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“From Aspirations for Climate Action to the Reality of Climate Disasters”: How Remittances Respond to Extreme Weather Events in Migrants’ Home Countries?

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Abstract: Climate change and extreme weather events have led to a surge in natural hazards in Pakistan that have escalated into humanitarian disasters. Prior studies have largely documented the significant role of remittances in dealing with unforeseen natural disasters. This paper investigates the reaction of Pakistani migrants to natural disasters via remittances from 1972 to 2023. Using a flexible event-study methodology suited to examining the changes in remittances beyond expectation during a specific period of time, the paper compares the responses of remittances in different host countries namely Gulf Cooperation Council (GCC), Europe and North America. Our findings reveal that the response is significant two (one) months after the events for GCC (Europe and North America), and tends to dissipate five months from the disaster occurrence (except for GCC). The intensity and the persistence of remittances’ responsiveness (abnormal returns and volatility) depends on the nature of disasters, host countries' features and the economic conditions of migrants limiting their ability to send additional financial resources at home. Overall, migrant remittances may act as immediate and direct aid to households harmfully affected by disasters, substituting for the delayed arrival of official aid.

Keywords: Remittances, Natural Disaster, Pakistan, Event Study Methodology, Abnormal returns, Volatility.

JEL classification: F22, F24, Q54.

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1. Introduction

Natural disasters² have been occurring since time immemorial. However, with climate deregulation, their frequency and intensity are increasing. For example, according to the EM-DAT³ in 2002 more than 185 million people are affected by natural disaster. Pakistan is no exception, in fact, as the number of natural disasters continues to rise as shown in the figure in the appendix. On average, Pakistan has experienced 3 natural disasters a year. Moreover, the trend, the red line, is clearly upwards. 2005 and 2016 are both tied for the highest number of disasters at 8 followed by 2002. Therefore, the Global Climate Risk Index 2021 ranked Pakistan as one of the most vulnerable countries in the world to climate change and extreme weather events. In 2022, the latter recorded more than 33 millions affected by natural disaster mainly due to Storm, Flood, Earthquake, Extreme temperature and Wildfire. However, the main natural disaster affecting Pakistan are flash floods.

Consequently, Catastrophe insurance aims to protect and assist insurance underwriters against natural disaster. Generally speaking, catastrophe insurance in developing countries is less prevalent. Fortunately, other forms of solidarity exist to compensate for insurance shortfalls. In this vein, this paper examines the reaction of remittances to natural disasters by delving into the experience of Pakistan.

In Jamaica, Clarke and Wallsten (2003) find that remittances increase after hurricane. This study seeks to assess whether remittances help to prepare households against natural disasters and to cope with the loss afterwards. This paper contributes to the literature on the potential motivations to send remittances, and complements existing studies on the macroeconomic determinants of remittances. It also highlights the importance of remittances in general and in Pakistan in particular. More, the added value of this work compared with previous work on the relationship between remittances and natural disasters is to take remittances by host country, in order to take account of the nature of migrants and the economic structures

² Flood, Earthquake, Storm, Landslide, Epidemic, Extreme temperature, Drought, Wildfire.

³ EM-DAT, CRED / UCLouvain, Brussels, Belgium (www.emdat.be).

of host countries. It is complicated to explore the impact of extreme events if the population is not followed post-event (Frankenberg et al., 2023).

Remittances is the subject of a passionate debate among politicians, researchers and academics. This is due to the fact that it involves human, economic and societal aspects (Makhlouf, 2013). Likewise, Remittances is considered to be one of the problems that most concerns both sending and receiving countries. Remittances are considered a significant source of financing (Mughal and Makhlouf, 2013). In the case of Pakistan, they reach 30 billion and represent around 9% of GDP. The literature shows that remittances can be counter-cyclical, i.e. they increase when national production falls (Makhlouf et al., 2020). They also help to reduce the amplitude of variations in the income of recipient households (Mandelman and Zlate, 2012).

Remittances touch on several issues: political (Makhlouf et al., 2019), but also economic (Maimbo and Ratha, 2005), social and societal (Kasmaoui et al., 2023). In this study, we will look at one of the most important consequences of international migration, the reaction of remittances to shocks in countries of origin. Remittances can be defined as interpersonal transfers between migrants and their families and friends back home. Most of the work on the factors that influence remittances mainly focuses on the individual characteristics of migrants, such as the migrant's level of education or gender (Makhlouf et al., 2019; Edelbloude et al., 2017a). Moreover, the migrant's host community can play an influential role in shaping remittances. It seems, therefore, of utmost importance to extend these studies by examining the impact of host country characteristics on remittances.

The cyclical properties of remittances are the result of a combination of several behaviors linked to culture, family support and investment. The elements that may explain the cyclical properties of remittances are outlined below. Institutional changes in the country of origin, migrants' perceptions of and degree of trust in these institutions can also influence remittance behavior. If migrants have more confidence in their institutions, they may send money to carry out investment projects (Makhlouf, 2013). In other words, macroeconomic stability and improvements in the efficiency of public administrations can generate remittances for investment purposes.

The rest of this paper is organized as follows: Section 2 reviews the literature. Section 3 describes the data and the methodology. Section 4 reports and discuss the results. Finally, Section 5 concludes the paper and provides some relevant policy implications.

