JSEG
JOURNAL OF SMART ECONOMIC GROWTH
www.jseg.ro ISSN: 2537-141X Volume 5, Number 2, Year 2020

THE EFFECT OF THE QUANTITATIVE EASING ON THE CAPITAL MOVEMENT: THE USD/YEN EXCHANGE RATE 2008M1-2019M6

PhD student: AYADI Salah [1*], Professor: BEDA SADANI Amal [2]
1 Laboratory of COFIFAS; Univ-Oum El Bouaghi (Algeria), AYADI.Salah@univ-oeb.dz
2 ENSAM - University of Moulay Ismail, Meknès (Maroc), DrAmalEnsam@gmail.com

Abstract: *In this study, we attempted to track the impact of quantitative easing on the currency of both Japan and the USA during the (2008M1-2019M6) study period by formulating an econometric model where the results indicated that the low long-term interest rates in Japan compared to the United States allowed the outflow of investments. This movement reduced the demand for the Japanese Yen, causing its devaluation against the US dollar, which further on allowed Japan to use it to encourage its exports.*

JEL Classification : E52 ; F21; F31
Key words : Monetary Policy; Quantitative Easing; Capital Movement; Exchange Rate; Interest Rate

1. INTRODUCTION

At the beginning of the last century, when John Maynard Keynes predicted the liquidity trap, many economists viewed it as a merely theoretical economic term, considering that it would be unlikely to happen because central banks are able in general to control the money supply and liquidity rates by activating the interest-rate instrument.

At the beginning of the 1990's, what Keynes had predicted came true and the liquidity trap appeared to be a problem in the Japanese economy .In order to resolve this problem and get the economy out of recession, the Japanese central bank took the traditional attitude by decreasing interest rates to near 0%, but the Japanese economy did not respond to this mechanism and THE growth rates rested in low level.

The situation is that the liquidity trap is becoming a major challenge for the Central Bank of Japan about what measures can be taken to avoid this trap. Because it is not possible to reduce interest rates to near 0% levels and the contraction has been prolonged and it can no longer be addressed by increasing the money supply. Nearly the same situation happened in the United States of America due to the 2008 mortgage crisis, when the traditional monetary policy instruments became ineffective. This let the Federal Reserve to run monetary policy with unconventional monetary instruments consistent with such unusual cases.

In order to revive the economy and restore confidence in the financial market, the monetary authorities of the two countries pursued a policy of quantitative easing by buying up long term and high-risk defaulted bonds and reducing their associated interest rates to around 0%. However, this action taken by the two countries may affect the movement of capital abroad toward countries have higher interest rates in order to benefit from this difference and increase profits.

The research issue of this study can be formulated by the following main question:

How does quantitative easing politic affect the movement of capital between Japan and the United States of America during 2008M1-2019M6?

The following two sub-questions fall into this problematic:

- What are the monetary variables that control the movement of capital between Japan and the United States of America?

- What is the impact of the quantitative easing policy on the movement of capital between Japan and the United States during the study period?

This research study tries to achieve the following objectives:

– Identifying theoretical concepts related to a modern instrument of unconventional monetary policy consisting in quantitative easing instrument;

– Reviewing Japan's and the United States experience in the application of the quantitative easing policy;

– Trying to explain the direction of capital movement as well as the impact of quantitative easing on the currency of both Japan and the United States through standard modeling.

2. UNDERSTANDING QUANTITATIVE EASING (QE)

Quantitative easing has been defined from several different points of view, including by a modern monetary policy instrument, through which the central bank purchases bonds in order to increase the money supply. (Stephen D & Collateral, 2014, p. 2)

It was also defined as: A monetary policy applied by the central bank through the purchase of government bonds from financial institutions and commercial banks, which supports lending operations and increases credit, creating money. (Brightmen, 2015, p. 1)

Quantitative easing is also defined as a monetary policy applied by the central bank to reduce the impact of economic stagnation on real economic activities by issuing new amounts of money as it is introduced in the economy at no charge. (Dadush & Eidelman, 2011, p. 13).

This instrument is used to treat a country's long-term economic contraction, although the short-term interest rate is close to zero, in order to reactivate the economy directly by lowering long-term interest rates and is based on two factors:

– Provision of liquidity for circulation in the economy;

– Increasing the banking sector reserves.

The first is a fundamental factor in a financial crisis, in which central banks can avoid a depression, while the second stimulates commercial banks to lend again and restore confidence in the financial market.

As a continuation of what has been addressed, quantitative easing is central banks' unconventional monetary policy to stimulate the economy after traditional monetary-policy instruments become ineffective. This is why contraction, despite the very low interest rate nearing zero, is so that the central bank buys government bonds from financial institutions (such as Treasury bonds and subprime mortgage bonds) to increase the money supply available in the economy, in order to use them in credit lending, which increases the volume of money.

