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# *An attempt to measure the impact of financial crises on the interconnectedness and integration of emerging and developed financial markets.*

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***Abstract***

This study aims to examine the impact of financial crises on the integration/disintegration of financial markets and how the global financial crisis spreads to other countries' markets. It relies on a sample of ten developed and emerging markets, divided between Europe, America, and Asia, namely: France, Italy, Hong Kong, Japan, Canada, the United States, Indonesia, Malaysia, Brazil, and Mexico.

The study data consists of the closing prices of the main market indices, extracted from the Morgan Stanley Capital International (MSCI) database. The study period covers the period from September 3, 1989, to December 31, 2014, with a monthly frequency of 303 observations. This period was chosen to obtain a sufficient number of observations to conduct the necessary tests for studying integration across sub-periods. This period also witnessed several financial crises.

To address the research problem, we used a set of statistical models: cointegration tests and the Autoregressive Distributed Lag (ARDL) model. The study concluded that financial crises directly affect the degree of interconnection between markets, often leading to increased volatility and instability. Financial crises also stimulate market integration; that is, financial markets become more integrated during and after crises due to the increased correlation between these markets during periods of turmoil. Furthermore, we found that the American market readily transmits financial crises to the largest global financial markets, whether developed or emerging, regardless of their economic strength. Because the US market has a strong relationship with developed markets, these markets are highly susceptible to its effects, unlike emerging markets, which are characterized by a degree of stability and are therefore less affected.

***Keywords***: Financial integration; Market integration; Correlation; Returns; Risks; Financial markets; Financial crises.

## *Introduction:*

The global economy has experienced significant fluctuations due to several factors, including political and economic ones. Financial crises are among the most prominent economic phenomena that directly affect the stability of the global economy and the nature of relationships between different financial markets. With the significant development of the global financial system, financial markets have become more interconnected and integrated,

with capital, information, and fluctuations moving rapidly between markets. This financial integration has contributed to boosting investment and diversifying investment portfolios.
Financial market integration is defined as the level of interdependence and convergence between local and global markets, where changes in one market affect others. It's worth noting that the integration of financial markets within the global system can lead to a convergence of price trends for assets traded in these integrated markets, ultimately resulting in a state of information efficiency across all integrated markets. Consequently, assessing financial market integration becomes a necessary requirement in portfolio development. In line with this, financial integration is considered the efficient allocation of capital, which reduces financing costs, stimulates investment flows, and thus raises economic growth rates. Financial market integration also expands investment opportunities, provides accurate information, and ensures acceptable levels of stability. The importance of this integration is further demonstrated by its role in improving the efficiency of financial resource allocation, increasing liquidity, and boosting economic growth. However, financial crises such as the Asian crisis of 1997 and the global financial crisis of 2008 revealed the fragility of this integration, leading to increased levels of financial contagion and heightened volatility and instability in global markets.
From this perspective, the impact of financial crises on the integration of financial markets has become a crucial topic that has garnered the attention of researchers and investors. This is due to the changes in investor behavior and capital flows that crises cause, as well as their impact on market efficiency and the degree of interdependence among markets. This study aims to understand the nature of the relationship between financial crises and the integration of financial markets, and the extent to which economic and regulatory policies can mitigate the spread of crises and enhance the stability of the financial system.
Given that the selected study period, 1989-2014, is punctuated by a series of financial crises that had a significant impact on financial markets, this study attempts to answer the following question:
To what extent do financial crises affect the integration of financial markets in the long term?
This topic has witnessed increasing interest from researchers, particularly after the financial crises experienced by the global economy, which highlighted the interdependence of financial markets and their vulnerability to economic shocks. Among these studies are:
Lucie Samon; Fatou Diaw, Intégration des marchés boursiers d'Asie et des états-Unis. This study aims to analyze the level of integration of selected Asian markets in the study sample with the New York Stock Exchange during the period from February 1981 to March 1993. This is achieved by analyzing the stock market returns of three Asian countries: Hong Kong, Malaysia, and Singapore, in addition to the New York Stock Exchange, using two approaches: one based on the preferences of individual investors and the other relying on modeling unobserved variables. This study also allows for an evaluation of the determinants of Asian stock market returns in the study sample and the American market. The analysis is conducted in two steps. First, the problem of individual portfolio selection is defined within a specific timeframe. Based on the conditions arising from the optimization problem, a relationship is established between various stock market returns and the temporary replacement margin rate of agent consumption. The researchers postulated a utility function for this latter rate, which can be empirically tested in the second step. Instead of formulating equations to characterize individual utility, the researchers developed a linear model of the initial conditions to test the hypothesis of a reference portfolio with a strong correlation to the temporary replacement margin rate. This leads to limitations in many prediction equations. This step allows for a direct review of the issue of return prediction and the degree of integration of the New York market with Asian markets. In both cases, a comparison is made before and after the October 1987 crisis. This study showed that markets appear more integrated after the 1987 stock market crash compared to the preceding period. It also demonstrated that emerging Asian stock markets exhibit significant openness to foreign investment and have achieved integration with developed markets, particularly the New York market, which has risen over the past decade.

Cristina Tudor, Changes in Stock Market Interdipendences as a Result of the Global Financial Crisis: Empirical Investigation or the CEE Regions.

