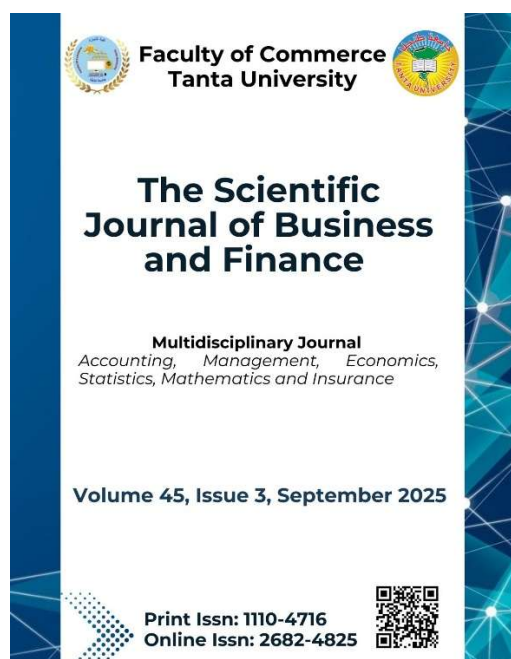




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The Impact of International Reserves and Downgrading the Sovereign Credit Rating on the Egyptian Stock Market

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ABSTRACT

This study aimed to investigate the impact of changes in international reserves on the volatility in the Egyptian stock market returns, and examined the asymmetric of negative and positive of international reserves shocks on the volatility of Egyptian stock market returns. To achieve these objectives, the Asymmetric BEKK GARCH model was employed using monthly data spanning from January 1998 to December 2024. The results indicate a statistically significant positive impact of changes in the international reserves and the volatility of Egyptian stock market returns. In addition, no evidence was found to support asymmetry in the impact of negative versus positive shocks on market volatility. The study also targeted the impact of Egypt's sovereign credit rating downgrade on the daily returns of the Egyptian stock market by employing a one-sample t-test within an event study framework, and it examined whether the results differed depending on the rating agency issuing the credit rating. The results did not reveal any response in the Egyptian stock market to the announcements of the rating downgrade, nor were there any differences in the results depending on the rating agency. The robustness of the results was confirmed using several methods, such as employing the non-parametric Wilcoxon Signed Rank test instead of the parametric t-test, using alternative event windows to calculate cumulative abnormal returns, and excluding downgrade announcements issued by other rating agencies within one month from the downgrade announcement issued by a specific rating agency. The study's findings are beneficial to investors, portfolio managers, and policy makers in the Egyptian market. Moreover, the study guides researchers for future research in several other areas related to the topic.

Keywords : International reserves ; sovereign credit rating (SCR);the Egyptian stock exchange;event Study;BEKK GARCH model.

1. Introduction

Governments, especially in developing and emerging economies, aim to improve their sovereign credit ratings from major agencies like Standard & Poor's, Fitch, and Moody's. These ratings influence investor and lender confidence in a country's ability to meet financial obligations and determine investment risks, guiding decisions for direct investments or indirect investments through the stock market.

The stock market reflects the state of a country's economy. Economic stability leads to market growth and reduced volatility in stock prices. It plays a vital role in attracting indirect foreign investments, which contribute significantly to foreign currency reserves held by the central bank, such as gold, convertible currencies like the dollar and euro, Special Drawing Rights issued by the IMF, and international bonds. These reserves are crucial for ensuring financial stability during crises, whether financial or geopolitical. They also enhance the country's sovereign credit rating, promoting stability in the stock market.

Sovereign credit ratings rely on institutional, financial, monetary, and economic assessments to evaluate a country's stability and creditworthiness. Institutional assessment evaluates the effectiveness of institutions, governance, security risks, and political factors such as democracy and political freedom, with studies (e.g., Chee *et al.*, 2015; Osobajo & Akintunde, 2019, Gossel & Mutize, 2024) highlighting their positive impact on ratings, while corruption negatively affects them (Akter *et al.*, 2021). In addition, financial assessments focus on debt burden, liquidity, and financial performance (Hassouba *et al.*, 2023), while monetary flexibility is considered in the monetary assessments. Moreover, economic assessments, a key factor for agencies like Moody's, S&P, and Fitch, evaluate growth rates, GDP per capita, debt sustainability, inflation, trade balance, budget deficits, and international reserves.

International reserves have a direct impact on sovereign credit ratings, as highlighted by several studies (e.g., Hassouba *et al.*, 2023; Afons *et al.*, 2011; Akter *et al.*, 2021; Mohammad & Aruna, 2024). They also exert an indirect influence by strongly affecting other economic variables critical to ratings, such as GDP size, economic growth rate, inflation, trade balance, and exchange rate stability (Ibrahim, 2021). Increased reserves boost international financial institutions' confidence in a government's ability to meet obligations and pay for imports, helping address trade deficits and stabilize foreign exchange rates against the national currency.

Emerging markets in the Middle East, like Egypt, are facing instability, this drives investments to more stable regions such as Europe or the U.S., especially with rising interest rates by the Federal Reserve. This reduces international reserves, negatively impacting economic indicators crucial for sovereign credit ratings. Lower reserves diminish confidence in the economy's ability to meet obligations, affecting trade balance and currency stability.

Several studies, discussed in the literature review section, have shown that sovereign credit rating announcements significantly impacts stock markets, with downgrades having a stronger effect than upgrades. Additionally, the market's reaction may vary depending on the rating agency issuing the announcement. Investors are expected to rely on international reserves and

sovereign credit ratings to guide their investments, particularly indirect investments in stock market.

The present study highlights the importance of examining the Egyptian stock market's response to information on international reserves and sovereign credit ratings. Despite the significance of these factors based on prior related studies, there is a notable lack of research on the impact of international reserves and limited studies on the direct effect of credit rating information on Egypt's stock market. This research aims to fill this gap using appropriate statistical methods and covering a recent period marked by major events, including the 2011 and 2013 revolutions, the IMF loan, the 2016 Egyptian currency float, the COVID-19 pandemic.

The present study covers the period from January 1998, when EGX30 data was first published, to the end of 2024, employing statistical methods tailored to the research objectives. These research objectives are as follows:

1. To Investigate the impact of international reserves on the volatility of the EGX30 index returns and verify that declines in reserves have a stronger impact than increases. This is achieved using the Asymmetric BEKK GARCH model.
2. To examine the effect of credit rating downgrades for Egypt on the EGX30 index returns, and to study the influence of the rating agency issuing the downgrade on the relationship between sovereign credit ratings and stock market returns. This is accomplished through the Event Study methodology.

The remainder of the study covers a review of previous studies, followed by the research hypotheses based on the theoretical framework and prior research findings. It then presents the study's data and sample, along with the measurement of variables and research limitations. Next, it explains the methodologies used in the analysis. Afterwards, it provides a descriptive data analysis, followed by a detailed presentation and discussion of the study's results. The study concludes with a summary and key recommendations for future research in this field.

2. Literature Review

This section reviews and discusses previous studies in three group, namely studies related to international reserves, studies concerning sovereign credit ratings, and those that combine international reserves and sovereign credit ratings.

2.1 Studies Related to International Reserves

Some studies, like (Romero,2017) and (Mallik *et al.*, 2024), explored the impact of international reserves and other macroeconomic variables on stock markets. (Romero,2017) analyzed monthly data (2005–2014) in the Philippines using the EGARCH model and Granger causality test but found no evidence of an effect on stock returns.

In the study by (Mallik *et al.*, 2024), data were analyzed from July 2010 to December 2021 on the Dhaka Stock Exchange based on the ARDL model and Granger causality test. They found that foreign reserves positively impacted stock returns, while inflation and broad money supply (M2) had negative effects. These impacts were limited to the short term.

In addition to studies examining the direct relationship between international reserves and stock market returns, other studies explored the indirect impact of international reserves on stock markets by examining their effect on output, economic growth and financial risks. Reserves that boost output and growth, and reduce risks enhance investor confidence, creating a favorable environment for stock market improvement.

