4                            | 21.7                                   | -17.2                                   | -14.2                           | 43.3           | 70.4                           | 87.5                          | -0.6                                | -0.5                               | -0.3                     |
| Spain         | -3.9                     | -3.1   | 113.6                          | 1.0                                  | 185.8                   | -0.5                            | 15.8                               | 14.5                                    | 43.7                                     | 4.6                  | 8.6                      | 12.8                           | -2.0                                   | -2.2                                    | -21.4                           | 55.7           | 100.1                          | 79.0                          | -0.6                                | -0.7                               | -0.9                     |
| Ireland       | 0.4                      | -6.0   | 47.0                           | 12.2                                 | 557.9                   | -2.8                            | 2.7                                | 11.4                                    | 53.0                                     | 9.0                  | 10.0                     | 4.9                            | -108.0                                 | 5.2                                     | -15.3                           | 29.0           | 148.9                          | 31.5                          | -0.9                                | -1.6                               | -1.5                     |
| Portugal      | -1.9                     | -3.9   | 114.7                          | -1.1                                 | 180.9                   | -1.6                            | 9.7                                | 10.6                                    | 46.4                                     | 6.4                  | 8.1                      | 6.0                            | -13.8                                  | 22.0                                    | 8.1                             | 63.6           | 96.3                           | 86.4                          | -1.0                                | -0.8                               | -1.1                     |
| Greece        | -4.4                     | -0.3   | 177.6                          | -6.7                                 | 285.0                   | 0.3                             | 14.5                               | 5.7                                     | 81.5                                     | 5.2                  | 8.2                      | 12.1                           | 19.6                                   | -6.0                                    | -7.4                            | 51.3           | 59.8                           | 58.5                          | -0.2                                | -0.2                               | -0.3                     |

\*Vulnerability indicators: (1) % GDP. (2) Deviation from four-year average. (3) % of total debt. (4) % year on year. (5) % of Total labour force. (6) Financial system credit to deposit. (7) Index by World Bank governance indicators.

Source: BBVA Research, Haver, BIS, IMF and World Bank

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## **Vulnerability Indicators Table**