This study attempts to examine the causal relationships and short-term interaction mechanisms of six stock markets in Central and Eastern Europe (CEC) and the American market during the period of global turmoil during the 2007-2009 financial crisis. Daily observations of the sample markets were used from January 2006 to March 2009, subsequently divided into pre-crisis and post-crisis periods. The crisis revealed that the relationship between CEC and Eastern European stock markets varied over time. While the interrelationship between the markets was limited before the crisis, it increased during the crisis. The results of this study indicate the limited diversification of risk through investment in CEC markets during the period of financial instability. The study also highlights the role of the Russian market in the region before the crisis and notes that CEC markets were influenced by pre-crisis financial innovations, which explains their vulnerability to the crisis and its rapid spread within the region.

Chu-sheng Tai; Market itegration and contagion: Evidence from Asian emerging stock and foreign exchange markets.

This study attempts to test the possibility of integrating Asian emerging stock markets with the global stock market since their official opening. This is achieved by estimating and testing the dynamics of the MEDAFI international financial asset pricing model in the absence of purchasing power parity, using the MGarach-M approach.

The study relies on a sample of six Asian emerging markets: India, Korea, Malaysia, the Philippines, Taiwan, and Thailand. Historical end-of-month data is used for the period from January 1980 to March 2002 for India, Korea, and Thailand, and from December 1984 to March 2001 for Malaysia. Taiwan, and the Philippines, during the period from January 1986 to March 2001, where all market returns were converted to US dollars. Integration was tested using an International Financial Asset Pricing Model (IFPM), which allows for complete market segmentation before the official opening date and market integration afterward.

The study's results showed that all international currency and market risks were assessed, indicating that neglecting currency risk in the IFPM can lead to inaccurate results. The study also showed that the stock markets of India, Korea, Malaysia, the Philippines, and Thailand were separate from the global capital market before their opening dates but became integrated with it afterward. Furthermore, the study concluded that market opening reduces the cost of capital and price volatility in most markets. Regarding the contagion effect for Korea and Malaysia... The Philippines demonstrated a feedback loop between stock prices and exchange rates. This relationship was corroborated by estimates of both securities models and exchange rates. Data from India and Taiwan showed that exchange rates controlled securities pricing, while Thailand failed to reveal any recognized model during the crisis.

Alessandra Bonfigliole and Carol A. Favero, Explaining Co-movement between Stock Markets: The Case of the US and Germany.

This study proposes a model for deconjugating contagion in the coordinated movements of stock markets and applies it to the German and US stock markets. The researchers tested the relative importance of contagion and correlation within a clearly defined structural model using cointegration. They constructed a long-term equilibrium model by testing various properties and elaborating on the cointegration hypothesis between the logarithm of the US yield rate and the long-term interest rate. Within this framework, they found that the hypothesis of non-correlation between the two markets could not be rejected. The researchers then used the VEC model as a basis for reducing the shape and constructing a structural model to test the relative importance of correlation and contagion in determining the short-term dynamics of the two markets.

The structural model showed that the impact of fluctuations in the US stock market on the German market was captured with non-linear characteristics, while normal fluctuations in the US market do not affect the German market in the same non-linear way, and it is consistent with the usefulness of contagion in that it reaches the modification of the correlation in the

short term following crises. That is, the results of this study are consistent with the results of the study that adopted the Instrumental Variable model by Rigobon in 2003.

***Data:***

This research aims to examine the integration of a group of developed and emerging financial markets geographically distributed across Europe, Asia, and the Americas, specifically: France, Italy, Hong Kong, Japan, Canada, the United States, Indonesia, Malaysia, Brazil, and Mexico. It also studies the impact of the financial crises experienced during this period on the integration relationships within these markets.

The data for this study consists of closing prices for major stock market indices, extracted from the Morgan Stanley Capital International (MSCI) database. The study period spans from September 30, 1989, to December 31, 2014, with a monthly frequency of 303 observations. This period was chosen because it encompasses a series of crises, including regional financial crises and a global economic crisis. The different currencies used for the indices were standardized by converting them to the US dollar to mitigate exchange rate risks and their impact on the returns of various securities. To achieve the study's objectives, the data was summarized as follows:

- Reliance on closing prices for major indices, comprising 10 monthly series of 303 observations;
- Calculation of weekly return rates for each indices (excluding dividend distributions);
- Standardization of closing prices by converting them to the US dollar;
- Division of the study period into sub-periods to examine the impact of the financial crisis.

***Methodology and Tools Used***

To achieve the objectives of this study and to gain a comprehensive understanding of its various aspects, we employ several methodologies commonly used in economic and financial studies, tailored to our specific topic. Accordingly, we adopted a case study approach, which includes a field study of a group of developed and emerging financial markets. We utilized a combination of measurement and statistical tools to examine the integration of financial markets and the impact of financial crises on these relationships during the study period.

We relied on a series of standard tests to prove or disprove the integration of the financial markets under study. These tests included stability tests, specifically the Dickey-Fuller test (developed) and the Philip Peron test, as well as the Johannes cointegration test and the error correction model.

We also used the ARDL model when examining the impact of the US market on the portfolios of developed and emerging markets.

All these tests were conducted using the following statistical software programs: EViews 8.0, EViews 9.0, and Microfit 5.

***Studying the Impact of Financial Crises on Financial Integration Relationships***

To study the impact of financial crises on financial integration, we divided the study period according to the crises recorded during the selected period from 1989 to 2014. We chose two periods of instability:

• The period from 1997 to 1999, which included the Russian, Asian, and Brazilian crises. To facilitate our study, we grouped these closely related crises into a single period to gather a sufficient number of observations.

• The 2007 global financial crisis: This crisis began in the United States and its effects spread to all countries worldwide. It also lasted longer than the other crises.

