

# Forecasting migrant remittances during the global financial crisis

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## Abstract

The financial crisis has highlighted the need for forecasts of remittance flows in many developing countries where these flows have proved to be a lifeline to the poor people and the economy. This note describes a simple methodology for forecasting country-level remittance flows in a manner consistent with the medium-term outlook for the global economy. Remittances are assumed to depend on bilateral migration stocks and income levels in the host country and the origin country. Changes in remittance costs, shifts in remittance channels, global exchange rate movements and unpredictable immigration controls in the migrant-destination countries pose risks to the forecasts. Much remains to be done to improve the forecast methodology, data on bilateral flows, and high-frequency monitoring of migration and remittance flows.

**Keywords:** Financial crisis, remittances, migration, forecasting.

## Introduction

The global financial crisis which started in August 2008 with the collapse of Lehman Brothers led to concerns among policymakers that it would result in precipitous declines in external resource flows to developing countries, which could adversely impact the sustained economic growth and reduction in poverty during the previous decade (World Bank 2009).<sup>1</sup> Given the size and increasing importance of migrant remittances for developing countries, which had reached more than \$330 billion in 2008 (see next section), there were similar concerns that a decline in remittances would affect the poorest countries and households that were heavily dependent on remittances. Policymakers needed forward-looking analysis of the impact of the global economic crisis on remittance flows to developing countries.

Migrant remittances have usually been counter-cyclical with respect to downturns and crises in origin countries (see discussion below). However, unlike past emerging market crises that had started in emerging markets—Mexico in 1994-95, East Asia in 1997-98—the current crisis started in the rich countries and spread to developing countries (Ratha et al. 2008). Although a number of studies have documented the importance of both host and home country factors in determining remittance flows (see section 3), it was not clear *a priori* how remittances would behave in response to a deep economic downturn in the host countries. To our knowledge, there had been no previous models for forecasting remittances, a necessary tool for analyzing the impact of the global financial crisis on remittance flows.

This note describes a first attempt to develop a methodology to forecast remittances. It exploits an existing bilateral remittance matrix for over 200 countries developed by Ratha and Shaw (2007) to generate country level forecasts. The

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<sup>1</sup> The World Bank's Global Development Finance 2009 report estimated that net private capital inflows to developing countries fell to \$707 billion in 2008 (from a peak of \$1.2 trillion in 2007) and were expected to fall by further by 50 per cent by end of 2009 (World Bank 2009).



framework allows the forecasts of remittances to be consistently linked to the forecasts of global economic growth.

The next section provides a brief discussion about the rising importance of remittances for developing countries and the need for forecasting remittances. Section 3 discusses the available evidence on the determinants of remittance flows, and the extent to which these explanatory variables can be used for forecasting future remittances. Section 4 describes the World Bank's methodology for forecasting remittances. Section 5 discusses the results of the forecasts, outlines some of the caveats that need to be considered when using this methodology, and concludes with recommendations for improving the quality of forecasts.

### **Rising importance of migrant remittances for developing countries and need for forecasting remittances**

Recorded migrant remittances to developing countries are estimated to have reached 316 billion dollars in 2009. These constitute 2 % of GDP for developing countries and nearly 6% of GDP for the group of low income countries (LICs); in several countries, these flows are more than a quarter of GDP (Ratha et al. 2010b). In many countries these flows exceed foreign direct investment, portfolio equity, and debt flows, and in some countries official aid. Remittances have been remarkably stable compared to other types of flows, contribute to stabilizing the current account position, and reduce the volatility of capital flows and output volatility of recipient countries (World Bank 2005; Ratha 2005 and 2007; Bugamelli and Paterno, 2009; Chami et al. 2009; Gupta et al. 2009). Their size and stable and counter-cyclical nature has implications for improving debt sustainability and creditworthiness of developing countries, and their access to international capital markets (Avendano et al. 2009, Ratha 2007; Ratha et al. 2010a). Remittance receipts are associated with reduction in poverty, increased household resources devoted to investment, improved health and education outcomes, and higher levels of entrepreneurship.<sup>2</sup> Remittances can also improve recipient households' access to formal financial services (Giuliano and Ruiz-Arranz 2009; Gupta et al. 2009). The growing importance of remittances for developing countries implies that there is a need to evaluate the sustainability of remittances (whether remittance flows would continue at their current or higher levels) in the short term and in medium term.