2. Review of Literature

The pioneering works of (Lucas and Stark, 1985) at the micro level and of (Swamy,1981) at the macro level, on the determinants of remittances, has triggered an exciting debate on the phenomenon of remittances as well as their behavior and responses to environmental and socio-economic shocks in both home and host countries. However, many avenues remain to be explored in this area, particularly with regard to the relationship between remittances and natural disasters (Debnath, 2015). In this vein, the economic literature has shown that economic conditions in both host and home countries impact remittances (Wahba, 1991; Vargas-Silva and Huang, 2006; Singh et al., 2011; Bang et al., 2015; Edelbloude et al., 2017b).

Karpestam (2011) in estimating the consumption equation with remittances as an explanatory variable, note that altruistic behavior takes precedence over insurance behavior. The insurance hypothesis developed by the new economics of migration presents the latter as an insurance process in the event of a drop in income. Remittances are also reacting to the political crisis, thus Edelbloude et al. (2017b) find that remittances increased significantly following the Arab Spring in Tunisia. In addition, they are sensitive to the political systems in the countries of origin. More, Makhoul et al. (2019) find that remittances are more important in political systems that are more democratic than autocratic. The authors explain this result by the fact that migrants become more involved, through their remittances, in systems with more transparency and also can easily participate in the economic policy of their countries of origin. Remittances contribute to the decrease in child mortality, for example in the case of Mexico, Córdova (2006) associates declining child mortality with increased remittances. This sensitivity may also be present in the case of natural shocks. In

fact, a few research publications have been carried out in this sense. To our knowledge, the first study to examine and explore the relationship between remittances and natural disasters is that of Clarke and Wallsten (2003). The authors studied the case of Jamaica on the nature of remittance in response to natural disasters. They see that remittances play an insurance role. As an example of a natural disaster, they took the hurricane that hit Jamaica. In the same context, Attzs (2008) find that remittances smooth consumption aftermath disaster. Remittances can help cope with post-disaster damage (Mohapatra et al., 2012). In their analyses, the authors use cross-country macroeconomic data and find that remittances increase in countries with high number of migrants abroad. In this vein, by using panel data of 23 Sub-Saharan African (SSA) countries over the period 1980-2007, Naudé and Bezuidenhout (2012) find that remittances slow to react to natural disaster. Likewise, Ebeke and Combes (2013) find that remittances reduce output volatility in post-disaster situations. In the case of Indonesia, Mitrut (2014) examined the impact of the Indian tsunami of December 2004 on the remittance response and found that the share of remittances in GDP increased by 1.35 points. Comparatively, Le De et al. (2015) investigate the response of remittances to natural disasters affecting households in affected Samoa, a survey is being carried out in coastal communities affected by the 2009 tsunami, and some of which were again hit by Cyclone Evan in 2012. The results show that remittances reach those affected very quickly, and remain high over the long term. In the case of Nepal, Chaudhary and Timsina (2017) find that remittances help recipient families restore their homes after natural disasters.

Studying the post-shock behavior of remittances in countries of origin using bilateral data from 103 Italian provinces to 107 developing countries from 2005 to 2011, Bettin et al. (2017) find that remittances are counter-cyclical and increase after natural disasters. Still on panel studies, Bettin and Zazzaro (2018) using 98 developing countries for the period 1990 to 2010 illustrate that remittances respond positively to natural disasters and also contribute to post-disaster rebuilding. In Pakistan, remittances have a significant economic stabilizing effect, offering a consistent and reliable source of revenues that can help mitigate the impact of economic downturns (Ahmed and Martinez-Zazoso, 2016). This paper goes in this direction by analyzing the response of remittances to natural shocks in Pakistan, something that has not been studied.

This study complements studies on the response of remittances and their cyclical properties, to this effect, Ahmed (2012) finds that remittances to Pakistan are counter-cyclical.

3. Empirical investigations

As stated at the outset, this study focuses on the response of remittances to the shock in the countries of origin. This study, first, conducts a standard event study methodology to examine the abnormal returns of remittances in response to natural disasters. Then, we extend the existing literature by using a dynamic factor model that consists of accounting for certain potential features that may characterize the dynamic of remittances flows (i.e., stochastic, time varying non-diversifiable risk and a time varying heteroskedastic error structure (Brockett, 1999). Even though most standard event study methods propose a constant variance through the pre-and post-event windows, some researchers including Brown (1985) have argued that if the variance is underestimated, the test statistic will prompt a rejection of the null hypothesis. This dynamic event study is carried out based on the cumulative sums of standardized one-step-ahead forecast errors that is based on a GARCH model in order to effectively capture how and to what extent a particular disaster event exerts an impact on remittance flows.

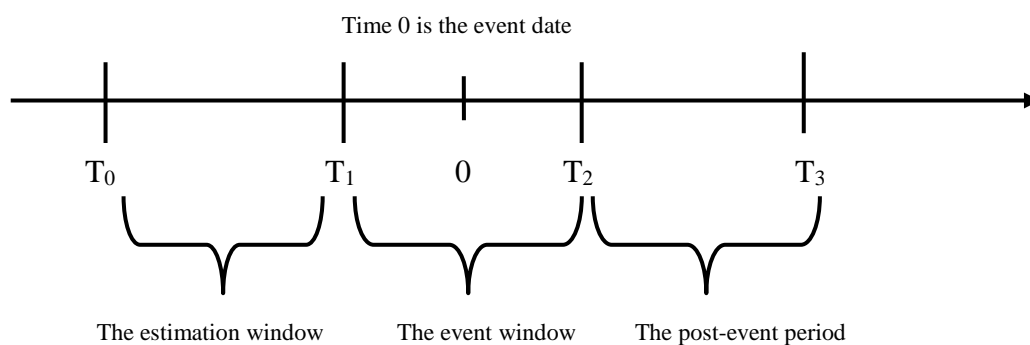
3.1.The standard event study model

We use the standard market model event study methodology as depicted by Dodd and Warner (1983) and Brown and Warner (1985) to do the analysis. The conducted empirical strategy has been successfully applied to a large variety of events (Benninga, 2008). A common concern is that the event under consideration is rarely an unanticipated occurrence. Often, news about corporate events is publicly announced prior to their taking place. Differently, we are interested throughout this study in the reaction of remittances that occurs immediately after natural disasters in the country of origin. This assessment does not

suffer from the problem of partial anticipation that may plague event studies. Nonetheless, we should be cautious and acknowledge the possible occurrence of idiosyncratic effects.