In this section, we divide the study period into sub-periods, separating the periods of stability preceding the financial crises from the periods of turmoil interspersed with the crises studied, as follows:

1- The first phase: The period before the financial crises of 1997-1999. This period extends from October 1989 to June 1997.

2- The second phase: The period of intensified financial crises (the Asian crisis, the Russian crisis, and the Brazilian crisis). This period extended from July 1997 to December 1999.

3- The third phase: The period after the financial crises and before the 2007 global financial crisis. This period was characterized by stability following a series of crises and extended from January 2000 to June 2007.
4- The fourth phase: The period of the 2007 global financial crisis. This crisis affected several markets and had a longer duration, defined as the period from July 2007 to April 2009.
5- The fifth phase: The period after the global financial crisis. This period extended from May 2009 to December 2014, the maximum period for the study.

1.4. Analysis of Market Returns During Sub-Periods:

Financial market returns are characterized by constant fluctuations in value. However, any impact on them due to crises is more pronounced during periods of turmoil compared to periods of stability. The most prominent crises witnessed during this period are listed below:

• The Mexican Crisis of 1994;
• The Asian Crisis of 1997;
• The Russian Crisis of 1998;
• The Brazilian Crisis of 1999;
• The Argentine Crisis of 2001;
• The Global Crisis of 2007;
• The Greek Crisis of 2010. Based on the above breakdown, these crises had varying impacts on financial market returns from one crisis to another and from one country to another, as follows:

 ***American Markets:***

Canadian market returns were relatively stable, particularly at the beginning of the study period, ranging between 21% and -27.2%. The impact of the Russian crisis became evident, causing returns to fall to -21.9%. Returns were also affected by the events of September 2001, and the 2008 financial crisis had a greater impact than previous crises, reaching its lowest point in October 2008. As for the US market, returns were highly volatile throughout the study period, fluctuating between 11% and -17%. These returns were affected by several crises, most notably the 1989 Russian crisis, which saw the lowest returns, in addition to the events of September 2001 and the Argentine crisis. Returns stabilized briefly before experiencing an unprecedented decline during the study period due to the impact of the 2008 financial crisis. Emerging *American* markets exhibited varying movements depending on the crises they faced. For example, the Mexican market experienced significant volatility at the beginning of the period, with returns ranging between The Brazilian market was impacted by a series of crises, most notably the Mexican crisis, where returns reached their lowest point. Furthermore, returns were affected by the 1989 Russian crisis, and the 2008 global financial crisis also contributed to the decline in these market returns. Brazilian market returns were characterized by a wide range of fluctuations, ranging between 81.3% and -66.9%. Returns in the first few years of the study experienced significant volatility, before stabilizing. However, these returns were then impacted by the Brazilian crisis, which saw them reach their lowest point, followed by the 2001 Argentine crisis and the global financial crisis.
26.7% and -34.3%, respectively.

 **European Markets:**

The French market experienced successive fluctuations throughout the study period, ranging between 15.3% and -22.4%. A series of crises impacted this market, leading to a decline in returns. These crises included the 1998 Russian crisis, where returns reached -11.5%, the impact of the September 2001 attacks, and the Argentine crisis, where returns reached -11.7%. The 2008 crisis had a significant impact compared to the others, resulting in a sharp drop in returns to -22.4%. The 2010 sovereign debt crisis also affected returns. The Italian market experienced similar fluctuations, although its returns ranged between 21.4% and -23.6%.
The French market experienced higher returns throughout the study period.

 **Asian Markets:**

Asian markets were characterized by their relative resilience to financial crises. Japanese market returns ranged between 24.2% and -19.4%, impacted by the 1994 Mexican crisis,

which saw losses of -11.5%. Furthermore, Japanese market returns were affected by the 2008 global financial crisis, reaching -19.4%. Hong Kong market returns ranged between 32.8% and -29.1%, impacted by the 1997 Asian financial crisis, which saw it reach its lowest point.
As for emerging Asian markets, their returns remained relatively stable, although the range of maximum returns achieved was significantly higher than that of developed markets. Returns in the Indonesian market ranged between 0.556% and -0.408%, while in the Malaysian market, returns ranged between 49.9% and -30.3%.

***Analysis of the Impact of Financial Crises on Financial Market Integration:***

Having divided the study period into sub-periods, we will now examine the integration relationships between countries—where integration occurred during the overall period—within these sub-periods and between different countries, as follows:

- Group 1: Developed US and Asian markets;
- Group 2: Developed US and European markets;
- Group 3: Developed European and Asian markets;
- Group 4: All developed markets;
- Group 5: All developed and emerging markets.

The following table summarizes the number of integration relationships using the Johansen test for the cases mentioned above:

***Table No. (1) Results of Johansen's Integration Tests***

| Phase Five (Stability) | Stage Four (Disorder) | Phase Three ((Stability | Phase Two (Disorder) | Phase One (Stability) | periods / markets |
|---|---|---|---|---|---|
| 2 | 1 | 1 | 3 | 0 | ***Group 1*** |
| 2 | 2 | 2 | 2 | 0 | ***Group 2*** |
| 1 | 2 | 1 | 2 | 1 | ***Group 3*** |
| 3 | 4 | 2 | 4 | 1 | ***Group 4*** |
| 4 | / | 4 | 4 | 3 | ***Group 5*** |

***Source prepared by the researcher using EViews 8 software.***

From the table above, we observe that the relationship of integration is variable over time, and that the financial crisis stimulates integration relationships due to globalization. However, this effect varies over time and according to the spatial context, as a set of variables affecting integration interact.