(Ibrahim, 2021) studied the impact of international reserves on Egypt's output and economic growth from 1991 to 2018 using annual data, based on ARDL and VECM models. He documented a significant positive relationship among reserves, output, and growth, only in the short-term. In addition, (Aizenman, & Jinjara, 2020) highlighted the importance of managing international reserves to mitigate financial risks, particularly during crises, based on quarterly data from 2000–2019 across eight major emerging markets

2.2 Studies Related to Sovereign Credit Rating (SCR)

This section explores the impact of sovereign credit ratings on stock markets. It also focuses on the asymmetry of upgrades and downgrades, spillover effects of credit rating changes across countries, and their combination. It also examines the influence of credit ratings on corporate performance and variables like foreign direct investment and economic risks.

(Bashir *et al.*, 2017) analyzed the impact of sovereign credit rating changes on European stock and bond markets during the Greek and Irish debt crises, using quarterly data from March 2008 to December 2015. They found a significant effect of credit ratings on financial markets during the crisis.

The studies by (Pacheco, 2012) and (Reddy *et al.*, 2019), among others, examined the impact of credit ratings on stock prices at the corporate level using event study methodology. More specifically, (Pacheco, 2012) studied the impact of Moody's credit ratings on stock price changes for seven Portuguese companies during 2006–2011. The results showed significant stock price responses to credit rating changes before rating announcement, possibly due to prior sovereign rating changes or spillover effects from other countries.

In the study by (Reddy *et al.*, 2019), the impact of sovereign credit ratings on daily U.S. excess stock returns before, during, and after the 2008 global financial crisis were examined over the period 2006–2015. The study focused on using a 14-day event window (three days before to ten days after the rating announcement), they found that credit rating downgrades led to significant negative market reactions, whereas upgrades had minimal impact. The effect of downgrades was more pronounced post-crisis, with Fitch's rating changes eliciting stronger reactions compared to those by Standard & Poor's and Moody's.

(Pukthuanthong-Le *et al.*, 2007) analyzed the impact of sovereign credit rating changes and their outlooks on international stock and bond markets across 34 countries during 1990–2000. Using event study methodology and a multiple regression model, the study found that downgrades significantly negatively affected stock and bond returns, while upgrades had minimal impact. Downgrades had a stronger effect on weaker economies, such as emerging markets, countries with low inflation rates, or those with current account deficits.

(Klimaviciene,2011) studied the impact of sovereign credit rating announcements on stock markets in the three Baltic states—Estonia, Latvia, and Lithuania—using daily data from 2000 to 2009 and event study methodology. The findings revealed that downgrades had a much greater impact on prices than upgrades. Despite some ratings being anticipated, announcements still significantly influenced prices on the event day. The effects varied across the three Baltic stock markets and depended on the credit rating agency issuing the announcement.

In a study on nine developing countries, (Safari & Ariff,2015) studied the impact of sovereign credit rating changes on stock, bond, and equity futures markets from 1998 to 2013. Using daily data for 94 credit rating announcements and event study methodology, they found that stock and bond indices were significantly affected by rating changes, with evidence of information leakage prior to the announcement. Downgrades had a stronger impact than upgrades, while equity futures markets reacted only to downgrades, showing insensitivity to rating upgrades.

(Li *et al.*, 2019) analyzed 40 European countries using annual panel data from 1990 to 2018 with linear and nonlinear ARDL models. The study found long-term asymmetry in the effects of sovereign credit ratings, while evidence for short-term asymmetry was limited. Moreover, (Li *et al.*, 2022) examined the impact of credit rating changes on the Chinese financial market development index (1980–2018) using nonlinear ARDL and threshold models, revealing asymmetric responses to sovereign rating announcements.

Using a sample of 31 emerging markets, including Egypt, (Bales & Malikane,2020) employed the EGARCH model to extract conditional volatilities of stock and bond market returns. These conditional volatilities were then used as dependent variables in a fixed-effects panel regression model, following the methodology of (Afonso *et al.*, 2014). (Bales & Malikane,2020) found that credit rating downgrades significantly increased volatility in stock and bond markets, while upgrades had no significant effect on stock volatility and an unclear impact on bond volatility. In addition to the studies previously discussed, Research on sovereign credit rating spillovers highlights their significant impact on international financial markets. For example,

(Arezki *et al.*, 2011) used a VAR model and event study methodology (2007–2010) to show that rating changes in one European country influenced others, with effects varying by announcement type, country, and rating agency. Furthermore, (Klimaviciene&Pilinkus ,2011) studied sovereign rating changes in eight Central and Eastern European countries (2004–2010) and found that both downgrades and upgrades in one country significantly impacted other countries' stock markets, with stronger regional effects among Baltic states.

Moreover, there are other studies have investigated the asymmetry of sovereign credit rating upgrades and downgrades on financial markets, as well as the spillover effects of rating changes in one country on other countries' markets, such as the studies by (Ferreira & Gama, 2007), (Afonso *et al.*, 2014; Fatnassi *et al.*, 2014; Candeias, 2015).

More specifically, (Ferreira & Gama, 2007) analyzed the impact of sovereign credit rating changes on international stock markets across 29 countries (18 emerging and 11 developed) from July 3, 1989, to December 31, 2003. Using event study and panel regression models, they found that downgrades negatively impacted stock markets, while upgrades had no clear effect.

A downgrade in one country reduced average market returns in others by 51 basis points, with stronger effects in geographically close and emerging markets. The impact was more pronounced in industries dealing with tradable goods and smaller industries.

(Afonso *et al.*, 2014) employed the EGARCH model to examine the impact of sovereign credit rating announcements on stock and bond market volatility in selected European Union countries and the spillover effects on other European markets. Using daily data from January 2, 1995, to October 24, 2011, they found that downgrades increased stock and bond market volatility, while upgrades had a smaller effect. Downgrades in one country increase volatility across others, whereas upgrades reduce volatility, particularly in countries with low interest rates.

(Fatnassi *et al.*, 2014) analyzed stock market reactions in Greece, Portugal, Spain, and Italy to sovereign credit rating changes from June 2008 to June 2012. Using a fixed-effects panel regression model with conditional volatility from EGARCH as the dependent variable, they found that both downgrades and upgrades impacted stock returns domestically and internationally, with downgrades having a stronger effect. Market reactions to downgrades were more pronounced during the sovereign debt crisis.

In the study by (Candeias, 2015), sovereign credit rating changes were analyzed in Portugal, Italy, Ireland, Greece, and Spain during the European sovereign debt crisis (2009–2014) using event study methodology. The findings revealed that downgrades conveyed more information to markets than upgrades. Market reactions varied by country, with Greece showing significant responses on the event day, while Italy and Spain exhibited no notable reactions. Only downgrades by Standard & Poor's agency triggered significant market responses the day after the announcement. Additionally, Greek downgrades impacted Portuguese and Irish stock markets.

The studies previously discussed in this section have established a direct relationship between sovereign credit ratings and stock market performance or company stock prices. Additionally, other group of studies have explored the connection between sovereign credit ratings and variables such as foreign direct investment (FDI), capital flows, and economic risk. Some of these studies will be discussed to highlight the indirect effects on financial markets through changes in FDI, capital flows, and economic risk. Increased FDI and capital flows, and reduced economic risks lower country risk, boosting investor confidence, and positioning the country as a safe investment haven, which may positively impact stock markets.

For instance, (Emara & El Said, 2021) examined the impact of sovereign credit ratings on FDI in 24 emerging markets, including Egypt, across four regions: BRICS, Europe, the Middle East, and Africa, during 1990–2018. Using the Dynamic Panel System GMM method, they documented a positive relationship between credit ratings and FDI. The influence of sovereign rating changes on FDI flows intensified during the global financial crisis and was more pronounced during country-specific crises. Additionally, credit rating changes in BRICS countries had a significant positive spillover effect on FDI flows to emerging markets in the other three regions.