### **Determinants of remittances**

Remittance flows are broadly affected by three factors: the migrant stocks in different destination countries, incomes of migrants in the different migrant-destination countries, and to some extent incomes in the migrant-sending country. The size of emigrant stocks is arguably the most important determinant of remittances (Ratha and Shaw 2007; Freund and Spatafora 2008; Lueth and Ruiz-Arranz 2008; Singh et al. 2009).

The income level of the migrant and the needs of the family at home play an equally important role in influencing both the level and changes in remittances. Several studies have documented that that remittance respond positively to an increase

<sup>2</sup> There is a large literature on the development implications of remittances (see, for example, Adams and Page 2005; Hildebrandt and McKenzie 2005; Fajnzylber and Lopez 2007; Valero-Gil 2009; Amuedo-Dorantes et al. 2010).

in the host country GDP (Glytsos 1997, Silva and Huang 2006; Frankel 2009; Ruiz and Vargas-Silva 2010), and in a negative or counter-cyclical manner during economic downturns, financial crises and natural disasters in the migrant-sending country (Clarke and Wallsten 2004; World Bank 2005; Yang and Choi 2007; Yang 2008; Frankel 2009; Mohapatra et al. 2009; Ratha 2010).<sup>3</sup> In terms of the relative importance of home and host country factors, several studies have found that the host country economic conditions appears to be more important compared to home country factors (Swamy 1981; Glytsos 1997; Silva and Huang 2006; Barajas et al. 2010).

Other factors such as remittance costs and migrants' vintage also play a role in influencing remittance flows. In a survey of Tongan migrants in New Zealand, Gibson and colleagues (2006) find that remittances sent would rise by 0.22 percent if costs fell by 1 percent. Other studies have found that remittances are influenced by interest rate differentials, exchange rate premia (the difference between the official and black market exchange rates), and the duration of migration (Glytsos 1997; El-Sakka and McNabb 1999). Freund and Spatafora (2008) report that recorded remittances depend negatively on transfer costs and the parallel market premium, as migrants may prefer to send money through informal channels when transfer costs are high or when the official exchange rate is unattractive. Some authors argue that the skill composition of migrants matter for remittances, but the evidence of this phenomenon is mixed. While Niimi and Ozden (2006), Faini (2007) and Adams (2009) using cross-country data find that countries that have a larger proportion of high-skilled migrants receive less remittances—perhaps because these migrants are also more likely to settle in the host countries and reunite with their families—studies based on micro-level survey data find the opposite result. Bollard, et al. (2009) using survey data in 11 OECD destination countries find a positive relationship between education levels of migrants and the amounts remitted. Clemens (2009) finds that Nigerian migrant doctors in the United States sent more than \$5,000 a year in remittances.

### **A simple model for forecasting remittances**

While remittances are influenced by all of the above factors, their use in a forecasting exercise is constrained by the lack of reliable forecasts of the future evolution of these explanatory variables. The data on remittance costs are not easy to model, although we know that remittance costs are falling and causing remittance flows to increase. The migrants' vintage, or the number of years lived in the destination country, is also a plausible determinant of remittance flows to the origin countries (Merkle and Zimmermann 1992; Glytsos 1997). New migrants may send more remittances as a percentage of their income, since they have better ties back home. However, there is anecdotal evidence that new migrants often have financial obligations (such as repaying loans incurred while migrating) and therefore unlikely to send remittances immediately after arrival in the host country.<sup>4</sup> Modeling the evolu-

<sup>3</sup> Lueth and Ruiz-Arranz (2008) however report that bilateral remittances respond positively to increases in both host and home country GDP. Some other studies have found that remittances are strongly counter-cyclical in poorer countries such as India and Bangladesh, but pro-cyclical in middle-income countries such as Jordan and Morocco (Sayan 2006, World Bank 2005).