2.1. Objectives of quantitative easing policy implementation:

The quantitative easing Policy aims to achieve the following objectives:

- Change the path of financial flows from fixed investment instruments to productive sectors that provide employment and increase the volume of exports;

- Depreciation of the currency exchange rate to increase the competitive strength of national goods compared with those of other States in the domestic and global market;

– Facilitating bank credit and providing it enough to revive economic activity and at attractive interest rates (near zero) for bank loan applicants, thus enhancing the confidence lost in the financial system;

– Decreasing long-term interest rates on low-yield financial instruments by the central bank buying these assets, thereby contributing to higher prices and lower long-term interest rates; (Zakaria, 2010, p. 7).

– Reducing the risk of bond prices from the risk of fluctuations in interest rates over the length of the bond, encouraging investors to trade and create liquidity in the market; (Krishnamurthy & Vissing-Jorgensen, 2011, p. 28).

2.2. Effects of the quantitative easing policy:

– Quantitative easing leads to higher inflation rates, especially in the medium and long terms. According to quantitative theory, any rise of monetary mass (M2) because of increased money supply creates a rise in the general price rate, but there is a clear difference between monetary supply and the monetary base (M0) that increases its volume through quantitative easing programs, and until the monetary base becomes a monetary mass, the commercial banks that received quantitative easing liquidity must convert it into loans to economy and thus effect inflation rates;

– Quantitative easing affects bank credit through buying securities held by commercial banks by the central bank. The latter's access to liquidity encourages them to distribute more loans to the non-financial sector and thus provide funds to the real sector; (Blot & al, 2015, p. 276).

– The quantitative easing policy affects the value of the currency through the rate of yield, as the low rate of yield on bonds denominated in local currency causes financial operators to resort to foreign securities with higher yield, these transactions require foreign exchange against the local currency, which results in a depreciation and thus improve the competitiveness of the country's exports applying the quantitative easing policy. (Koenig, 2016, p. 13)

3. JAPAN'S AND UNITED STATES EXPERIENCES

3.1. Presentation of JAPAN'S QE experience:

Japan is one of the first countries to implement the quantitative easing policy in order to lift its economy out of contraction as a result of the bond bubble explosion in 1990. This led to a collapse in the general price level and a recession in the Japanese economy. To escape this dilemma, the Japanese central bank took the traditional position and lowered interest rates in order to bring the economy out of recession, but the Japanese economy did not respond to this mechanism and growth rates remained very weak despite the near zero interest rates, thus falling Japan into the first liquidity trap on the ground.

3.1.1. Reasons for QE implementation in JAPAN

With low interest rates, liquidity in the Japanese economy has increased, but this increase has not be translated into actual and new investments, most likely because of the weak confidence of investors in the recovery and exit of the Japanese economy from recession Hence, they didn't invest their money with the aim to face future crises.

In this sense, individuals' preference for holding cash instead of spending has increased their value as a result of increased demand for money as a stock of value rather than as an exchange intermediary, which has led to a lower general price level if compared to the money's value. This situation has been a contraction situation and a challenge to Japan's central bank about what can be taken to exit the liquidity trap, because interest rates cannot be reduced below 0% and the cash contraction can no longer be addressed by increasing money supply due to liquidity trap.

3.1.2. Implementing QE steps in JAPAN:

With the Japanese economy entering a recession due to the bond bubble explosion in 1990, the Japanese Central Bank reduced the interest rate slowly to 0.5% in 1995 and 0% in 2000; (Shigenori & al, 2010, p. 84)

- "Between 2001 and 2003, the Central Bank of Japan has phased out the monthly purchase of long-term government bonds from 400 billion Yen to 1200 billion Yen. Moreover, the current account balance has been raised from 5 trillion Yen to 20 trillion Yen;

- In January 2014, the Bank of Japan's current account balance was raised from 20 trillion Yen to 35 trillion Yen;" (Takatoshi & Frederic, 2006, p. 143;147)

-" In October 2010, the Bank of Japan purchased the equivalent of 5 trillion Yen of long-term assets;

– In August 2011, the money supply was raised from 40 trillion Yen to 50 trillion Yen;

– In October 2011, the Central Bank of Japan expanded the purchase value of long-term assets from 5 trillion Yen to 50 trillion Yen;

– In 2013, the Central Bank injected 80 trillion Yen where the economy grew by 1.5%." (Dimitri & Viktor, 2013, p. 3).

3.1.3. QE implementation results in JAPAN:

- It has reduced long term interest rates, which has helped to restore confidence to credit banks;

–"The quantitative easing experience in Japan has contributed to the support of weak banks by providing them with funding sources in order to furnish credit on easier terms;

– contributed to the stability of the banking system by reducing the vulnerability of assets that are not good and/or are doubtful to be collected.