Methodologically, we define day “0” as the announcement day of the occurrence of natural disaster. Then, the estimation and event windows can be determined (see Figure 1). The interval T_0 - T_1 is the estimation window which provides the information needed to specify the normal return (i.e., prior to the occurrence of the event). The interval T_2 - T_1+1 is the event window, and the interval T_3 - T_2 is the post event window which is used to investigate the behavior of remittances following the extreme weather event. The length of the event window often depends on the ability to accurately date the announcement date. If one is able to date it precisely, the event window will be less lengthy, and thus capturing the abnormal returns will be more appropriate. Following (Peterson, 1989), we use the 120 monthly remittances return observations for the period around the day of the natural disaster, beginning at month - 115 and ending at month + 5 relative to the event. The first 110 months (- 115 through -5) is denoted as “the estimation period”, and the following 11 months (- 5 through + 5) is designated as “the event period”.

Figure 1. Data structure of an event study



Based on the selected return model, event studies consist generally of applying an event window only (e.g., the market-adjusted model) or an event and an estimation window (e.g., the market model) to the sample data. The market model is the most commonly used model in the literature. It predicts normal returns with a regression investigation that in this study regresses the remittances (by host countries: Gulf

Cooperation Council countries, Europe and North America) returns on global remittances returns over the estimation window. Figure 1 sketches the data structure used by the event studies and offers information on how this data structure is employed by the market model. Based on Figure 1, the cumulative abnormal returns (CAR) can be defined as the difference made up by the remittances (by host countries) returns during the event window minus the return expected based on its past performance, as compared to the returns of the global remittances over the estimation window. The CAR for the remittances during the event window $[\tau_1; \tau_2]$ surrounding the event day $t = 0$, where $[\tau_1; \tau_2] \in [-5; +5]$, is expressed as follows:

$$CAR_{[\tau_1, \tau_2]} = \sum_{t=\tau_1}^{\tau_2} (R_t - \alpha - \beta R_{M,t}) \quad (1)$$

where $CAR_{[\tau_1, \tau_2]}$ is the cumulative abnormal return of the remittances during the event window $[\tau_1; \tau_2]$, $R_{i,t}$ is the realized return of remittances on month t , $R_{M,t}$ is the return of the global remittances, α and β are the regression estimates from the ordinary least squares (OLS) regression in Equation (1).

3.2. The dynamic factor model

In the following, we extend the time-invariant market model to a time varying coefficient regression (TVCR) model. The idea here is that the β term may be modeled by ARMA (p, q) process in order to capture the volatility dynamics of remittances in response to different extreme weather events. This time-varying coefficient regression can be denoted as:

$$CAR_{[\tau_1, \tau_2]} = \sum_{t=\tau_1}^{\tau_2} (R_t - \alpha - \beta R_{M,t}) \quad (2a)$$

$$\text{Where } \beta_t - \bar{\beta} = \phi(\beta_{t-1} - \bar{\beta}) + \alpha_t \quad (2b)$$

ϕ is the backshift operator.

We thereafter conduct the market model to reflect the heteroskedastic behavior of the error variance over time. Even though most standard event study methods propose a constant variance through the pre-and post-event windows, some researchers including Brown and Warner (1985) have argued that if the variance is underestimated, the test statistic will prompt a rejection of the null hypothesis. Also, some studies such as Schwert and Seguin (1990) have examined the prominence of adjusting for autoregressive conditionally heteroskedastic (ARCH) effects in the residuals derived from the standard market models. It is shown that the ability to reliably form statistical inferences can be compromised by failing to account for the ARCH error structure. Because the volatility clustering and leptokurtosis are commonly observed in economic and financial time series, we consider this in our model by performing the generalized autoregressive conditionally heteroskedastic GARCH (1, 1) to the error or residual term.

The GARCH (General Autoregressive Conditional Heteroskedasticity)-type modeling has been and continues to be a very valuable tool in finance and economics since the seminal paper of Engle (1982). Engle (1982) proposes to model the time-varying conditional variance with Auto- Regressive Conditional Heteroskedasticity (ARCH) processes using lagged disturbances. Further, Engle (1982) argues that a high ARCH order is required to properly capture the dynamic behavior of the conditional variance. The Generalized ARCH (GARCH) model of Bollerslev (1986) fulfills this requirement. However, one of the most important limitations of standard GARCH models is that they are unable to capture the stylized fact that conditional variance tends to be stronger after a decrease in return than after an increase.