<sup>4</sup> In some of the simulations, we try to capture the vintage effect examining a low case scenario where recent migrant inflows of the last one or two years are forced to go back as the economic crisis deepens in the major destination countries, an unlikely but high-impact scenario.

tion of variables such interest rate differentials, official and parallel market exchange rates and other variables over the medium term is fraught with similar difficulties.

The model-based remittances therefore rely primarily on the latest available information on bilateral migrant stocks (Ratha and Shaw 2007, World Bank 2010a) and the World Bank and IMF's medium term projections of nominal incomes in the host countries and in the home country.<sup>5</sup> Changes in exchange rates are captured to some extent since projections of nominal GDP factor in plausible assumptions about the evolution of nominal exchange rates.

The forecasts for remittance flows are based on stocks of migrants in different destination countries, incomes in the host country which can influence remittances sent by these migrants, and to some extent incomes in the origin country. Therefore, remittances received by country *i* from country *j* can be expressed as

$$R_{ij} = f(M_{ij}, Y_i, Y_j)$$

where  $M_{ij}$  is the stock of migrants from country *i* in country *j*,  $Y_j$  is the nominal per capita income of the migrant-destination country, and  $Y_i$  is the per capita income of the remittance-receiving country. The bilateral remittance estimates are calculated using the methodology described in Ratha and Shaw (2007) based on migrant stocks in different destination countries, incomes of migrants in the different destination countries, and incomes in the source country (see Annex I). We assume that migrant stocks will remain unchanged. This is not an unreasonable assumption in the short term. We prepare the forecasts for remittance flows by examining the effects of income changes in destination countries worldwide.

206

Remittance intensities ( $I_{ij}$ ) were calculated as the ratio of remittance outflow from country *j* to migrant-origin country *i* ( $R_{ij}$ ) to the nominal GDP of remittance-source country *j* ( $Y_j$ ):

$$I_{ij} = R_{ij}/Y_j = (R_{ij}/R_j) * (R_j/Y_j) = r_{ij} I_j$$

where  $I_j$  is the share of remittance outflows  $R_j$  to the GDP  $Y_j$  of country *j*,  $r_{ij}$ , the share of country *j*'s remittance outflows received by country *i*, was calculated using the bilateral remittance matrix of Ratha and Shaw (2007).

Two approaches were followed to forecast remittances for country *i*. The first assumes that remittances from remittance source country *j* to a migrant-origin country *i* grow at the same rate as migrant incomes in the host country. The second approach recognizes that remittances may grow faster (or slower) than the incomes in the destination country.

**(a) Remittance matrix based approach**

The first approach assumes that remittances grow (or decline) at the same rate as migrant incomes in the host country. Remittance outflows from country *j* were forecasted using estimated remittance intensities ( $I_{ij}$ ) and the projections of nominal gross domestic product for each source country *j* ( $Y_j$ ) from the World Bank's global macroeconomic forecasts.

<sup>5</sup> The World Bank's projections up until April 2010 have used the bilateral migration matrix of Ratha and Shaw (2007). This is an updated version of the bilateral migration matrix developed by Parsons and colleagues (2005, 2007).

$$\hat{R}_j^{t+1} = I_j \hat{Y}_j^{t+1}$$

The forecasts for remittance inflows for country  $i$  were calculated by adding up the share of remittances to country  $i$  in the remittance outflows from country  $j$  ( $r_{ij}$ ) for all remittance-source countries.