–It helped the weaker banks to withstand during financial shocks;

– To remove future funding concerns among individuals and companies, thereby encouraging consumption and investment.

In general, the quantitative easing experience in Japan has not left the Japanese economy out of a long-term depression, owing to the export-oriented nature of Japan's economy as an engine of the economy, thus reducing the impact of the quantitative easing mechanism.

3.2. The quantitative easing experience in USA:

The Fed (Federal Reserve) before the subprime mortgage crisis was used to influence the volume of money supply by a set of traditional monetary instruments to guide financial institutions and commercial banks toward desired and predetermined policy. However, with the crisis occurring, these instruments have become ineffective, where the task of conducting

monetary policy has been undertaken with unconventional monetary instruments consistent with such unusual circumstances.

3.2.1. Reasons for applying QE in the united states of america:

Before the 2018 financial crisis, the Fed was adjusting the economy through the short-term interest-rate channel. When the latter declines, both consumption and investment rise, resulting in increased economic activity.

As the subprime mortgage crisis hit, the US economy was in a big recession and unemployment rates reached record numbers as a result of commercial banks' reluctance to lend, leading to a big retraction in expenditure level.

In late 2008, short-term interest rates reached near zero and the Fed could not cut them further. To get out of this dilemma, he had no optimal solution but to pursue a policy of quantitative easing, he reduced long-term interest rates by buying long-term government bonds to create additional demand for them, raising their prices and lowering their associated interest rates.

3.2.2. Stages of QE application in the USA:

Quantitative easing in the US economy has been implemented in three stages:

– **Phase I (QE-1):** This stage was announced on 25/11/2008 during which it was allocated: (FAWLEY & NEELY, 2013, p. 60).

- ✓ 100 billion Dollars for the purchase of GSE bonds, which are the direct obligations of Fannie and Freddie Mac
- ✓ 500 billion Dollars for the purchase of guaranteed real estate securities;
- ✓ On 18/03/2009 the Federal Reserve's Open Market Committee (FOMC) announced that it was ready to buy 300 billion long-term Treasury bonds, with purchases of mortgage guaranteed securities increasing to 750 billion Dollars and purchases of GSE bonds to an additional 100 billion Dollars. (Dupuy, 2012, p. 246)

This stage lasted for about 17 months during which the equivalent of 1.75 trillion Dollars of long-term bonds was purchased through printing new dollars for these assets, thus

easing the real estate market by reducing the cost of lending and easing the conditions of credit.

– Phase II (QE-2): At this stage, given the slow pace of growth in the US economy and the worsening unemployment rate of 10%, the US Federal Reserve announced in November 2010 that it would allocate 600 billion Dollars to buy Treasury bonds in order finance the public budget deficit.

The US Federal Reserve did not stand up to this measure, but also exchanged bonds by buying long-term bonds with a maturity of 6-30 years and selling Treasury bonds with a maturity of less than 30 years, as follows:

- ✓ in September 2011, 400 billion Dollars in Treasury bonds was purchased; (Eric.S, 2015, p. 128).
- ✓ this measure was expanded in 2012 by buying and selling 267 billion Dollars in Treasury bonds (Katla, 2014, p. 44).

- Phase III (QE-3): This stage is different from the previous two phases because it is not limited in duration, as announced by the Federal Reserve's Open Market Committee on 13/09/2012, where: (Eiji & Wang, 2015, p. 4).

- ✓ The amount of $40 billion a month has been allocated for the purchase of mortgage-guaranteed treasury bonds;
- ✓ $45 billion a month has been allocated for the purchase of treasury bonds, beginning in December 2012, in order to reduce unemployment and boost the economy;
- ✓ From January 2014, the funds allocations for the purchase of securities were reduced by: $5 billion, this reduction continued until the date of the announcement of the quantitative easing policy on 29/10/2014.

3.2.3. Results of QE in the US

Following the 2008 subrime mortgage crisis, the Fed undertook its quantitative easing mechanism to bring the US economy out of recession in three stages, with the first phase aimed at revitalizing the financial market and restoring confidence in financial institutions and bailing them out of bankruptcy; the second and third stages aimed at stimulating the economy

by injecting enough liquidity to take off from the depression. The following figure shows the effect of quantitative easing on some macroeconomic variables during its period of application.

Fig 1. Some variables of the American economy developed during the period of applying quantitative easing

Source: Prepared by researchers based on OECD data https://data.oecd.org

We note from the figure above that:

✓ Following the announcement of the first stage with the purchase of long-term Treasury bonds and mortgage-guaranteed securities, this easing did not give any support to the economy, instead of reduction in unemployment rates it increases from 5.8% in 2008 to around 10% in 2010;

✓ We note the gradual decline in unemployment rates during the second and third phases of quantitative easing, after the unemployment rate fell 9.6% in 2010 to 6.2% in 2014, indicating that the quantitative easing in this period has yielded positive results;

✓ The same observations were made on inflation rates as they fell in the first phase of quantitative easing from 3.8% in 2008 to nearly 1.6% in 2010.