To control for this bias, many alternative models that account for asymmetry have been proposed including the Exponential- GARCH introduced by Nelson (1991). This model specifies the conditional variance in logarithmic form denoted as:

$$\log(\sigma_t^2) = \omega + \sum_{i=1}^q (\alpha_i z_{t-i} + \gamma_i (|z_{t-i}| - \sqrt{2/\pi})) + \sum_{j=1}^p \beta_j \log(\sigma_{t-j}^2) \quad (3)$$

where ω , α_i , β_j , γ and z_t are the parameters to estimate (the reaction of conditional variance, the ARCH effect, the GARCH effect, the leverage effect and the standardized value of error, respectively).

After determining the cumulative abnormal returns using the Exponential-GARCH model (CAR*), an investigation of responses of remittances abnormal returns to different extreme weather events is then undertaken.

3.3.Data

To investigate the possible responsiveness of remittances to natural shocks, we will use monthly data extracted from the Central Bank of Pakistan (SBP)⁴. Monthly data are more appropriate for this type of study, as annual data can obscure the remittance response (Makhlouf, 2013). Descriptive statistics are given in Table 2. Table 2 shows that remittances from the Gulf countries are the highest on average compared with other regions over the period from July 1972 to April 2023. The peak in remittances to Pakistan is reached in April 2022 when the health crisis ends (covid-19) but they are also more volatile. In general, remittances have grown considerably since the 2000s (Figure 2) and are resilient in times of economic crisis (Ratha, 2003). The average monthly growth in remittances sent by Pakistani migrants is 1% for the period 1972-2023. This increase can be explained by a conjunction of several factors, such as the improvement of economic institutions in host countries, the increasing degree of involvement of migrants in their home countries, the development of means of communication, and the lower cost of sending remittances. As a result, for some developing countries, remittances constitute an important foreign financial resource, essential to macro-economic equilibrium, and Pakistan is no exception. With regard to natural disasters, Pakistan is often hit by natural disasters. In terms of damage, 2023 was the worst as shown in the Figure 2. Moreover, Pakistan has experienced almost all types of natural disasters, i.e. floods,

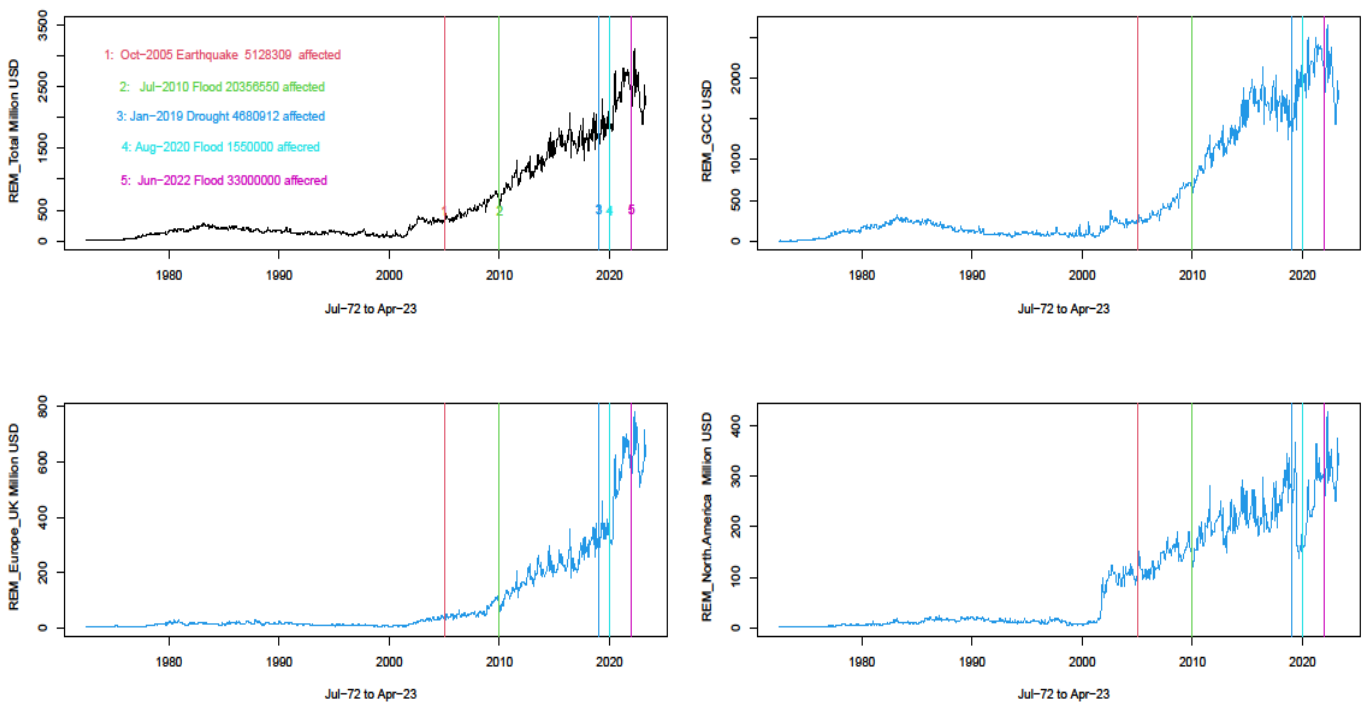
⁴ <https://www.sbp.org.pk/ecodata/index2.asp>

droughts, storms, etc., as shown in the Table 1. Pakistan has often been affected by natural disasters, as described in the introduction. Flooding is the disaster that affects Pakistan the most. Almost half of all natural disasters are floods, followed by earthquakes (around 20%) and storms (11%). To test the response of remittances to natural disasters, as an example, we have chosen 5 dates for natural disasters, based on the intensity and damage caused, see the table in the appendix. Figure 2 shows that remittances react positively to natural disasters.