#### **VULNERABILITY INDICATORS\* 2022: EMERGING ECONOMIES**

|             | Fiscal<br>sustainability |  | External sustainability        |                                      | Liquidity<br>management |                              |                                    | Macroeconomic performance                             |                        |  | Credit<br>and housing |                           | Private<br>debt                |                                    |   | Institutional  |                                |                               |                                     |                                    |                          |
|-------------|--------------------------|--|--------------------------------|--------------------------------------|-------------------------|------------------------------|------------------------------------|---|------------------------|--|-----------------------|---------------------------|--------------------------------|------------------------------------|---|----------------|--------------------------------|-------------------------------|-------------------------------------|------------------------------------|--------------------------|
|             | Fiscal<br>balance<br>(1) | Interest<br>rate GDP<br>growth<br>differentia<br>I 2022-27 | Gross<br>public<br>debt<br>(1) | Current<br>account<br>balance<br>(1) | External<br>debt<br>(1) | Reserves<br>to ARA<br>Metric | Gross<br>financial<br>needs<br>(1) | Reserves<br>to short-<br>term<br>external<br>debt (3) | Reserves<br>to Imports | Debt held<br>by non-<br>residents<br>(3) | GDP<br>growth<br>(4)  | Consumer<br>prices<br>(4) | r Unemploy<br>ment rate<br>(5) | Private<br>credit to<br>Gap<br>(4) | Real<br>housing<br>prices<br>Gap<br>(4) | HH debt<br>(1) | NF<br>corporate<br>debt<br>(1) | Financial<br>liquidity<br>(6) | WB<br>political<br>stability<br>(7) | WB<br>control<br>corruption<br>(7) | WB rule<br>of law<br>(7) |
| Bulgaria    | -3.3                     | -5.0   | 22.8                           | -0.9                                 | 53.7                    | 1.9                          | 3.5                                | 2.3   | 11.3                   | 43.9                                     | 3.9                   | 12.7                      | 5.0                            | -36.2                              | -18.0                                   | 23.7           | 66.6                           | 66.0                          | -0.5                                | 0.2                                | 0.0                      |
| Czech Rep   | -4.0                     | -4.4   | 41.5                           | -4.3                                 | 70.4                    | 11.9                         | 9.1                                | 1.4   | 12.7                   | 22.1                                     | 1.9                   | 20.0                      | 3.6                            | -4.0                               | 21.4                                    | 34.5           | 54.6                           | 78.7                          | -1.0                                | -0.6                               | -1.1                     |
| Croatia     | -2.8                     | -5.4   | 72.6                           | 2.2                                  | 73.1                    | 1.5                          | 8.1                                | 1.8   | 9.9                    | 32.9                                     | 5.9                   | 9.2                       | 6.1                            | -21.8                              | -1.3                                    | 31.9           | 59.9                           | 71.9                          | -0.7                                | -0.1                               | -0.3                     |
| Hungary     | -4.9                     | -4.3   | 74.8                           | -6.7                                 | 141.2                   | 1.4                          | 14.0                               | 0.4   | 3.9                    | 29.4                                     | 5.7                   | 20.1                      | 3.9                            | -4.7                               | 16.3                                    | 18.6           | 80.0                           | 86.9                          | -0.9                                | 0.0                                | -0.5                     |
| Poland      | -4.1                     | -6.0   | 48.7                           | -4.0                                 | 53.0                    | 1.4                          | 7.2                                | 1.5   | 5.7                    | 25.7                                     | 3.8                   | 15.9                      | 5.1                            | -13.7                              | -23.0                                   | 30.4           | 81.1                           | 94.6                          | -0.5                                | -0.6                               | -0.4                     |
| Romania     | -6.4                     | -4.5   | 49.7                           | -8.4                                 | 51.9                    | 1.0                          | 12.4                               | 1.6   | 5.3                    | 44.5                                     | 4.5                   | 2.7                       | 5.2                            | -16.6                              | -26.3                                   | 14.1           | 34.7                           | 72.9                          | -0.5                                | 0.0                                | -0.4                     |
| Russia      | -2.3                     | 0.1  | 16.2                           | 12.2                                 | 25.1                    |                              | 3.4                                | 5.1   | 18.0                   | 20.8                                     | -3.4                  | 12.5                      | 3.8                            | -33.6                              | -22.8                                   | 17.4           | 54.6                           | 104.4                         | 0.6                                 | 0.9                                | 0.9                      |
| Turkey      | -3.1                     | -17.2  | 45.6                           | -6.3                                 | 53.5                    | 0.9                          | 11.3                               | 0.4   | 2.6                    | 33.4                                     | 5.5                   | 72.6                      | 10.6                           | 10.0                               | 24.5                                    | 11.0           | 58.8                           | 86.5                          | 1.1                                 | 0.4                                | 0.4                      |
| Argentina   | -4.0                     | -10.5  | 79.4                           | -0.7                                 | 47.5                    | 0.7                          | 19.5                               | 0.8   | 8.2                    | 41.7                                     | 5.0                   | 73.1                      | 7.2                            | -9.1                               | -17.0                                   | 3.9            | 25.4                           | 234.9                         | 0.1                                 | 0.4                                | 0.5                      |
| Brazil      | -5.8                     | 2.2  | 88.2                           | -1.5                                 | 38.4                    | 1.6                          | 18.9                               | 2.7   | 18.0                   | 11.7                                     | 2.8                   | 6.0                       | 9.1                            | 10.3                               | -8.9                                    | 35.5           | 54.2                           | 103.5                         | 0.5                                 | 0.5                                | 0.3                      |
| Chile       | 0.9                      | -3.1   | 36.2                           | -6.7                                 | 75.8                    | 1.1                          | 9.2                                | 1.3   | 6.9                    | 42.7                                     | 2.0                   | 12.2                      | 8.7                            | 13.2                               | -14.9                                   | 45.0           | 98.4                           | 142.2                         | -0.1                                | -1.0                               | -0.9                     |
| Colombia    | -5.6                     | -1.4   | 60.8                           | -6.0                                 | 50.5                    | 1.4                          | 7.5                                | 2.8   | 13.5                   | 34.6                                     | 8.0                   | 10.1                      | 11.3                           | -0.8                               | 11.1                                    | 29.2           | 33.2                           | 117.9                         | 0.9                                 | 0.3                                | 0.5                      |
| Mexico      | -3.0                     | 2.2  | 49.3                           | -0.8                                 | 44.1                    | 1.3                          | 12.7                               | 2.7   | 5.6                    | 26.8                                     | 2.6                   | 8.0                       | 3.3                            | 1.7                                | 4.5                                     | 16.1           | 23.9                           | 79.4                          | 0.6                                 | 1.0                                | 0.8                      |
| Peru        | -1.6                     | -2.6   | 34.5                           | -4.0                                 | 36.6                    | 2.9                          | 3.9                                | 7.5   | 20.7                   | 49.4                                     | 2.7                   | 7.8                       | 7.7                            | 0.1                                | 4.3                                     | 16.6           | 39.7                           | 151.5                         | 0.4                                 | 0.6                                | 0.5                      |
| China       | -8.9                     | -5.0   | 76.5                           | 1.9                                  | 14.6                    |                              | 4.4                                | 3.2   | 16.3                   |  | 3.6                   | 2.3                       | 4.9                            | 44.5                               | 10.9                                    | 62.3           | 159.0                          | 108.1                         | 0.5                                 | -0.1                               | 0.0                      |
| India       | -9.9                     | -4.1   | 83.4                           | -3.5                                 | 18.5                    | 2.0                          | 14.3                               | 4.4   | 13.4                   | 4.9                                      | 6.8                   | 6.4                       | 6.4                            | -11.6                              | -13.0                                   | 35.9           | 47.9                           | 75.5                          | 0.6                                 | 0.3                                | 0.1                      |
| Indonesia   | -3.9                     | -3.8   | 40.9                           | 2.2                                  | 34.5                    | 1.1                          | 6.4                                | 2.9   | 9.4                    | 40.2                                     | 5.3                   | 7.2                       | 5.6                            | -8.5                               | -29.7                                   | 16.5           | 23.9                           | 88.9                          | 0.5                                 | 0.4                                | 0.2                      |
| Malaysia    | -4.9                     | -2.6   | 69.6                           | 1.6                                  | 64.2                    | 1.2                          | 9.7                                | 1.2   | 6.8                    | 24.9                                     | 5.4                   | 3.2                       | 3.5                            | -11.4                              | 9.0                                     | 90.0           | 62.9                           | 111.4                         | -0.1                                | -0.2                               | -0.6                     |
| Philippines | -5.4                     | -4.9   | 59.3                           | -4.4                                 | 26.5                    | 2.3                          | 12.8                               | 6.4   | 9.9                    | 24.7                                     | 6.5                   | 5.8                       | 5.2                            | 5.1                                | -17.8                                   | 4.6            | 43.4                           | 66.4                          | 0.9                                 | 0.5                                | 0.6                      |
| Thailand    | -5.6                     | -2.0   | 61.5                           | -0.5                                 | 41.0                    | 2.5                          | 12.7                               | 2.8   | 12.9                   | 11.6                                     | 2.8                   | 7.3                       | 1.3                            | 21.7                               | -14.1                                   | 87.7           | 84.1                           | 95.3                          | 0.5                                 | 0.5                                | -0.1                     |