✓ As for economic performance, it has not been improved in the first phase of quantitative easing, with the rate of economic growth falling below zero in 2009, recovering somewhat during the second phase of quantitative easing and improving in 2014, where the Fed announced the end of the mechanism.

4. METHODOLOGY AND DATASET

The theoretical aspect of this study was based on the analytical descriptive approach because of its relevance with the nature of the subject .However, in the application aspect, the standard quantitative statistical method is used to conduct the standard study and determine the optimal model for the explanation of the problem as well as the designation of the impact, the relationship and the direction of the variables explained to the dependent variable, depending on the Eviews10 software.

4.1. The hypothesis:

To answer this research questions, we suggest the following hypotheses:

- ✓ –Interest rate and monetary supply cause capital movement to and from abroad;
- ✓ –There is a direct impact of the quantitative easing policy in the United States of America on Japan's currency as a result of pursuing the same policy.

4.2. Data description:

In order to try to formulate a model for measuring the impact of quantitative easing applied by Japan and the United States on capital movements, the following formula has been based on:

$$Exch\_rate_t = f(M3_t, Lt\text{-}int_t)$$

Assuming the linear relationship between the variables, the preceding formula can be written as follows:

$$Exch\_rate_t = B_0 + B_1 M3_t + b_2 Lt\text{-}int_t + \mathscr{E}_t$$

Where:
T: time period
B_0: stands for fixed threshold
$\mathscr{E}_t$: Random error limit at time period
-Dependent variable (Exchange Rate): The ratio between Japan's and united states currencies where the US dollar (USD) was taken as the base currency and the Japanese Yen as the pricing currency

$$Exch\_rate = (USD)/(Yen).$$

-Explained variables: The tools used in the quantitative easing mechanism are:

JOURNAL OF SMART ECONOMIC GROWTH
JSEG
www.jseg.ro ISSN: 2537-141X Volume 5, Number 2, Year 2020

✓ ***Long-term interest rates (LT-INT)***: In order to effectively facilitate quantitative easing, the governments of the two countries have reduced long-term interest rates, which are now near 0% short-term interest rates.

$$Lt\text{-}int = Lt\text{-}int(USA) / Lt\text{-}int(JPN)$$

✓ ***Additional Monetary Mass (M3)***: During the quantitative easing periods, both governments of Japan and the US purchased defaulted government bonds issued by financial institutions as well as treasury bonds in order to provide liquidity in the economy.

$$M3 = M3(USA) / M3(JPN)$$

These variables issued by the Economic Cooperation Organization (OECD) reflect monthly data from the first month of 2008 to the sixth month of 2019, about 138 OECD views.

4.3. Econometric Methodology

4.3.1. Stationary and cointegration of study variables:

The Stationary of time series is a necessary condition for analyzing economic series where there are many tests that reveal Stationary, but the best and most commonly used is the advanced Dickey Fuller (ADF) test.

Before this test, however, the graph of all the study variables can be presented in order to give an initial figure of their dynamic.

Fig 2. Graph of time series

Source: Prepared by researchers based on Eviews10 outputs

We note that with the graph of the time series in question, there is a general trend in the series (LT-INT) that implies an increase and the series (M3) and (EXCH_RATE) do not

fluctuate around a fixed arithmetic. This means that the series are unstable and to make sure that, this study will rely on the Dickey Fuller Developer Test (ADF).

4.3.2. Stationarity test:

To see how long and stable the Study Model variables are, the Dickey Fuller developed Test (ADF), which is based on the degree of delay, is determined by a zero delay based on the partial self-link function (Bourbonnais, 2011, p. 107) and the resulting table summarizing the results of the study:

Table 1. Results of ADF test

Model	EXCH_RATR		M3		LT-INT		**Decision**
	Prob	**t-Stat**	**Prob**	**t-Stat**	**Prob**	**t-Stat**	
With constant	0.06*	-2.80	0.70	-1.11	0.73	-1.03	**Not stationary**
With constant &Trend	0.17	-2.86	0.17	-2.86	0.64	-1.90	
Without constant &Trend	0.00**	-3.75	0.61	0.61	1.00	5.05	
Model	**D(EXCH_RATR)**		**D(M3)**		**D(LT-INT)**		Decision
	Prob	**t-Stat**	**Prob**	**t-Stat**	**Prob**	**t-Stat**	
With constant	0.00***	-5.63	0.00***	-7.10	0.00***	-8.34	**stationary**
With constant &Trend	0.00***	-5.64	0.00***	-7.08	0.00***	-8.34	**stationary**
Without constant &Trend	0.00***	-5.65	0.00***	-7.13	0.00**	-2.09	**stationary**

(***),(**) and (*)represent respectively the statistical significance of the coefficients of the model at 1%, 5%, and 10%

Source: Prepared by researchers based on Eviews10 outputs

By extrapolating the results of the ADF test shown in the table above, we find that all-time series are unstable at the level but stable after taking the first difference, series are therefore first class integrated.