$$\hat{R}_i^{t+1} = \sum_j r_{ij} R_j^{t+1}$$

### (b) Elasticity-based approach

An elasticity-based approach recognizes that the remittances may grow faster than incomes in the host country, i.e. the elasticity of remittances with respect to the host country may be greater than 1 (Ratha et al. 2010a). For example, during the pre-crisis period, remittances grew faster than GDP of remittance-source countries because of a number of factors, including improvements in remittance technologies, falling costs, and steady increase in migrant stocks. The World Bank has used elasticity-based estimates in its most recent projections. Some recent studies have used similar elasticity-based estimates for estimating remittance flows to specific regions that have gaps in official data on remittances.<sup>6</sup>

Consistent with the view that remittances would grow at a lower, more “sustainable” rate, in the post-crisis period (2010 and beyond), the elasticity of remittances ( $R$ ) with respect to migrant incomes ( $MY$ ) is assumed to be half of the pre-crisis period (2003-08), with an upper bound of 3 and lower bound of 1. These remittance elasticities are used to forecast remittance outflows from each remittance-source country in 2010 and beyond using the latest available forecasts of GDP from the World Bank, using the following formula:

$$\hat{R}_j^{t+1} = R_j^t \left( 1 + \eta_j (I_j) \log \left( MY_j^{t+1} / MY_j^t \right) \right)$$

The forecasts for remittance inflows for country  $i$  were calculated by adding up the share of remittances to country  $i$  in the remittance outflows from country  $j$  ( $r_{ij}$ ) for all remittance-source countries.

$$\hat{R}_i^{t+1} = \sum_j r_{ij} R_j^{t+1}$$

In later versions, the bilateral migration matrix developed by Ratha and Shaw (2007) was updated with immigrant stock data from various sources to provide the most comprehensive estimates of bilateral immigrant stocks worldwide in 2010 (World Bank 2010a).

## Discussion of results

The model has performed well during the global financial crisis. Despite initial concerns of a sharp decline, the actual decline in remittances in 2009 has been similar to our forecasts. The model predicted correctly that remittance flows to developing countries would decline only modestly, unlike foreign direct investment and

<sup>6</sup> In the absence of timely and reliable official data on remittances for most Sub-Saharan African countries, Barajas and colleagues (2010) use the elasticity of remittances to income computed by Singh et al. (2009) and the IMF's GDP estimates to estimate the extent of decline in remittance flows to Sub-Saharan Africa in 2009.

portfolio debt and equity flows. The initial forecasting exercise prepared in November 2008—see Ratha et al. (2008)—predicted that remittance flows to developing countries would fall by 1 percent in 2009 in the base case scenario and no more than 6 percent in a low-case scenario (where the last year's flow of migrants was forced to return). Remittance flows were forecast to decline in five of the six developing regions (other than the East Asia and Pacific region) in the base case scenario. As the financial crisis deepened and the World Bank and the IMF revised down their growth forecasts, the model-generated forecasts of remittances were also revised downward, to 5-8 percent decline in March 2009, and 7-10 percent decline in July 2009 (Ratha and Mohapatra 2009; Ratha et al. 2009a).

The actual outcome in 2009 was a 6 per cent decline in remittance flows to developing countries (Ratha et al. 2009b, 2010a). In terms of regional distribution, remittance flows declined in five of the six developing regions, but the extent of declines in some regions were larger and in others smaller than initially predicted—East Asia & Pacific, Middle East and North Africa, South Asia and Sub-Saharan Africa did better while Europe & Central Asia and Latin America & the Caribbean performed worse. However, as initially predicted, remittances remained more resilient compared to other types of private resource flows to developing countries.

There are several limitations of the forecasting methodology outlined above. First, the model does not explicitly feature return migration, a key risk factor. We do not have data on return migration for most migrant-destination countries. In order to account for the additional vulnerabilities that migrants might face during a downturn, we developed a low-case scenario where we assumed that the stock of migrants in high income countries would decline by the last two years of migrant inflows. (Annual inflows were about 2 per cent of migrant stocks for the US, 4 per cent for Europe and 5 per cent for the Gulf Cooperation Council Countries - see Ratha et al. 2008). Such a scenario could also be a result of some return migration and a disproportionately larger impact of the crisis on migrants' employment and incomes. The actual returns during the crisis have turned out to be smaller (Ratha et al. 2009b). This suggests a need for high-frequency data on new migration flows and return.

