Economic dynamic of remittances sent from Spain and the United States to Colombia between 2005-2013: An analysis of cointegration

Dinámica económica de las remesas enviadas desde España y Estados Unidos a Colombia entre 2005-2013: un análisis de cointegración

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Research article

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Abstract

The purpose of this paper is to analyze the behavior of remittances sent from Spain and the United States to Colombia over the last nine years, searching specifically for the long-term determinants. To achieve this, a cointegration analysis is implemented, validated with an error correction method. It is found that the series under analysis for both Spain and the United States are cointegrated, that is, there are stable long-term relationships between the remittances, GDP, unemployment and the exchange rate, although the rate of convergence between the short and long term for this ratio is high for the U.S. and lower for Spain.

Keywords: remittances, cointegration, error correction mechanism, long-term stability.

JEL: C01, C22, F22, F24.

Resumen

El propósito del artículo es analizar el comportamiento de las remesas enviadas desde España y Estados Unidos hacia Colombia en los últimos nueve años, y buscar específicamente cuáles son sus determinantes a largo plazo. Para lograrlo se implementa un análisis de cointegración convalidado con un método de corrección de errores. Se encuentra que las series bajo análisis tanto para España como para Estados Unidos están cointegradas, es decir hay relaciones estables de largo plazo entre las remesas, el PIB, el

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desempleo y el tipo de cambio, aunque la velocidad de convergencia entre el corto y largo plazo de dicha relación es alta para Estados Unidos y más lenta para España.

Palabras clave: remesas, cointegración, mecanismo de corrección de errores, estabilidad a largo plazo.

INTRODUCTION

Remittances, understood as the money sent by emigrants to their country of origin, have gained special prominence in the sphere of the world economies, but especially in those of Latin American. According to the IDB (2007: p. 9), in Latin America remittances grew at double-digit rates during most of the first decade of the new millennium. In Colombia, the figures from the Banco de la República show that, for the period analyzed, its behavior in real terms was very dynamic, but later lost strength, going from US $ 4.784 billion between 2005 and 2008, to US $ 3.969 billion in 2013.

In the last five years (2009-2013) the trend has changed, largely due to the global financial crisis that left manyof the senders of these flows of capital unemployed and it had a negative impact on remittances in countries such as Mexico, Colombia, Guatemala, Brazil, and Ecuador, among others. In the case of Colombia, the economic crisis in the United States and Spain, which are the main senders of remittances to our country, has affected its regional economy, primarily that of the coffee belt and Valle del Cauca. Although since the outbreak of the crisis, remittences have declined by an average of 4.4%, they still remain significant in the national economy (5% of current account revenues), as issuers continue to send money despite the crisis (above all from Spain), mainly from women who are hired as maids or nannies.

In spite of all of the above, remittances have constituted a permanent income for Colombian families, who use them mostly for consumption and in a smaller proportion for savings and investment (IDB, 2007, p.19). That is to say, these flows have constituted an income of vital importance for the support of many families in our country. The determination of why Colombians send remittances to their relatives in Colombia is simple: in some cases, they try to improve or maintain their quality of life and, in other cases, to generate savings to then buy or invest in goods or services. But beyond strictly family or affective ties, or personal interests of various kinds, there must be other aspects of an economic and social nature that can not be overlooked regarding the sending of such resources.

For example, the balance of payments shows that on average 72.1% of remittances have been sent from Spain and the United States in the last nine years, which coincides with the fact that for the same period these two countries were the main migratory destinations for Colombians. From this point of view, the sending of remittances to any destination is strongly linked to the migratory phenomenon, constituting a variable of a social nature, as well as others which are economic, such as the economic cycle, since it is assumed that

during recessions, the sending of money is scarce and, on the contrary, abundant during expansions.

In general, studies on the subject, at least for Colombia, such as those of Roa (2011), IDB (2007); Garay and Rodríguez (2005), have been descriptive in nature and focused more on the accounting, legal and social aspects. Others have focused on very particular economic issues, relating remittances with labor participation, their impact on the coffee belt, or economic growth, such as those carried out by Arango, Montenegro and Obando (2011); Romero and Salinas (2010); Mora, (2008); Sinisterra, (2005). But in these, little has been said about the structural determinants that condition the sending of remittances to our country. With this orientation it is possible to not only glimpse the economic reasons that migrants have for sending money, but also to anticipate what the cyclical behavior of the remittances will be and how it will impact on the medium and long term in our country. This process could also be useful for public policy makers to take emergency measures in regions or cities where the sending of remittances has a high participation in the level of economic activity, as happens in the *Centro Occidente Metropolitan Area* -AMCO, by its acronym in Spanish -.

In this context, this document implements an analysis of integration orders with data at constant prices of 2005, the estimation of a cointegration model and its validation through a method of error correction so as to capture said dynamics. The objective is therefore to establish the impact of the aforementioned factors on remittances, under a previous analysis of cointegration in order to reveal the existence of stable long-term relationships between them and determine if the speed of adjustment in the short term to the long term trend is high or low through an error correction mechanism.

Accordingly, this document consists of five parts: the first, which is this introduction; the second, which presents not only the theory related to migration, but will take into account the reference of some studies; the third, in which the evolution of remittances in Colombia is analyzed descriptively; the fourth, in which the econometrics of the case are implemented, and finally, the fifth, in which some conclusions and recommendations are established.

THEORETICAL REFERENCES AND APPLIED STUDIES

The explanations for the sending of remittances to any destination are generally provided by economic and social factors. From economics, Garay and Rodríguez (2005), Mora (2008) and García (2010), agree that within the economic aspects of which nationals abroad take into account when sending these resources, is the behavior of the GDP, at least that of the country of origin. In this way it is considered that the GDP is a signal that motivates the sending of remittances, since the level of economic activity of the countries, their expansions and recessions, condition the supply and demand of the same. Following Garcia (2010), this relationship obeys, incidentally, the failure of the neoliberal model:

> The economic evolution of Latin America (LA) during the late twentieth and early twenty-first centuries shows how, as the various national development

> projects were dismantled, the state stopped being the promoter of that development and of the population's well-being, delegating the management of its economies into the hands of international organizations such as the International Monetary Fund (IMF), the World Bank (WB), and the international financial oligarchy - linked to national oligarchies. The economic crises returned chronicly and with them international migrations became explosive as from the nineties. Under the current neoliberal model it was thought that these migrations were functional to the same model, since they acted as an " escape valve" for a working population that increasingly could not be respectably absorbed in their countries of origin, contributing to satisfying the labor demand in the destination countries in expansion and also generating important flows of family remittances with significant macroeconomic effects, at the national, regional and family level (García, 2010, p. 120-121).

Another factor to consider is national unemployment, although in the face of this relationship there are several behavioral hypotheses in a prolific discussion about it. Arango et al. (2011) state that sending remittances is an incentive to seek work or not and serves as a cushion for households when there is a recession:

> With the decrease in the resources received by households in Colombia from remittances sent by their relatives, some members of these households have been forced to go to work or to seek employment; which explains the increase in labor participation. Remittances reduce incentives to participate in the labor market by increasing the reserve salary of secondary workers in the household and increasing the probability of discouragement of the unemployed. Remittances also allow their recipients to finance longer periods of job search, which should reduce levels of both income and skills related to underemployment in the medium and long term (Garay and Rodríguez, 2005). Likewise, remittances are used by families to cover the basic needs of food, education, housing, etc., as well as being an alternative source of income during the recession phases of the economic cycle (Cadena and Cárdenas, 2004). (Arango et al., 2011, p. 1-2).

Although Mora (2007) had already tested this hypothesis for the city of Cali, finding that indeed the beneficiaries of remittances have reduced incentives to participate in the labor market. On the other hand, Montoya et al. (2010) assure us that the entry of remittances into our country boosts employment and reduces poverty, as these resources are directed to the purchase of real estate:

> With a view to optimizing the use of these funds, the reduction of transaction costs for sending remittances and the creation of financial cooperatives aim to maximize the impact of remittances through the financial system (Castañeda, 2006), but there are projects such as *Mi Casa con Remesas* from the Colombian savings banks that have aimed to channel remittances towards the purchase of housing in order to reduce unemployment and reduce poverty. (Montoya et al., 2010, p. 65-66).