4.3.3. Determine lag intervals for endogenous with lag length criteria:

Using the delay rating criteria for a vector auto regression model (VAR) the number of appropriate periods and the subsequent table indicates the number of optimal decelerations by each criterion.

Table 2. The Optimal Lag Length

Log	LogL	LR	FPE	AIC	SC	HQ
0	120.6738	NA	3.47e-05	-1.7556325	-1.691448	-1.729962
1	812.5340	1342.415*	1.30e-09*	-11.94827*	-11.68876*	-11.84281*
2	820.4757	15.05378	1.32e-09	-11.93247	-11.47833	-11.74793
3	826.0218	10.26443	1.39e-09	-11.88092	-11.23215	-11.61728
4	829.6831	6.612213	1.51e-09	-11.80124	-10.95784	-11.45851

Source: Prepared by researchers based on Eviews10 outputs

Table 2 results show that all standards: FPE, AIC, SC, HQ agree that the appropriate delay score is (p=1) because it corresponds to the lowest value for the standards.

4.3.4. The johansen cointegration test:

The objective of this test is to verify that there is a long-term equilibrium relationship between study variables. As well as that all time series are first-degree integrated and the appropriate delay is (P=1) . Joint integration testing can be performed in a substantial manner (Osterholm, 2007, p. 5) in order to verify a long-term equilibrium relationship between variables, the following table shows the test results:

Table 3. Results of Johansen Co-integration

	Nihilistic hypothesis	Alternative hypothesis	Calculated Value	Critical Value
Impact test	$r = 0$	$r \geq 1$	34.21	**29.79**
	$r \leq 1$	$r \geq 2$	8.77	**15.49**
	$r \leq 2$	$r \geq 3$	1.21	**3.84**
Maximal eigenvalue test	$r = 0$	$r = 1$	25.43	**21.13**
	$r \leq 1$	$r = 2$	7.56	**14.26**
	$r \leq 2$	$r = 3$	1.21	**3.84**

Source: Prepared by researchers based on Eviews10 outputs

The results of the impact test indicate rejection of the nihilistic hypothesis H_0, which includes the absence of a common integration of variables at a 5% level of meaning, where we note that the calculated value of the impact test is estimated at 34.21 which are greater than the critical value 29.79 indicating a common integration relationship.

For both the second and third hypothesis, the calculated value of the impact test is smaller than the critical value at a 5% level of meanings and therefore accepts the hypothesis of nihilism that there is no common integration between the variables under consideration.

From the above, it can be said that there is one common integration relationship between variables, where a great value test gave the same results as an impact test and therefore there is a long term equilibrium relationship between variables (Sandrine & Valérie, 2002, p. 213) which means that variables are not far apart in the long term and therefore the best model for estimating this long term equilibrium relationship is the random error correction model.

5. RESULTS

5.1. Vector Error Correction Model (Vecm) Estimates

After making sure that all time series are first-degree integrated and there is a common balance relationship between the study variables, the error correction form, which estimates M3 and LT-INT to EXCH_RATE in the short and long term, is estimated to be one parallel relationship and one deceleration period, with the estimate results as follows and shown in Appendix 01:

D(EXCH_RATE) = - 0.401 [EXCH_RATE(-1) - 1347.032*M3(-1) - 20.184*LT_INT(-1) + 26.3509050313] + 0.007*D(EXCH_RATE(-1)) - 3167.462*D(M3(-1)) - 587.046*D(LT_INT(-1)) + 1.422.

The results indicate the following:

- ✓ Exchange rate is defined by this equation for the long-term and short-term VECM model, known in the long term as the constant and delay for both M3 and LT-INT and known in the short term as the constant and delay of the first difference for M3, EXCH_RATE and LT-INT;

- ✓ The error correction factor, which represents the return to balance impact from the short to the long term, fulfills the necessary requirement, which indicates that the reverse force of the error correction factor is the one that corrects and returns the path from the short to the long term;
- ✓ The error correction factor is statistically significant because the T-Statistic value in absolute value is greater than its scheduled value in absolute and non-existent terms. The 40.12% of short-term errors can be corrected in one time in order to return to the parallel mode.

One estimates the time needed by the correction coefficient to address the deviation in the exchange rate from the short to long term is approximately 1/0.4012=2.49) two and a half months.