Second, the model does not fully capture effects of movement of exchange rates. Exchange rate movements such as between the Euro and the US dollar, and the US dollar and relevant local currency, can affect the value of remittances in US dollar terms, as well as the consumption versus investment motive for sending remittances. Even though remittance flows from the Russian Federation to Central Asian countries such as Kyrgyz Republic, Armenia, and Tajikistan declined by between 15-34 per cent in US dollar terms in the first half of 2009, the decline in terms of the Russian Ruble was much smaller since the Ruble lost a quarter of its value against the US dollar (Ratha et al. 2009b). Similarly, the depreciation of the Indian rupee and the Philippine peso produced a "sale effect" on housing, bank deposits, stocks and other assets back home which made these assets cheaper in foreign currency terms and increased remittances sent for investment motives.

Third, immigration controls and quotas imposed during a crisis are a political decision, and therefore difficult to capture in a mathematical model. The forecasting exercise described above attempts to address this risk by developing a low-case scenario that assumes there might be no new flows or that existing migrants might need to return.

Fourth, the model does not capture the response of remittance flows to falling costs. Remittance costs have been fallen rapidly during the last decade (Ratha 2005; World Bank 2010b). As discussed in a previous section, the elasticity of remittance flows to remittance cost can be high (Gibson et al. 2006 and World Bank 2005). Structural equations that estimate remittances as a function of remittance costs are needed, but it would be difficult to undertake this estimation until the quality of data on flows and costs improve.

Fifth, the model does not capture shifts in remittance flows between formal and informal channels. In the pre-crisis period, remittance flows shifted from informal to formal channels in response to falling remittance costs and intensification of monitoring of informal channels after September 11, 2001. There appears to be a reversal of this trend after the crisis as a weak job market and tightening of immigration controls have resulted in many documented migrants staying on without proper documents and are probably relying on informal channels.

In conclusion, the financial crisis has highlighted the need for forecasts of remittance flows in many developing countries where these flows have proved to be a lifeline to the poor and the policy makers. Yet, much remains to be done to improve the forecast methodology, data on bilateral flows, and high-frequency monitoring of migration and remittance flows.

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### Annex I: Estimating Bilateral Remittances<sup>7</sup>

Credible national data on bilateral remittances are not available. Even when such data are reported, they may not be accurate, because funds channeled through international banks may be attributed to a country other than the actual source country. For example, funds flowing from the Gulf region through international banks may be attributed to New York or London (Ratha 2005). Market players and researchers, therefore, have attempted to derive bilateral remittance flows indirectly using bilateral migrant stock data and estimates and assumptions about the remittance behavior of migrants. Harrison, Britton, and Swanson (2004), for example, assume that each migrant sends a fixed average amount.

We have calculated bilateral remittances by allocating remittances received by each developing country among the countries of destination of its migrant nationals. We use three different allocation rules: (i) weights based on migrant stocks abroad; (ii) weights based on migrant incomes, proxied by migrant stocks multiplied by per capita income in the destination countries; and (iii) weights that take into account migrants' incomes abroad as well as source-country incomes. Each of the three methods is discussed in more detail below.

<sup>7</sup> This section draws on Ratha and Shaw (2007).

**(1) Using the share of migrants in different destination countries as weights**

The first method of estimating bilateral remittances assumes that remittances  $R_i$  received by country  $i$  are proportional to migrant stocks in the different destination countries. Hence, the weight attached to destination country  $j$  is

$$w_{ij} = \frac{M_{ij}}{\sum_j M_{ij}} \quad (1)$$

where  $M_{ij}$  is the number of migrants from country  $i$  in destination country  $j$ . Bilateral remittances received by country  $i$  from destination country  $j$  are therefore  $w_{ij}R_i$ .