In this study, a different approach is considered, since unemployment, aided by the lack of job opportunities and low wages at the local level and high wages internationally, is a strong reason to migrate to other countries where the economic situation is better, with the objective of sending money to the families that stay behind.

On the other hand, Castillo (2001) also contemplates the possibility that the exchange rate is a key factor for the sending of these resources on two levels for the Mexican case. Initially, since the purchasing power of the remittance involves more or less economic efforts on the part of the one who sends the remittance. That is, in periods of revaluation of the Colombian peso, fewer dollars or euros should be sent, and in times of devaluation, more dollars or euros. Finally, devaluation could be perceived as an opportunity to send more remittances in order to obtain a higher real income in the money transfer:

> It is reasonable to argue that a devaluation of the peso would lead to an increase in the purchasing power of that sector of the population that receives its income in dollars. That is, relatives in Mexico of US-based migrants would need fewer dollars to obtain their consumption basket, so we would expect a decrease in the amount of remittances in response to a devaluation of the currency. (Castillo, 2001, p. 38).

Additionally, this author points out:

> On the other hand, the fact that the purchasing power of the relatives in Mexico has increased could represent a possibility of increasing their consumption (wealth effect) and acquiring more goods. They could, for example, build a house with two bedrooms, instead of one. In that case, a depreciation of the currency would result in an increase in the flow of remittances (Castillo, 2001, p. 38).

Another perspective on the relationship between the exchange rate and remittances is presented by Roca (2009), who considers that remittances have a differential macroeconomic impact, depending on whether the exchange rate is fixed or flexible. Regarding the fixed exchange rate, he states that:

> Greater foreign exchange inflows from remittances coming from abroad increase disposable income by increasing aggregate demand. On the other hand, the supply of foreign exchange increases, which generates downward pressures on the exchange rate, which forces the Central Bank to buy foreign currencies to maintain the exchange rate so that the money supply endogenously increases, reinforcing the expansion effect. (Roca, 2009, p. 3)

For the flexible exchange rate, he shows that:

> A greater inflow of foreign exchange from remittances coming from abroad has a net negative effect on the level of short-term equilibrium production. Although the increase in remittances into the country increases the disposable

> income, such foreign exchange inflow increases the supply of foreign exchange and reduces the exchange rate and deteriorates net exports which is stronger than the effect on consumption so that the net level of production falls on the short term (Roca, 2009, p. 4)

Other variables to consider, although not purely economic but rather of a social nature, are migratory phenomena. In fact, according to Garay and Rodríguez (2005), Lozano (2008), Cerruti and Maguid (2011), they consider that migration is also closely linked to remittances. Following Garay and Rodríguez (2005), it is found that

> Given these circumstances, there is no doubt about the need to deepen the analysis of the impacts of international migration and remittances on the welfare and quality of life of the protagonists (individuals, households and communities both in the country of origin and of destination) and on economic and social development not only at the national level but also at the level of the regions and localities of origin with high international migration. (p 60).

This is basically because the economic situation in emerging countries is not the best, either because of low wages or low employment opportunities, leading to migration towards developed countries in search of an improvement of their economic situation and subsequently of that of their families, through the sending of money in the form of remittances once they have been able to obtain a job. The authors acknowledge that there are other phenomena such as family reunification, or the offer of studies in higher education[1].

Regarding the topic, Lozano (2008) implemented a logistic model where the dependent variable is whether or not the migrant sends remittances to their country of origin, which is explained by 18 explanatory variables of a socioeconomic nature for all of Latin America (except Puerto Rico). The results indicate, among other things, that the probability that Caribbean migrants send remittances from the United States is 80% higher than among migrants from Mexico who are used as a base category. Central American migrants are 72% more likely to send remittances than Mexicans. Finally, although among South American emigrants the probability of sending remittances is 10% lower than in the reference category, this difference was not statistically significant.

It is worth mentioning that Sinisterra (2005, p.85-86) paraphrasing Faini (2002), says that the relationship found for the latter, between remittances and migration, is not so clear, since, according to his study, a larger volume of skilled emigrants is associated with a lower flow of remittances. But the underlying question is whether Colombian emigrants

[1] The largest number of Colombian migrants, according to the International Organization for Migration (IOM), has been directed in the last ten years towards the United States (34.6%) and Spain (23.1%). That is to say, more than half of the total number of migrants are headed towards these two countries. The largest proportion (63.6%) of respondents emigrated during the last five-year period (2000-2004), while 19.2% did so between 1995 and 1999. There is a greater relative participation of women (around 48.7% are men). 93.5% of the senders of remittances are economically active (working or seeking employment). 70.5% have completed secondary or higher education, a percentage that is significantly higher than that of the receivers with 58.6%. (Garay & Rodríguez, 2005, p. 35).

have a high degree of qualification. Empirical evidence, according to IDB figures (2007, p.26), shows that this is not the case, since migrants are generally people with low levels of education, with only 31% reaching secondary and 28% university or higher education, so the remaining 41% has only primary, some or no studies. Thus, it seems that the correct hypothesis must be the opposite of the author in question, that is, a larger volume of unskilled migrants is associated with a greater flow of remittances.

Studies on remittances at the national level show different perspectives on the subject, but are constructed under a common denominator, and this is their analytical descriptive nature from the economy. A first approximation is made by Garay and Rodríguez (2005). In this document, migrations are first approached by a theoretical context from different schools of economic thought, as well as from history, anthropology, political science and psychology. The effort is very valuable and novel, as it shows an analysis of these capital flows from different disciplines. The study also focuses on the characteristics of the dynamics of remittances in Colombia from 1996 to 2004. In this part it defines the profiles of the senders and the receivers, as well as the use and destination of the flows. It concludes that the regions with the greatest participation in receiving remittances are those of the Pacific, with 32%, the coffee belt, with 19%, and Bogota, with 16%. In addition, the study found that 80 out of every 100 remittance senders residing in Spain migrated between 2000 and 2004, and in the case of US residents, the figure was 54 out of 100 senders.

Another effort was made by the International Organization for Migration (IOM), also in 2005. From the first analysis, IOM's relationship with migratory flows and remittances in Latin America and the Caribbean is shown. It is indicated that migration is due to labor factors and is part of the regional dynamic that can be highly beneficial, if negotiated with the partners concerned and can have great potential as long as it is well prosecuted. In another analysis, on the one hand, a methodology is constructed for the measurement of migration with all its documented technical supports that include the description of its processes and procedures, and on the other, a methodology that will ensure the timely provision of statistics on emigration.

Another socio-economic analysis of the emigrants from the *Centro Occidente Metropolitan Area* (AMCO, by its acronym in Spanish), in which is found, for example, that high rates of unemployment, the destruction of jobs and the reduction of household income, which occurred in the second five-year period of the 1990s, could have been a determining factor in the emigration of many Colombians abroad; and from the labor market it is revealed that the labor force participation rate (TGP, by its acronym in Spanish) and unemployment, are ostensibly lower for those who receive remittances. The gap in the labor force participation rate between recipients and non-recipients is 10 points in favor of non-recipients, while the unemployment rate of non-recipients is double that of recipients.

In 2007, the Inter-American Development Bank (IDB) made a wide sweep of what surrounds the dynamics of remittances, but with a low economic content (which focuses on descriptive conjuncture) and makes emphasis on aspects such as legal status, international remittance service providers, means of payment and channels for transfers, as well as the costs and the methodology for measuring them. On the economic side, it finds, among other things, that in terms of current balance of payments revenues, in 2006 remittance revenues

were equivalent to 11.1% and 15.4% of the export of goods, and in relation to current revenues of the balance of payments, its relative importance was 57.6%, which concludes that the remittances of workers have become the second greatest source of resources, less volatile than those of FDI.

A study aimed at showing the impacts of migration and remittances on economic growth was carried out by Sinisterra (2005), in which basically, the main causes and economic effects of international labor migration are attempted to be shown. Based on the neoclassical theory of international trade and based on the Heckscher-Ohlin (1933) and Mundell (1957) model, it is shown how international labor mobility generates economic growth in the destination country by increasing the quantity of labor intensive factors (Rybczynski effect) and in the home country by increasing household incomes and therefore consumption and investment. Due to this importance, a public policy is required so as to reduce the transaction costs that impede the greater flow of remittances.

