Stress-testing a shock to remittances in a post-Covid world – what impact on liquidity?

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Working Paper

Stress-testing a shock to remittances in a post-Covid world – what impact on liquidity?

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Abstract

Remittances have historically been a stable source of funding which has played a key role in the development efforts of many nations worldwide. As a consequence of the Covid crisis and the lockdown measures imposed to counteract the spread of the disease, the World Bank estimated a drop of 20% in remittances by the end of 2020. To study the effect that such a conjuncture would have on the financial stability of developing economies, this paper develops a remittance stress test that investigates the impact of the projected shock on banking sector liquidity at a country level. The study encompasses 112 countries and finds that small, emerging economies with underdeveloped financial sectors suffer the most, with six of the ten most affected nations experiencing a drop in their liquid asset ratios that would place their banking sector at significant liquidity risk.

Keywords: remittances, stress test, liquidity risk, financial development, banking sector

JEL Classification: F24, F37, G21

The findings, interpretations, and conclusions expressed in this paper are entirely those of the author. They do not necessarily represent the view of the organization that he or she is affiliated with.

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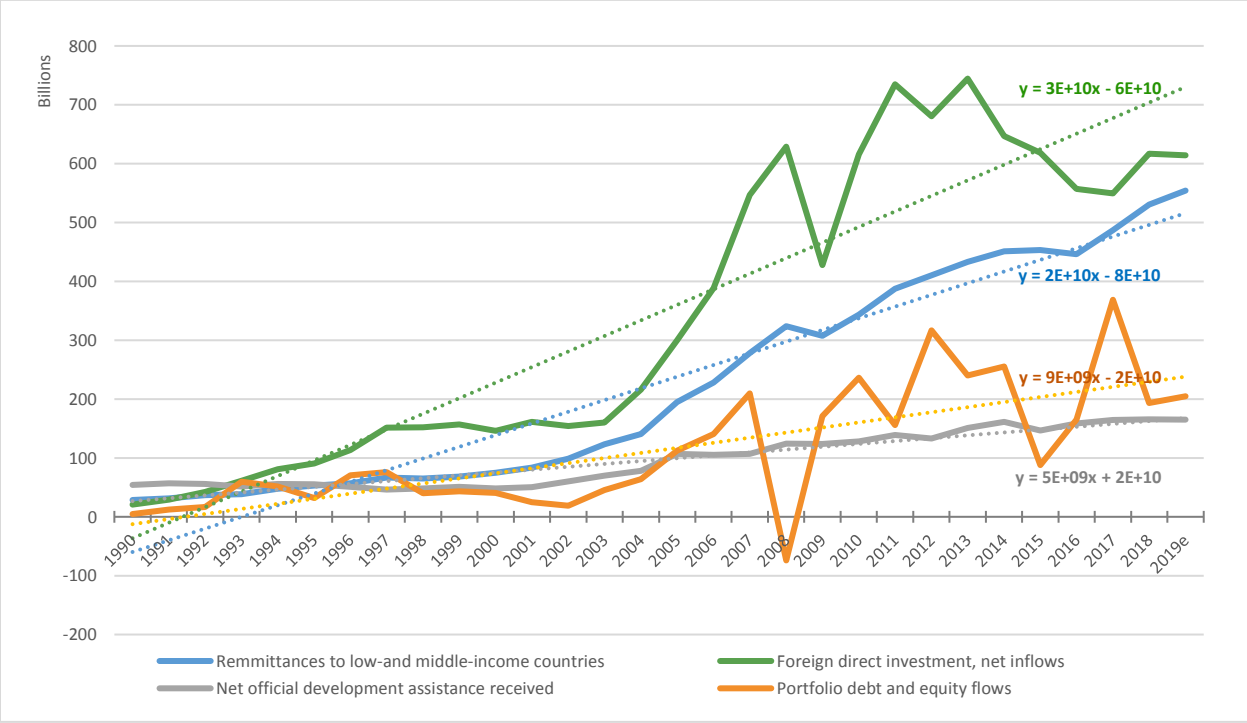
1. Introduction

For many economies, remittances are a vital inflow of funds that serve to finance current expenditures or constitute starting capital for business development. Their importance has grown significantly over the past 10 years, with remittances to developing economies reaching 529B USD in 2018, up by more than 200B USD since 2009.

Word Bank data shows remittances to be on an increasing trend and very close to overtaking FDIs, as the principal source of capital inflows to low and middle income countries. Furthermore, FDIs have the advantage of historically being relatively stable with a coefficient of variation of 0.79 over the 1990 – 2019 timespan, which ranks slightly higher than that for FDIs (0.73), but significantly lower than that of portfolio investments which are known to be vulnerable to sudden stops and reversals (thus having a higher coefficient of variation of 0.92).

Figure 1 shows the dynamics of remittances compared to other flows of funds. Over the analysis period, remittances are the second fastest growing flow after FDIs, although data from the most recent years suggests that FDI growth is slowing. On the other hand, portfolio investments are unstable over time and are on a less steep growth path than remittances. They are subject to sharp declines during periods of instability or crises. As such, they experienced drops in the early 2000s, 2008 and 2015. At the opposite spectrum is the official development assistance, which is the most stable source of funding, but also the slowest growing and therefore insufficient to meet the financing needs of developing economies.



Source: World Bank and IMF data

Figure 1. Remittance flows to low and middle-income countries – a stable and growing stream of funds

Figure 1 shows different flows of capital to low and middle-income countries in billions of USD, as well as their trend throughout the period spanning from 1990 to 2019. Values for 2019 are estimates based on World Bank data.

In light of the Great Lockdown imposed by the Coronavirus crisis, GDP fell worldwide and unemployment rose. As a consequence of the economy being placed on hold for three months, coupled with isolation measures and a slowdown in trade, the World Bank published a study[1] on the resulting impact on remittances. Initial estimates anticipate a decline of about 20% of remittances worldwide, although the effect is different across regions. Table 1 summarizes the projected effect.

Table 1 depicts the highest anticipated decline for Europe and Central Asia, followed by the Sub-Saharan Africa Region and South Asia, each with a decline of over 22%. The Middle East and North Adrica, as well as Latin America and the Caribbean would register a drop of just under 20% in remittances, while the East Asia and Pacific region would be the least affected, with a projected deline of 13%. The larger decrease in the Europe and Central Asia region come on the backdrop oh higher than average growth rates in 2019 of 6%, with Ukraine being the largest recepient of remmitances in the region.

