

### **Case 3: EXCHANGE RATE SHOCKS AND STOCK PRICES**

Q1: WHAT WILL BE THE VALUE OF VIETNAM DONG IN 2022?

#### **ABSTRACT**

Based on the value above, the future exchange rate is forecasted to be 22.736 VND/\$, compared to the present exchange rate is around 23,025 VND/\$. Vietnam Dong is expected to move down 0,316 VND/\$. In other words, one unit of Vietnamese currency can be converted into more dollars in 2022 compared to it in 2021. So, in conclusion, Vietnam Dong will appreciate in value in 2022.

#### **LITERATURE REVIEW**

##### **M2/GDP**

M2 is a money supply estimate that incorporates all of the variables of M1 as well as "near money." Cash and checking deposits are classified as M1, whereas savings accounts, money market securities, mutual funds, and other time deposits are classified as near money (THE INVESTOPEDIA TEAM, 2021).

Gross Domestic Product (GDP) is the monetary value of all finished goods and services made within a country during a specific period, providing a comprehensive economic picture of a country, used to estimate the size of an economy and growth rate (Chappelow.J, 2020)

On the one hand, GDP is a measure of production inside a country's borders. M2 on the other hand, is made up of cash in circulation, demand deposits, and the majority of savings accounts. As a result, this ratio intuitively represents the proportion of transactions enabled by quasi-money as a payment medium.

## CPI

A consumer price index (CPI) is a calculation of the average price of goods and services purchased by households (Subhani, 2009). The coefficient between exchange rates and the consumer price index (CPI) is less significant than the official rate, according to the article, which used correlation and Granger causality to determine the importance of the associations (Adetiloye, 2010). The CPI is an important economic indicator released on a regular basis by major economies to give a timely glimpse into current growth and inflation levels (Lobel.B, n.d). The greater the CPI, the higher the inflation rate. As a result, a country's currency is more likely to gain if its interest rate is greater. Countries with lower interest rates, on the other hand, frequently have weaker currencies (Lobel.B, n.d)

## Inflation

Inflation reflects how increases in price of a set of goods and services has become over a period of time (IMF Survey, Volume 30, Issue 01, 2001). Inflation is measured by consumer price index (CPI) (2021). Research papers of Mohammed Omrana and John Pointon support the view that as inflation rate measures the prices level, then stocks price would move along with price levels. So, when the inflation rate increases the stock price should also increase (Omran, M., & Pointon, J. ,2001).

## Exchange Rate

The value of a country's currency in relation to the currency of another country or economic zone is known as an exchange rate. A managed floating exchange rate indicates that the value of each currency is influenced by the government or central bank's economic activity. The increase in currency value leads to a rise in the exchange rate.

## DATA AND METHODOLOGY

### Data

See the Appendix 1, table 1

### Methodology

In question 1, in order to predict the Vietnam dong's value in 2022, we employ simple linear regression to forecast the exchange rate. In our models, we employ inflation rate (as an

indicator of the percentage change in CPI), M2/GDP and delta CPI of Vietnam and US to predict the exchange rate in 2022. More information about the regression is provided in Appendix 3.3.

## EMPIRICAL RESULTS

### Future Exchange Rate in 2022:

The R programming language is used to define relationships between variables. The result is show below:

$$\ln(\text{future exchange rate}) = 9.808 + 0.005\Delta\text{CPI (with } \Delta\text{CPI} = \text{CPI}_{VN} - \text{CPI}_{US}) \quad (1)$$

$$\ln(\text{future exchange rate}) = 9.527 + 1.345\text{M2GDP} \quad (2)$$

$$\ln(\text{future exchange rate}) = 10.016 - 0.007.\text{Inflation rate} \quad (3)$$

To find out how much the exchange rate will fluctuate next year, we need to calculate based on predicted economic indicators in 2022. According to trading economics, in 2022, the CPI of Vietnam, US is predicted respectively to be 178.185 and 170.37. M2 and GDP of Vietnam in 2022 are 14315724, 6706830 billions VND. On the other hand, the inflation rate is forecasted to be 3,5% next year.