Another study that is a little more focused on primary information is the one carried out by Roa (2011), which shows the use of remittances sent from Spain in the Pacific region. Using a survey and a clearly descriptive method, the study concludes fundamentally that households use this money primarily for food, the payment of public services, education and health, in addition there is evidence that remittances from Spain have a greater redistributive effect than the rest of the countries, because it has the highest number of senders, lower amounts of remittances and largely covers household needs related to food, public services, education and health. Therefore, it is a palliative against the poverty of the households.

Although it is true that the analysis of migrations and remittances has been approached from different perspectives and from different disciplines, according to Garay and Rodríguez (2005) there is no consolidated interdisciplinary analysis, since areas such as political science and psychology have come late to the debate. Therefore, in relation to migration studies: "They must be closely related to theories on ethnicity, identity, human and civil rights, citizenship, (...) on community, nation and state (Hammar, 2000, cited by Garay & Rodríguez, 2005, pgs. 25-26).

Other authors such as Hagen-Zanker (2008, 19) consider that the migratory phenomenon must be analyzed on three levels: micro, meso and macro. In the first, migration is due to aspects specific to the individual and the family, such as their levels of studies or gender; the second involves aspects of migration networks, migratory institutionality, among others, and the macro component, where phenomena such as unemployment, levels of growth and development of the country of origin are located. In this wide range of contributions, perhaps others which must be taken into account are, for example, the phenomenon of the stability and political ideology of the destination country, the ease of legalizing their stay in the destination country, cultural patterns that identify the migratory phenomenon with the destination country, the criteria of citizen security that the national takes into account when traveling and then sending the remittance.

Finally, the only study found that was carried out from econometrics was constructed by Castillo (2001). In this paper, a cointegration analysis is made, which establishes that there

is a long-term relationship between remittances, US GDP, Mexico's GDP and the real exchange rate. In addition to establishing that the variables considered are cointegrated, the text shows a forecast of the effect that changes in the Mexican and US macroeconomic environment would have on the amount of the remittances.

EVOLUTION OF REMITTANCES IN COLOMBIA

Importance of remittances in the national economy

As of 2005, remittances entering Colombia from different destinations have been of considerable importance in the level of economic activity. As a percentage of GDP, their quarterly participation went from 0.3% to almost 0.45% at their peak, according to Figure 1, although in comparative terms, regarding the beginning of the decade of the new millennium, these have fallen, as there was more than 1% participation registered, according to the Inter-American Development Bank-IDB- (2007, p.16). It should also be noted that since the second quarter of 2008 the share has been decreasing, reaching only 0.24% for the second quarter of 2013.

Remittances have constituted a permanent income for the receiving families, which use them generally for consumption, saving and investment. In the financial field, remittances account for 49.3% of foreign direct investment (FDI) on average for the period under review. The stability of remittances over time, according to their rates of variation, is evident in the following figure, compared to other short-term (foreign investment in portfolio) and long-term investments (foreign direct investment).

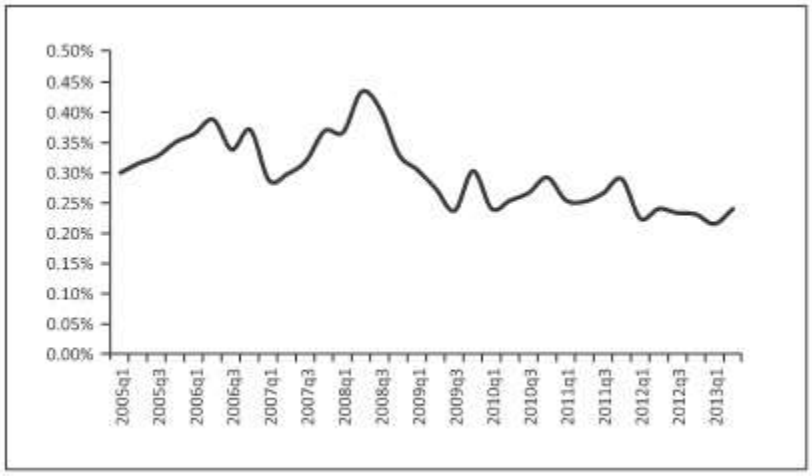

Figure 1. Quarterly participation of remittances in the GDP in Colombia. 2005:1-2013:2. Millions of USD (2005=100).
Source: Calculations by the author. DANE and Banco de la República.

In fact, the foreign investment in portfolio shows great leaps because of the influence it receives from the rises not only of the interest rate but also of the exchange rate in the short term, while FDI shows less volatility because it is constituted of low risk investments.

Regarding remittances, their behavior is the most stable of all, and shows that while it is true that there must be social and economic variables that influence the time of remittances, they are possibly carried out with some degree of independence from these variables. This shows that the transfers maintain a high degree of temporary stability and therefore it is a more stable investment than other types of foreign investments.

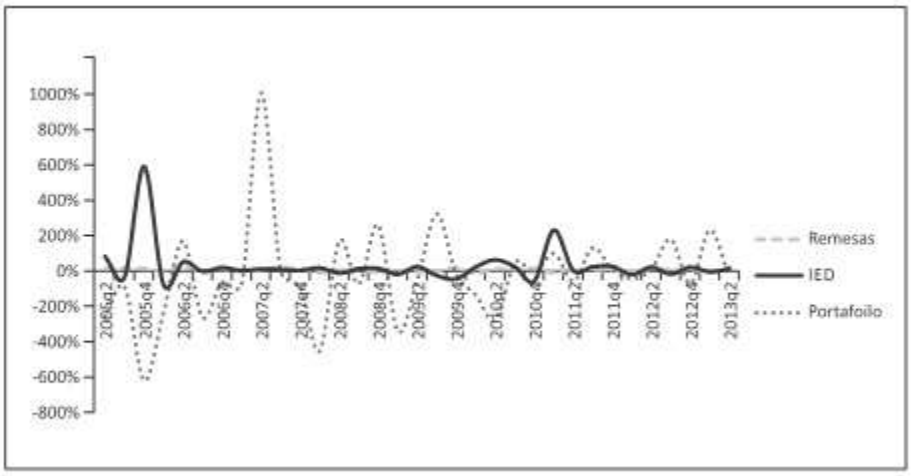

Figure 2. Quarterly variation of remittances, foreign investment in portfolio and FDI. Colombia. 2005:1-2013:2. Millions of USD (2005=100).
Source: Calculations by the author. DANE and Banco de la República

Behavior of remittances sent from Spain and the United States

In Colombia, the entry of foreign currency (including remittances) is regulated by the exchange rate regime[2]. In accordance with Resolution 8 of 2000 of the Board of Directors of the Banco de la República, article 58, commercial banks and exchange offices are authorized to receive and dispatch said resources. The tendency in our country, due to the low level of bank affiliation of those receiving such transfers, is that exchange houses are preferred to banks. According to the magazine *Dinero* (2013), the commissions that these charge for the transfer range from 3% to 5% of the total value of the transaction, while in the bank the commission for the transaction is worth between US $20 and US $30 , depending on the entity and the country of origin. The maximum amount that can be received in exchange houses is US $10,000 per day, and if it exceeds that amount, the transaction must be done through a bank. If the amount received does not exceed the limit for declared income, the only tax collected is that of the 4 x 1,000 upon receiving the cash.

According to the Banco de la República, on average 72.1% of the remittances entering Colombia come from Spain and the United States, with a very similar participation for the

[2] Said regime is established by Law 9 of 1991, the resolutions issued by the Board of Directors of the Banco de la República as a credit, monetary and exchange authority because of the powers granted to it by Law 31 of 1992, currently Resolution 8 of 2000 and by the International Investment Regime, contained in Decree 2080 of 2000, as amended by Decree 1844 of 2003, both of the National Planning Department.

last nine years (approximately 36%). In this same period, Venezuela has gained a significant share, as remittances have gone from 0.3% to 13.1% in less than a decade, although in comparative terms with the two countries of reference, their contribution is still low. The remaining 15% comes from the United Kingdom, Italy, Ecuador, the Netherlands and, with a strong rebound in recent years, from Chile.

From the first quarter of 2005 to the second of 2008, that is to say, before the global financial crisis broke out, the growth of remittances sent from Spain and the United States was positive (above 3% on average for both), but from then until the middle of 2013, there was a total change in the situation, since there has been a contraction of 0.4% for remittances sent from the United States and 1.3% for those sent from Spain on average.