The financial crises of 1997-1999 led to a decline in the development of industrial production in various American markets, influenced by the 1999 Brazilian crisis, after it had recorded significant rates at the beginning of the period. This decline extended beyond the crisis. In European markets, the rate of industrial production growth declined due to the impact of the 1998 Russian crisis.

The Asian crisis also affected Indonesia, Malaysia, and Hong Kong. The decline in industrial production during these crises is explained by the increase in unemployment rates during this period, resulting from high inflation and the bankruptcy of institutions, which led to layoffs. The 2007-2009 financial crisis affected all countries within a short period, making it a global crisis. It led to a decline in industrial production that persisted for several years afterward. While the impact of the 1997-1999 crises on unemployment was immediate, occurring only during those periods, the global crisis's effects became apparent towards the end of the crisis period and extended for years afterward, particularly in European countries already affected by the Greek crisis. Unemployment rates in these countries rose steadily, unlike in American and Asian countries, which experienced a rise followed by stabilization. As mentioned, rising unemployment rates can be attributed to either high inflation or an increase in bankruptcies, leading to layoffs.

Generally, inflation and unemployment rates tend to coincide, but only in European countries have we observed a sustained rise in unemployment rates alongside fluctuations in

inflation. The increase in unemployment can be explained by layoffs resulting from bankruptcies or a decline in business activity. As for exchange rates, they experienced a significant decline in all countries during the series of crises from 1997 to 1999, except for the United States. This was due to the increased demand for the US dollar during these crises, which stabilized it until it eventually rose. In other countries, their currencies were affected by the decline in demand caused by the panic triggered by the financial crisis. Because economic variables are interconnected, and given the high inflation rates, this negatively impacted foreign trade (exchange rate fluctuations increase the risks faced by exporters and investors). Therefore, a depreciation of the local currency leads to lower prices for domestic goods compared to foreign prices. Conversely, raw material prices rise, leading to higher prices domestically and consequently a decline in the standard of living in countries suffering from a depreciated exchange rate.

The decline in exchange rates also affects imports. A lower exchange rate leads to higher import prices domestically, which in turn reduces the volume of imports and consequently decreases the demand for foreign currency. Similarly, during the global financial crisis, all countries experienced a decline in their exchange rates, which negatively impacted their trade openness. The real interest rate also witnessed a significant decline during both crises, which in turn affected investment and capital inflows, which decreased during periods of instability in response to the lower interest rates.

The current account deficit is a reflection of the movements of various preceding changes: trade liberalization, foreign direct investment, and financial flows, which themselves respond to other variables such as unemployment, exchange rates, and interest rates. The impact of the crisis on these factors was evident. As with the other variables, the financial crises of 1997-1999 had an immediate impact, occurring within the crisis years. However, the global crisis affected all the sample markets, and its effects persisted beyond the crisis itself. As a result of the combined movements of these variables across these countries, the complementary relationships between them were affected over time.

***Discussion of the findings regarding the impact of financial crises on market integration***

The results presented show that integration relationships change over time, depending on the study period and the classification of markets into different groups. This finding aligns with Cristina Tudor's 2014 study. The table also indicates that the developed American and Asian markets were initially completely separate, with no integration relationship between them. However, they moved towards integration during the first wave of crises, a trend that continued until the 2008 crisis, after which integration between these markets stabilized compared to the preceding period. This finding is consistent with Lucie Samon's 1995 study. Similarly, for the second group, the developed American and European markets, these markets initially exhibited separation. However, after the wave of financial crises recorded in the second period, they moved towards integration, and this relationship remained stable in subsequent phases. This finding is consistent with the 2005 study by Alessandra Bonfigliole and Carol A. Favero.

The results also show that integration relationships change over time, depending on the division of the study period and the classification of markets into different groups. The relationship of integration between developed European and Asian markets was positive; that is, these markets have been integrating from the outset, and financial crises have further encouraged this integration.

Similarly, in the study of developed markets as a whole, these markets were integrating from the outset, and the impact of the financial crises of the period encouraged this integration. This finding is consistent with the 2007 study by Chu-sheng Tai.

The relationship of integration between the total markets was also characterized by

***Table (2) Unit wall test using ADF and PP***

| **Philips Piron PP Test** | | **(Dickey and Fuller Advanced Test (ADF** | |
|---|---|---|---|
| **Results of the stability test at first-** | **Stability test results at the level** | **Results of the stability test at first-** | **Stability test results at the level** |

| order differences | | order differences | | |
|---|---|---|---|---|
| **Before the financial crisis** | | | | |
| -7.730102 | -0.389925 | -7.760655 | -0.454020 | **DIV** |
| -7.673732 | -0.358283 | -7.669179 | -0.417252 | **EM** |
| -7.704459 | 0.602538 | -7.704459 | 0.773496 | **USA** |
| **Financial crisis period** | | | | |
| -7.730102 | -0.389925 | -7.760655 | -0.454020 | **DIV** |
| -7.673732 | -0.358283 | -7.669179 | -0.417252 | **EM** |
| -7.704459 | 0.602538 | -7.704459 | 0.773496 | **USA** |
| **Scheduled values** | | | | |
| -2.575916 | -3.461327 | -3.461327 | -2.575916 | **1%** |
| -2.875062 | -1.94233 | -2.875062 | -1.9423 | **5%** |
| -1.615703 | -2.574054 | -2.574054 | -1.615703 | **10%** |

***Source: Prepared by the researcher using EViews 8.0 software.***

The table shows that the time series stabilize at first-order differences in both tests, as well as during the two study periods, i.e., before and after the financial crisis.