Table 1: Descriptive statistics

Statistic	N	Mean	St. Dev.	Min	Max	C.V
REM_Total	610	578.433	713.953	9.470	3,124.370	123.4 %
REM_GCC	610	545.859	680.452	3.550	2,650.523	124.6 %
REM_Europe_UK	610	97.019	157.382	3.770	781.389	162.2 %
REM_North.America	610	87.076	101.600	0.710	428.518	166.6 %

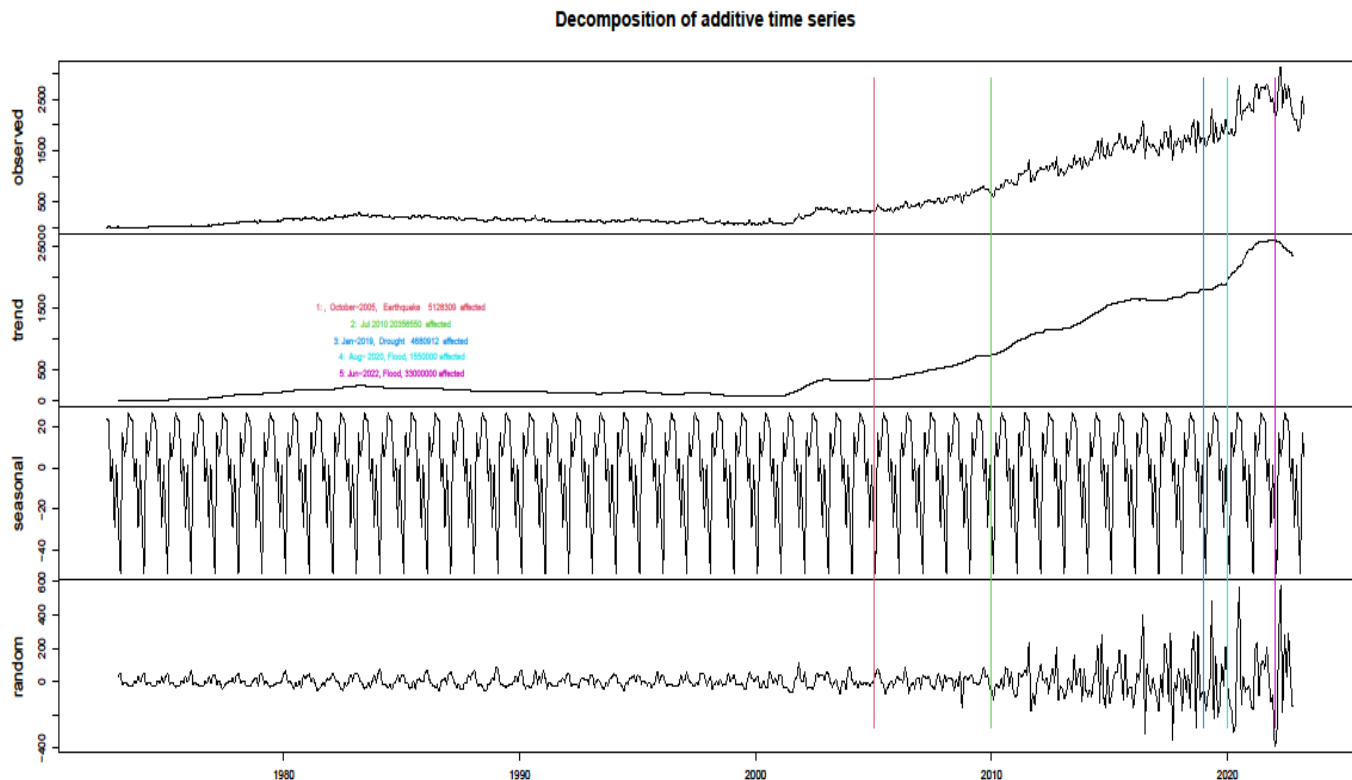
Figure 2: Monthly Remittances to Pakistan



Source; State Bank of Pakistan and EM-Dat.

There is no doubt that overall remittances to Pakistan are on an increasing trajectory (see Figure 3). Natural disasters can affect remittances in two different ways: on volume and on volatility. These two points will be tested in this section. The Figure 3 also shows that the proportion of random remittances is comparatively higher during the disaster periods than other periods.

Figure 3: Total monthly remittances to Pakistan



Source; Authors calculations date from State Bank of Pakistan and EM-Dat.

4. Results and discussion

4.1. Main findings

As mentioned above, the existing evidence demonstrate a robust positive role of remittances in preparing households against natural disasters and in dealing with the loss afterwards. This study seeks to check whether this evidence is often valid or depends on the host countries by delving into the experience of

Pakistan. By the means of a standard event study methodology and a dynamic factor model, we attempt to address whether remittances react ex-post to natural disasters. To conduct the event study, we first define the focal event dates and identify the period of analysis, i.e., the event window. The event window incorporates the one day of the announcement of the event. Table 2 reports the cumulative abnormal returns of REM-GCC, REM-Europe and REM-North America prior to and after the event (i.e., the natural disaster). We consider the three most natural disasters that have harmfully affected Pakistan’s economy (i.e., January 2019, August 2020 and June 2022, see Figure 2 for more details about the extent of the damage caused by these recent disasters).