\*Vulnerability indicators: (1) % GDP. (2) Deviation from four-year average. (3) % of total debt. (4) % year on year. (5) % of Total labour force. (6) Financial system credit to deposit. (7) Index by World Bank governance indicators. ARA Metric: see https://www.imf.org/external/np/pp/eng/2011/021411b.pdf Source: BBVA Research, Haver, BIS, IMF and World Bank





#### Methodology: indicators and maps

- Financial Stress Map: It stresses levels of stress according to the normalized time series movements. Higher positive standard units (1.5 or higher) stand for high levels of stress (dark blue) and lower standard deviations (-1.5 or below) stand for lower level of market stress (lighter colours)
- Sovereign Rating Index: An index that translates the letter codes of the three important rating agencies' rating (Moody's, Standard & Poor's and Fitch) to numerical positions from 20 (AAA) to default (0). The index shows the average of the three rescaled numerical ratings
- Sovereign Spreads Maps: It shows a colour map with six different ranges of sovereign spreads (darker >500, 300 to 500, 200 to 300, 100 to 200, 50 to 100 and the lighter below 50 bp). For European countries the spread corresponds to the difference of the local 10-year bond yield vs. Germany.
- Vulnerability Radars: A Vulnerability Radar shows a static and comparative vulnerability for different countries. For this we assigned several dimensions of vulnerabilities, each of them represented by three vulnerability indicators. The dimensions included are: Macroeconomics, Fiscal, Liquidity, External, Excess Credit and Assets, Private Balance Sheets and Institutional. Once the indicators are compiled, we reorder the countries in percentiles from 0 (lower ratio among the countries) to 1 (maximum vulnerabilities) relative to their group (Developed Economies or Emerging Economies). Furthermore, Inner positions (near 0) in the radar shows lower vulnerability, while outer positions (near 1) stand for higher vulnerability. Furthermore, we normalize each value with respect to given risk thresholds, whose values have been computed according to our own analysis or empirical literature. If the value of a variable is equal to the threshold, it would take a value of 0.8 in the radar
- Equity Prices Gap: Equity Prices Indexes are first transformed to real prices using the CPI index. The gap is estimated as the deviation of the current value of the logarithm of real equity prices vs. its corresponding 4-year moving average.