A. In the long term:

- ✓ There is a reverse relationship between the M3 cash mass and the exchange rate, which is consistent with the logic of economic thinking, as the low market base increases interest rates by banks, but the cash-mass index has no statistical significance;
- ✓ there is a reverse relationship between the interest rate and exchange rate factors, which is in line with the meaning of economic theory, as the interest rate is lower and capital is moving abroad, resulting in a decline in the value of the local currency.

B. In the short term:

- ✓ The results indicate that there is no significant short-term relationship of a positive nature between the exchange rate and other variables, since the statistical irrelevance of the model parameters set out in Appendix 10 also allows for recognition of a dynamic relationship absence in the short term between the study variables.

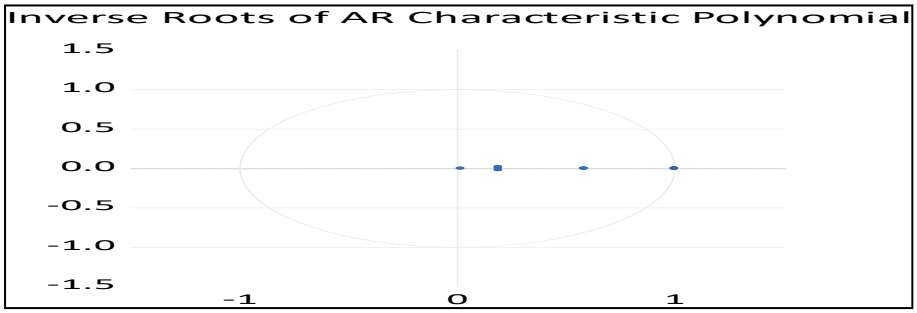
This disparity in the investment flows size between Japan and the US, is illustrated by the inverse relationship between the two countries due to the difference in long-term interest rates. The large volume of investment flows from Japan toward the United States indicates that Japan's long-term interest rates are very low than those in the US, which allows capital to leave Japan to the US, causing the Yen to fall in value against the dollar.

5.2. Diagnostic tests to assess the VECM Model

5.2.1. Testing the model stability

By testing the Roots of characteristic polynomial, the random error correction form can be confirmed as recursive, as shown in the following figure:

Fig 3. Residual stability test of ECM model



Source: Prepared by researchers based on Eviews10 outputs

In the figure above, we note that the estimated model satisfies the stability condition, since all transactions are smaller than one and all roots fall within one circle, which means that the model does not have an error link problem.

5.2.2. The serial link of residuals errors test:

To ensure that the estimated model does not suffer from the problem of serial link of errors by performing a double test of Lagrange, the results of which are shown in the following table:

Table 4. VEC Residual serial cirrelation LM tests

Null hypothesis: No serial correlation at lag h						
lag	LRE* stat	df	Prob	Rao F-stat	df	Prob
1	13.88183	9	0.1266	1.559655	(9,306.8)	0.1266
2	11.80100	9	0.2248	1.321401	(9,306.8)	0.2248
3	4.104187	9	0.9044	0.453872	(9,306.8)	0.9044
4	12.89397	9	0.1675	1.446346	(9,306.8)	0.1675

Source: Prepared by researchers based on Eviews10 outputs

Extrapolating the Eviews 10 output shown in the table above, we reject the assumption that there is a serial link in the residuals series where we note that all the probabilities are not significant (greater than 5%) and therefore accept the nihilistic hypothesis that there is no self-correlation between errors.

5.2.3. Contrast instability test

To test the inconsistencies of the error pattern for the estimated model, we relied on the White test and the following table showing the test results

Table 5. Contrast instability Test

Joint test:		
Chi-sq	Df	**Prob**
102.6408	84	**0.0816**

Source: Prepared by researchers based on Eviews10 outputs

Through the table, we note that the probability value is greater than 0.05 and therefore accept the nihilistic hypothesis with a probability of 8.16%, from which we accept the hypothesis of variability within the error limits of the estimated model.

6. CONCLUSION:

In order to exit the Japanese economy's recession caused by the bond bubble explosion in 1990, the Japanese central bank reduced interest rates slowly to 0%, but the contraction has been prolonged and cannot be addressed by an increase in the money supply

due to a liquidity trap, so it has applied the quantitative easing mechanism by printing money and pumping it into the market after it bought long-term assets and reducing related interest rates.

The same mechanism was applied by the Fed following the 2008 subprime mortgage crisis, in order to bring the US economy out of recession through three stages. In the first phase, it aimed to stimulate the financial market, inspire confidence in financial institutions, and save them from bankruptcy. In the second and third phases, the objective was to stimulate the economy by injecting enough liquidity to get it out of the recession.