Region	Growth rate of remittances (%)
Europe and Central Asia	-27.5
Sub-Saharan Africa	-23.1
South Asia	-22.1
Middle East and North Africa	-19.6
Latin America and the Caribbean	-19.3
East Asia and the Pacific	-13.0
World Average	-19.9

Source: World Bank, Knomad

Table 1. Projections for the decline in remittances following the Great Lockdown

To mitigate the negative impact on remittances, a joint initiative[2] between the UK government and the Federal Council of the Swiss governments, as well as multiple international organizations (the World Bank, UNCDF, UNDP and the Asian Development Bank, among others) was initiated to promote remittances as an essential service, reduce transaction costs, improve coverage and facilitate the regulatory framework for service providers.

To better study the extent to which the reduction in remittances has the potential of affecting the financial sector, as well as the economy more generally, this paper proposes a remittance stress test in the form of a scenario that investigates the effect of a shock to liquidity from the decline of remittances, utilizing a liquid asset ratio constructed for the purposes of this paper.

2. Remittance stress test methodology

2.1. Stress test structure and transmission channels

The remittance stress test is constructed by taking in three inputs: liquid assets, total assets and remittance inflows. The liquid asset ratio is compiled by dividing liquid assets to total assets:

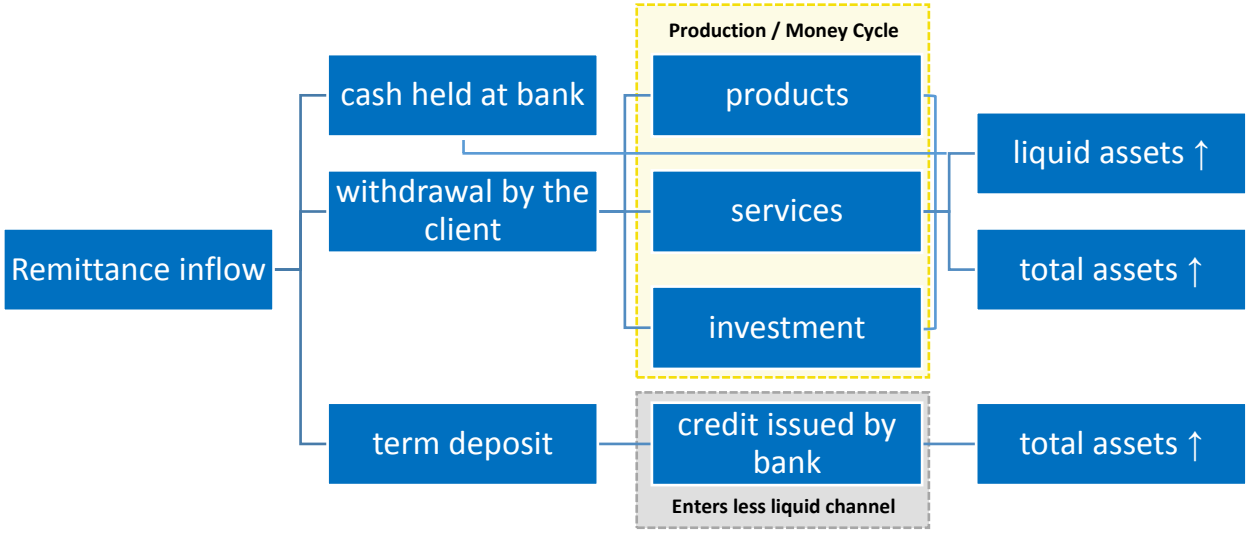
[1] The study is accessible online and contains the reasoning used by the World Bank to produce its forecast, as well as the methodology used to produce remittance projections; https://www.knomad.org/sites/default/files/2020-06/R8_Migration%26Remittances_brief32.pdf

[2] The initiative call is accessible online and contains details regarding its objectives and the planned actions that signatory countries aim to perform; https://www.knomad.org/covid-19-remittances-call-to-action/

$$Liquid\ Asset\ Ratio = \frac{Liquid\ Assets}{Total\ Assets} \quad (1)$$

The next step is to construct the remittance shock on assets. After being transferred, the funds sent as remittances pass through the following channels, graphically depicted in Figure 2:

1) liquidity held by the bank for the client's current account
2) after withdrawal by the client, the money is spent on products, services or as investment and, thus, enters the production circuit – which, in time, contributes to an increase of the liquid assets of the bank since the money will continue to be spent / parked and/or deposited in banks
3) term deposits which could be slower to enter the production cycle and therefore result in an increase of assets of lower liquidity



Source: author

Figure 2. Remittance stress test mechanism

As such, a β_{LIQ} share of remittances will enter the bank's balance sheet as liquid assets, with the rest of the amount $1 - \beta_{LIQ}$ entering as less liquid assets. To this effect, one must calibrate or make assumptions about the coefficient β_{LIQ}.

2.2. Remittances and liquid assets: a review of the literature

To investigate possible values for β_{LIQ}, it is worthwhile to look at the literature on the impact of remittances on deposits. Aggarwal et al. (2006) use a simple linear regression model, followed by a GMM to estimate the impact of remittances on bank deposits, controlling for other factors that potentially affect bank deposits such as GDP, inflation, the exchange rate, exports, financial liberalization and others. In their paper, in the baseline model they find that increasing the remittance to GDP ratio by 1 induces an increase of the deposit to GDP ratio of roughly 0.5 - 0.6. When correcting for the potential impact of increased remittances due to declining costs in the face of increased competition and availability of financial transfer services by including time dummies, the coefficient of the impact of remittances on deposits drops to 0.2. The GMM presents a coefficient of remittances to deposits of 0.4 - 0.5, however using lags as instruments for the variables similarly reduces the impact from 0.4 to 0.19. Given that the study does not dissociate between short-term deposits, which, if taken into consideration, would further

increase the amount of remittances passing through as liquid assets, it is safe to assume that the coefficient β_{LIQ} appropriate for the purposes of this stress test should be above 0.8 (given that $1 - \beta_{LIQ} < 0.2$).

According to Gunatilleke (1992) who performs a study on seven Asian countries, at most the unspent part of remittances held by receivers of funds constitutes one fifth of the funds received. The author, however, stresses that the remainder is held in deposits of varying liquidity and usually for shorter-term purposes or relatively rapid investment. This also suggests that the coefficient β_{LIQ} should be above 0.8, but perhaps much larger than that if only a very small proportion of the received funds goes into term deposits.