A shortcoming of this method is that it assumes that each migrant sends the same amount of remittances regardless of where she lives and no matter what her income in the host country. The large variance of incomes across migrant-receiving countries (and even across countries within each income group) limits the usefulness of this method. This method yields an upper bound estimate of South-South remittances, however, since it attributes the same amount of remittances to a developing country as to a high-income country.

**(2) Using both migrants abroad and income level in the host country**

The second method of estimating bilateral remittances uses migrant stocks in different destination countries and host-country incomes to construct weights. The weight attached to destination country  $j$  is:

$$w_{ij} = \frac{M_{ij} Y_j}{\sum_j M_{ij} Y_j} \quad (2)$$

where  $M_{ij}$  is the number of migrants from country  $i$  in destination country  $j$  and  $Y_j$  is the average per capita GNI of migrant-receiving country  $j$ . Bilateral remittances received by country  $i$  from destination country  $j$  are therefore  $w_{ij}R_i$ .

Although this method is superior to the first one, as it takes into account both migrant stocks and the average income of the country where the migrant resides, it assumes that each migrant sends a fixed share of her income, regardless of the level of that income or the needs of the family back home. This method yields a lower-bound for South-South remittances.

**(3) Using weights based on migrant stocks, per capita income in the destination countries, and per capita income in the source countries**

The third method tries to correct for the shortcomings of the first two methods. The average remittance sent by a migrant in destination country  $j$  ( $r_{ij}$ ) is modeled as a function of the per capita income of the migrant-sending country and the host country.

$$r_{ij} = f(\bar{Y}_i, Y_j) = \begin{cases} \bar{Y}_i & \text{if } Y_j < \bar{Y}_i \\ \bar{Y}_i + (Y_j - \bar{Y}_i)^\beta & \text{if } Y_j \geq \bar{Y}_i \end{cases} \quad (3)$$

where  $Y_j$  is the average per capita GNI of migrant-receiving country  $j$ ,  $\bar{Y}_i$  is the per capita GNI of the migrant's home country, and  $\beta$  is a parameter between 0 and 1. The amount sent by an average migrant is assumed to be at least as much as the per capita income of the home country, even when the individual migrates to a lower-income country. The rationale is that the migration occurs in the expectation of earning a higher level of income for the dependent household than what the migrant would earn in her home country. Ideally, the migrants' income should be taken from household survey data; but in the absence of such data, we use per capita GNI in the host country as a proxy for the migrant's income abroad and per capita GNI in the sending country as a proxy for the dependent household's income (assuming that the migrant's remittances compensate at least the counter-factual loss of income due migration).

The level of remittances is assumed to increase with the level of host country income, but at a decreasing rate:  $f' > 0$  and  $f'' < 0$ . The total amount of remittances received by country  $i$  is therefore

$$R_i = \sum_j r_{ij} M_{ij} \quad (4)$$

The parameter  $\beta$  in equation (3) is estimated for each country such that the total of remittances received is equal to  $R_i$  in equation (4). The parameter  $\beta$  is found to be remarkably stable across developing

countries (0.74 for Bangladesh and China, 0.78 for India, 0.77 for Philippines, and 0.67 for Vietnam). In order to estimate bilateral remittances for all countries, we use the average  $\beta$  (equal to 0.75) for the top 20 remittance-receiving countries. Equation (3) is then used to create weights so that individual remittances from equations (3) and (4) add up to the total remittances received.

A comparison of these estimates for South-South and North-South remittances calculated using the three different methods is provided in the main text. It is usually impossible to verify the accuracy of these bilateral estimates as most countries in the South as well as in the North do not report sources or destinations of remittance flows. A handful of countries (e.g. Bangladesh and the Philippines) do report sources of remittance inflows, but in these data, more flows are likely to be attributed to the United States and Europe where international banks have headquarters (Ratha 2005). Remittances from South countries may also be underestimated due to restrictions on outward remittance flows and irregular status of migrants (e.g., Bangladesh does not report any remittance inflows from India even though it has a large migrant population in India).