Meanwhile, (Takawir & Motseta ,2021) utilized quarterly time series data from 1994 to 2017 in South Africa to examine the impact of sovereign credit ratings on capital flows. The ARDL and ECM models were employed for this purpose. The findings revealed a positive relationship between credit ratings and capital flows. Furthermore, macroeconomic stability variables, such as economic growth, inflation, and financial sector development, enhance a country's credit rating and increase capital inflows.

In addition, (Athari *et al.*, 2021) examined the impact of sovereign credit ratings on economic risks in five Balkan countries: Bulgaria, Greece, Croatia, Romania, and Slovenia. Using quarterly data from 1999 to 2018, the study applied the Vector Autoregressive (VAR) model and Fourier Toda-Yamamoto causality test. The findings revealed a one-way causal relationship from sovereign credit ratings to economic risks in Bulgaria and Croatia in the long term. Additionally, a two-way causal relationship was identified between sovereign credit ratings and economic risks in Greece, Romania, and Slovenia.

2.3 Studies Related to Both International Reserves and Sovereign Credit Rating (SCR):

In this final group of studies, the focus is on research that combines international reserves and sovereign credit ratings. Some studies, such as (El Ghayesh,2017), have explored the impact of both international reserves and sovereign credit ratings on FDI. Other studies have examined the role of international reserves among macroeconomic variables in influencing sovereign credit ratings issued by the three major agencies: Standard & Poor's (S&P), Moody's, and Fitch (e.g., Afonso *et al.*, 2011, Osobajo & Akintunde,2019; Hassouba *et al.*, 2023).

The purpose of discussing these studies is to highlight the indirect relationship between international reserves, sovereign credit ratings, and stock markets. An increase in FDI signals a favorable investment environment, which is expected to positively influence stock price movements. Additionally, demonstrating the impact of international reserves on sovereign credit ratings suggests an indirect link between reserves and stock markets, especially if credit ratings are found to affect stock price dynamics.

In the study by (El Ghayesh,2017), the determinants FDI in Egypt were analyzed, focusing on international reserves, sovereign credit ratings, and economic growth. Using annual data from 1997 to 2016, the study found that international reserves contributed 13.6% to attracting FDI, credit ratings contributed 13.1%, and economic growth had the strongest impact, accounting for 48%. These three variables collectively explained 75% of FDI inflows into Egypt

Baes on employed the Ordered Probit Model, (Afonso *et al.*,2011) demonstrated significant impact of foreign reserves to imports ratio, along with a set of other macroeconomic variables, on long-term sovereign credit ratings. They relied on unbalanced annual panel data, covering 66 countries for Moody's ratings, 65 countries for S&P ratings, and 58 countries for Fitch ratings during the period 1995–2005.

The study by (Osobajo&Akintunde,2019) was conducted on 20 emerging markets, including the Egyptian market, using annual panel data spanning from 2001 to 2015, comprising 300 observations. The study highlighted the importance of international reserves and other

macroeconomic variables in determining the sovereign credit ratings of emerging markets. This conclusion was based on the results of the Pooled OLS Regression model.

Finally, the study by (Hassouba *et al.*, 2023) was conducted on 19 emerging markets, including Egypt, using annual panel data from 1998 to 2020. Their study employed the Ordered Probit Model and found a significant impact of foreign reserves to GDP ratio, along with other macroeconomic variables, on sovereign credit ratings. Moreover, the influence varied across the three major credit rating agencies: Moody's, S&P, and Fitch.

2.4 Comments on Literature Review

It is evident that there is a scarcity of research investigating the direct impact of international reserves on the stock market (e.g., Romer, 2017, Mallik *et al.*, 2024) compared to studies analyzing the reaction of stock markets to sovereign credit ratings.

Despite the abundance of studies highlighting the effects of credit rating changes on stock markets, the number of studies focusing on the Egyptian market in this area remains limited. Among these is the study by (Bales & Malikane, 2020), which was not specifically dedicated to the Egyptian market but included it as part of a sample comprising 31 emerging markets.

In addition, the studies which were applied to the Egyptian market have primarily focused on the impact of sovereign credit ratings and/or international reserves (among other economic variables) on foreign direct investment (FDI). Examples include (El Gayish, 2017) study on the Egyptian market, (Osobajo & Akintunde, 2019) study on 20 emerging markets, including Egypt, and Emara & El Said's study (2021) on 24 emerging markets, also including Egypt.

Moreover, there are some studies analyzed the impact of international reserves on Egypt's economic growth, such as (Ibrahim's study, 2021) which examined the effect of foreign reserves (among other variables) on sovereign credit ratings. In addition to other studies aimed at determining the impact of foreign reserves (among other variables) on credit ratings, such as the study by (Hassouba *et al.*, 2023), which was conducted on 19 emerging markets, including the Egyptian market.

Upon reviewing the methodologies used in previous studies, it is evident that the Event Study methodology has been the primary approach for analyzing the impact of sovereign credit rating changes on stock markets. However, this methodology has not been employed in the studies previously discussed that were applied to the Egyptian market or included it within their sample. The reason, as mentioned earlier, is that most studies focusing on the Egyptian market did not aim to examine the impact of credit rating changes on stock markets. Among the reviewed studies, the only one addressing this topic is (Bales & Malikane, 2020). This study utilized a different methodology, employing EGARCH and panel data regression models. Therefore, the current study will adopt the Event Study methodology to assess the impact of credit rating downgrades on the Egyptian stock market.

Other studies have utilized the EGARCH model to estimate conditional volatility, which was then used as a dependent variable in other multivariate models, such as panel data regression (As in the studies by (Afonso *et al.*, 2014; Bales & Malikane, 2020) or Granger causality models

(Like the study by (Romero *et al.*, 2017). One advantage of using the EGARCH model is that it accounts for the leverage effect, meaning that negative news has a stronger impact than positive news. However, EGARCH is a univariate model, making it unsuitable for scenarios involving multiple variables or time series. Therefore, the current study will rely on a multivariate GARCH model, namely the Asymmetric BEKK-GARCH model, which also considers the asymmetry of positive and negative shocks. This model will be used to study the relationship between international reserves and stock return volatility.

3. Research Hypotheses

On the one hand, the relationship between international reserves and stock market performance stems from the increased investor confidence, financial stability, and currency stability that reserves provide. These factors could reduce risks for foreign investors, enhance market liquidity, and boost stock indices. In addition, the increase in international reserves reflects a country's enhanced ability to withstand external shocks, such as geopolitical tensions and global financial crises. This relationship could be justified by Keynes' General Theory for Employment, Interest and Money. It could also be justified by Markowitz's Portfolio Theory, Solnik's International Asset Pricing Model, and Minsky's Financial Instability Hypothesis.

According to The General Theory of Employment, Interest and Money presented by the British economist John Maynard Keynes, countries need sufficient reserves to address economic fluctuations. Adequate international reserves can help a country emerge from economic recession by increasing liquidity levels. High liquidity enhances a country's ability to face economic crises, reduces exchange rate volatility, and boosts investor confidence in the financial market, positively reflecting on the stock market (Keynes, 1936).

In 1952, the American economist and financial theorist Harry Markowitz introduced the Portfolio Theory in his renowned paper titled "Portfolio Selection". The theory emphasizes the importance of investment diversification to reduce risk and achieve the optimal portfolio that balances returns and risks (Markowitz, 1952). This theory can be used to explain the relationship between international reserves and stock markets. As international reserves increase and become more diversified, investor confidence in the country grows, leading to greater allocation of the country's stocks in investors' portfolios, which positively impacts the stock market.