Cooray (2010) studies the positive impact of remittances on liquid assets in a regression including Liquid Assets / GDP as one of multiple independent variables. Barajas et al. (2016) mention another mechanism through which remittances generate an increase in liquid assets, especially in developing economies. In their paper, they speak about the fact that the liability increase resulting from the inflow of remittances does not translate into a one-for-one increase in private sector credit, and that the banks therefore retain a portion of the deposits opened with them by clients that do not wish to immediately withdraw (and spend / invest) the received funds. The effect is that banks will hold larger shares of liquid assets.

Given the nature of remittance flows to developing economies which are the focus of the World Bank's projections and call for action, and given that the literature suggests that the vast majority of remittances pass through into liquid assets, from the banking sector's perspective, this paper will assume a β_{LIQ} of 1, whereby the entirety of remittances pass-through into liquid assets. This assumption can be relaxed for more advanced economies, but for the purposes of having an equal shock applied to all the countries in the study, a unique value is retained.

2.3. Applying the shock

The third step is to apply the shock to the Liquid Asset Ratio. This is done by integrating the decrease in remittances into the Liquid Asset Ratio formula:

$$Liquid\ Asset\ Ratio = \frac{Liquid\ Assets - \beta_{LIQ} * \beta_{SHK} * Remittances}{Total\ Assets - \beta_{SHK} * Remittances} \quad (2)$$

Here, β_{LIQ} is the coefficient of pass-through of remittances to liquid assets, β_{SHK} is the size of the shock to remittances.

The retained value for $\beta_{SHK} = 0.2$, given the projected decrease in remittances of 20%, as calculated by the World Bank.

The stress tests should be interpreted as an answer to the following question: what would the Liquid Asset Ratio have been had remittances in the study period (i.e. past year) been β_{SHK} % lower? In this sense, this is a retroactive stress test that uses current asset data and describes what the situation would have been like had remittances been lower and, thus, had the system received less of a liquidity injection.

In this paper, the shock is applied to the cumulative assets of all the banking institutions in the economy, but the same methodology can be used on individual bank data. However, in this case, the stress tester must either:

1. Obtain data on the remittances received by each bank – or –
2. Construct a model that relates the volume of remittances received by each bank to other variables

2.4. Setting a threshold for liquidity risk

In this stress test, a threshold of 20% is introduced to reflect the fact that banking institutions that have less than 20% of assets in a liquid form are more prone to liquidity shortfalls and could, potentially, face difficulties in the event of a liquidity crisis (i.e. economic crisis followed by deposit withdrawals, a bank run, etc.). Of course, the 20% threshold is best used on individual bank data. This is because on an aggregate level, lower and higher performing banks in terms of liquidity even out, while at the individual level, significant disparities may exist. A supplementary buffer at 25% could be used as an early warning indicator to reflect increasing risk in the banking sector, as banks or banking sectors falling in the [20% ; 25%] interval following the decline in remittances could risk a further worsening of their liquidity position in case of a supplementary shock to remittances or to liquid assets.

3. Data

3.1 Data sources

This study uses data from the IMF and World Bank for 112 countries around the world. The constructed cross-sectional dataset, combines the following data sources:

Indicator	Unit	Source	Comments
Core			
Liquid Assets	Domestic Currency	IMF, Financial Soundness Indicators Database	
Total Assets	Domestic Currency	IMF, Financial Soundness Indicators Database	
Remittances	USD	World Bank, Knomad	
Helper			
Exchange rate	Domestic Currency Units per USD	World Bank, World Development Indicators	Used to convert indicators into a comparable base
GDP*	Domestic Currency	IMF, International Financial Statistics Database	Used to study whether size effects exist

** GDP data reporting varies widely among countries in terms of periodicity of reporting and latest available data. As such, for the vast majority of countries, the latest available data is for 2018 at the time of writing this paper, however for some countries data for 2019 already exists, whereas for others, only data for 2017 is available.*

Table 2. Data sources used as inputs to the stress test

The constructed database is constrained by missing variables for a number of countries that either don't fully report financial soundness indicators or where remittance data is absent. The map presented in Figure 3 below shows in blue those countries for which data is available. Most of the missing data is concentrated in Africa, however in Europe, there are also a number of countries that do not report all of the positions from the Financial Soundness Indicators database needed to produce the stress-test. The same is true for some countries in Asia and Southern America.

Within the database, the Liquid Asset Ratio before the shock is calculated based on the Liquid Assets and Total Assets variables, after converting both of the indicators to USD. This transformation is needed in order to apply the shock to remittances, which are denominated in USD. After subtracting the share of remittances projected to decline, the Liquid Asset Ratio after the shock is obtained, and is subsequently compared with its counterpart from before the shock.

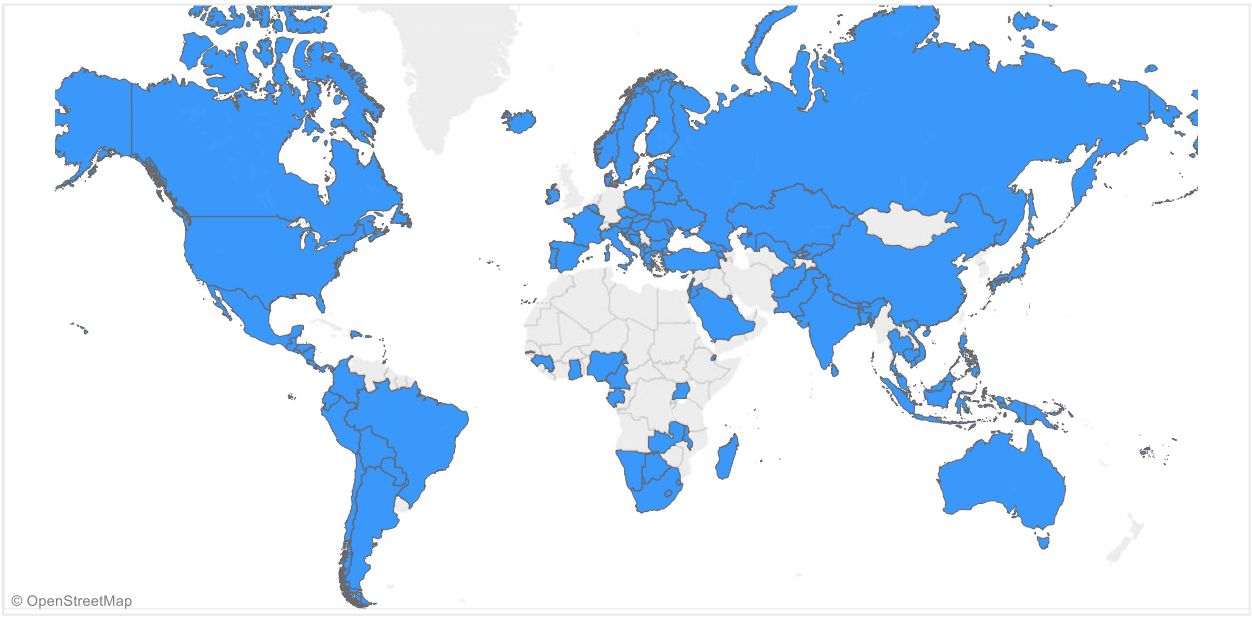


Figure 3. Data availability map

This map shows most countries in Africa to have unavailable data, as well as some countries in Europe, Asia and Latin America. The unavailable data, for the most part, is concentrated in the Financial Soundness Indicators database.