*2.4.4*Cointegration Test Using the Autoregressive Distributed Lag (ARDL) Model

In this part of the study, we use the ARDL methodology developed by Shinand and Sun (1998) and Pesaran (1997). The reason for choosing this model over other cointegration testing methods is the uncertainty that often arises regarding the properties and stationarity of time series. Therefore, the boundary method is considered the best option. This test can be applied regardless of the time series' properties, whether they are stationary at levels I(0), first-order integrals I(1), or a combination of both. The only requirement for applying this test is that the time series not be second-order integrals

***Table (3) shows the results of the cointegration test using the boundary method.***

| The upper limit is at the .90% level | Minimum at 90% level | The upper limit is .at the 95% level | Minimum at level%95 | The calculated value of the testF–statistic |
|---|---|---|---|---|
| **Before the financial crisis** | | | | |
| **L_DIV=f(L_USA)** | | | | |
| 6.3750 | 5.6528 | 7.5223 | 6.6727 | 8.5368 |
| **L_ME=f(L_USA)** | | | | |
| 7.5436 | 6.7582 | 6.4039 | 5.6407 | 7.2886 |
| **Crisis period** | | | | |
| **L_DIV=f(L_USA)** | | | | |
| 4.14 | 3.17 | 4.85 | 3.79 | 5.852428 |
| **L_ME=f(L_USA)** | | | | |
| 4.14 | 3.17 | 4.85 | 3.79 | 5.3966 |

***Source: Prepared by the researcher using Microfit 5 software.***

The table above shows the results of the F-statistic, where the values were greater than the upper limit of the critical values in models ≥1 and ≥2. These values were obtained from the tables proposed by Pesaran et al. (2001) at significance levels of 5% and 10%. Therefore, we reject the null hypothesis, i.e., we reject the hypothesis that there is no long-run equilibrium relationship, and we accept the alternative hypothesis of cointegration between L_DIV and L_USA from the first equation and between L_USA and L_EM from the second equation.

**Estimating the Long-Run Equilibrium Model Using the ARDL Model**

Having confirmed in the previous section the existence of cointegration between the variables in both models, it is necessary to estimate the long-run relationship of these two equations. The long-run model is estimated using the ARDL model for each of the two equations mentioned. This stage involves obtaining the long-run parameter estimates, as shown in the table below. The lag periods were based on the Schwarz-Bayesian Criterion. However, before adopting the ARDL model, its performance quality must be verified. This is done by conducting the following diagnostic tests:

1.Lagrange Multiplier Test of Residuals [Breush-Godfrey (BG)

2. Autoregressive Conditional Heteroscedasticity (ARCH) Test

3. Jarque-Bera Test for Normality of Random Errors

4.Ramsey RESET Test for the suitability of the estimated model's design in terms of its functional form.

Table (3) shows the results of estimating the ARDL(1,1) model chosen by SC for the Emerging Markets Index. Table (4-4) shows the results of estimating the ARDL(1,1) model chosen by SC for the Emerging Markets Index equation. The following is evident from these two tables:

 The LM test indicates that the two models are free from serial correlation.

 The ARCH test indicates acceptance of the null hypothesis of homoscedasticity in the estimated models.

 The JB test indicates acceptance of the hypothesis that the random errors are normally distributed in the estimated models.

 The RESET test indicates the validity of the functional form used in the aforementioned models.

Based on the results of the diagnostic tests for the estimated models, a decision can be made regarding the suitability of using these two models for estimating the long-term relationship. The following is evident from these two tables:

 All estimated regression coefficients are statistically significant.

The $R^2$ value indicates a high explanatory power for the independent variable under study, while the F-test value indicates the statistical soundness of the estimated model as a whole.

Before the financial crisis, every one-unit increase in the returns of the US market index would lead to a 0.938732 increase in the returns of the developed markets portfolio and a 0.92873 increase in the returns of the emerging markets portfolio in the long run. This reflects a strong positive correlation between the US market and developed and emerging markets in the long run. However, the impact of the crisis on emerging markets was less severe than its impact on developed markets.

Prior to the 2008 Global Financial Crisis:

***Table (4): Estimates of Long-Term Parameters for the Evolving Markets Portfolio Equation Prior to the 2008 Financial Crisis***

| probability | T-Ratio | Coefficient | variable |
|---|---|---|---|
| 0.000 | 10.9765 | 0.734 | L_DIV(-1) |
| 0.000 | 15.0779 | 0.93873 | L_USA |
| 0.000 | -5.8994 | -0.58459 | L_USA(-1) |
| 0.001 | -3.4909 | -0.64487 | INPT |
| 0.000 | 4.2456 | 0.0011496 | TREND |
| R-Squared = 0.99 | | | |
| F-Stat. 2270.7[.000] | | | |
| DW-statistic = 2.01 | | | |
| + Diagnostic tests | | | |
| **RESET (1)** | **ARCH (1)** | **BG LM (2)** | **JB(2)** |
| 0.27051[.604] | 0.13698[.712] | 1.0501[.413]* | X2= 4.7080[.095] |