6.1. The test of hypotheses:

- ✓ The study has shown that there is a reverse relationship between the monetary mass (M3) and the exchange rate, which is consistent with the logic of economic thinking, where the market's monetary mass is low, banks raise interest rates and thus capital moves inward, but the cash-mass index has no statistical significance and has not caused an explanation of the exchange rate;
- ✓ The study showed that there is a reverse relationship between the interest rate and exchange rate factors, which is in conformity with the meaning of economic theory, as the low interest rate in Japan causes the movement of capital abroad, which made the Japanese Yen depreciate against the US dollar.

6.2. Results of the study:

- ✓ Japan and the United States have pursued a policy of quantitative easing in order to revive and restore their economies from a long-term state of recession;
- ✓ The quantitative easing mechanism affects the movement of capital through the exchange-rate channel, where interest rates in the country in which the mechanism is adopted differ, resulting in capital movements toward countries with a higher interest rate and thus devaluing the currency of the State from which the investment flows;
- ✓ The standard study results in the long-term relationship evaluation indicated that there was a reverse relationship between the explained and dependent variables, which was consistent with the meaning of economic theory but not statistically acceptable;

- ✓ The results of the short-term relationship evaluation indicated that there was no statistically significant correlation between the study variables.

6.3. Recommendations:

The high interest rates in a country encourage investment in it, and consequently the demand for the currency of that country rises and its value rises as well and vice versa. One result of this research has been that Japan's low interest rate has had an impact on capital which moved abroad toward countries with high interest rates. As a result of this capital movement abroad, demand for the Japanese Yen is falling and its value will consequently fall, so that Japan must use this monetary depreciation to encourage its exports.

7. REFERRALS AND REFERENCES

1- Blot, C., & Al. (2015). Que Peut-On Attendre De L'assouplissement Quantitatif De La BCE ? Revue De L'ofce(2), Pp. 256-290.
https://www.cairn.info/revue-de-l-ofce-2015-2-page-265.htm
https://doi.org/10.3917/reof.138.0265
2- Bourbonnais, R. (2011). Econométrie Manuel Et Exercices Corrigés (Ed. 8). Paris: Dunod.
3- Brightmen, C. (2015, February 4). What's Up? Quantitative Easing And Inflation. Retrieved Septembre 17, 2019, From Research Affiliates:
https://www.advisorperspectives.com/commentaries/2015/02/04/what-s-up-quantitative-easing-and-inflation.pdf
4- Dadush, U., & Eidelman, V. (2011, September 23). Currency Wars. Voxeu.Org Publication. Retrieved September 10, 2019, From
http://www.tek.org.tr/dosyalar/vox-539.docx
Https://Voxeu.Org/Article/Currency-Wars
5- Dimitri, O. L., & Viktor, O. L. (2013). To The Problem Of Turbulence In Quantitative Easing Transmission Channels And Transactions Network Channels At Quantitative Easing Policy Implementation By Central Banks. Retrieved From Cornell University Arxiv.Org: https://arxiv.org/pdf/1305.5656
6- Dupuy, M. (2012). Les Effets Des Politiques De Quantitative Easing Sur Le Taux De Change: Les Enseignements De L'expérience Américaine. Revue D'économie Financière, 108(4), Pp. 243-260.
https://www.cairn.info/revue-d-economie-financiere-2012-4-page-243.htm
https://doi.org/10.3917/ecofi.108.0243
7- Eiji, O., & Wang, Z. (2015, March). Effects Of Quantitative Easing Monetary Policy Exit Strategy On East Asian Currencies. Retrieved Octobre 12, 2019, From Research

Institutr Of Economy, Trade And Industry: Https://Www.Rieti.Go.Jp/En/Publications/Summary/15030025.Html

8- Eric.S, R. (2015). Lessons From The U.S. Experience With Quantitative Easing. In E. D. Kaufman George G, Innovative Federal Reserve Policies During The Great Financial Crisis (Vol. 14, Pp. 125-140). World Scientific-Now Publishers Series In Business.
https://books.google.fr/books?hl=fr&lr=&id=qfzodwaaqbaj&oi=fnd&pg=pa125&dq=10.%09eric.s,+r.+(2015).+lessons+from+the+u.s.+experience+with+quantitative+easing.+in+e.+d.+kaufman+george+g,+innovative+federal+reserve+policies+during+the+great+financial+crisis+(vol.+14,+pp.+125-140).+world+scientific-now+publishers+series+in+business.&ots=sdsfaszt9s&sig=u8pkmavckwhvj4y3tei3me6njdq#v=onepage&q&f=false

9- FAWLEY, B., & NEELY, C. J. (2013). Four Stories Of Quantitative Easing. Federal Reserve Bank Of St. Louis Review, 95(1), Pp. 51-88. Retrieved Octobre 14, 2019, From
https://files.stlouisfed.org/files/htdocs/publications/review/13/01/fawley.pdf

10- Fujiwara. (2006). Ippei Evaluating Monetary Policy When Nominal Interest Rates Are Almost Zero. Journal Of The Japanese And International Economies, 20(3).
http://fmwww.bc.edu/repec/esfeam04/up.23297.1080608054.pdf

11- Katla, A. (2014). Quantitative Easing -Economic & Financial Effects Of An Unconventional Monetary Policy. Copenhagen Business School.