3.2. Remittances, Liquidity and GDP - taking a closer look at the data

Before proceeding with the study, it is worthwhile to check whether there are size effects that should be taken into consideration, as the dataset contains countries with widely varying characteristics. The chart presented in Figure 3, but also the construction of trend lines for each continent separately, as well as one globally, confirm this with the p-value of the coefficient associated with GDP in the regression of GDP on Liquid Assets being, at its lowest, 0.096 for Europe and, at its highest, 0.937 for the group of countries in South America. We, therefore, conclude that size effects play only a minimal role, if any.

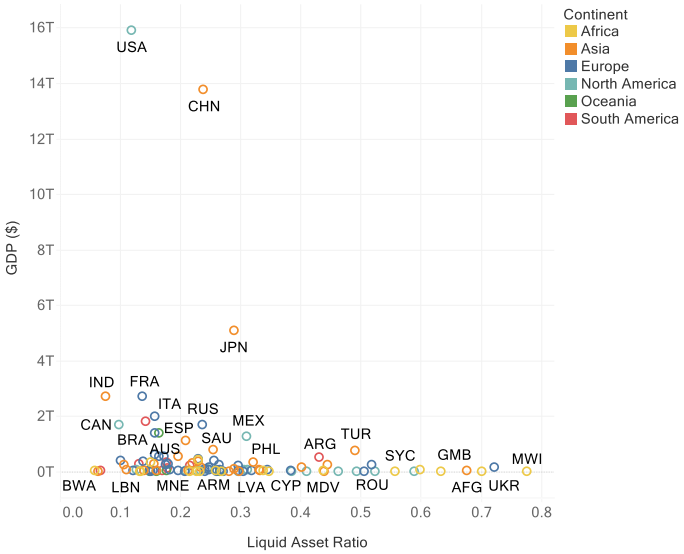
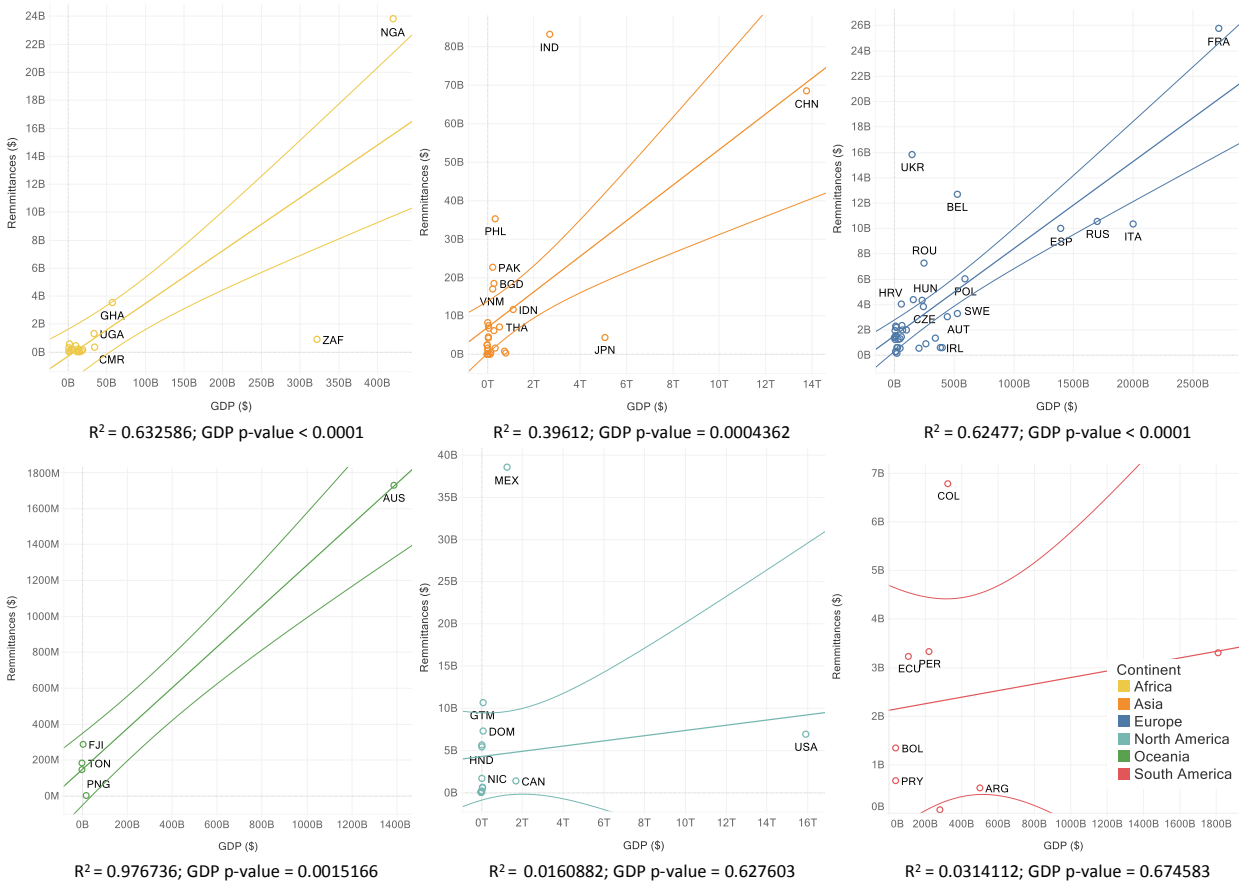


Figure 3. Liquid Asset Ratios uncorrelated with GDP



R^2 = 0.632586; GDP p-value < 0.0001 | R^2 = 0.39612; GDP p-value = 0.0004362 | R^2 = 0.62477; GDP p-value < 0.0001

R^2 = 0.976736; GDP p-value = 0.0015166 | R^2 = 0.0160882; GDP p-value = 0.627603 | R^2 = 0.0314112; GDP p-value = 0.674583

Figure 4. Size does matter for remittances, but not in all regions

Figure 4 shows that there is a significant effect of GDP on remittances, and that this is especially true for Europe, Asia, Oceania and Africa. The effect is less clear for North and South America.