Based on the above data and model (1) (2) (3), three results obtained for  $\ln(\text{exchange rate})$  are 10.157; 10.0158; 9.906 Thence, expected exchange rate next year (2022) is predicted to be 25.77; 22.376; 20.058. The average results of the future exchange rate in 2022 is 22,736.

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Q2: HOW DO EXCHANGE RATE, INFLATION, INDUSTRIAL PRODUCTION INDEX, INTEREST RATE INFLUENCE VN-INDEX DURING 2010-NOW?

## ABSTRACT

By using Johansen Cointegration and VECM, we found out that Industrial Production Index have long term and short term causality on VN-Index at lag -1. In other words, the Industrial Production Index has a causality effect on the VN-Index from 2010 to now.

## LITERATURE REVIEW (Cont)

### Industrial Production Index

The index of industrial production (IIP) is a monthly economic statistic that compares real output in the manufacturing, mining, electric, and gas industries to a base year (Kenton, n.d.). Based on the result from the research of Sahu, Tarak & Bandopadhyay, Kalpataru (2020), in the long run, the Indian stock market is sensitive to changes in industrial production index, and that changes in the index have a favorable impact on stock price movement.

### Interest Rate (Bond Yields & Interbank Rate)

#### i) Bond yields

The return on a bond is referred to as the bond yield. Bond yields can be defined in a variety of ways. The simplest definition is to set the bond yield equal to the coupon rate. If the bond's price differs from its face value, the current yield is a function of the bond's price and its coupon or interest payment, and it will be more accurate than the coupon yield (ADAM HAYES, 2021).

#### ii) Interbank rate

The interest rate paid on a loan from one bank to another is known as the interbank rate. Market rates are often computed using a "fixed" system in which the average rate is calculated using quotes from a group of banks (Gyntelberg & Wooldridge, 2008).

## **VN-INDEX**

The common symbol for the Vietnam stock index is VN Index. It is based on the total market capitalization of all firms listed on the Ho Chi Minh Stock Exchange's HOSE exchange. Investors and stock traders can use the VN-Index to monitor and evaluate the volatility of the overall market over a certain time period. The State Securities Commission manages the VN Index, which is calculated using the current Pinscher average price index technique.

## DATA AND METHODOLOGY

### Data

See the Appendix 1, table 2

## Methodology

In question 2, we use Johansen to test cointegration, Varsselect to find optimal number of lag, and VECM to test causality. .

### EMPIRICAL RESULTS

#### i) Johansen Cointegration Result

At first, we applied Johansen for testing cointegration. We run Johansen with `Vn_index`, `IIP_percent`, `inflation`, `fx_rate`, `one_year_bond`, and `interbank_rate` with `K` equal to 6. In the result, we see the "Value of test statistic and critical values of test". At " $r \leq 1$ ", we have a test value greater than critical value at 5 percent level ( $86.26 > 76.07$ ). There is at least one cointegration between variables.

#### ii) Selecting number of lags

To run VECM, at first we run Varsselect to define a suitable number of lag. Look at "\$selection", 2 is the common number. However in VECM, the number of lags will be equal to 2 minus 1, which is equal to 1. So 1 is the suitable number of lag.