Indeed, by 2009, economic deregulation, high prices of raw materials (especially oil), the global food and energy crisis, as well as a crisis in credit, mortgages and confidence in the markets, began to hit North America and then Europe. According to Grande (2010), the crisis adversely affected Colombia and Latin America, not only in the sending of remittances, but also in migration: "Migrants were the first victims of the deterioration of economic conditions in developed countries, which directly affected the flow of remittances, a decisive factor in the transmission of the crisis to Latin America"(Grande, 2010, p.2857).

Regardless of the country analyzed, the global financial crisis directly affected the sending of financial resources to our country. According to Argüello (2011, p.12), these tranfers declined during most of 2009, with the largest fall occurring in July, when their value collapsed by 23%, and for the whole of 2009 was 14. 4 %. FDI plummeted by 21% for the first quarter, and by the fourth, it fell by 64.6%.

This has conditioned the short, medium and long-term behavior of remittances sent from Spain and the United States, since it has been expansive and then recessive during the period analyzed, a behavior that has been in keeping with the world economic situation and its gross domestic product. Because most of the remittances are sent from Spain, the crisis that has engulfed this country, has directly affected many of the residents who benefit from these monies. Figure 3 shows that Spanish GDP has a strong relationship with remittances to our country, and shows a downward trend for both items as of 2008, when the financial crisis intensified. A simple correlation analysis shows that their value rose to 0.72, which shows not only the behavior at the same pace for both items but their relationship is procyclical, therefore, booms in the level of economic activity drive the sending of money and vice versa.

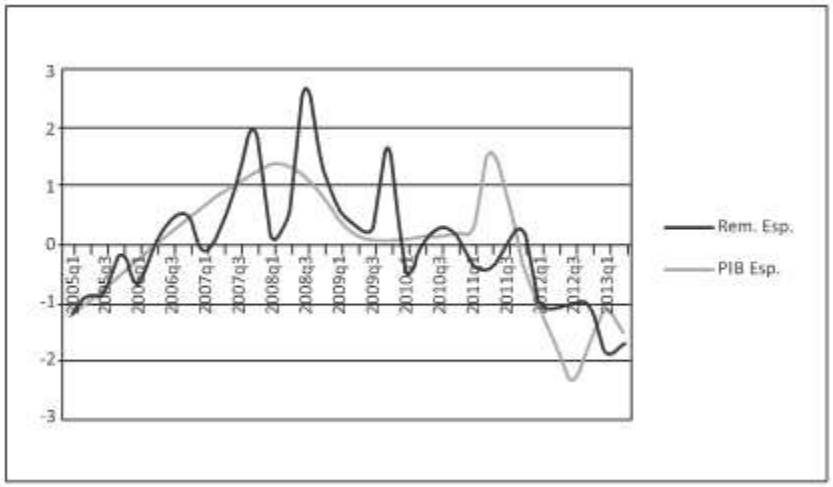

Figure 3. Evolution of FDI and remittances from Spain normalized.
2005:1 - 2013:2. Millions of USD (2005=100).
Source: elaborated by the author with Banco de la República data.
Rem. Esp.: Remittances Spain. PIB Esp.: GDP Spain

Finally, according to figures from the Ministry of Employment and Social Security of the Government of Spain, the number of Colombians in that country at the beginning of 2010 reached 284,000, but because of high unemployment rates (more than 20 percentage points), the exodus of nationals is estimated at about 20,000 people in the last three years. The region most affected by immigration has been the coffee belt, with 67% coming from there.

In the case of the United States, the situation is similar to the beginning of the period analyzed, although, as noted, tranfers after the onset of the crisis were much lower compared to Spain, but in the end it has stabilized a little more than the European country. Figure 5 shows that from 2005 to 2008, US GDP grew, as did remittances, but once the recessive phase began, remittances to Colombia also suffered a sharp fall, but unlike Spain, US GDP has recovered and remittances have activated again, and by 2013 will have the levels demonstrated in 2006. The correlation before the crisis was 0.77; during the crisis this reached 0.68 and finally, after it, is 0.31; that is, all are elevated and procyclical.

The reason for this behavior is that labor conditions, despite the crisis in the United States, are better and there are possibilities for promotion. In addition, unemployment is much lower than in Europe, since between 2010 and 2012 it went from 9.6% to 7.6%, while in Spain for the same years it went from 20.5% to 26.3%. For these reasons many Colombians have chosen to stay in the United States or migrate from Spain to this country.

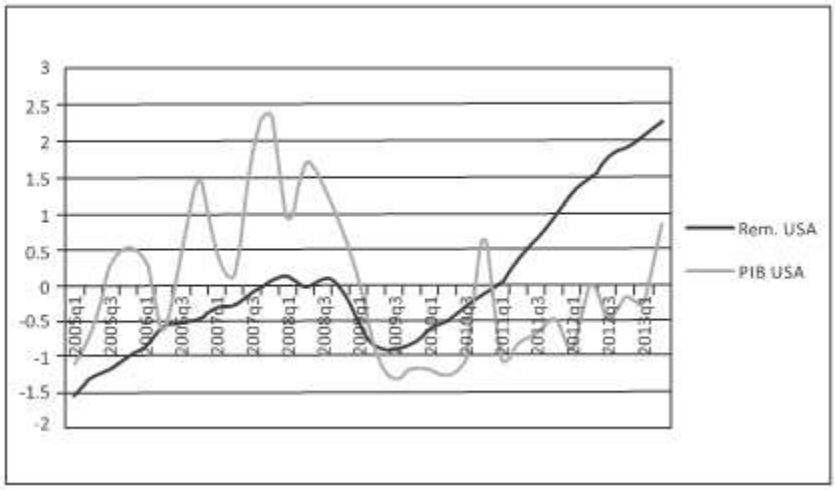

Figure 4. Evolution of the GDP and remittances from the United States normalized. 2005:1 - 2013:2. Millions of USD (2005=100).
Source: elaborated by the author with Banco de la República data.
Rem. USA: Remittances United States. PIB USA.: GDP United States

According to the IDB (2007), in our country, basically, remittances are used for recurrent expenses, that is, to meet the basic needs of families, such as food, clothing, housing (rental payments or credit fees) , health and others with lower percentages such as investment expenses, durable consumer goods and savings. Indeed, the study shows that the uses of remittances are for food (29.3%), public services (23.3%); housing (15.5%), health (6.2%), education (5.8%), transport (5.4%), clothing (3.9%), others (10.6%). Regarding this use, the study stresses the following:

> The topic of remittances has given rise to a special interest of the Colombian authorities to seek alternatives that allow the reorientation of some of these resources towards productive sectors of the economy. However, it is the beneficiaries who decide on their use and as long as the internal conditions regarding employment and income are not favorable, the beneficiaries will not have incentives to increase their demand for durable goods, investment and savings (IDB, 2007, p.36).

According to the IDB study (2007, p. 34), the characterization of the beneficiaries of remittances in our country are heads of household (60%), the majority of whom are women whose average age is 40 years. Their levels of education are lower than those of their relatives abroad. Thus, 40% have a lower level of education than secondary school, 31% have completed high school and 28% higher studies. 40% of the receivers are employed, while 99.3% of the senders comply with this condition. The remaining activities of the beneficiaries are household (35.6%) and studying, only 12.9%. The main recipients of remittances are located in the Pacific region (32%), the coffee belt (19%), Antioquia (16%), Bogotá (16%), the Atlantic coast (10 %) and finally, the eastern plains (4 %). On the other hand, according to the study carried out by Garay and Rodríguez (2005, p.32), recipients of remittances in exchange houses are mostly women (76%), the average age of recipients is 40 years, with 11. 1% over 60 years of age. 50.8% receive remittances from relatives of the

first degree of consanguinity (brothers, children and parents), 15.7% from their spouse or partner and another 15% from people with whom they are not related. 93% of remittance senders are Colombian or the child of Colombian parents.

According to García (2010), remittances are linked to the behavior of Colombian migrations, more as a result than as a cause of the phenomenon. In order to corroborate their ideas, the number of emigrants to the two countries of reference was added, as well as the amount of remittances sent to our country in the analyzed period. The results showed, at least graphically and statistically speaking, that the long-term relationship between remittances and the total number of emigrants in Spain and the United States is moderately high, since the correlations at both contemporary and lagged levels exceed the value of 0.62.