As expected, size does play a role in terms of remittance volumes with Figure 4 showing this effect by region. In the Americas, however, the effect is more diffuse, owing to the smaller number of countries in the sample and the high level of disparity between the outlier countries and the other economies in the region.

4. Stress Test Results

One of the observations that this paper highlights is that advanced economies usually hold less liquid assets owing to the larger size of the economy, deeper financial markets with larger financing needs and a better utilization or absorption rate of financing. As such, most advanced economies have liquid asset ratios below 20%. Conversely, in many developing nations, higher levels of liquid assets are prevalent given the more prudent approach of local banks in their crediting operations or due to the absence of sufficient viable projects.

An analysis of the liquidity situation in the banking sectors of the countries included in the study shows the division between the two groups of countries.

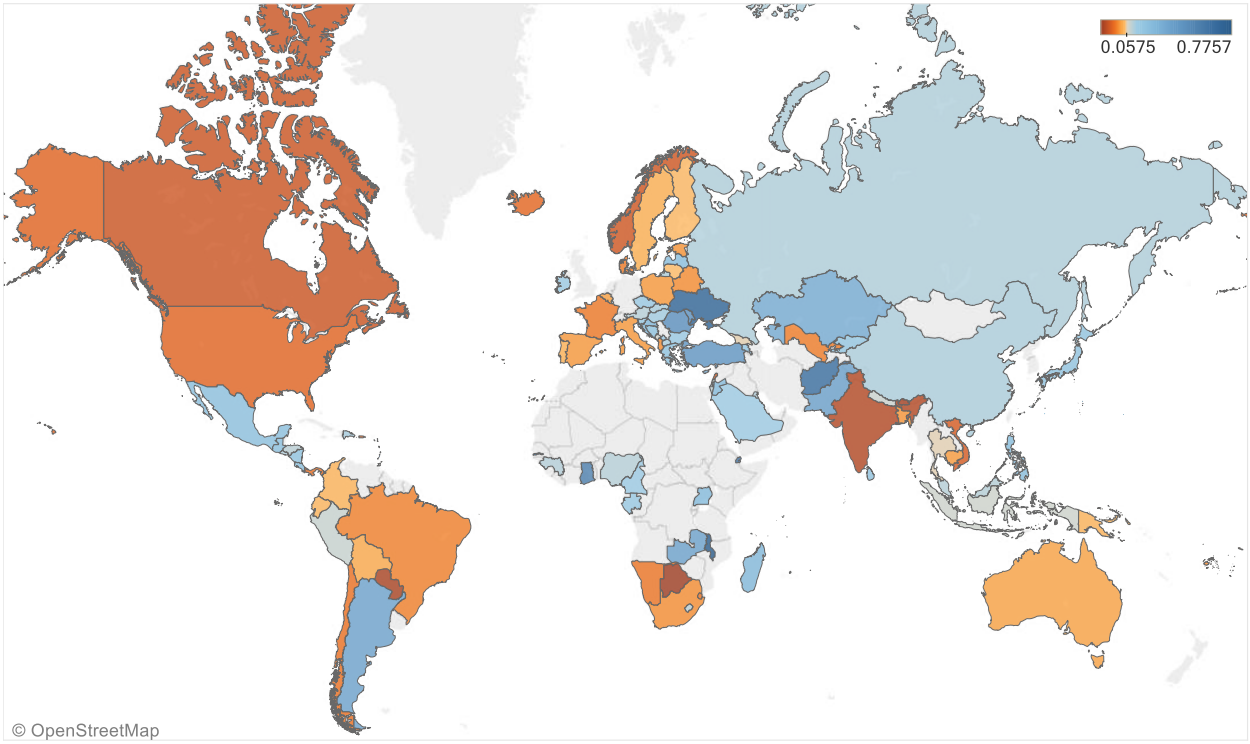


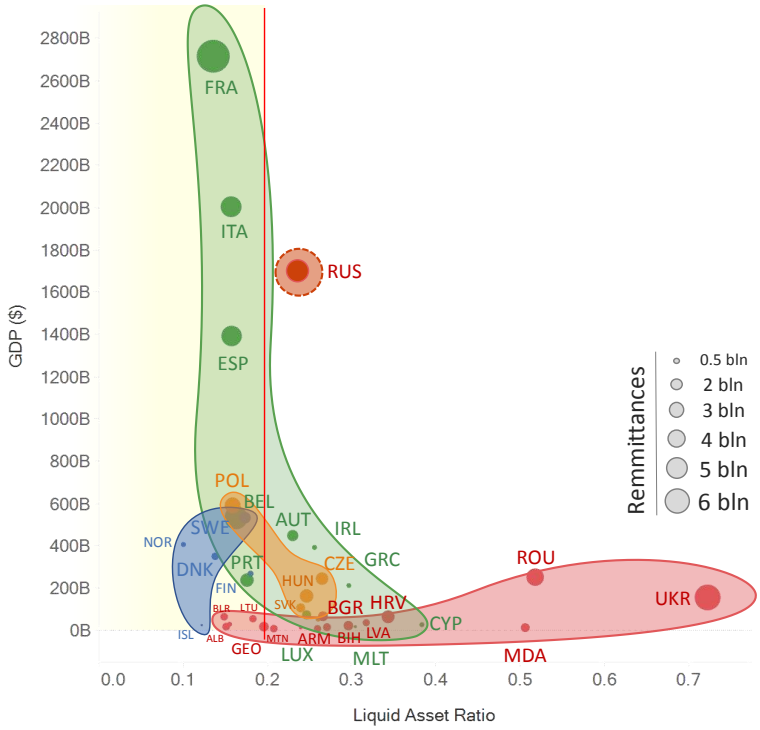
Figure 5. The Liquid Asset Ratio prior to applying the shock

Figure 5 depicts the ratio of Liquid Assets to Total Assets for the banking sectors of countries at the end of 2019. For some countries that have not yet reported the most recent data, this may correspond to the ratio at the end of 2018. Countries with a ratio above 20 are depicted in blue, with darker blue indicating a larger share of liquid assets to total assets. Countries with a ratio below 20 are shown in orange, with a darker orange indicating a lower liquid asset ratio.