Table 3: Standard event study results: The responses of remittances to natural disasters in Pakistan (Cumulative abnormal returns, CAR)

T_t	T_0 : Event month								
	REM-GCC			REM-Europe & UK			REM-North America		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
-5	-0.05**	0.11*	0.07**	0.09**	0.07***	0.10***	0.001*	0.03**	0.01*
-2	0.03*	0.13	0.05*	0.11**	0.10**	-0.07	0.02	0.06*	-0.09
-1	0.07**	0.09**	0.10***	0.12***	0.12***	0.09**	0.05**	0.09**	0.08*
0	0.08**	0.10*	0.10**	0.11**	0.11**	0.10*	0.07***	0.09*	0.08**
+1	0.27**	0.16**	0.09	0.14**	0.14**	0.12**	0.09**	0.11**	0.12*
+2	0.23**	0.15***	0.14**	0.16*	0.18***	0.11*	0.13*	0.14**	0.19**
+5	0.22***	0.17**	0.13*	0.17**	0.19**	0.13***	0.11**	0.18*	0.15*

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4: The volatility of remittances to Pakistan by host countries: Exponential-GARCH parameters

	(REM-GCC)	(REM-Europe & UK)	(REM-North America)
<i>Mean equation</i>			
C	0.0412** (0.0053)	0.0612* (0.0504)	0.0346** (0.0071)
r_{t-1}	-0.0156* ** ((0.0000))	-0.0324* (0.0298)	-0.0157 (0.4329)
<i>Variance equation</i>			
ω	-0.0216 (0.1183)	0.0145* (0.0969)	0.0193* (0.0406)
α	0.0343** (0.0094)	0.0087*** (0.0006)	0.0210** (0.0049)
β	0.0504** (0.0088)	0.0112* (0.0752)	0.0347** (0.0056)
γ	0.1398** (0.0064)	0.1098*** (0.0003)	0.1145** (0.0078)

Note:

*p<0.1; **p<0.05; ***p<0.01

 r : is the return of remittances ω : is the reaction of conditional variance; α : is the ARCH effect β : is the GARCH effect; γ : is the leverage effect

This study contributes to the event studies literature by conducting a stochastically flexible event-study methodology to assess the abnormal returns of remittances as a reaction to the occurrence of natural disasters in Pakistan. Accurately, we adopt a new procedure of calculating the cumulative abnormal returns by taking into account certain known characteristics of financial and/or economic time series including the time-varying beta, the autocorrelated squared returns, and the fat-tailed property of return data. An autoregressive process with order 1, AR (1) is initialized for β , and an Exponential-GARCH (1,1) process is utilized to model the time-varying conditional variance while accounting for asymmetry. Our results reported in Table 5 indicate that the ARCH effects, betas and the leverage effects are present in our sample, which

underscores that the traditional event study method may be inappropriate, and therefore causes some of the problems that we have already discussed. Unlike the cumulative abnormal returns (CAR) of remittances derived from the standard event-study, the cumulative abnormal returns derived from the dynamic factor model (CAR*) are reported in Table 6, and reveal that the turning points are not at the event date itself.

Table 5: The dynamic factor model results: The responses of remittances to natural disasters in Pakistan (Cumulative abnormal volatility, CAR*)

T_t	T_0 : Event month								
	REM-GCC			REM-Europe & UK			REM-North America		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
-5	-0.05**	0.11*	0.07**	0.09**	0.07***	0.10***	0.001*	0.03**	0.01*
-2	0.03*	0.13	0.05*	0.11**	0.10**	-0.07	0.02	0.06*	-0.09
-1	0.07**	0.09**	0.10***	0.12***	0.12***	0.09**	0.05**	0.09**	0.08*
0	0.08**	0.10*	0.10**	0.11**	0.11**	0.10*	0.07***	0.09*	0.08**
+1	0.27**	0.16**	0.09	0.14**	0.14**	0.12**	0.09**	0.11**	0.12*
+2	0.23**	0.15***	0.14**	0.16*	0.18***	0.11*	0.13*	0.14**	0.19**
+5	0.22***	0.17**	0.13*	0.17**	0.19**	0.13***	0.11**	0.18*	0.15*

Note:

*p<0.1; **p<0.05; ***p<0.01

4.2. Discussion of results

Pakistani migrants not only help to improve living standards in Pakistan, they can also participate in the country's development and mitigate the effects of natural disasters, which are affecting more and more of the country. Pakistan, like other developing countries, will need its emigrants to help improve the efficiency of its economy by sending remittances, capital and know-how.

Remittances rise in times of natural disasters because they are motivated by altruistic feelings and solidarity. They are considered counter-cyclical and stable. Our results corroborate (Mughal and Makhoulf, 2011)'s findings for Pakistan, who found that remittances are counter-cyclical. Our results join their findings that remittances from Europe and North America are less volatile than those from

the Gulf states. Consequently, this stability may provide emigration countries with access to a reliable and secure external source of funding. By studying the reaction of remittances to natural disasters, we show that migrants show solidarity by increasing the volume of their remittances. Natural disasters generate human and financial losses, and the need to rebuild is all the greater after such periods of shock. This is why the growth in remittances systematically increases after natural disasters. However, this increase differs according to the host country. Consistently with Bettin et al. (2023), we find that the intensity and timing of remittances' responses to natural disasters are conditioning upon the receiving country's characteristics, and migrants' socio-economic conditions in the host country.