The International Asset Pricing Model (IAPM), introduced by the French economist Bruno Solnik, extends the Capital Asset Pricing Model (CAPM) to the international level by incorporating exchange rate risks alongside market risks in both local and international markets (Solnik, 1974). This model could be employed to justify the relationship between international reserves and stock markets through the impact of reserves on exchange rates, which subsequently affect stock markets. Higher international reserves are expected to improve the value of the local currency and reduce exchange rate risks, encouraging increased foreign direct investment and foreign investments in stocks. This leads to higher demand for stocks and an increase in their prices.

Exchange rates can influence stock markets through their impact on corporate profits and, consequently, stock prices, especially for multinational companies. They also affect FDI due to currency value changes and influence inflation rates and interest rates, which impact capital costs and stock prices. Dornbusch & Fischer (1980) demonstrated how exchange rate fluctuations affect trade flows and economic activity, subsequently impacting corporate profits and stock prices. (Adler & Dumas, 1983) were among the first to use the International Asset Pricing Model (IAPM) to explain the relationship between international asset returns and exchange rates. Recent studies, such as (Algebaly & Abd Elmoghny, 2024), have confirmed the relationship between exchange rates and the Egyptian stock market.

The Financial Instability Hypothesis by the American economist (Hyman Minsky, 1986) argues that international reserves act as a buffer of foreign currencies and gold to ensure financial stability. Larger reserves boost investor confidence in a country's ability to handle economic crises. During financial turmoil, reserves can be used to stabilize exchange rates and reinforce investor trust in the stock market.

Furthermore, the study by (Mallik *et al.*, 2024) found evidence supporting a significant positive relationship between international reserves (among other macroeconomic variables) and stock prices in the Dhaka Stock Exchange, Bangladesh, during the period from July 2010 to December 2021. In addition, given the Leverage Effect, where negative shocks impact stock return volatility more than positive ones (Brooks, 2008), this study will test the asymmetrical effects of shocks on the volatility of returns in the Egyptian stock market. Therefore, the first two hypotheses could be formulated as follows:

H1: There is a significant positive impact of changes in international reserves on the volatility of returns in the Egyptian stock market.

H2: The negative shocks related to international reserves have a stronger impact on the volatility of stock market returns than positive shocks.

The two previous hypotheses will be tested using an appropriate model for this purpose, which is the Asymmetric BEKK-GARCH (1,1) Model.

On the other hand, several theories could be employed to explain the impact of sovereign credit ratings on stock markets, highlighting their influence on investor confidence, capital flows, and borrowing costs. Key theories include the Signaling Theory, Efficient Market Hypothesis, and Financial Contagion Theory.

The American economist and financial theorist Stephen Ross is one of the first to discuss the Signaling Theory in finance (Ross, 1977). Sovereign credit rating could be viewed as a signal to investors about a country's economic and financial stability. An upgrade in sovereign credit ratings signals economic strength and reduced financial risks, increasing demand for stocks and driving up prices, while a downgrade is expected to have the opposite effect.

The Efficient Market Hypothesis (EMH), developed by the American economist and financial theorist Eugene Fama, posits that stock prices should reflect all available information about the issuer, its industry, and macroeconomic conditions (Fama, 1970). This hypothesis could be

applied to understand the impact of changes in sovereign credit ratings on stock prices. In an efficient market, sovereign credit rating information should already be reflected in stock prices, with only unexpected changes influencing stock price behavior. An upgrade in credit ratings is expected to improve stock prices, while a downgrade would likely have the opposite effect.

The Financial Contagion Theory, developed by various researchers, explains how crises spread from one country to others. The American economist Paul Krugman was among the first to discuss this theory on currency crises and their impact on financial markets (Krugman, 1979). Several studies presented in the literature review section have shown how sovereign credit rating information in one market can influence other markets. Consequently, stock markets may be directly affected by a country's credit rating information or indirectly by the ratings of neighboring or trade-related countries.

Moreover, a decline in sovereign credit ratings increases a country's borrowing costs, leading to higher inflation rates. This inflation reduces companies' real profits, causing stock prices to drop. Additionally, higher inflation raises the required rate of return on investments, used as a discount rate when estimating a stock's fair value, further lowering stock prices.

By referring to the previous studies section, it becomes clear that there is a large number of studies that have demonstrated the adverse impact of sovereign credit rating downgrades on stock prices. However, studies applied to the Egyptian market in this field are limited, such as the study by (Bales & Malikane, 2020), which was conducted on 31 emerging markets, including the Egyptian market. Therefore, the third hypothesis of the study can be formulated as follows:

H3: There is a significant negative impact of sovereign credit rating downgrades on the returns of the Egyptian stock market.

Furthermore, many studies have shown that the stock market's reaction to credit rating announcements depends on the rating agency issuing the announcement. For example, in the study by (Candeias, 2015) it was found that only downgrades by Standard & Poor's (S&P) caused a significant market reaction on the day following the announcement. Meanwhile, the results of (Reddy *et al.*, 2019) showed that the reactions to Fitch's rating announcements were more pronounced compared to those of Standard & Poor's and Moody's. Therefore, the fourth hypothesis is:

H4: The reaction of the Egyptian stock market returns to Egypt's sovereign credit rating announcements varies depending on the rating agency issuing the announcement.

4. Research Hypotheses

Monthly data on Egypt's international reserves were collected from January 1998 to December 2024, as the EGX30 index data has been available since the beginning of 1998. Quarterly data on reserves and GDP were also gathered from Q1 2002 to Q3 2024 based on the availability of GDP data. This was done to analyze the impact of the ratio of international reserves to GDP on stock market return volatility. The sources for international reserve data

include Bloomberg's database, monthly bulletins of the Central Bank of Egypt, and the website <https://tradingeconomics.com/>. GDP data was obtained from Egypt's Ministry of Planning and Economic Development and International Cooperation. The collected data was converted into billions of Egyptian pounds based on the dollar selling exchange rate to convert values from USD to EGP.

The credit rating data relied on the three most renowned independent global agencies: Standard & Poor's (S&P), Moody's, and Fitch. Egypt's first credit rating was issued by Moody's on October 9, 1996, followed by S&P's first rating on January 15, 1997. The data source for these ratings is the website of trading economics platform (<https://tradingeconomics.com/>). Fitch began issuing ratings for Egypt on September 21, 2000 in the institution's website (<https://www.fitchratings.com>). In addition, Daily stock return data are collected from the beginning of January 1998, when information about the EGX30 index became available. The EGX30 index values were obtained from the Egyptian Exchange website (<https://www.egx.com.eg/ar/indexdata.aspx?type=1&nav=1>).

The total number of sovereign credit rating announcements for Egypt includes 40 by Fitch, 25 by Moody's, and 24 by S&P. Four announcements from Moody's and one from S&P precede the availability of EGX30 index data at the beginning of 1998; thus, these ratings are excluded. The first rating relevant to Egypt since the publication of the EGX30 index data was on July 3, 2000. Consequently, the study will cover announcements by rating agencies from July 2000 to the latest available rating on November 1, 2024, issued by Fitch. Therefore, During the study period, S&P issued 23 credit rating announcements for Egypt, including 8 downgrades and 2 upgrades. Moody's issued 21 announcements, with 7 downgrades and 2 upgrades. Fitch issued 40 announcements, including 8 downgrades and 3 upgrades.

The number of credit rating downgrade announcements for Egypt totals 23. However, 4 announcements during the January 25 Revolution in 2011 are excluded, reducing the final count to 19. These excluded announcements include two by Moody's: the first on January 31, 2011, downgrading Egypt's rating from Ba1 to Ba2, and the second on March 16, 2011, downgrading it from Ba2 to Ba3. Additionally, one announcement by S&P on February 1, 2011, and another by Fitch on February 3, 2011, downgraded Egypt's rating from BB+ to BB. These exclusions are due to the unavailability of the EGX30 returns data from January 27 to March 23, 2011, making analysis of these events impossible.

In addition, our study focuses solely on downgrade announcements by any of the three rating agencies since the limited number of upgrade announcements (7) negatively impacts the reliability of results based on them.