In Figure 5, the divide between countries with different liquidity stances becomes apparent. The disparity is, in part, explained by the development level of the economies and their financial systems, however other factors may also be at play. In particular, one can notice that China and India, which are both rapidly developing economies, have different liquidity situations. This may be due to the structure of the banking sector in terms if the number of banks operating in the market, but may also have to do with the risk-taking strategy of the financial sector whereby in India the tolerance for risk and therefore the number of financed projects would be higher.

The split between high liquidity and low liquidity countries is also visible in Europe where the divide occurs along a geographic dimension. Here, we notice Western European economies predominantly with lower levels of liquid assets, whereas their Eastern counterparts tend to have higher liquid asset ratios. Figure 6 points towards this phenomenon being explained by the developmental reasoning presented above, and therefore highlights the hypothesis of absence of viable projects. However, factors such as preference for liquidity may reflect a more prudent stance of the banking sector which is confronted with a lower regulatory intervention power of the State and/or Central Bank in the developing nations of the East, in

contrast with the vaster resources and unified framework present in Western nations, where the regulator can do more to stimulate the financial sector in the event of crises.



Eastern Europe	
Ukraine	72.28%
Romania	51.85%
Moldova, Rep. of	50.64%
Croatia, Rep. Of	34.43%
Latvia	31.82%
Bosnia and Herzeg	29.64%
Armenia, Rep. Of	27.07%
Bulgaria	26.60%
Kosovo, Rep. Of	26.05%
North Macedonia	24.02%
Russian Federation	23.63%
Montenegro	20.79%
Georgia	19.63%
Lithuania	18.30%
Estonia, Rep. Of	15.47%
Albania	15.10%
Belarus, Rep. Of	14.97%

Central Europe	
Czech Rep.	26.44%
Slovenia, Rep.	25.95%
Hungary	24.75%
Slovak Rep.	24.02%
Poland, Rep.	15.81%

Western Europe	
Cyprus	38.38%
Malta	30.44%
Greece	29.62%
Ireland	25.64%
Luxembourg	24.73%
Austria	23.01%
Portugal	17.58%
Belgium	16.39%
Spain	15.78%
Italy	15.74%
France	13.66%

Northern Europe	
Finland	18.02%
Sweden	17.34%
Denmark	13.85%
Iceland	12.20%
Norway	10.03%

Figure 6. A clash of two worlds in terms of liquidity

Figure 6 shows the diverging trends in Western vs. Eastern Europe in terms of liquid asset holdings by the banking sector. The liquid asset ratio is presented on the horizontal axis, whereas GDP is shown on the vertical axis. Remittance data appears as circles with varying sizes, where larger circles represent countries with higher remittance inflows. Furthermore, countries are grouped according to their geographic positioning. The proposed 20% regulatory threshold of increased liquidity risk is shown as a vertical line. Liquid Asset Ratios are detailed in tables on the right of the figure for the countries included in the graph. Remittances and GDP data are presented in Bln. USD.

Figure 6 shows Eastern European economies to be in a high-liquidity low-GDP situation, whereas the inverse is true for Western nations. A notable exception is Russia, which, given its size manifests more of the characteristics of Western economies. Similarly, Northern states are more similar to Western nations and Central economies tend to look similar to Eastern European countries, but the variation between these two regions is on a much smaller scale.

Applying the remittance shock produces the highest impact on countries where remittances as a share of total assets are greatest. As a consequence of applying the shock, the liquid asset ratio for seven countries drops below the 20% threshold: 1 in Europe, 2 in Asia, 2 in North America, 1 in Africa and 1 in Oceania. The top ten countries in terms of the size of the impact on the liquid asset ratio are also amongst the smallest, with underdeveloped financial markets and a small share of national GDP to world GDP. Figure 7 summarizes this finding and presents the liquid asset ratios before and after the shock, as well as the impact on the ratio for these economies.

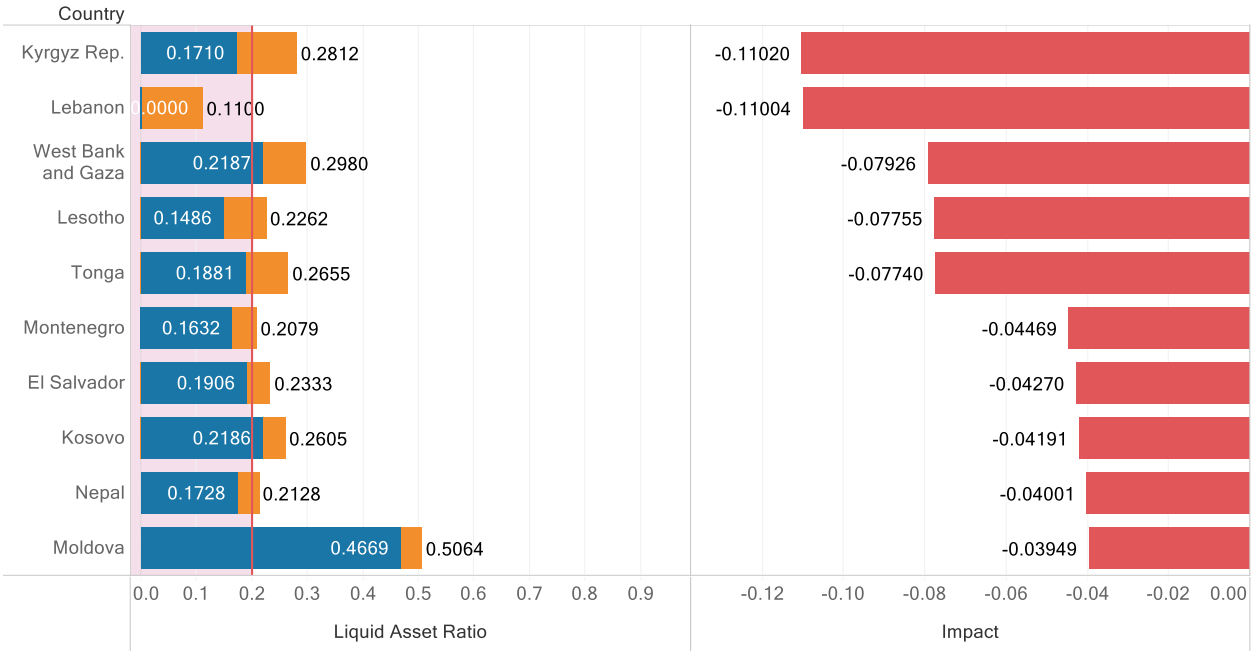


Figure 7. Top 10 most impacted countries by a shock to remittances

Figure 7 presents the 10 countries with the highest impact of a 20% shock to remittances on the liquid asset ratio. On the left-hand side, the before and after liquid asset ratios are presented. On the right-hand side, the figure shows the impact. As a result of the shock, six of the ten countries shown in the graph would see their liquid asset ratio drop to levels under the 20% threshold (depicted as a red vertical line), which would be indicative of increasing liquidity risk in the banking sector.