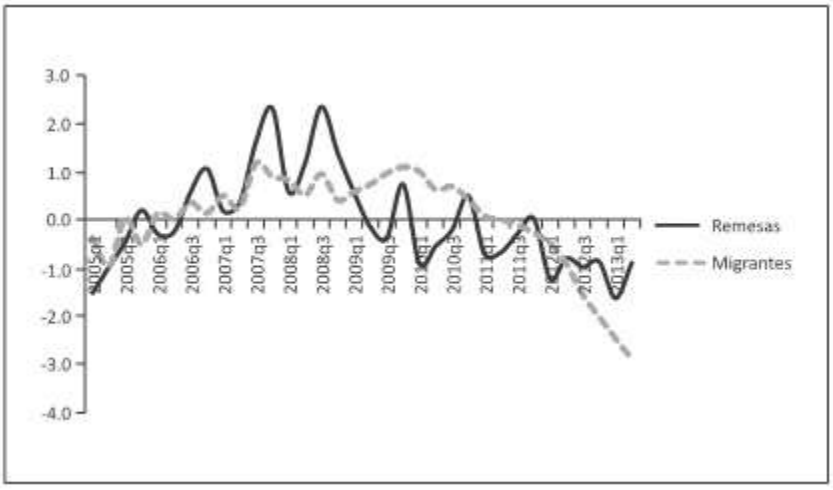

Figure 5. Standardized contemporary quarterly relation between emigrants and remittances. Spain and the United States. 2005:01-2013:2. Millions of USD (2005=100)
Source: calculations by the authors. Banco de la República, Ministry of Employment and Social Security of the Government of Spain, and Pew Hispanic Research Center.

This could indicate that remittances are sent in the same period (quarter) that the migrant arrives in the destination country, but in other cases, they are sent in the subsequent period, which gives indications that people must have a margin for adaptation either for a job search or to obtain their first income, so as to later send money to their families in Colombia.

Another result that is worth highlighting is that this correlation is positive, which would indicate that large waves of migration bring with them high transfers of remittances, either in the same period in which the migration rises or later, and vice versa. That is to say, low migration implies smaller transfers of money to Colombia[3].

[3] Figure 4 is presented in a standardized or normalized way so as to be able to appreciate the behavior of the two variables jointly, otherwise the disparate values assumed by them would result in the graph not being understood.

Econometric models for Spain and the United States[4]

According to García (2010), Montoya et al. (2010), Castillo (2001), Roca (2009) and Lozano (2008), remittances are determined by national GDP and the country from which the remittances originate, the exchange rate between countries, levels of unemployment and finally the number of emigrants.

The time series of remittances were extracted quarterly from the Banco de la República since 2005: 1 to 2013: 2 and implemented at constant 2005 prices through the local CPI. In order to obtain the real exchange rate for both the dollar and the euro, the nominal exchange rate of the currencies was multiplied by the relative CPI of the receiving and of the issuing country. In the case of the chosen unemployment rate, it is the one presented for the 24 most important cities of Colombia according to the DANE, because it is to these where the greatest amount of remittances are sent from abroad

The series for the GDP and CPI of the United States and Spain at constant 2005 prices were drawn from the International Monetary Fund. Finally, the number of emigrants was obtained from the Ministry of Employment and Social Security for the case of Spain and the Pew Hispanic Research Center for the United States[5].

Accordingly, the model for the United States is as follows:

$$LREMUSA_t = \beta_1 + \beta_2 LPIBC_t + \beta_3 LPIBUSA_t + \beta_4 LTCPD_t + \beta_5 LMIGUSA_t + \beta_6 LDES_t + \omega_t \quad [1]$$

Where LREMUSA are the remittances sent to Colombia from the United States, LPIBC is the GDP of Colombia, LPIBUSA is the US GDP, LTCPD denotes the real peso-dollar exchange rate, LMIGUSA are Colombian emigrants to the US, and LDES captures unemployment in Colombia. Finally, ωt is a random variable that is assumed to meet the classical statistical assumptions, and which reflects the influence of other variables that have not been taken into account when explaining the sending of remittances from the United States to our country. It should be noted that all variables are expressed in logarithms, so the parameters should be understood as elasticities.

[4] The following models are not based on a general theory that explains the sending of remittances because this theory has not yet been constructed. In this vein, we try to basically capture its behavior from macroeconomic theory and empirical observation. It should be remembered in this sense that the econometric models can also be constructed from hypotheses of behavior and not necessarily from theories, as manifested in the initial pages of the classic guides texts like Greene (2002, p.1) or Gujarati and Porter (2000, p. 3 and 9).

[5] As mentioned before, there are several factors that explain the sending of remittances as well as migratory phenomena, which go beyond the limits of the economy. Therefore, the econometric model tries to capture the relevant macroeconomic phenomena that possibly explain the phenomenon, including the amount of migrants as a social variable. Other variables in other areas of knowledge are out of the reach of the same, not only because of a lack of information, but as Garay and Rodríguez (2005) recognize, this phenomenon still has not been addressed in an interdisciplinary way.

Now, the model for Spain is as follows

$$LREME_t = \beta_1 + \beta_2 LPIBC_t + \beta_3 LPIBE_t + \beta_4 LTCPE_t + \beta_5 LMIGE_t + \beta_6 LDES_t + \varepsilon_t \quad \textbf{[2]}$$

Where LREME are the remittances sent to Colombia from Spain, LPIBC is the GDP of Colombia, LPIBE the Spanish GDP, LTCPE denotes the real peso-euro exchange rate, LMIGE are Colombian emigrants to Spain, and LDES captures unemployment in Colombia. Finally, εt is a random variable that is assumed to meet the classical statistical assumptions, and which reflects the influence of other variables that have not been taken into account when explaining the remittances from Spain to Colombia. It is worth noting that as in the previous model, all variables are expressed in logarithms, so that the parameters should also be understood as elasticities. [6]

What is expected of the variables analyzed regardless of the country they come from is that the relationship between remittances and Colombian GDP will be negative, since if things go well at the aggregate level in the Colombian economy, people abroad will send a smaller quantity of money, and vice versa, that is, internal economic recessions expand the flow of money from abroad. Regarding the GDP of the country from which the money is sent, the relationship is supposed to be positive, since if economic activity is good abroad, there is more money available to send remittances to our country.

According to Castillo (2001), with the real exchange rate, the relationship is not so clear, because it can be said that if there is a devaluation of the peso against the currency, it is not necessary to send a very large amount of money from outside, as a smaller quantity buys the same consumption basket in our country. But, on the other hand, the devaluation could also be perceived as an excellent opportunity to send more remittances to obtain a greater "real income" in the tranfers. So the expected sign can be positive or negative. With regard to emigrants, a positive relationship is expected, because if more people leave the country, remittances should be higher. Finally, if Colombian unemployment soars, remittances would be expected to increase, either from residents or new Colombian emigrants abroad, expelled by the labor conditions of our country. Before estimating the models, it is necessary to establish if the series are cointegrated or not, in order not to fall into the problem of spurious regressions.

Cointegration analysis

To investigate the order of integration of the series mentioned, the augmented Dickey-Fuller test (ADF) was implemented. The ADF test, allows to identify if there are unit roots,

[6] The intertemporal relationship between the variables should not be discarded, mainly because of those listed above there are some with a structural nature such as GDP, and others, like the exchange rate, that are more volatile. For example, for the latter it could happen that agents take into account their behavior in the previous quarter when they want to send remittances today. In keeping with this annotation they will explore contemporary and non-contemporary functional forms.

that is, it decides whether the series is stationary or not, always observing the fulfillment of assumptions, in order to then proceed to determine the cointegration range of the system, that is, to apply a Johansen cointegration test. It should be mentioned that if two variables are integrated into different orders, there will be no cointegration. The results were the following: [7]

Table 1. Orders of integration. Dickey Fuller.