**Source: Prepared by the researcher using Microfit 5 software.**

**Table (5): Estimates of long-term parameters for emerging market portfolios before the 2008 financial crisis**

| probability | T-Ratio | Coefficient | variable |
|---|---|---|---|
| 0.000 | 11.9765 | 0.7434 | L_EM(-1) |
| 0.000 | 15.2779 | 0.92873 | L_USA |
| 0.000 | -6.8994 | -0.59459 | L_USA(-1) |
| 0.001 | -3.3909 | -0.61487 | INPT |
| 0.000 | 4.22456 | 0.012496 | TREND |
| R-Squared = 0.99 | | R-Bar-Squared = 0.99 | |
| F-Stat. F(4,89) 2461.2[.000] | | | |
| DW-statistic = 2.0 | | Durbin's h-statistic = -.55181[.58 | |
| + Diagnostic tests | | | |
| **RESET (1)** | **ARCH (1)** | **BG LM (2)** | **JB(2)** |
| 0.22545[.636] | 0.081846[.775] | 1.0109[.447] | X2= 3.4675[.177 |

**Source: Prepared by the researcher using Microfit 5 software**

During the 2008 Global Financial Crisis:

**Table (6): Estimates of Long-Term Parameters for the Evolving Markets Portfolio Equation after the 2008 Financial Crisis**

| probability | T-Ratio | Coefficient | variable |
|---|---|---|---|
| 0.000 | 6.206350 | 0.677386 | L_DIV(-1) |
| 0.0364 | 2.129085 | 0.228459 | L_DIV(-2) |
| 0.9527 | -0.059456 | -0.000233 | L_USA |
| 0.0123 | -2.563473 | -0.061337 | INPT |
| R-Squared = 0.99 | | | |
| F-Stat. 13972.62 [.000] | | | |
| DW-statistic = 1.97 | | | |
| + Diagnostic tests | | | |
| RESET (1) | ARCH (1) | BG LM (2) | JB(2) |
| 0.10583 [.918] | 0.19636[.659] | 1.7461[.075] | 0.59413 [.743] |

**Source: Prepared by the researcher using Microfit 5 software**

**Table (7): Estimates of long-term parameters for emerging market portfolios after the 2008 financial crisis**

| probability | T-Ratio | Coefficient | Regressor |
|---|---|---|---|
| 0.000 | 6.359854 | 0.669948 | L_EM(-1) |
| 0.0395 | 2.094585 | 0.216723 | L_EM(-2) |
| 0.0109 | 2.609404 | 0.069531 | L_USA |
| 0.0115 | -2.590550 | -0.070166 | L_USA(-1) |
| 0.0029 | 3.074523 | 0.070378 | INPT |
| R-Squared = 0.99 | | | |
| F-Stat. 13115.46 [.000] | | | |
| DW-statistic = 1.99 | | | |
| + Diagnostic tests | | | |
| RESET (1) | ARCH (1) | BG LM (2) | JB(2) |

| | | | |
|---|---|---|---|
| 0.010583 [.918] | 0.19636 [.659] | 1.746 ]0.075[ | 0.42160 [0.810] |

***Source: Prepared by the researcher using Microfit 5 software***

During the financial crisis, the impact of US market yield movements on emerging and developed market portfolios differed. Each one-unit increase in US market yields resulted in a loss of 0.000233 in the yield of the developed market portfolio, while the same increase in US market yields led to a 0.069531 increase in the yield of the emerging market portfolio. Thus, the financial crisis negatively impacted developed market yields, causing them to experience losses. Although emerging markets did not experience losses in their yields, they recorded a significant decline compared to the preceding period of the study, which was considered a period of stability.

Short-Term Equilibrium Analysis:

To measure the short-term relationship, an error correction model was used. This model has two advantages: first, it measures the short-term relationship, and second, it measures the rate of adjustment to restore equilibrium in the dynamic model. Before the 2008 Global Crisis:

Table (7) shows the results of estimating the error correction formula for the SBC-selected ARDL model for the developed markets portfolio. Table (4-8) also shows the results of estimating the error correction formula for the SBC-selected ARDL model for the emerging markets portfolio. The following is evident from these two tables:

 The presence of statistical significance for both the ECM1(-1) and ECM2(-1) coefficients, along with a negative sign for these coefficients, confirms the existence of cointegration between the variables under study in the equations for the developed markets portfolio and the emerging markets portfolio.

 For the developed markets portfolio equation, the estimated value of the ECM1(-1) coefficient was -0.27131. This means that approximately 27% of the imbalance in developed market returns from the previous year is corrected in the current year.

 For the emerging markets portfolio equation, the estimated value of the ECM2(-1) coefficient was -0.25659. This means that approximately 25% of the imbalance in emerging market returns from the previous year is corrected in the current year.

 There is a positive and significant impact of changes in US market returns on the short-term returns of the developed markets portfolio.

 There is a positive and significant impact of changes in US market returns on the short-term returns of the emerging markets portfolio. The coefficient of determination (CID) value showed a high explanatory power of the independent variables in explaining the change in the dependent variable for the two equations. The CID values were approximately 0.732 and 0.745 for these two equations, respectively.