The complete impact analysis is presented for all countries included in the sample in Annex 1, where countries are grouped by region and sorted according to the size of their liquid asset ratios.

Annex 2 shows the impact on the liquid asset ratio on a map to facilitate viewing the data for the large number of countries included in the study.

Conclusion

This paper developed a simple, but versatile methodology for stress testing the impact of a shock on remittances. The retained scenario for the analysis utilized projections published by the World Bank, whereby remittances were estimated to drop by around 20%. Indeed, the stress test showed that developing economies would be the most impacted by a reduction in the volume of remittances and would experience a weakening of the soundness of their banking sectors. Five out of the ten most impacted countries would experience a decline of their liquid asset ratios of above seven percentage points, and in six of the ten cases the ratio would drop below the proposed 20% risk threshold. A natural conclusion is that remittances continue to play a vital role for the stability of multiple emerging economies and a reduction in this historically stable flow of funds would undermine development efforts worldwide.

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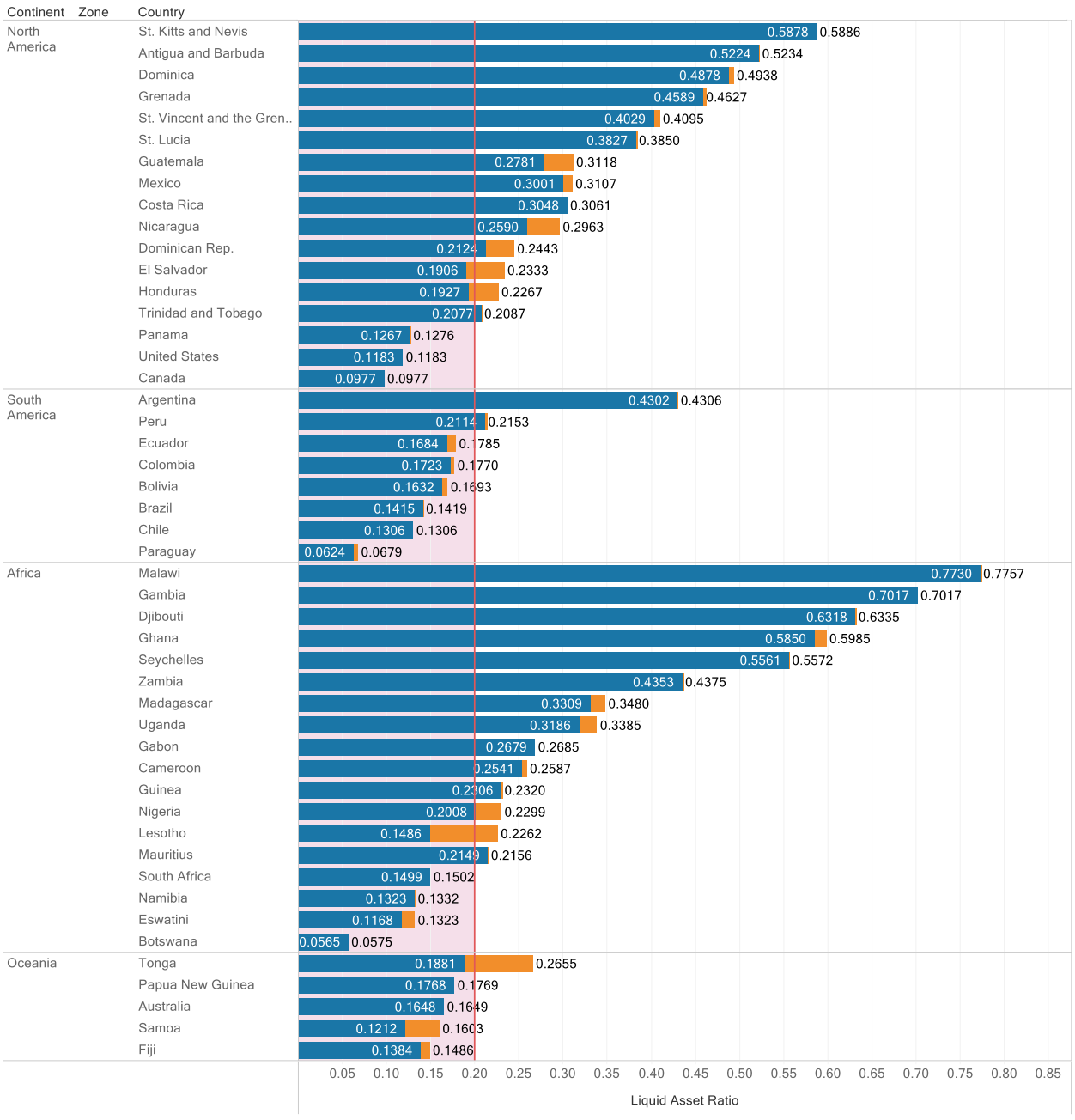
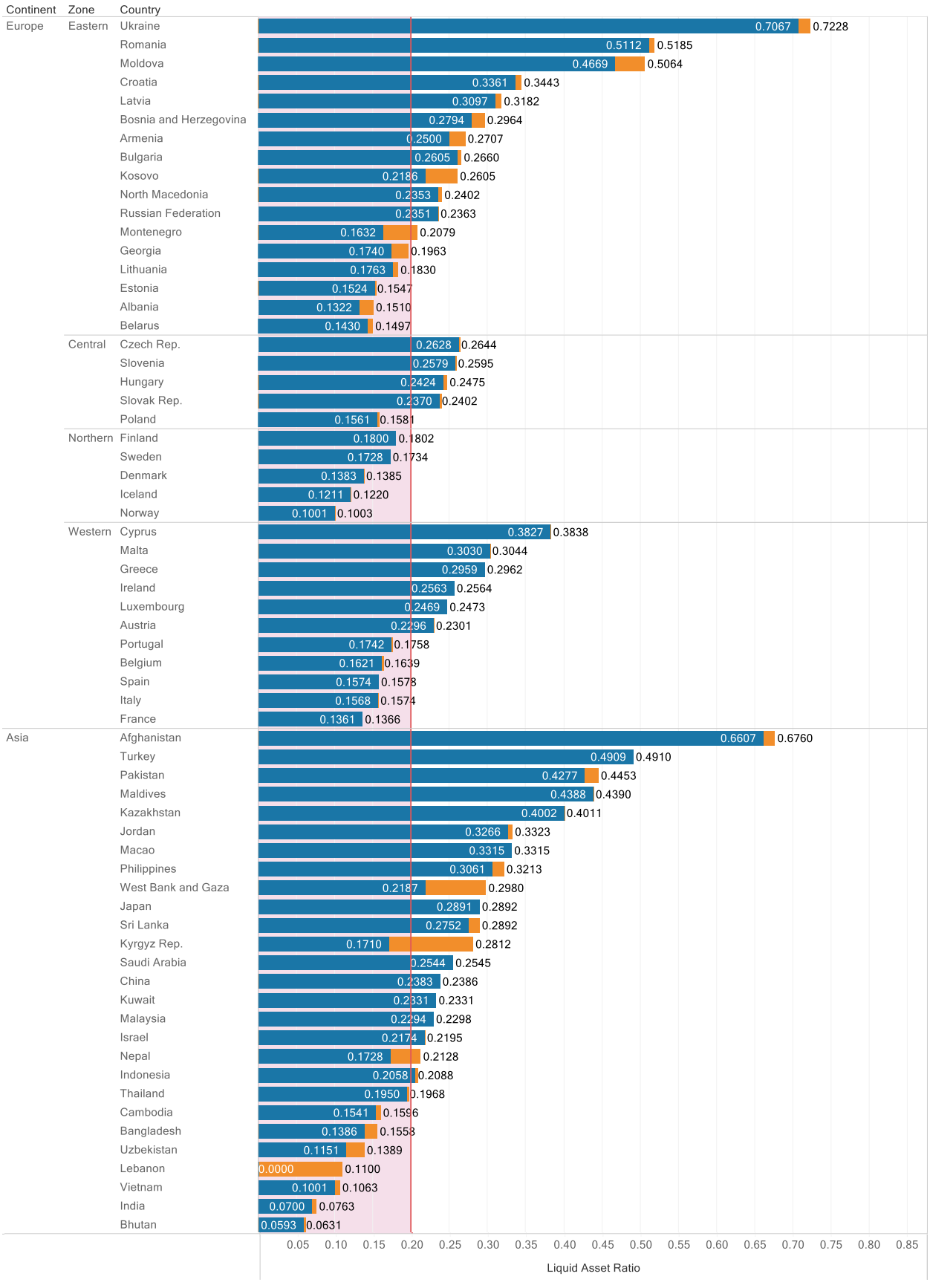
Annex 1