EE.UU.	Niveles	Primera Diferencia	España	Niveles	Primera
Variable	ADF	ADF	Variable	ADF	ADF
LREMUSA	(-2.557)	(-6.519)*	LREME	(-0.269)	(-6.267)*
LPIBC	(-1.039)	(-4.892)*	LPIBC	(-1.039)	(-4.892)*
LPIBUSA	(-0.060)	(-2.957)**	LPIBE	(-1.724)	(-3.684)**
LTCPD	(-2.407)	(-5.502)*	LTCPE	(-1.439)	(-5.549)*
LMIGUSA	(-1.005)	(-7.178)*	LMIGE	(-0.618)	(-5.235)*
LDES	(-1.183)	(-3.033)**	LDES	(-1.183)	(-3.033)**

Source: calculations by the authors.
Note: ** Rejects the null hypothesis of a process with unit root at 5%.
*** Rejects the null hypothesis of a process with unit root at 1%.

The test shows that the series in levels, for both the United States and Spain, have unitary roots for all the series analyzed, that is, they are random walks. In first differences, all the series are transformed into stationary and therefore it is concluded that they are integrated of order one, or I (1). This indicates that a cointegration analysis can be implemented, since the series have the same degree of integration. For this purpose the Johansen test will be used.

Table2. Johansen cointegration test (trace). United States.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.**
None *	0,903	186,164	95,754	0,000
At most 1 *	0,863	113,899	69,819	0,000
At most 2 *	0,524	52,369	47,856	0,018
At most 3	0,446	29,342	29,797	0,056
At most 4	0,275	11,025	15,495	0,210
At most 5	0,033	1,046	3,841	0,306

Source: calculations by the author.

Table 3. . Johansen cointegration test (trace). Spain.

[7] The expanded results for both countries are listed in Appendixes 1 and 2.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.**
None *	0,892	184,441	95,754	0,000
At most 1 *	0,775	115,321	69,819	0,000
At most 2 *	0,674	69,100	47,856	0,000
At most 3 *	0,498	34,371	29,797	0,014
At most 4	0,330	13,008	15,495	0,115
At most 5	0,019	0,593	3,841	0,441

Source: calculations by the author.

Table 2 shows that there are at least two vectors of cointegration for the case of the United States, and in Table 3, that there are at least three vectors for Spain. This allows to assure that the cointegrating models proposed in equations 1 and 2 are not spurious or false, that is, following Greene (2002, p.632) the series, separately, are random, but together they form a stationary linear combination, which gives solidity to the long-term relationship between the variables considered. In this way, the models can be estimated without any statistical difficulty. The results are listed below: [8]

Table 4. Estimation of the model for the United States

Variable	Coeficiente	Desv. Estandar	P-valor
C	-1,000	3,798	0,794
LPIBE	0,760	0,399	0,062
LMIGE	0,911	0,101	0,000
LDES	-1,023	0,110	0,000
LPIBC	-1,037	0,136	0,000
LTCPE	0,526	0,128	0,000
R2	0,886	P-Valor F	0,000

Source: calculations by the author. Estimations under Newey-West consistency.

In the US case, the model presents a good fit at the individual and aggregate levels, since the p-values are all close to zero and R^2 is high (65.9%), and the p-value of the F statistic is zero . The variable real exchange rate between the peso and the dollar does not achieve this individual significance and therefore is not relevant for the model. Regarding the expected signs, all are correct.

In particular terms, the remittances sent and the US GDP have a highly sensitive relationship, since the elasticity is equal to 4.4; therefore, under *ceteris paribus* conditions, increases in the level of US economic activity encourage the sending of more money to Colombia. In other words, if the GDP of the United States rises by 1%, the amount sent in remittances increases by 4.4% for the sample period analyzed, leaving everything else constant. This may be due to the fact that Colombian residents have been able find employment more easily despite the recession, as shown by said country's labor market macroeconomic figures.

[8] The expanded results for both countries are listed in appendixes 5 and 6.

Faced with the number of emigrants traveling to the United States, there is a positive and inelastic relationship with remittances (approximately 0.7), leaving the rest constant. Thus, increases in the number of Colombians traveling to the US, allow remittances to rise today, but to a lesser extent. In the case of unemployment, if in our country, this increases by 1%, the remittances sent increase by 0.39%, leaving the rest constant. Finally, with the national GDP, the ratio of remittances is elastic, that is, sensitive but low (-1.2), *ceteris paribus*. Thus, increases in the Colombian GDP of 1%, impel that the remittances are reduced today by a slightly lower proportion.

For the real exchange rate between the peso and the dollar, the results show that if there is a devaluation of the peso, more remittances are sent in order to obtain a higher "real income" in the transfers. In this context, the relationship is direct and also inelastic *ceteris paribus*, so if the devaluation of the peso against the euro increases by 1%, remittances sent from Spain increase by 0.18%. The problems of heteroscedasticity and autocorrelation do not affect the consistency of the parameters, since they were estimated under Newey-West correction (HAC). In addition, multicollinearity is very low among the regressors, the highest being between unemployment and Colombian GDP, although it was only 0.4, following a matrix of simple correlations not shown here. Finally, the residuals estimated for ωt are stationary according to the ADF test, although again this result should not cause surprise, since the series of this model are cointegrated with the same order.[9]

In the case of Spain, the individual adjustment is found to be good since the p-values of the regressors are close to zero and the level of joint significance is high according to R^2 and to the p-value of the F statistic. The intercept does not comply with the above, but is maintained to ensure that residuals are minimized. The parameter of Spanish GDP is also significant, but at 6.2% according to its p-value[10]. Regarding the expected signs, all are correct.

Table 5. Estimation of the model for Spain**.**

Variable	Coeficiente	Desv. Estandar	P-valor
C	-1,000	3,798	0,794
LPIBE	0,760	0,399	0,062
LMIGE	0,911	0,101	0,000
LDES	1,023	0,110	0,000
LPIBC	-1,037	0,136	0,000
LTCPE	0,526	0,128	0,000
R2	0,886	P-Valor F	0,000

Source: calculations by the author. Estimations under Newey-West consistency.

[9] The ADF test shows a test statistic equal to (-4.81), with a p-value of (0.00). (See Appendix 7).

[10] It should be remembered that the statistical significance is chosen *a priori* by the researcher, which is usually between 1% and a maximum of 10%. The p-value indicates the maximum probabilistic value at which the null hypothesis of non-statistical significance can be accepted. As shown in Table 5, for the GDP variable for Spain (LPIBE) its p-value is equal to 6.2%, indicating that the probability of error at the moment of considering this variable as relevant for the model is low, since it still does not reach 10%. Therefore, the variable should be considered as relevant and statistically significant.

The output shows that with the Spanish GDP, the relationship is inelastic (0.76) and positive, which shows that effectively an improvement in the level of Spanish economic activity, allows the sending of more remittances to Colombia, *ceteris paribus*, possibly as in the previous case because Colombians in that country have access to more and better sources of employment.

For the emigrants there is a positive and inelastic relationship with remittances, leaving the rest constant. Thus, if the increase in the number of Colombians traveling to Spain is 1%, remittances increase in a smaller proportion (0.91%). For the case of unemployment, the relationship is unit elastic, that is, the sensitivity is intermediate. In other words, if unemployment increases by 1%, the increase in remittances will be of the same order, leaving everything else constant. On the other hand, the remittances sent from Spain in the sample period behave in a unitary elastic way against the national GDP and inversely, keeping the rest constant. That is to say, increases in the national GDP of 1% cause remittances to be reduced today by an equal proportion (1%).

As in the case of the United States, in relation to the real exchange rate between the peso and the euro, the results reinforce the hypothesis that if there is a devaluation of the peso against the currency, there is an excellent opportunity to send more remittances to obtain a greater "real income" in the money transfers. In this sense, the relationship is direct and also inelastic, so if the devaluation of the peso against the euro increases by 1%, remittances sent from Spain increase by 0.5%, leaving everything else constant.

As in the previous case, the parameters were estimated under the Newey-West correction (HAC), so its consistency is maintained against the possible problems of heteroscedasticity and autocorrelation. In addition, multicollinearity is also very low among the regressors, with the highest being between unemployment and Colombian GDP, although it was only 0.44 from a matrix of simple correlations, not shown here. Finally, the residuals estimated for εt are stationary according to the ADF test.[11]

Error correction mechanism (ECM)

In the previous section it was shown that there is a long-term stable relationship between remittances and the variables that determine them, under two scenarios, but it is very likely that in the short term there may be imbalances between them. For this reason an error correction mechanism (ECM) is implemented, appealing to Engle and Granger (1987), more specifically Granger's representation theorem, which states that if two or more variables are cointegrated, then the relation can be expressed as an ECM. A model of this type is then estimated for each country which attempts to reveal how fast or how slow the adjustment to the long-term stable trend is, the imbalances presented in the short term.