Table (7) shows the results of the error correction model estimations for the ARDL model for developed market portfolio returns.

| probability | Coefficient | Regressor |
|---|---|---|
| 0.000 | 0.93850 | DL_USA |
| 0.000 | -0.27131 | ECM1(-1) |
| 0.000 | 0.0011878 | DTREND |
| | | |
| F-Stat. F(3,91) 82.1707[.000] R-Squared = 0.73255 | | |

Ecm1 = L_DIV - 1.3271*L_USA + 2.3773*INPT - 0.0043780*TREND

Source: Prepared by the researcher using Microfit 5 software

***Table (8) Model Estimation Results: Error Correction for the ARDL Model for Emerging Markets Portfolio Returns***

| probability | Coefficient | Regressor |
|---|---|---|
| 0.000 | 0.92655 | DL_USA |

| | | |
|---|---|---|
| 0.000 | -0.25659 | $ECM_2(-1)$ |
| 0.000 | 0.0012422 | DTREND |
| | | |
| R-Squared = 0.74255 F-Stat. F(3,90) 84.4715[.000] | | |

**$Ecm_2$ = L_EM -1.3063*L_USA + 2.3888*INPT -.0048411*TREND**

Source: Prepared by the researcher using Microfit 5 software

During the 2008 Global Crisis:

The same conditions were met during the financial crisis, as shown in Table (4-9) showing the results of the error correction formula estimation for the ARDL model chosen by SBC for the developed markets portfolio, and Table (4-10) showing the results of the error correction formula estimation for the ARDL model chosen by SBC for the emerging markets portfolio.

 The presence of statistical significance for both the ECM1(-1) and ECM2(-1) coefficients, along with a negative sign for these coefficients, confirms the existence of co-integration between the variables under study in the developed markets portfolio and the emerging markets portfolio models.

•A positive and significant effect of changes in US market returns during the financial crisis was observed on the short-term returns of developed and emerging market portfolios.

•The coefficient of determination (CID) value demonstrated the high explanatory power of the independent variables in explaining the change in the dependent variable in both equations. The CID values were approximately 0.732 and 0.745 for these two equations, respectively.

***Table (9): Results of the Error Correction Model (ARDL) Estimates for Developed Market Portfolio Returns***

| probability | Coefficient | Regressor |
|---|---|---|
| 0.9522 | -0.002474 | DL_USA |
| 0.0291 | -0.094155 | $ECM_2(-1)$ |
| 0.0825 | -0.651447 | DTREND |
| | | |
| **R-Squared = 0.74255 F-Stat. F(3,90) 84.4715[.000]** | | |

$Ecm_1$ = L_DIV - (1.1051*L_EM -0.0025*L_USA -0.6514 )

Source: Prepared by the researcher using Microfit 5 software

***Table (10) Model Estimation Results: Error Correction for the ARDL Model for Emerging Markets Portfolio Returns***

| probability | Coefficient | Regressor |
|---|---|---|
| 0.8718 | -0.005608 | DL_USA |
| 0.0102 | -0.113330 | $ECM_1(-1)$ |
| 0.0323 | 0.621000 | DTREND |
| | | |
| **F-Stat. F(3,91) 82.1707[.000] R-Squared = 0.73255** | | |

***$Ecm_2$ = L_EM - (0.9077*L_DIV -0.0056*L_USA + 0.6210)***

***Source: Prepared by the researcher using Microfit 5 software***

Model Stability Test

To ensure that the data used in this study is free from any structural changes, it is necessary to use one of the appropriate tests, such as the Cumulative Sum of Residuals (CUSUM) and the Cumulative Sum of Squares (CUSUM of Squares). These two tests are among the most important in this field because they reveal two important aspects. Structural stability of the estimated coefficients for the error correction formula of the distributed gap autoregressive

model is achieved if the graph of both the CUSUM and CUSUM of Squares tests falls within the critical limits at the 95% level. In light of most of these studies, we applied the CUSUM and CUSUM of Squares tests to the available data before and during the financial crisis.
Before the 2008 Global Crisis:
From the graph, we observe that the CUSUM test for these two models crosses the midpoint of a line within the critical region, indicating a degree of stability in the model at significant levels. 95% is also the result for the cumulative sum of squared residuals (CUSUMSQ) test. These two tests demonstrate stability or consistency in the models between long-term and short-term results.

***Figure (1): Results of the CUSUM and CUSUMSQ tests for the stability of the error correction formula coefficients of the ARDL model for developed markets portfolios.***

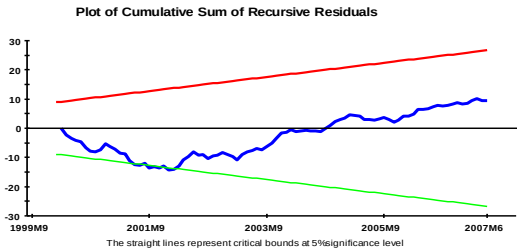
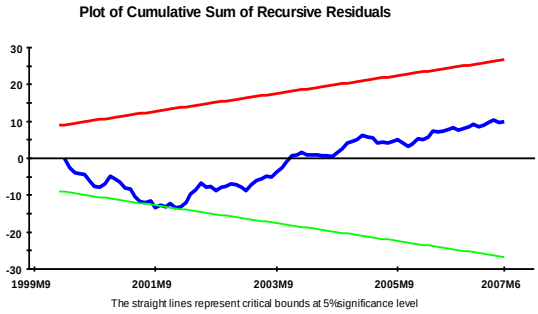
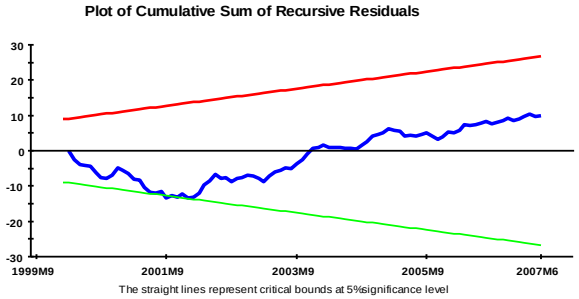



***Figure (2): Results of the CUSUM and CUSUMSQ tests for the stability of the error correction formula coefficients of the ARDL model for emerging markets portfolios.***

During the 2008 Global Crisis:




Similarly, during the financial crisis, we observe that the graph for both the CUSUM and

CUSUMSQ tests shows a line mediating the critical boundary, indicating a degree of model stability at a significant level of 95%. The same applies to the CUSUMSQ test. These two tests demonstrate stability and consistency in the models between long-term and short-term results.