12- Koenig, G. (2016). La Politique D'assouplissement Quantitatif: Limites Et Alternative. Bulletin De l'Observatoire Des Politiques Economiques En Europe, 1(34), Pp. 11-17. Consulté Le Octobre 12, 2019, Sur https://opee.unistra.fr/img/pdf/bulletinopee_34_koenig.pdf

13- Krishnamurthy, A., & Vissing-Jorgensen, A. (2011). The Effects Of Quantitative Easing On Interest Rates: Channels And Implications For Policy. The National Bureau Of Economic Research. Retrieved Octobre 12, 2019, From https://www.nber.org/papers/w17555.pdf

14- Masujim.M, & Harada.T. (2008). Effectiveness And Transmission Mechanism Of The Quantitative Monetary Easing Policy (In Japanese). H.Yoshikawa Ed , Keioh Univ, Press, In Japanese.
http://www.esri.go.jp/jp/archive/e_dis/e_dis204/e_dis204.pdf

15- Nakazawa, & Yoshikawa. (2011). Monetary Policy In The Deflation, Empirical Test Of Quantitative Easing Monetary Policy. Pri Discussion Paper Series No-11A-03.

16- Osterholm, P. &. (2007). Testing For Cointegration Using The Johansen Methodology When Variables Are Near-Integrated (Vols. 7-141). International Monetary Fund.

17- Sandrine, L., & Valérie, M. (2002). Econométrie Des Séries Temporelles Macroéconomiques Et Financières. Paris: Economica.

18- Shigenori, S., & Al. (2010). Size And Composition Of The Central Bank Balance Sheet: Revisiting Japan's Experience Of The Quantitative Easing Policy. Monetary And Economic Studies, 28(3), Pp. 79-105.
https://core.ac.uk/download/pdf/6340971.pdf

19- Stephen D, W., & Collateral, S. (2014). The Term Premium, And Quantitative Easing. Retrieved Septembre 12, 2019, From Economic Research - Federal Reserve Banks Of Richmond And St. Louis: https://research.stlouisfed.org/wp/more/2014-008 https://doi.org/10.20955/wp.2014.008
20- Takatoshi, I., & Frederic, S. (2006). Two Decades Of Japanese Monetary Policy And The Deflation Problem. In Monetary Policy With Very Low Inflation In The Pacific Rim. 131-202. National Bureau Of Economic Research - EASA.Volume 15. University Of Chicago Press. Retrieved Octobre 12, 2019, From https://www.nber.org/chapters/c0092.pdf
21- Zakaria, M. (2010). Assouplissement Quantitatif ; Quels Enseignements Tirer De L'expérience Japonaise ? (Thèse Doctorat). Faculté Des Sciences Economiques Et De Gestion, marseille: université de la méditerranée (AIX-MARSEILLE II). https://www.theses.fr/2010aix24027.pdf

8. APPENDICES:

Appendix 01: Vector error correction model (VECM) estimates

Vector Error Correction Estimates
Date: 10/22/19 Time: 13:33
Sample (adjusted): 2008M03 2019M06
Included observations: 136 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1		
EXCH_RATE(-1)	1.000000		
M3(-1)	-1347.033 (7576.15) [-0.17780]		
LT_INT(-1)	-20.18423 (101.803) [-0.19827]		
C	26.35091		
Error Correction:	**D(EXCH_R...**	**D(M3)**	**D(LT_INT)**
CointEq1	-0.401212 (0.07771) [-5.16294]	1.28E-07 (5.5E-07) [0.23482]	-3.55E-07 (6.1E-06) [-0.05820]
D(EXCH_RATE(-1))	0.007134 (0.08737) [0.08165]	-5.46E-07 (6.1E-07) [-0.88761]	-2.35E-06 (6.9E-06) [-0.34238]
D(M3(-1))	-3167.463 (12875.3) [-0.24601]	0.129180 (0.09062) [1.42558]	2.127860 (1.01208) [2.10247]
D(LT_INT(-1))	-587.0470 (1111.86) [-0.52798]	-0.005198 (0.00783) [-0.66425]	0.245318 (0.08740) [2.80687]
C	1.422461 (4.51679) [0.31493]	1.18E-05 (3.2E-05) [0.37212]	0.002004 (0.00036) [5.64407]

Source: Author's calculation using Eviews10