The study sample covers several global and local economic events that impacted the Egyptian economy. Among the most significant events are the financial crisis of East Asian currencies at the end of 1997 and the beginning of 1998, followed by the 2008 global financial crisis related to mortgage loans in the United States and its spread worldwide. Then, the study covers the Egyptian two recent revolutions on January 25, 2011 and June 30, 2013, as well as the currency floatation in 2016 alongside the implementation of the economic reform program.

Subsequently, it covers the COVID-19 pandemic in 2019 resulted in widespread closures of economic activities worldwide and associated health losses, affecting global financial markets. Before the world could recover from these events.

5. Variables Measurement

The international reserves variable is measured by taking the natural logarithm of the monthly values of international reserves. To verify the robustness of the results, the variable will be re-measured using the ratio of international reserves to GDP, as adopted in some studies (e.g., Hasouba *et al.*, 2023). In this case, quarterly data are used since GDP values are available quarterly. Stock returns are calculated in the logarithmic form, as recommended by several studies (e.g., Reddy *et al.*, 2019).

6. Research Limitations

The study was conducted entirely on Egypt due to the scarcity of studies that fully address this topic in the country, despite its importance and the growing interest in international reserves and sovereign credit ratings for Egypt, especially after the Egyptian pound's devaluation and obtaining an IMF loan in March 2016. The potential impact of reserve and sovereign credit rating information on the stock market, directly affecting shareholders and portfolio managers.

The study period begins with the publication of the EGX30 index data at the beginning of 1998, although sovereign credit rating information for Egypt was first published in 1996. In addition, the research focuses on the direct impact of the Egyptian international reserves and sovereign credit ratings on Egypt's stock market, without examining the indirect effects of volatility spillover or contagion from other markets to the Egyptian market.

7. Research Methods

To test the impact of international reserves on the return's volatility in the Egyptian stock market and to examine the asymmetry of positive and negative shocks in international reserves on return volatility, the Asymmetric BEKK-GARCH (1,1) Model will be employed. This model takes the following form:

$$\text{Equation (1)} \quad H_t = C'C + A' \varepsilon_{t-1} \varepsilon_{t-1}' A + B'H_{t-1}B + D'\zeta_{t-1} \zeta_{t-1}' D$$

Where H_t and H_{t-1} refer to the 2×2 conditional variance-covariance matrix of the error terms at time t and the previous period ($t-1$), respectively. CC is a lower triangular matrix of constants. AA represents a 2×2 matrix where its off-diagonal parameters measure the spillover of shocks between the series of international reserves and stock returns, while its diagonal parameters measure the impact of past specific shocks to the series of international reserves and stock returns (ε_{t-1}) on their current conditional volatility (H_t). BB is a 2×2 matrix where its off-diagonal parameters measure the spillover of volatility between the series of international reserves and stock returns, while its diagonal parameters measure the effect of past volatility in the series of international reserves and stock returns (H_{t-1}) on their current conditional volatility (H_t). DD is a 2×2 matrix where its off-diagonal parameters measure the market's response to

negative shocks from the other market, while its diagonal parameters represent the impact of past specific negative shocks to the series of international reserves and stock returns (ζ_{t-1}) on their current conditional volatility (H_t). ζ_t is defined as ϵ_t if ϵ_t is negative, and zero otherwise.

In order to achieve the remaining study objectives regarding the impact of Egypt's sovereign credit rating on stock market returns, measured by the logarithmic returns of the EGX30 index, the Event Study methodology will be applied. Implementing this methodology involves several sequential steps (Armitage, 1995; Brooks *et al.*, 2004; MacKinlay, 1997). First, the event to be studied should be identified, which in this case refers to the announcement date of Egypt's sovereign credit rating downgrading by the rating agency. Second, the Abnormal Return (AR_t) should be determined, calculated by subtracting the Normal Return from the Actual Return (R_t) of the EGX30 index at time t .

There are several methods that can be used to calculate normal returns. These models can be divided into statistical models, which do not rely on economic theory, and economic models, which are based on economic and financial theories related to investor behavior. Among the most commonly used statistical models for determining normal returns are the Constant Mean Return Model and the Market Model. As for economic models, the most prominent ones include the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT).

One of the simplest models used to determine normal returns is the Constant Mean Return Model. Despite its simplicity, this model is comparable in accuracy to more complex models, as shown by the results of several studies (MacKinlay, 1997). It is also suitable for the current study, which focuses on a single country. To calculate normal returns using the Constant Mean Return Model, an estimation period should be defined, which should precede the event window.

In this study, the event window is $[-10; +10]$, This means that the event window extends from 10 days before the announcement, includes the announcement day (time zero), and ends 10 days after the announcement. The event window will be preceded by a 100-day estimation period $[-120; -21]$, consistent with the studies of (Brooks *et al.*, 2004) and (Candeias, 2015). It means that the estimation period starts 121 days before the announcement and ends 21 days before it. A 100-day period is considered sufficient to obtain accurate estimates during the estimation phase (Armitage, 1995). Therefore, abnormal returns in this study will be calculated using the following equation:

$$AR_{i,t} = R_{i,t} - \bar{R}_{i,-121,-21}$$

Equation (2)

Where $AR_{i,t}$ is the abnormal return of the EGX30 index for event i on day t for each day in the event window, $R_{i,t}$ is the actual return of the EGX30 index for event i on day t and $\bar{R}_{i,-121,-21}$ is the average return of the index during the period from 21 days to 121 days prior to event i .

The third step in the event study involves determining the cumulative abnormal returns (CAR_i) by aggregating the abnormal returns for event i over the period extending from 10 days before the credit rating announcement of downgrading to 10 days after the announcement, as shown in Equation (3).

$$CAR_i = \sum_{t=-10}^{+10} AR_{i,t}$$

Equation (3)

The event study concludes by conducting either a parametric test, specifically the one-sample t-test, to test the null hypothesis that the mean cumulative abnormal returns (CAR) for all events do not significantly differ from zero, assuming the returns follow a normal distribution. Alternatively, a non-parametric test, the Wilcoxon Signed-Rank Test, is applied to test the null hypothesis that the median cumulative abnormal returns do not significantly differ from zero when the returns do not follow a normal distribution.

8. Descriptive Study

Table .1 Descriptive Statistics of the Study Variables

	RESERVES (Billion Egyptian Pounds)	EGX30M	RESRATIO	CAR
Mean	349	1.05%	52.8%	3.6%
Median	148.63	0.7%	55.72%	0.87%
Minimum	51.086	-40.33%	18.66%	-9.61%
Maximum	2402.1	31.2%	92.23%	29.05%
Standard Deviation	441.99	8.94%	25.11%	9.85%
Skewness	2.54	-16.44%	0.08	0.87
Kurtosis	10.58	5.06	1.53	3.41
JB (P. Value)	8.065 (0.018**)	58.63 (0.000***)	1120.98 (0.000***)	2.509 (0.285)
N	323	323	89	19

Note: ** and *** indicate significance levels of 5% and 1%, respectively.

Table (1) presents descriptive statistics for the monthly values of international reserves in billion Egyptian pounds (RESERVES), the monthly return on the EGX30 index (EGX30M), the quarterly ratio of international reserves to GDP (RESRATIO), and the cumulative abnormal returns over the period spanning 10 days before and 10 days after the announcement of a credit rating downgrade.

The first three variables are used in the first part of the study, which examines the impact of international reserves on EGX30 index returns. By examining the first three variables in the table, it is evident that skewness values differ from zero, especially for the first two variables. Kurtosis values also deviate from 3, indicating that the data does not follow a normal distribution, as further evidenced by differences between the mean and median values. This conclusion was confirmed by the results of the Jarque-Bera test, which rejected normality at a 5% significance level for international reserves and 1% for EGX30 returns and the reserves-to-GDP ratio. The analysis relied on monthly data for 323 months for the first two variables and quarterly data with 89 observations for the last variable.