***Figure (4): Results of the CUSUM and CUSUMSQ tests for the stability of the error correction formula coefficients of the ARDL model for developed markets portfolios.***

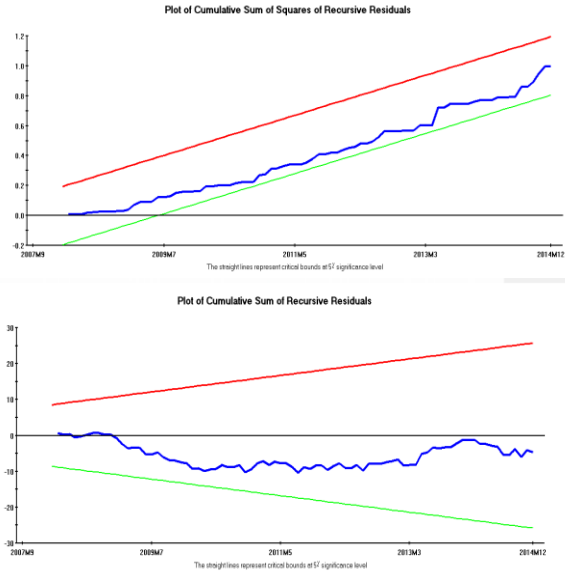
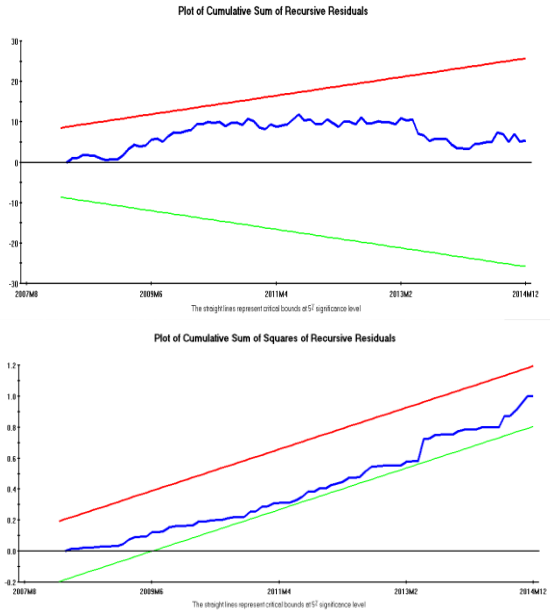



***Figure (4): Results of the CUSUM and CUSUMSQ tests for the stability of the error correction formula coefficients of the ARDL model for emerging markets portfolios.***




The US economy accounts for 25% of global imports, making it highly susceptible to financial crises. It can easily transmit these crises to major global financial markets, whether developed or emerging, regardless of their economic strength. Because the US market is closely linked to developed markets, it is rapidly and significantly affected by them, unlike emerging markets, which are more stable and therefore less impacted by fluctuations in the US market. Nevertheless, the 2008 crisis affected all countries, albeit to varying degrees. It transformed from a financial crisis into an economic crisis with devastating consequences across various sectors. It led to the bankruptcy of major financial and economic institutions in different countries, and a sharp decline in economic growth rates was recorded, particularly in European countries, some of which even registered negative growth. Growth rates in emerging markets were also affected, though to a lesser extent than in developed markets. In addition to the bankruptcies of major institutions, this resulted in layoffs and increased unemployment and poverty rates – among the most detrimental effects of the financial crisis. In January 2010, unemployment, poverty, and informal employment rates had risen. During

the period 2007-2009, these figures were approximately According to the International Labour Organization, 34 million people were unemployed, with the majority concentrated in developed countries and the European Union, which accounted for 40% of the increase in unemployment during that period. Finally, it should be noted that developed markets are more affected by the US market than emerging markets, as they suffered more during the financial crisis.

***Conclusion:***

In conclusion, this study demonstrates that financial crises are among the most prominent factors affecting the integration of financial markets. This is due to the disruptions and fluctuations they cause, which spread rapidly between markets because of the increasing interconnectedness of global financial systems. Technological development and the liberalization of capital flows have contributed to strengthening this integration, but this has also made markets more vulnerable to the transmission of the effects of crises and financial contagion across different countries and economies. The study also showed that financial crises directly affect the degree of interconnectedness between markets, often leading to higher levels of volatility and instability. Our study concluded the following:

• Integration relationships are not fixed but change over time and across geographical boundaries, depending on the influence of a range of different variables that act as determinants of financial integration;

• Financial crises stimulate market integration; that is, financial markets become more integrated during and after financial crises due to increased correlations between these markets during periods of turmoil.

In a study of the transmission of the 2008 global crisis to developed and emerging markets, we assessed the impact of the US financial market on both developed and emerging markets. We concluded that the US market easily leads and transmits financial crises to the largest global financial markets, whether developed or emerging, regardless of the strength of their economic structures. Because the US market has a close relationship with developed markets, they are quickly and significantly affected by it, unlike emerging markets, which are characterized by a degree of stability and are therefore less affected.

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