The ECM model for the United States is the following:

[11] The ADF test shows a test statistic equal to (-6.14), with a p-value of (0.00). (See Appendix 8).

$$\Delta LREMUSA_t = \alpha_1 + \alpha_2 \Delta LPIBC_t + \alpha_3 \Delta LPIBUSA_t + \alpha_4 \Delta LTCPD_t + \alpha_5 \Delta LMIGUSA_t + \alpha_6 \Delta LDES_t + \alpha_7 \hat{\omega}_{t-1} + \delta_t \quad [3]$$

Where Δ is the first difference of the variable, ω _ (t-1) are the residuals of the cointegrating model (equation 1) lagged in a period, and 〖δ〗 _t denotes the stochastic errors that are assumed to be well behaved. The parameter α_7 is known as the equilibrium error coefficient, which shows the discrepancy of the fit between the short and the long term, in this case of remittances[12]. The results are shown below: [13]

Table 6. Error correction method (ECM) for the United States.

Variable: D (LREMUSA)	Coeficiente	P-Valor
C	-0,016	0,335
D(LPIBUSA)	-0,500	0,771
D(LMIGUSA)	0,539	0,000
D(LDES)	-0,345	0,000
D(LPIBC)	2,186	0,059
D(LTCPD)	0,214	0,243
RES(-1)	-0,813	0,000
R2	0,660	
DW	1,543	
P-valor F	0,000	

Source: calculations by the authors. Estimations under Newey-West consistency.
Where D is equal to the first difference Δ and RES (-1) to $\hat{\omega}_{t-1}$.

The estimate reveals that the coefficient of error correction is different from zero (-0.813), and statistically significant, so the model is not in equilibrium in the short term. In this context, the variable shows that 81.3% of the discrepancy between the ratio of the remittances and explanatory variables in the short and long term is eliminated in the following quarter. In other words, if the change in remittances is above (below) its equilibrium value, in the long term it will begin to decrease (increase) slowly in the quarter in order to correct the gap.

In the Spanish case, the ECM is:

$$\Delta LREME_t = \gamma_1 + \gamma_2 \Delta LPIBC_t + \gamma_3 \Delta LPIBE_t + \gamma_4 \Delta LTCPD_t + \gamma_5 \Delta LMIGE_t + \gamma_6 \Delta LDES_t + \gamma_7 \hat{\varepsilon}_{t-1} + \theta_t \quad \textbf{[4]}$$

Where Δ is the first difference of the variable, ε _ (t-1) are the residuals of the cointegrating model (equation 2) lagged in a period, and 〖θ〗 _t denotes the stochastic errors that are

[12] It should be noted that the equilibrium error coefficient must be less than one in absolute terms, statistically significant and negative.
13 The expanded results for both countries are listed in Appendix 9

assumed to be well behaved. As in the previous case, the parameter γ_7 is the equilibrium error coefficient, which shows the discrepancy of the fit, between the short and the long term, of the remittances.[14]

As with that of the United States, the estimate reveals that the equilibrium error coefficient is not zero (-0.917) and statistically significant, so the model is also not in equilibrium in the short term. Thus, the variable shows that 91.7% of the divergence between the ratio of remittances and explanatory variables in the short and long term is eliminated in the following quarter. Viewed differently, if the change in remittances is above (below) its equilibrium value, in the long term it will begin to decrease (increase) slowly in the quarter in order to correct the discrepancy.

Table 7. Error correction method (ECM) for Spain.

Variable: D (LREMUSA)	Coeficiente	P-Valor
C	0,009	0,727
D(LPIBE)	0,664	0,386
D(LMIGE)	0,769	0,002
D(LDES)	-0,977	0,000
D(LPIBC)	-1,769	0,353
D(LTCPE)	0,570	0,005
RES(-1)	-0,917	0,000
R2	0,810	
DW	1,938	
P-valor F	0,000	

Source: Calculations by the author. Estimations under Newey-West consistency. Where D is equal to the first difference Δ and RES (-1) to $\hat{\varepsilon}_{t-1}$.

CONCLUSIONS

The reception of remittances in our country, despite having suffered a serious collapse in recent years, caused by the US financial crisis and more recently by the Spanish economic recession, is still a significant item in the GDP (1.7% on average per year since 2006) and in the balance of payments. Many households, especially those belonging to the AMCO and the southwestern part of the country, still recieve basic subsistence income in remittances. In the last two years, transfers have been increasing from Venezuela and more incisively from Chile. If this trend continues, remittances from the latter two countries should be included in future studies.

The estimated cointegrating models show in a comparative way that the flow of remittances when the international economy improves is greater from the United States than from Spain, a phenomenon that can be explained mainly by the high levels of Spanish unemployment. In this sense, the hypothesis proposed by Garay and Rodríguez (2005), is corroborated for this period of analysis. On the other hand, it is also verified the one raised

[14] The expanded results for both countries are listed in Appendix 10.

by García (2010), in that migrations are directly related to the sending of remittances, but it is surprising in this study that the relationship is not very sensitive in both cases, especially in the North American case, which may indicate that not all emigrants send money to our country.

The proposal made from this study, that national unemployment implies a greater sending of remittances is also verified, but the impacts are differential, since it is greater for the Spanish case than the North American one, which is also surprising, since the crisis was and continues to be very strong in the European country.

Finally, there is evidence regarding the exchange rate, in the sense that one of the two proposals made by Castillo (2001) is met in both sending countries. In fact, if there is a devaluation of the peso against the dollar (euro), migrants resident in the United States (Spain) send a greater amount of money to our country to take advantage of the increase in purchasing power of the money transfer. It is worth noting that inelasticity shows that somehow, remittances are somewhat independent of the behavior of the dollar and euro prices in the domestic market. Although for a country not considered in this study, such as Venezuela, the behavior of the exchange rate is fundamental for what has been called "the remittance business", since the differentials between dollar, bolivar and peso cause arbitrage practices, which leave substancial gains on both sides of the border, a situation with which many families in both countries earn their monthly income. This situation has led to the current establishment of an exclusive exchange rate between the Bolivar and the peso for the sending of remittances between Colombia and Venezuela.

The causal relationships between remittances and their determinants are presented in a contemporary way and not lagged. In fact, several functional forms that had lags between variables were tested, but their statistical robustness was very poor. This means that a quarter is sufficient time for those who send, as well as those who receive money, to evaluate the economic and social situation of the countries and make the decision to send or receive the money transfers.

The results of the Johansen test for both Spain and the United States show that the series are cointegrated. That is, the variables that explain the sending of the remittances referred to above are part of a long-term stable behavior, not a simple trend coincidence. This relationship does not present extremely strong deviations or unlimited increases, so there is a relationship that is not spurious or false among the variables included. In addition, the relationship is stationary, that is, it is a relationship of equilibrium in the pure statistical field, so the effects of shocks are transient and do not deviate them widely from their state, especially for the North American case.

The ECM reinforces the previous result, since it shows that the short-term imbalances in the relation with the considered variables, are small and slowly return to normal on the long-term, although the North American case is not as acute as the Spanish. Seen in another way, the ECM analysis for both scenarios shows a convergence rate between the short and long term a little different between countries, but the integration ratifies the strength of the validity of the cointegrating model in the long term. The behavior of the speeds is possibly due to factors associated with the economic crisis that the countries under analysis have

been going through, since this has been resolved better in the medium term by the Americans than by the Spanish.

It should be noted finally that the causal relationships shown in the cointegration model are mostly inelastic or of unitary elasticity, possibly indicating that remittances from Spain and the United States are sent with some degree of independence from the economic conditions listed here, which must weigh on factors possibly of a family, or affective nature or to do with economic urgency that means that they send remittances without strictly considering economic or social phenomena.