To test the first two hypotheses, the impact of international reserves on EGX30 returns was examined, driven by a strong correlation between them (91% Pearson correlation). The results

of Breusch-Pagan test (Obs R-Squared = 3.826, P-Value = 0.05) and Breusch-Godfrey test (Obs R-Squared = 4.28, P-Value = 0.039) test revealed heteroscedasticity and autocorrelation in the model's error terms, respectively. Thus, employing a nonlinear model is required. Therefore, the BEKK-GARCH (1,1) model was used to test these hypotheses.

To test the last two hypotheses, the Event Study methodology was employed. The data for the fourth variable (CAR) follows a normal distribution, as confirmed by the Jarque-Bera test with a p-value of 0.285 (greater than 5%). Further verification using the Kolmogorov-Smirnov and Shapiro-Wilk tests yielded similar results, confirming normality. Specifically, the Kolmogorov-Smirnov test produced a Z-statistic of 0.590 with a p-value of 0.877, while the Shapiro-Wilk test yielded a Z-statistic of 0.645 with a p-value of 0.259. This justifies the use of the parametric t-test to assess whether cumulative abnormal returns significantly differ from zero.

Table (2) presents the results of the unit root tests for the variables used in the BEKK-GARCH model, based on the regression model with only an intercept¹. The tests applied are the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The variables include the monthly logarithmic returns of the EGX30 index (EGX30M), the monthly values of international reserves in natural logarithms (RESM), and the ratio of international reserves to GDP (RESRATIO). These tests are conducted for the level and, if the variable is not stationary at the level, for the first difference.

Table. 2 Unit Root Test Results

Variables & Tests	EGX30M	RESM	RESRATIO
ADF (LEVEL)	-15.45 (0.000) ***	0.643 (0.991)	-1.173 (0.683)
PP (LEVEL)	-15.82 (0.000) ***	0.947 (0.996)	-1.215 (0.665)
PP (1ST Dif.)		-17.674 (0.000) ***	-8.573 (0.000) ***

The output of Table (2) shows that the EGX30 return variable is stationary at the level at a 1% significance level, eliminating the need to test its first difference. This variable (EGX30M) will be used in its current form in the Asymmetric BEKK GARCH (1,1) model. However, the other two variables (RESM and RESRATIO) were not stationary at the level but became stationary at the first difference at a 1% significance level. Therefore, the first difference of the natural logarithm of international reserves (logarithmic return of reserves) and the first difference of the ratio of international reserves to GDP will be used in the model to ensure variable stationarity.

9. Results and Discussion

9.1 Empirical Result

Table 3. Outputs of the Asymmetric BEKK GARCH (1,1) Model for the Monthly Return on International Reserves (RRESM) and the Monthly Return on the Egyptian Stock Market Index (EGX30M)

Usable Observations	322			
Log Likelihood	790.8509			
Variable	Coeff	Std Error	T-Stat	Signify

Mean Model (EGX30M)				
1. Constant	0.011335981	0.004053967	2.79627	0.00516964
2. EGX30M {1}	0.206867929	0.042190349	4.90320	0.00000094
3. RRESM {1}	-0.033863382	0.068280232	-0.49595	0.61993175
Mean Model (RRESM)				
4. Constant	0.010683732	0.000257798	41.44234	0.00000000
5. EGX30M {1}	0.130456538	0.002862938	45.56736	0.00000000
6. RRESM {1}	0.104761317	0.012798191	8.18563	0.00000000
7. C (1, 1)	0.057906150	0.002100293	27.57051	0.00000000
8. C (2, 1)	-0.001673944	0.001239136	-1.35090	0.17672882
9. C (2, 2)	-0.000001309	3.834510017	-3.41387e-07	0.99999973
10. A (1, 1)	0.313448858	0.063163880	4.96247	0.00000070
11. A (1, 2)	-0.014872418	0.024121780	-0.61656	0.53752792
12. A (2, 1)	-0.035347975	0.111079460	-0.31822	0.75031623
13. A (2, 2)	0.197945436	0.039468161	5.01532	0.00000053
14. B (1, 1)	0.610292998	0.023112366	26.40547	0.00000000
15. B (1, 2)	0.074273070	0.008612703	8.62367	0.00000000
16. B (2, 1)	0.093625104	0.024549613	3.81371	0.00013690
17. B (2, 2)	0.752151628	0.005076888	148.15211	0.00000000
18. D (1, 1)	0.472620713	0.071251181	6.63316	0.00000000
19. D (1, 2)	-0.023033995	0.020077725	-1.14724	0.25128191
20. D (2, 1)	-0.288086780	0.106993341	-2.69257	0.00709042
21. D (2, 2)	-1.809846215	0.020153292	-89.80400	0.00000000

The value of the t-statistic for coefficient B (1,2) is 8.62367 with a p-value of 0.000, as shown in Table (3), indicating a significant positive effect of past volatility in international reserve returns on the conditional volatility of EGX30 returns at a 1% significance level. This supports the acceptance of the study's first hypothesis (H1), which posits a significant effect of international reserves on stock market return volatility. These findings align with (Mallik et al., 2024), who reported a significant positive impact of foreign reserves on stock returns in the Dhaka Stock Exchange, Bangladesh. This result also supports Keynes' General Theory of Employment, Interest, and Money, Solnik's International Asset Pricing Model, Minsky's Financial Instability Hypothesis, and Markowitz's Portfolio Theory.

The results also indicate that past volatility in stock market returns significantly and positively impacts the conditional volatility of international reserve returns at a 1% significance level, as evidenced by the value and p-value of coefficient B (2,1). Additionally, previous stock returns significantly affect current international reserve values, as shown in the mean equation. This demonstrates a bidirectional relationship between international reserves and the stock market.

The coefficient D (1,2) has a value of -1.147 with a p-value of 0.251, indicating insignificant difference between the effects of negative and positive shocks in international reserves on stock market returns. This implies the absence of a leverage effect, leading to the rejection of the study's second hypothesis (H2), which posited that negative shocks in international reserves have a greater impact than positive ones.

To test the third and fourth hypotheses, the Event Study methodology was applied, following the steps outlined in the research methods section. Table (4) lists the announcement dates for credit rating downgrades by the three credit rating agencies used in the study: Standard & Poor's (S&P), Moody's, and Fitch.

Table 4 . Announcements of Downgrading Sovereign Credit Rating

No.	Date	Agency	Rating	No.	Date	Agency	Rating
1	May 22 2002	S&P	BB+	11	Jan 30 2013	Fitch	B
2	Aug 21 2002	Fitch	BB+	12	Mar 21 2013	Moody's	Caa1
3	Oct 18 2011	S&P	BB-	13	May 09 2013	S&P	CCC+
4	Oct 27 2011	Moody's	B1	14	Jul 05 2013	Fitch	B-
5	Nov 24 2011	S&P	B+	15	Feb 07 2023	Moody's	B3
6	Dec 21 2011	Moody's	B2	16	May 05 2023	Fitch	B-
7	Dec 30 2011	Fitch	BB-	17	Oct 05 2023	Moody's	Caa1
8	Feb 10 2012	S&P	B+	18	Oct 20 2023	S&P	B
9	Jun 15 2012	Fitch	B+	19	Nov 03 2023	Fitch	B-
10	Dec 24 2012	S&P	B-				

An event window spanning from 10 days before the credit rating downgrade announcement, including the announcement day, to 10 days after the announcement [-10; +10] is used. Abnormal returns and cumulative abnormal returns (CAR) are calculated. Then, a one-sample t-test is conducted, following confirmation of the normal distribution of CAR using multiple tests. Table (5) presents the results of the one-sample t-test.