Further, as Makhoul (2019) highlights, the economic characteristics of host countries influence remittances. However, the increase in remittances during natural disasters is not specific to Morocco. This phenomenon is widespread in developing countries of emigration. Remittances may play an increasingly important role in absorbing domestic shocks. In this respect, remittances are intended for households in need, but not necessarily the neediest. Indeed, Ahmed and Martinez-Zarzoso (2016) find in Pakistan remittances contribute to manage economic shocks, which further supports our results. They also contribute to helping recipient families meet their needs in terms of current consumption, education and health, in order to improve the living conditions of migrant family members. The fact that remittances are counter cyclical as shown by Ahmed (2012) can mitigate the negative effects of natural disasters on economic activity. Moreover, remittances can play a "social protection" role in countries of origin. This role is particularly relevant in times of economic crisis linked to natural disasters. In this light, this study suggests that remittances have two types of role: the first is to help the family with day-to-day expenses, and the other is to help insure the family in the event of a major crisis. In the aftermath of natural disasters, some households lose their tools of production, particularly in rural areas.

Remittances are therefore essential, as an additional source of income that can be added to other non-wage income can have a positive impact on the likelihood of an individual participating in the labor market. In the case of a decline in the recipient household's income, particularly in times of crisis or natural disaster,

remittances can compensate in full or in part for this decline to maintain consumption at its usual level. In addition, remittances reduce the volatility of consumption, providing insurance for beneficiary households living in catastrophe-prone areas, which in turn can reduce migration linked to climate change.

5. Conclusion

Remittances are by nature a highly complex phenomenon, translating the complex relationship between the migrant and his or her country of origin. Remittances can be seen as the result of micro- and macro-economic drivers. The aim of this paper mainly consists of taking a closer look at the remittances of Pakistani migrants and to understand their dynamic behavior after natural disasters. To this end, we use a dynamic event Study methodology to assess the validity of this evidence. It is important to underline that the issues raised in this study are highly relevant and reflect some of the debates raised recently by economists, sociologists and politicians.

This paper contributes to empirical debate on the reaction of remittances to unusual events in origin countries. There are several factors that make this relationship between remittances and origin countries complex and not easy to study, namely altruistic, solidarity and self-interested behavior that coexist at the same time in the motivations for sending remittances. The nature and characteristics of host countries can also make this relationship even more complex.

To address the unprecedented balance of payments crisis and the heightened uncertainty surrounding the restoration of a suspended 6.7 billion dollars funding program with the International Monetary Fund (IMF), governments in developing economies with high levels of emigration are expected to i) establish mechanisms to enable remittances to be sent to areas where there is a risk of natural disasters; ii) facilitate remittances after natural disasters; iii) attract remittances that do not use conventional financial channels; iv) reduce the cost of remitting for boosting remittances. In fact, people lacking access to any remittance-receiving technology would be very vulnerable in case of natural disasters. Whilst remitting capacity heavily

depends on migrants' economic conditions in host countries, lessening the costs of international transfers would free up additional financial resources that may be extremely useful in the case of a humanitarian emergency (Ahmed et al., 2021).

Last but not least, this paper provides valuable insights regarding the responsiveness of remittances to natural disasters. However, further surveys of migrants or recipient households affected by natural disasters may improve the quality of debate on the relationship between remittances and shocks in general in countries of origin.

References

Ahmed, J. (2012). Cyclical properties of migrant's remittances to pakistan: What the data tell us. *Economics Bulletin* 32 (4), 3266–3278.

Ahmed, J. and I. Martínez-Zarzoso (2016). Blessing or curse: The stabilizing role of remittances compared with other financial flows. *Journal of South Asian Development* 11 (1), 38–66.

Ahmed, J., M. Mughal, and I. Martínez-Zarzoso (2021). Sending money home: Transaction cost and remittances to developing countries. *The World Economy* 44 (8), 2433–2459.

Amuedo-Dorantes, C., S. Pozo, and C. Vargas-Silva (2010). Remittances in small island developing states. *The Journal of Development Studies* 46 (5), 941–960.

Attz, M. (2008). Natural disasters and remittances: Exploring the link-

ages between poverty, gender and disaster vulnerability in Caribbean SIDS. Number 2008/61. WIDER Research Paper.

Bang, J. T., A. Mitra, and P. V. Wunnava (2015). Financial liberalization and remittances: Recent panel evidence. *The Journal of International Trade & Economic Development* 24 (8), 1077–1102.

Benninga, S. and T. Mofkadi (2008). *Financial modeling*, 5e. Bettin, G., A. Jallow, and A. Zazzaro (2023). How do monthly remittances respond to natural disasters in migrants' home countries? Technical report, Money and Finance Research group (Mo. Fi. R.)-Univ. Politecnica Marche-Dept.

Bettin, G., A. F. Presbitero, and N. L. Spatafora (2017). Remittances and vulnerability in developing countries. *The World Bank Economic Review* 31 (1), 1–23.

Bettin, G. and A. Zazzaro (2018). The impact of natural disasters on remittances to low-and middle-income countries. *The Journal of Development Studies* 54 (3), 481–500.

Brockett, P. L., H.-M. Chen, and J. R. Garven (1999). A new stochastically flexible event methodology with application to proposition 103. *Insurance: Mathematics and economics* 25 (2), 197–217.

Brown, S. J. and J. B. Warner (1985). Using daily stock returns: The case of event studies. *Journal of financial economics* 14 (1), 3–31.

Chaudhary, G. and T. P. Timsina (2017). Does remittance receiving households prepared against natural disasters in nepal? *Journal of Advanced Academic Research* 4 (2), 6–17.

Clarke, G. R. and S. Wallsten (2003). Do remittances act like insurance? evidence from a natural disaster in jamaica. *Evidence from a Natural Disaster in Jamaica* (January 2003).