Remittance Stress Test Results for the World

This appendix shows the impact of a 20% drop in remittances on the Liquid Asset Ratio of the banking systems of 112 countries. The orange bar shows the ratio before applying the shock and the blue bar – thereafter. The orange portion of each bar corresponds to the decline in the liquid asset ratio. The vertical red line is the proposed 20% threshold under which banks could be more exposed to liquidity risks.




Continent
Zone
Country
Europe
Eastern
Ukraine 0.7067 0.7228
Romania 0.5112 0.5185
Moldova 0.4669 0.5064
Croatia 0.3361 0.3443
Latvia 0.3097 0.3182
Bosnia and Herzegovina 0.2794 0.2964
Armenia 0.2500 0.2707
Bulgaria 0.2605 0.2660
Kosovo 0.2186 0.2605
North Macedonia 0.2353 0.2402
Russian Federation 0.2351 0.2363
Montenegro 0.1632 0.2079
Georgia 0.1740 0.1963
Lithuania 0.1763 0.1830
Estonia 0.1524 0.1547
Albania 0.1322 0.1510
Belarus 0.1430 0.1497
Central
Czech Rep. 0.2628 0.2644
Slovenia 0.2579 0.2595
Hungary 0.2424 0.2475
Slovak Rep. 0.2370 0.2402
Poland 0.1561 0.1581
Northern
Finland 0.1800 0.1802
Sweden 0.1728 0.1734
Denmark 0.1383 0.1385
Iceland 0.1211 0.1220
Norway 0.1001 0.1003
Western
Cyprus 0.3827 0.3838
Malta 0.3030 0.3044
Greece 0.2959 0.2962
Ireland 0.2563 0.2564
Luxembourg 0.2469 0.2473
Austria 0.2296 0.2301
Portugal 0.1742 0.1758
Belgium 0.1621 0.1639
Spain 0.1574 0.1578
Italy 0.1568 0.1574
France 0.1361 0.1366
Asia
Afghanistan 0.6607 0.6760
Turkey 0.4909 0.4910
Pakistan 0.4277 0.4453
Maldives 0.4388 0.4390
Kazakhstan 0.4002 0.4011
Jordan 0.3266 0.3323
Macao 0.3315 0.3315
Philippines 0.3061 0.3213
West Bank and Gaza 0.2187 0.2980
Japan 0.2891 0.2892
Sri Lanka 0.2752 0.2892
Kyrgyz Rep. 0.1710 0.2812
Saudi Arabia 0.2544 0.2545
China 0.2383 0.2386
Kuwait 0.2331 0.2331
Malaysia 0.2294 0.2298
Israel 0.2174 0.2195
Nepal 0.1728 0.2128
Indonesia 0.2058 0.2088
Thailand 0.1950 0.1968
Cambodia 0.1541 0.1596
Bangladesh 0.1386 0.1558
Uzbekistan 0.1151 0.1389
Lebanon 0.0000 0.1100
Vietnam 0.1001 0.1063
India 0.0700 0.0763
Bhutan 0.0593 0.0631
0.05 0.10 0.15 0.20 0.25 0.30 0.35 0.40 0.45 0.50 0.55 0.60 0.65 0.70 0.75 0.80 0.85
Liquid Asset Ratio

Annex 2

Impact of a Remittance Shock on the Liquid Asset Ratio

This appendix shows the impact of a 20% drop in remittances on the Liquid Asset Ratio of the banking systems of 112 countries. Color represents the force of the impact with a darker red signifying a stronger impact. The size of the drop of the liquid asset ratio varies between 0 and 11.02 percentage points.