Table 5 .The Results of One-Sample T-Test for CAR Variable Using[-10; +10] Event Window

Obs	Mean	T Statistic	P. Value
19	3.602	1.593	0.129

Table (5) shows that the number of downgrade announcements (Obs) for which cumulative abnormal returns (CAR) were calculated is 19. The average CAR is 3.602, with a t-statistic value of 1.593 and a p-value of 0.129, which is greater than 5%. This indicates the null hypothesis, stating no difference between the mean CAR and zero, cannot be rejected. Consequently, the third hypothesis (H3), suggesting that credit rating downgrades significantly reduce stock market returns, should be rejected. This result implies that investors in the Egyptian stock market do not consider credit rating downgrade announcements when making investment decisions, or that the Event Study methodology may not be suitable for assessing the impact of such announcements on the Egyptian stock market.

A more detailed analysis can be conducted by studying the impact of announcements from each credit rating agency on the returns of the Egyptian stock market, as shown in Table (6). The results of the one-sample t-test in Table (6) confirm that the CAR of the stock market are not affected by Egypt's credit rating downgrades. This supports the rejection of the study's third hypothesis (H3), according to the announcements from all three credit rating agencies.

It also indicates no significant difference in the stock market's reaction to downgrades based on the issuing agency, leading to the rejection of the fourth hypothesis (H4). These findings contradict studies by (Klimaviciene, 2011), (Candeias, 2015), and (Reddy et al., 2019), which showed varying stock market reactions depending on the credit rating agency issuing the sovereign downgrade announcement.

Table 6. One-Sample T-Test Results for CAR Variable Using [-10; +10] Event Window, Based on the Announcements of Each Rating Agency

Rating Agency	Obs	Mean	T Statistic	P. Value
Standard and Poor's (S&P)	7	7.866	1.709	0.138
Moody's	5	-0.900	-0.319	0.766
Fitch	7	2.554	0.770	0.471

9.2 Robustness Checks

Several methods will be employed in this section to verify the robustness of the study's results, whether related to the impact of international reserves on the stock market or those concerning the Event Study, as follows

9.2.1 Using an Alternative Measure of International Reserves in the Asymmetric BEKK GARCH Model

The Asymmetric BEKK GARCH (1,1) model will be re-applied using the ratio of international reserves to GDP (RESRATIO), as utilized in studies such as (Hassouba et al.,

2023). Since GDP data is only available quarterly from Q1 2002 to Q3 2024, the model will be applied during this period. Referring to the unit root test results shown in Table (2), it is evident that the RESRATIO variable is non-stationary at the level but becomes stationary after taking the first difference (1st Difference).

Therefore, this variable will be used in its first-difference form, calculated as the difference between each quarter's ratio and that of the previous quarter, and will be labeled RES_1D. Quarterly returns for the EGX30 index will also be used, referred to as EGX30Q. Table (7) presents the outputs of the Asymmetric BEKK GARCH (1,1) model under these conditions.

Table 7. Outputs of the Asymmetric BEKK GARCH (1,1) Model for the Variables Ratio of International Reserves to GDP (RESM_1D) and Quarterly Return on the Egyptian Stock Market Index (EGX30Q)

MV-GARCH, BEKK - Estimation by BFGS

Convergence in 31 Iterations. Final criterion was 0.0000069 <= 0.0000100

Usable Observations 87
Log Likelihood 169.3525

Variable	Coeff	Std Error	T-Stat	Signif

Mean Model (EGXQ)				
1. Constant	0.030379665	0.015385754	1.97453	0.04832128
2. EGXQ {1}	0.358266638	0.102670685	3.48947	0.00048397
3. RES_1D {1}	-0.196854311	0.286430048	-0.68727	0.49191363
Mean Model (RES_1D)				
4. Constant	-0.009797267	0.006303023	-1.55438	0.12009477
5. EGXQ {1}	0.133183173	0.035417629	3.76036	0.00016967
6. RES_1D {1}	0.011089502	0.114180900	0.09712	0.92262934
7. C (1, 1)	0.085904819	0.022953533	3.74255	0.00018216
8. C (2, 1)	0.050951459	0.015765946	3.23174	0.00123038
9. C (2, 2)	-0.000001349	0.092372023	-1.46051e-05	0.99998835
10. A (1, 1)	-0.000004126	0.251592104	-1.63980e-05	0.99998692
11. A (1, 2)	-0.000001168	0.081804451	-1.42748e-05	0.99998861
12. A (2, 1)	-0.000002499	0.648986042	-3.85120e-06	0.99999693
13. A (2, 2)	0.000000048	0.136660359	3.53751e-07	0.99999972
14. B (1, 1)	0.617044107	0.141681657	4.35514	0.00001330
15. B (1, 2)	0.046855822	0.055056292	0.85105	0.39473993
16. B (2, 1)	-1.260048341	0.690179387	-1.82568	0.06789812
17. B (2, 2)	0.461270537	0.395099059	1.16748	0.24301629
18. D (1, 1)	-0.473449568	0.215842395	-2.19350	0.02827162
19. D (1, 2)	-0.013750516	0.062690010	-0.21934	0.82638410
20. D (2, 1)	2.289137615	0.696009301	3.28895	0.00100563
21. D (2, 2)	-0.361116717	0.176850445	-2.04193	0.04115820

Table (7) shows that the coefficient B (1,2) is no longer significant with quarterly data, unlike with monthly data, indicating no significant impact of past international reserve volatility on stock market returns. This may be due to the smaller sample size of quarterly data (87

observations compared to 322 when using Monthly data), suggesting a preference for monthly data in such analyses. Additionally, the symmetry of positive and negative shocks (insignificant D (1,2) aligns with results from monthly data.

9.2.2 Using the Nonparametric Wilcoxon Signed-Rank Test for One Sample

Although normality tests confirm that cumulative abnormal returns (CAR) follow a normal distribution, the nonparametric Wilcoxon Signed-Rank Test will be used instead of the parametric t-test to ensure robust results, particularly given the small sample size of only 19 observations. Table (8) presents the results of this test, which confirm that the median value of CAR does not differ from zero. This result aligns with the findings of the t-test, further supporting the rejection of the study's third hypothesis (H3).

Table 8. The Results of Wilcoxon Signed-Rank Test for CAR Variable Using [-10; +10] Event Window

Obs	Median	Z Statistic	P. Value
19	0.874	1.207	0.227

9.2.3 Repeating the Event Study After Excluding Events Within One Month of the Rating Downgrade Announcement

Some studies, such as (Klimaviciene & Pilinkus, 2011), suggest that the results may be biased because the impact of a credit rating change announcement by one agency might be stronger on the stock market compared to subsequent announcements from other agencies if the interval between announcements is short. This is because the stock market may have already reacted to the initial announcement. These studies recommend excluding credit rating change announcements within one month from the first agency's announcement.

Applying this to the preset study and referring to Table (4), which lists the dates of credit rating downgrades, announcements numbered 4, 6, 18, and 19 should be excluded. After excluding the four aforementioned events, the remaining CAR data will be used to perform one-sample t-test and Wilcoxon Signed-Rank Test, as presented in Table (9). The results in Table (9) confirm the rejection of the study's third hypothesis (H3), as the mean and median values of the CAR do not differ from zero.

Table 9. The Results of One-Sample T Test and Wilcoxon Signed-Rank Test for CAR

Variable, after Excluding Near Events				
One-Sample T Test	Obs	Mean	T Statistic	P. Value
	15	3.595	1.346	0.200
Wilcoxon Signed-Rank Test	Obs	Median	Z Statistic	P. Value
	15	-0.509	0.682	0.496

9.2.4 Using Alternative Event Windows in the Event Study

The original study used an event window of $[-10; +10]$, but there are other studies have utilized different event windows. According to (Reddy et al., 2019), the most common event windows in previous research are $[-5; +5]$ or $[-3; +10]$. Therefore, CAR will be recalculated, and one-sample t-test and Wilcoxon Signed Rank test will be applied for the new event windows. The results related to these new windows are presented in Table (10), using 19 observations in each test. Based on the observed P-values for the tests shown in the table, all values exceed 5%, indicating no difference between the mean and median of CAR and zero. This confirms the rejection of the study's third hypothesis (H3).