#### Methodology: indicators and maps

#### Risk Thresholds Table

\* (ARA Metric = 10% × Exports + 10% × Broad Money + 30% × Short-term Debt + 20% × Other Liabilities)

| Vulnerability Dimensions                                      | Risk Thresholds<br>Developed<br>Economies | Risk Thresholds<br>Emerging<br>Economies | Risk<br>Direction | Source  |
|---|---|--|-------------------|---|
| Macroeconomics  |   |  |                   |   |
| GDP   | 1.0                                       | 3.0                                      | Lower             | BB∀A Research (based on historical percentiles)                               |
| Inflation   | 4.0                                       | 10.0                                     | Higher            | BBVA Research (based on historical percentiles)                               |
| Unemployment  | 10.0                                      | 10.0                                     | Higher            | BBVA Research (based on historical percentiles)                               |
| Fiscal Vulnerability  |   |  | -                 |   |
| Government fiscal balance (% GDP)                             | -4.0                                      | -4.0                                     | Lower             | Baldacci et AI (2011). Assesing Fiscal Stress. IMF WP 11/100                  |
| Expected Interest rate GDP growth differential 5 years ah ead | 0.8                                       | 0.0                                      | Higher            | Baldacci et AI (2011). Assesing Fiscal Stress. IMF WP 11/100                  |
| Gross Public Debt (%GDP)                                      | 60.0                                      | 40.0                                     | Higher            | IMF Public Debt Sustainability Analysis (DSA) in Market-Acess Countries, 2013 |
| External Vulnerability  |   |  |                   |   |
| Current Account Balance (% GDP)                               | -5.0                                      | -3.0                                     | Lower             | BB∀A Research (based on historical percentiles)                               |
| External Debt (% GDP)   | 200.0                                     | 60.0                                     | Higher            | BB∀A Research (based on historical percentiles)                               |
| Real Exchange Rate (Deviation from 4 yr average) (Developed)  | 5.0                                       |  | Higher            | EU Commission (2012) and BBVA Research (based on historical percentiles)      |
| Reserves to ARA Metric (Emerging)                             |   | 0.8                                      | Lower             | Baldacci et AI (2011). Assesing Fiscal Stress. IMF WP 11/100                  |
| Liquidity Problems  |   |  |                   |   |
| Gross Financial Needs   | 25.0                                      | 15.0                                     | Higher            | IMF Public Debt Sustainability Analysis (DSA) in Market-Acess Countries, 2013 |
| Debt Held by Non Residents                                    | 55.0                                      | 45.0                                     | Higher            | IMF Public Debt Sustainability Analysis (DSA) in Market-Acess Countries, 2013 |
| Short Term Debt Pressure                                      |   |  |                   |   |
| Public Short-Term Debt as % of Total Public Debt (Developed)  | 15.0                                      |  | Higher            | Baldacci et AI (2011). Assesing Fiscal Stress. IMF WP 11/100                  |
| Reserves to Imports (Emerging)                                |   | 3.0                                      | Lower             | BBVA Research (based on historical percentiles)                               |
| Reserves to Short-Term Ext. Debt (Emerging)                   |   | 1.0                                      | Lower             | Baldacci et AI (2011). Assesing Fiscal Stress. IMF WP 11/100                  |
| Private Balance Sheets  |   |  |                   |   |
| Household Debt (% GDP)  | 84.0                                      | 54.0                                     | Higher            | BBVA Research (based on historical percentiles)                               |
| Non Financial Corporate Debt (% GDP)                          | 120.0                                     | 80.0                                     | Higher            | BBVA Research (based on historical percentiles)                               |
| Financial liquidity (Credit/Deposits)                         | 130.0                                     | 110.0                                    | Higher            | EU Commission (2012) and BBVA Research  |
| Excess Credit and Assets                                      |   |  |                   |   |
| Private Credit to GDP (annual Change)                         | 12.0                                      | 12.0                                     | Higher            | BBVA Research   |
| Real Housing Prices growth (% yoy)                            | 12.0                                      | 12.0                                     | Higher            | BBVA Research   |
| Equity prices gap (%)   | 20.0                                      | 20.0                                     | Higher            | BBVA Research (based on historical percentiles)                               |
| Institutions  |   |  |                   |   |
| Political Stability   | 1 (9th percentil)                         | -0.6 (8th percentil)                     | Lower             | World Bank Governance Indicators  |
| Control of Corruption   | 1 (9th percentil)                         | -0.6 (8th percentil)                     | Lower             | World Bank Governance Indicators  |
| Rule of Law   | 1 (8th percentil)                         | -1 (8 th percentil)                      | Lower             | World Bank Governance Indicators  |