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APPENDIXES

Appendix 1. ADF Test for the case of the United States

Null Hypothesis: D(LTCPD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5,5020547	7,40E-05
Test critical values:	1% level	-3,6537297	
	5% level	-2,9571102	
	10% level	-2,6174337	

Null Hypothesis: D(LMIGUSA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7,178550011	9,47E-07
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Null Hypothesis: D(LREMUSA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6,519846682	4,85E-06
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Null Hypothesis: D(LPIBUSA) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2,9570641	0,041764624
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Source: Elaborated by the authors.

Appendix 2. ADF Test for the case of Spain

Null Hypothesis: D(LREME) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6,267075978	1,74E-05
Test critical values:	1% level	-3,69987127	
	5% level	-2,976263488	
	10% level	-2,627419753	

Null Hypothesis: D(LPIBC) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4,892868518	0,000391842
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Null Hypothesis: D(LTCPE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5,54945301	6,50E-05
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Null Hypothesis: D(LPIBE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3,684373897	0,009272593
Test critical values:	1% level	-3,65372973	
	5% level	-2,957110201	
	10% level	-2,617433721	

Null Hypothesis: D(LDES) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3,033210695	0,044385834
Test critical values:	1% level	-3,69987127	
	5% level	-2,976263488	
	10% level	-2,627419753	

Null Hypothesis: D(LMIGE) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5,235565555	0,000225902
Test critical values:	1% level	-3,69987127	
	5% level	-2,976263488	
	10% level	-2,627419753	

Source: Elaborated by the authors.

Appendix 3. Johansen test for the United States

Date: 01/15/14 Time: 08:49
Sample (adjusted): 2005Q4 2013Q2
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LREMUSA LPIBUSA LMIGUSA LDES LPIBC LTCPD
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.**
None *	0,902815789	186,1641634	95,75366142	3,88E-11
At most 1 *	0,862594118	113,8986057	69,81888745	8,34E-07
At most 2 *	0,524229262	52,36930685	47,85612716	0,017740999
At most 3	0,446146146	29,34191219	29,79707334	0,056350282
At most 4	0,275246884	11,02542493	15,49471288	0,209942879
At most 5	0,033171988	1,045774367	3,841465501	0,306481438

Trace test indicates 3 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Elaborated by the authors.

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Appendix 4. Johansen test for the United States

Date: 01/15/14 Time: 08:53
Sample (adjusted): 2005Q4 2013Q2
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LREME LPIBE LMIGE LDES LPIBC LTCPE
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0,05 Critical Value	Prob.**
None *	0,892438653	184,4411809	95,75366142	5,58E-11
At most 1 *	0,774848918	115,3206693	69,81888745	5,64E-07
At most 2 *	0,673815635	69,10017681	47,85612716	0,000167389
At most 3 *	0,497991316	34,3711087	29,79707334	0,013871108
At most 4	0,329999	13,00783504	15,49471288	0,114528657
At most 5	0,018949662	0,593076742	3,841465501	0,441230731

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Source: Elaborated by the authors.

Appendix 5. Estimation model for the U.S.A.

Dependent Variable: LREMUSA
Method: Least Squares
Date: 01/15/14 Time: 08:46
Sample: 2005Q1 2013Q2
Included observations: 34
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-45,4878578	7,844421354	-5,798752482	0,0000
LPIBUSA	4,403796774	0,635173345	6,933220371	0,0000
LMIGUSA	0,696120224	0,152236421	4,57262606	0,0001
LDES	0,395176357	0,127641929	3,095976074	0,0044
LPIBC	-1,210470626	0,232164025	-5,213859571	0,0000
LTCPD	0,181658053	0,18445844	0,984818329	0,3331

R-squared	0,658067078	Mean dependent var	5,901042678
Adjusted R-squared	0,597007628	S.D. dependent var	0,121836346
S.E. of regression	0,07734376	Akaike info criterion	-2,122328534
Sum squared resid	0,167497601	Schwarz criterion	-1,852970794
Log likelihood	42,07958507	Hannan-Quinn criter.	-2,03046983
F-statistic	10,7774812	Durbin-Watson stat	1,478228151
Prob(F-statistic)	7,52E-06		

Source: Elaborated by the authors.

Appendix 6. ADF TEST for residuals United States model

Null Hypothesis: RES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4,185950592	0,002512813
Test critical values:	1% level	-3,646342448	
	5% level	-2,954021498	
	10% level	-2,615817272	

Source: Elaborated by the authors

Appendix 7. Estimation model for Spain

Dependent Variable: LREME
Method: Least Squares
Date: 01/15/14 Time: 09:00
Sample: 2005Q1 2013Q2
Included observations: 34
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0,999734958	3,797842996	-0,263237569	0,79429496
LPIBE	0,75956549	0,399477558	7,635546215	0,00000003
LMIGE	0,910604255	0,101180048	8,999840114	0,00000000
LDES	1,022698908	0,110153408	9,284314731	0,00000000
LPIBC	-1,037080103	0,135864928	-7,633170088	0,00000003
LTCPE	0,525658492	0,128110707	4,103158164	0,00031848

R-squared	0,886155599	Mean dependent var	5,871901195
Adjusted R-squared	0,865826241	S.D. dependent var	0,201078888
S.E. of regression	0,073654667	Akaike info criterion	-2,220073324
Sum squared resid	0,151900278	Schwarz criterion	-1,950715584
Log likelihood	43,74124651	Hannan-Quinn criter.	-2,128214621
F-statistic	43,58994646	Durbin-Watson stat	2,178266996
Prob(F-statistic)	2,32E-12		

Source: Elaborated by the authors.

Appendix 8. ADF TEST for residuals Spain model

Null Hypothesis: RES has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6,141657595	1,18E-05
Test critical values:	1% level	-3,646342448	
	5% level	-2,954021498	
	10% level	-2,615817272	

Source: Elaborated by the authors.

Appendix 9. ECM for the United States

Dependent Variable: D(LREMUSA)
Method: Least Squares
Date: 01/17/14 Time: 09:42
Sample (adjusted): 2005Q2 2013Q2
Included observations: 33 after adjustments
HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0,016171035	0,016453319	-0,982843351	0,334742599
D(LPIBUSA)	-0,500198931	1,699278696	-0,294359561	0,770820539
D(LMIGUSA)	0,538758969	0,130975114	4,113445298	0,000347585
D(LDES)	-0,345196801	0,05198449	-6,640380687	4,82E-07
D(LPIBC)	2,185821694	1,107993242	1,972775293	0,059242522
D(LTCPD)	0,213955036	0,178899062	1,195953931	0,242507998
RES(-1)	-0,813131483	0,12128044	-6,704555861	4,10E-07

R-squared	0,65987836	Mean dependent var	0,007541171
Adjusted R-squared	0,581388751	S.D. dependent var	0,099243205
S.E. of regression	0,064210526	Akaike info criterion	-2,467467773
Sum squared resid	0,107197784	Schwarz criterion	-2,150026775
Log likelihood	47,71321826	Hannan-Quinn criter.	-2,360658536
F-statistic	8,407206599	Durbin-Watson stat	1,542511161
Prob(F-statistic)	4,01E-05		

Source: Elaborated by the authors.

Appendix 10. ECM for Spain

Dependent Variable: D(LREME)
Method: Least Squares
Date: 01/17/14 Time: 10:19
Sample (adjusted): 2005Q2 2013Q2
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0,008893686	0,025249014	0,352238963	0,727498255
D(LPIBE)	0,6637915	0,752167649	0,88250472	0,385590708
D(LMIGE)	0,769487217	0,22331429	3,445758969	0,001946291
D(LDES)	-0,976951565	0,124405207	-7,852979709	2,50E-08
D(LPIBC)	-1,768614724	1,871833477	-0,944856873	0,35343047
D(LTCPE)	0,570099786	0,183409611	3,108341944	0,004517154
RES(-1)	-0,917124405	0,208257749	-4,403794852	2,29E-05

R-squared	0,80992562	Mean dependent var	-0,004550438
Adjusted R-squared	0,766062302	S.D. dependent var	0,154401481
S.E. of regression	0,074679529	Akaike info criterion	-2,165390077
Sum squared resid	0,145002832	Schwarz criterion	-1,847949079
Log likelihood	42,72893626	Hannan-Quinn criter.	-2,058580839
F-statistic	18,46475939	Durbin-Watson stat	1,938495363
Prob(F-statistic)	3,01E-08		

Source: Elaborated by the authors.