Table 10 .The Results of One-Sample T Test and Wilcoxon Signed-Rank Test for CAR Variable, Using Different Event Windows

	Mean	T Statistic	P. Value
One-Sample T Test Using $[-5; +5]$ Event Window	2.127	1.457	0.162
One-Sample T Test Using $[-3; +10]$ Event Window	3.149	1.905	0.073
	Median	Z Statistic	P. Value
Wilcoxon Signed-Rank Test Using $[-5; +5]$ Event Window	-1.139	0.885	0.376
Wilcoxon Signed-Rank Test Using $[-3; +10]$ Event Window	4.065	1.610	0.108

10. Conclusion

The relationship between sovereign credit ratings and stock markets has attracted significant attention from researchers. Some studies focus on specific countries, while others examine how changes in a country's sovereign credit rating influence stock market behavior in other nations. Additionally, research highlights the leverage effect, where credit rating downgrades have a more pronounced negative impact on stock markets compared to the positive effects of upgrades. A few studies also explore the impact of international reserves on stock markets.

The relationship between sovereign credit rating changes and stock markets can be explained using several theories, such as signaling theory, the efficient market hypothesis, and financial contagion theory. Similarly, the relationship between international reserves and stock markets can be justified by the theories of Keynes' General Theory of Employment, Interest, and Money, Markowitz's Portfolio Theory, Solnik's International Asset Pricing Model, and Minsky's Financial Instability Hypothesis.

Therefore, the present study focuses on analyzing the reaction of the Egyptian stock market to changes in international reserves and Egypt's sovereign credit rating. This is important as most studies on Egypt have not directly examined the impact of international reserves and/or credit rating changes on the Egyptian stock market. Instead, they have explored these variables in relation to other variables, particularly FDI.

The first two hypotheses of the study focus on analyzing the impact of changes in international reserves on the volatility of Egypt's main stock market index, EGX30, and examining the symmetry of positive and negative shocks in international reserves on the volatility of stock market returns. Monthly data from January 1998, when the index was first published, to December 2024, the latest available data on international reserves, were used to test these hypotheses. The Asymmetric BEKK GARCH (1,1) model was employed to achieve these objectives.

The study found evidence supporting the first hypothesis, indicating a relationship between previous fluctuations in international reserves and conditional volatility in stock market returns. However, no asymmetric effect of positive and negative shocks in international reserves on stock market returns was observed, leading to the rejection of the second hypothesis.

An alternative measure of international reserves, represented by the ratio of international reserves to quarterly GDP, was used to examine its relationship with quarterly EGX30 index returns. However, no significant relationship was established based on this measure, possibly due to the smaller number of quarterly observations (87) compared to monthly data (322).

The event study methodology is followed to test the third and fourth hypotheses. They focus on analyzing the impact of sovereign credit rating downgrades for Egypt on the cumulative abnormal returns (CAR) of the EGX30 index, and examining whether the results vary depending on the credit rating agency issuing the downgrade announcement. The analysis only included downgrade announcements, excluding upgrades, due to the limited number of upgrade events, which equals 7 announcements compared to 19 downgrade events (after excluding 4 cases due to unavailable market index data during the January 25, 2011 revolution).

The event study results did not confirm a significant difference between both the mean and median of daily CAR for the EGX30 index and zero, based on one-sample t-test and Wilcoxon Signed Rank test. The same conclusion was reached when analyzing downgrade cases issued by each credit rating agency separately. These findings were consistent across different event windows used to calculate CAR, and when excluding downgrade announcements from other agencies within one month of a specific agency's downgrade announcement. This led to the rejection of the third and fourth hypotheses.

These results indicate that international reserves significantly influence stock price volatility in the Egyptian stock market. However, the market does not respond to sovereign credit rating downgrade announcements for Egypt. These findings are valuable for stock market investors, portfolio managers, and policymakers. They also pave the way for further research in this area.

11. Recommendations for Future Research

Based on the study results, future research recommendations include:

- Exploring the impact of changes in international reserves and Egypt's sovereign credit rating on the behavior of the Egyptian bond market.

- Studying the spillover effects of changes in Egypt's sovereign credit rating on neighboring Arab stock markets, Middle Eastern markets, or MENA region markets, as well as the impact of sovereign credit rating changes in these countries on Egypt's stock market.
- Using methods other than event studies to confirm the relationship between sovereign credit rating changes and the Egyptian stock market behavior.
- Employing volatility event studies instead of return event studies to analyze the effect of sovereign credit rating changes on stock market behavior.
- Investigating the leverage effect by examining the asymmetric impact of downgrades and upgrades in sovereign credit ratings on stock market behavior, provided a sufficient number of observations are available for both cases.
- Studying the role of international reserves in addressing global crises such as the 2008 mortgage financial crisis, the 2020 COVID-19 pandemic and currency exchange rate crises.
- Conducting comparative studies between developing and developed countries regarding the impact of international reserves and sovereign credit rating changes on their stock markets.
- Examining investor sentiment as a mediating or a moderating variable in the relationship between international reserves and stock markets.
- Analyzing the influence of positive and negative expectations about credit rating changes on stock markets and their connection to market efficiency.
- Studying the effect of sovereign credit rating changes on sectoral indices within the market.
- Investigating the relationship between credit rating changes and foreign investments in stock markets.
- Exploring the relationship between corporate-level credit ratings and security prices for these companies.
- Examining the relationship between sovereign credit ratings and investment risks in securities or the weighted average cost of capital (WACC).

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المستخلص

تهدف الدراسة لبيان أثر التغيرات بالاحتياطات الدولية على تقلبات عوائد سوق الأسهم المصري، والتحقق من عدم تماثل تأثير الصدمات السلبية والإيجابية للاحتياطات الدولية على تقلبات عوائد سوق الأسهم المصري. ولتحقيق هذين الهدفين تم استخدام نموذج Asymmetric BEKK GARCH بالاعتماد على بيانات شهرية امتدت من شهر يناير عام 1998 حتى شهر ديسمبر عام 2024. وبينت نتائج الدراسة وجود أثر معنوي طردي للاحتياطات الدولية على تقلبات عوائد سوق الأسهم المصري. ولم يتم إثبات عدم تماثل لتأثير الصدمات السلبية والإيجابية على تقلبات عوائد سوق الأسهم. كما استهدفت الدراسة تحليل أثر تخفيض التصنيف الائتماني السيادي عن مصر على العوائد اليومية لسوق الأسهم المصري، بتوظيف اختبار (ت) لعينة واحدة في إطار منهجية دراسة الحدث. وكذلك دراسة مدى اختلاف النتائج بالاعتماد على الوكالة المصدرة للتصنيف الائتماني. ولم تظهر النتائج استجابة سوق الأسهم المصري للإعلانات عن تخفيض التصنيف الائتماني، أو وجود فروق في النتائج بالاعتماد على الوكالة المصدرة للتصنيف الائتماني. وتم تأكيد التحقق من قوة النتائج باستخدام عدة أساليب، كاستخدام اختبار ولكوكسون اللامعلمي بدلا من اختبار (ت) المعلمي، واستخدام نوافذ حدث بديلة لحساب العوائد غير العادية المتراكمة، واستبعاد الإعلانات عن التخفيض الصادرة عن وكالات التصنيف الأخرى خلال شهر من تاريخ إعلان وكالة تصنيف معينة عن التخفيض. وتفيد نتائج الدراسة كل من المستثمرين ومديري المحافظ وصانعي السياسات بالسوق المصري. كما تفتح الدراسة المجال لإجراء بحوث مستقبلية في العديد من المحاور الأخرى المرتبطة بموضوع البحث.

الكلمات المفتاحية : الاحتياطات الدولية ؛ التصنيف الائتماني السيادي؛ بورصة الأسهم المصرية؛ دراسة الحدث؛ نموذج BEKK GARCH Model.