#### Methodology: Sovereign Rating Index Model

The dependent variable is the average of the three rating agencies (Moody's, Standard & Poor's and Fitch) translated to numerical positions from 20 (AAA) to default (0).

The determinants of the sovereign ratings are estimated using a ordered-logit model with quarterly data from 51 countries and from 2000Q1 to the most recent quarter. The main determinants are the following:

- GDP per capita (real USD)
- Inflation
- Fiscal Balance to GDP
- Public Debt to GDP (local holders)
- Public Debt to GDP (external holders)
- Institutional Index (Rule of Law, Regulation Quality and Government Effectiveness)
- Composite indicator summarizing the *Number of Years since last Sovereign* Default (squared root) and the *Number of Historical Defaults* (over number of years since last default)
- Individual country dummies
- Time-specific dummies for 2020

The effects of the GDP per capita, inflation, and of Local and External Public Debts are decomposed into a global component (median of all 51 countries) and an idiosyncratic component (the deviation against the global component), allowing each component to have a separate effect on the rating.

Additionally, the effect of the fiscal balance is interacted with a categorical variable indicating different Public Debt levels, allowing different sensibilities depending on how indebted a country is.

#### Methodology: Private Debt Equilibrium & Gaps (Debt-to-GDP)

**Debt Gaps (Debt-to-GDP):** The Debt-to-GDP gaps are the difference between the observed debt ratio and an estimated equilibrium level for every country.

The equilibrium level is estimated through non-linear regression that adjust a Gompertz-curve type of relationship between the debt ratio and income per capita, with a saturation level at the highest levels of income. The regression is estimated using a panel data model with annual data from 88 countries and from 1980 to the most recent year available

The determinants are the following:

- GDP per capita (in PPP adjusted USD)
- Short-term interest rate
- Investment-to-GDP ratio
- Inflation
- · Bank spread (loans minus deposit interest rates)
- Index of quality of legal framework
- Gini index
- Regulatory capital to assets ratio
- Index of Information Sharing
- Banking Concentration

We finally combine our own estimated gaps with the gaps estimated following the BIS methodology (<u>trend based on a HP filter</u>), assigning a weight of 075 to our own gaps and 0.25 to the gaps estimated through the BIS methodology.

The full description of our methodology can be found in https://goo.gl/LTeTHD and https://goo.gl/r0BLbl

#### Methodology: Housing Prices Equilibrium & Gaps (1)

The housing price gaps are the difference between the observed real price and an estimated equilibrium level for every country. The equilibrium model is estimated through a panel data model in which the dependent variable is an index of real property prices, with annual data from 59 countries and from 1990 to the most recent year available, using a random-effects GLS model allowing for heteroscedasticity and autocorrelation, allowing also for a country-wise autocorrelation coefficient.

Some of the explanatory variables are decomposed into two components: a trend (10-years moving average) and a cyclical component (deviation from the trend). The contribution of the trend components is the one that adds to the estimated equilibrium price level:

- GDP real or GDP real per household
- Bank Credit-to-GDP
- Short-term real interest rates (as a deviation from US Libor interest rates)
- US Libor interest rates
- Unemployment rate

Other variables are not decomposed into cycle and trend components but also add to the equilibrium level:

- Households growth rate (%)
- Population between 25 and 44 years old growth rate
- Change in urban population

We finally combine our own estimated gaps with the gaps estimated following the BIS methodology (trend based on a HP filter), assigning a weight of 0.8 to our own gaps and 0.2 to the gaps estimated through the BIS methodology.

#### Methodology: Housing Prices Equilibrium & Gaps (2)

Para realizar cualquier tipo de análisis/comparación entre países necesitamos disponer de datos comparables para todos los países incluidos en el análisis. Por lo tanto, nos hemos basado principalmente en la base de datos de precios de la vivienda del BPI, que incluye unas 322 series para unos 70 países y regiones clasificadas por 6 características diferentes.