#### iii) VECM Result

At the VECM result, we look at "Cointegration vector (estimated ML)" and can see that `IIP`, `inflation` have negative cointegration on `vn_index`. By contrast, `fx_rate`; `one_year_bond`; `interbank_rate` have positive cointegration. At column "ECT", `IIP` is significant at 0.1%, so `IIP` has long term causality on `vn_index`. `IIP` is also significant at lag 1 with significant level 5%. So `IIP` have long term and short term causality on `vn_index`

## REFERENCE

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## APPENDIX

### 1. Data

Table 1: Data for the Question 1

<b>Variable</b>	<b>Description</b>	<b>Source</b>
CPIVN	Consumer Price Index of Vietnam annually in points from 2005 to 2020 (2010=100)	World Bank Database
CPIUS	Consumer Price Index of US annually in points from 2005 to 2020 (2010=100)	World Bank Database
delta_cpi	The difference Between CPI VN and CPI US	
M2	Total means of payment annually in Billion VND	Electronic Gate of Vietnam State Bank
GDP	Gross Domestic Product of Vietnam annually in Billion VND from 2005 to 2020	World Bank Database
M2/GDP	The ratio between M2 and GDP annually from 2005 to 2020	
FXRATE	The Foreign Exchange Rate between VND and USD annually from 2005 to 2020	World Bank Database
Inflation	Inflation Rate of Vietnam monthly in percentage from 2009 to 2021	Provided by the lecturer



ln_fxrate	The Logarithm of The Foreign Exchange Rate between VND and USD annually from 2005 to 2020	
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Table 2: Data for the Question 2

Variable	Description	Source
VN INDEX	The index represents the market value of all stocks listed on HoSE monthly from 2010 to 2021	Retrieved from Investing.com
IIP	Industrial production index growth over the same period	Provided by the lecturer
Inflation	Inflation Rate of Vietnam monthly in percentage from 2010 to 2021	Provided by the lecturer
FXRATE	The Foreign Exchange Rate between VND and USD monthly from 2010 to 2021	World Bank Database
1YBond	The Vietnam 1 year Bond yield monthly from 2010-2021	Investing.com
Interbank_rate	The Vietnam 2-week Interbank rate monthly from 2010-2021	Providing by Lecture

## 2. Coding

```
install.packages('urca')
install.packages('vars')
install.packages('xlsx')
install.packages('tsDyn')
```

```
install.packages('tseries')
library('vars')
library('tsDyn')
library('xlsx')
library('tseries')
library('urca')
library('tsDyn')
library('forecast')
library('fixest')
library('lmtest')
library('plm')
```

### **#Question 1:**

```
output1 = lm(ln_fxrate ~ delta_cpi,data=Q1)
summary(output1)
```

```
output2 = lm(ln_fxrate ~ M2GDP, data = Q1)
summary(output2)
```

```
output4 =lm(lnex ~ Inflation, data = Inflation)
summary(output4)
```

### **#Question 2:**

#### #Johansen

```
attach(Q2)
model = ca.jo(data.frame(vn_index, IIP_percent, inflation, fx_rate, one_year_bond,
interbank_rate), ecdet = "const", type ="trace", K=6)
summary(model)
detach(Q2)
```

#### #VECM:

#Choose the optimal lag:

```
attach(Q2)
lagselect = VARselect(data.frame(vn_index, IIP, inflation, fx_rate, one_year_bond,
interbank_rate),lag.max=7,type ='const')
lagselect #view the optimal lag
```

#Run VECM:

```
attach(Q2)
vecm = VECM(data.frame(vn_index, IIP, inflation, fx_rate, one_year_bond,
interbank_rate),lag =2, r=1, estim = "ML")
summary(vecm)
```

### 3. Result:

Call:

```
lm(formula = ln_fxrate ~ delta_cpi, data = Q1)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-0.045087	-0.006677	0.001351	0.010549	0.043450

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	9.8082590	0.0063035	1556.00	< 2e-16 ***
delta_cpi	0.0049576	0.0001958	25.33	4.29e-13 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### Appendix 3.1: OLS result between Ln(FXrate) and Delta CPI

Call:

```
lm(formula = ln_fxrate ~ M2GDP, data = Q1)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-0.07640	-0.03825	-0.01246	0.04288	0.09656

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	9.52778	0.04304	221.345	< 2e-16 ***
M2GDP	1.34540	0.15125	8.895	3.9e-07 ***