Córdova, J. E. L. (2006). Globalization, migration and development: the role of Mexican migrant remittances (Working Paper ITD= Documento de Trabajo ITD; n. 20), Volume 20. BID-INTAL.

David, A. C. (2011). How do international financial flows to developing countries respond to natural disasters? *Global Economy Journal* 11 (4), 1850243.

Debnath, P. (2015). Climate change-induced migration and post-disaster re-

mittance responses through a gender lens. *Environmental Change, Adaptation and Migration: Bringing in the Region*, 186–199.

Dodd, P. and J. B. Warner (1983). On corporate governance: A study of proxy contests. *Journal of financial Economics* 11 (1-4), 401–438.

Ebeke, C. and J.-L. Combes (2013). Do remittances dampen the effect of natural disasters on output growth volatility in developing countries? *Applied Economics* 45 (16), 2241–2254.

Edelbloude, J., C. F. Sers, and F. Makhlof (2017a). Do remittances respond to revolutions? the evidence from tunisia. *Research in International Business and Finance* 42, 94–101.

Edelbloude, J., C. F. Sers, and F. Makhlof (2017b). Do remittances respond to revolutions? The evidence from Tunisia. *Research in International Business and Finance* 42, 94–101.

Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica: Journal of the econometric society*, 987–1007.

Engle, R. F. and T. Bollerslev (1986). Modelling the persistence of conditional variances. *Econometric reviews* 5 (1), 1–50.

Frankenberg, E., C. Sumantri, and D. Thomas (2023). Understanding the impacts of a natural disaster: Evidence from the 2004 Indian Ocean Tsunami. In *Island Ecosystems: Challenges to Sustainability*, pp. 151–166. Springer.

Karpestam, P., F. N. Andersson, et al. (2011). International remittances—a proposal how to test hypotheses about determinants of remittances with macroeconomic time series. Technical report.

Kasmaoui, K., F. Makhlof, and R. Selmi (2023). The decision to remit: Is it a matter of interpersonal trust? *Economics Bulletin* (Forthcoming).

Le De, L., J. C. Gaillard, W. Friesen, and F. M. Smith (2015). Remittances in the face of disasters: A case study of rural samoa. *Environment, Development and Sustainability* 17, 653–672.

Lucas, R. E. and O. Stark (1985). Motivations to remit: Evidence from botswana. *Journal of political Economy* 93 (5), 901–918.

Lueth, E. and M. Ruiz-Arranz (2008). Determinants of bilateral remittance flows. *The BE Journal of Macroeconomics* 8 (1).

Maimbo, S. M. and D. Ratha (2005). *Remittances: Development impact and future prospects*. World Bank Publications.

Makhlouf, F. (2013). *Transferts de fonds vers le Maroc, enjeux, comportement et impacts*. Ph. D. thesis, Pau.

Makhlouf, F. (2019). Is productivity affected by remittances? the evidence from morocco. *Journal of International Development* 31 (2), 211–222.

Makhlouf, F., K. Kasmaoui, et al. (2020). Remittances and business cycle in morocco. *Economics Bulletin* 40 (2), 1431–1445.

Makhlouf, F., K. Kasmaoui, J. Edelbloude, et al. (2019). Voting with the wallet: The response of remittances to political systems”. *Economics Bulletin* 39 (2), 1639–1650.

Mandelman, F. S. and A. Zlate (2012). Immigration, remittances and business cycles. *Journal of Monetary Economics* 59 (2), 196–213.

Mitrut, A. (2014). Remittances after natural disasters: Evidence from the 2004 indian tsunami.

Mohapatra, S., G. Joseph, and D. Ratha (2012). Remittances and natural disasters: ex-post response and contribution to ex-ante preparedness. *Environment, Development and Sustainability* 14, 365–387.

Mughal, M. and F. Makhlouf (2011). Volatility of remittances to Pakistan: what do the data tell? *Economics Bulletin* 31 (1), 605–612.

Mughal, M. and F. Makhlouf (2013). Labour effects of foreign and domestic remittances—evidence from pakistan. *International Review of Applied Economics* 27 (6), 798–821.

Naudé, W. and H. Bezuidenhout (2012). Remittances provide resilience against disasters in Africa.

Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica: Journal of the econometric society*, 347–370.

Peterson, P. P. (1989). Event studies: A review of issues and methodology. *Quarterly journal of business and economics*, 36–66.

Ratha, D. (2003). Workers' remittances: an important and stable source of external development finance. *Global development finance*.

Schwert, G. W. and P. J. Seguin (1990). Heteroskedasticity in stock returns. *the Journal of Finance* 45 (4), 1129–1155.

Singh, R. J., M. Haacker, K.-w. Lee, and M. Le Goff (2011). Determinants and macroeconomic impact of remittances in sub-saharan africa. *Journal of African Economies* 20 (2), 312–340.

Su, Y. (2022). Networks of recovery: Remittances, social capital and post-disaster recovery in tacloban city, philippines. *International Journal of Disaster Risk Reduction* 67, 102641.

Swamy, G. (1981). International migrant workers' remittances: issues and prospects. *World Bank staff working paper (USA)*.

Vargas-Silva, C. and P. Huang (2006). Macroeconomic determinants of workers' remittances: Host versus home country's economic conditions. *Journal of International Trade & Economic Development* 15 (1), 81–99.

Wahba, S. (1991). What determines workers' remittances? *Finance and development* 28 (4), 41.