However, we have regrouped the original BIS series into a more comparable set of 42 variables according to only 3 characteristics:

- Geographical coverage (whole country, urban areas, large cities, etc.)
- Type of property (all types, single-family houses, apartments)
- "Vintage" (i.e. all properties, new, existing).

Additionally, since we also need to use other sources of data (Dallas FED, Haver) to complement the BIS database, we have tried to classify/organize them, if possible, according to the same criteria. If the most generic series is not available we chose the second "most generic" one. e.g. if there is no series that includes the whole country we would use the one that includes urban areas.

Importantly, since the dependent variable is defined as an index (2016=100), we now also transform all independent variables into indexes, making it much easier for the data to adjust to changes in the dependent variable

Finally, in order to use the number of households as part of our explanatory variables (e.g. GDP/income per household, etc.), we needed to smooth and carefully treat some of the very noisy original data.

#### **METHODOLOGY: EARLY WARNING SYSTEMS**

#### **EWS Banking Crises:**

The complete description of the methodology can be found at https://goo.gl/r0BLbI and at <u>https://goo.gl/VA8xXv</u>. A banking crisis is defined as systemic if two conditions are met: 1) Significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations), 2) Significant banking policy intervention measures in response to significant losses in the banking system. The probability of a crisis is estimated using a panel-logit model with annual data from 68 countries and from 1990 to 2017. The estimated model is then applied to quarterly data. The probability of a crisis is estimated as a function of the following leading indicators (with a 2-years lag):

- Debt-to-GDP Gap (Deviation from an estimated long-term level)
- Current account balance to GDP
- Short-term interest rate (deviation against US interest rate)
- Libor interest rate
- Credit-to-Deposits
- Regulatory Capital to Risk Weighted Assets ratio

#### **EWS Currency Crises:**

We estimate the probability of a currency crisis (a large fall in exchange rate and foreign reserves event) is estimated using a panel-logit model with 78 countries from 1980Q1 to 2020Q3, as a function of the following variables (with an 4-quarters lag):

- Credit-to-GDP ratio Gap (based on HP filter)
- Inflation
- BAA Spread
- Cyclical Current Account (based on HP filter)
- Short-term interest rate (deviation against US interest rate)
- Libor interest rate (different lags)
- Real effective exchange rate
- Investment to GDP
- GDP real growth rate (HP-trend and cyclical deviation from trend)
- Total trade to GDP

#### **METHODOLOGY: EARLY WARNING SYSTEMS**

#### **EWS Banking Crises Definition of Regions:**

- OPEC and Other Oil Exporters: Algeria, Angola, Azerbaijan, Bahrain, Canada, Ecuador, Nigeria, Norway, Qatar, Russia and Venezuela
- Emerging Asia: Bangladesh, China, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand and Vietnam.
- South America & Mexico: Argentina, Brazil, Chile, Colombia, Mexico, Paraguay, Peru and Uruguay
- Other LatAm & Caribbean: Bolivia, Costa Rica, Dominican Rep., El Salvador, Guatemala, Honduras, Nicaragua and Panama
- Africa & MENA: Botswana, Egypt, Israel, Morocco, Namibia and South Africa.
- Emerging Europe: Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Rep, Slovenia, Turkey, Ukraine
- Core Europe: Austria, Belgium, Denmark, Finland, France, Germany, Netherlands, Sweden and United Kingdom.
- Periphery Europe: Greece, Ireland, Italy, Portugal and Spain
- Advanced Economies: Australia, Japan, Korea, Singapore, Iceland, New Zealand and Switzerland

#### **EWS Currency Crises Definition of Regions:**

- OPEC and Other Oil Exporters: Algeria, Angola, Azerbaijan, Bahrain, Nigeria, Norway, Oman, Qatar, Russia, Trinidad and Tobago, United Arab Emirates and Venezuela
- Emerging Asia: Bangladesh, China, Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand and Vietnam.
- South America & Mexico: Argentina, Brazil, Chile, Colombia, Mexico, Paraguay, Peru and Uruguay
- Other LatAm & Caribbean: Bolivia, Costa Rica, Dominican Rep., El Salvador, Guatemala, Honduras, Jamaica and Nicaragua
- Emerging Europe: Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Rep, Slovenia, Turkey, Ukraine
- Africa & MENA: Botswana, Egypt, Israel, Morocco, Namibia, South Africa and Tunisia
- Advanced Economies: Australia, Japan, Korea, Singapore, Canada, Iceland, New Zealand and Switzerland

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