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Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### Appendix 3.2: OLS result between Ln(FXrate) and M2/GDP ratio

Call:

```
lm(formula = lnex ~ Inflation, data = CPI)
```

Residuals:

	Min	1Q	Median	3Q	Max
	-0.21334	-0.02320	0.01697	0.05067	0.09167

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	10.015539	0.008290	1208.07	< 2e-16 ***
Inflation	-0.007080	0.001091	-6.49	1.13e-09 ***

---

Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1

#### Appendix 3.2: OLS result between Ln(FXrate) and Inflation

### Appendix 3.3: Methodology in question 1:

In question 1, in order to predict the Vietnam dong's value in 2022, we employ simple linear regression to forecast the exchange rate. Simple linear regression is a model which describes the relationship between 2 econometrics variables. In this paper, we invest in the exchange rate predict value of Vietnam dong compared to the US dollar. In the case that the predicted exchange rate is found to be higher than it was in 2021, we can conclude that Vietnam Dong may appreciate in value in 2022 and vice versa. There will be 3 models given and the final result will be the average based on the 3 results obtained. In our models, we employ inflation rate (as an indicator of the percentage change in CPI), M2/GDP and delta CPI of Vietnam and US to predict the exchange rate in 2022.

```
#####
# Johansen-Procedure #
#####

Test type: trace statistic , without linear trend and constant in cointegration

Eigenvalues (lambda):
[1] 2.862989e-01 2.063380e-01 1.647825e-01 1.455165e-01 7.201152e-02 4.580405e-02 1.005973e-16

Values of teststatistic and critical values of test:

      test 10pct   5pct   1pct
r <= 5 |  5.86  7.52  9.24 12.97
r <= 4 | 15.20 17.85 19.96 24.60
r <= 3 | 34.86 32.00 34.91 41.07
r <= 2 | 57.37 49.65 53.12 60.16
r <= 1 | 86.26 71.86 76.07 84.45
r = 0 | 128.42 97.18 102.14 111.01

Eigenvectors, normalised to first column:
(These are the cointegration relations)

vn_index.l6      vn_index.l6      IIP.l6      inflation.l6      fx_rate.l6      one_year_bond.l6      interbank_rate.l6
vn_index.l6      1.0000000      1.0000000      1.0000000      1.0000000      1.0000000e+00      1.0000000
IIP.l6            7995.1312740      7538.3023385      -3157.4544896      5939.689968      -1.593032e+04      -2971.4715340
inflation.l6      -37.9976400      -28.7318490      -53.6958752      561.881566      -2.277894e+02      -19.2906619
fx_rate.l6         -0.1041284      -0.4715496      -0.1993433      -1.032246      -9.399561e-01      0.1376563
one_year_bond.l6   -9.3671144      -72.9683884      -234.7149273      -566.668949      -1.121375e+03      145.8208670
interbank_rate.l6 -134.5734782      225.1501918      2275.1224567      -2164.580808      4.558281e+03      -157.7058140
constant          279.2180208      9542.2566496      3182.8909960      23390.515549      2.424415e+04      -4001.0234374

vn_index.l6      1.0000000e+00
IIP.l6            -5.546252e+03
inflation.l6      -4.160538e+01
fx_rate.l6         -9.050257e-02
one_year_bond.l6   9.458835e+01
interbank_rate.l6  3.300344e+01
constant          1.422662e+03

Weights W:
(This is the loading matrix)

vn_index.l6      vn_index.l6      IIP.l6      inflation.l6      fx_rate.l6      one_year_bond.l6      interbank_rate.l6
vn_index.d      -1.686940e-02      -2.030388e-02      -1.492929e-02      2.010428e-03      2.612733e-03      1.786526e-02
IIP.d            -5.539672e-07      -6.998634e-05      -5.531677e-07      1.246182e-06      -1.907875e-06      -7.090314e-05
inflation.d      1.576437e-04      1.719229e-04      2.034809e-04      -1.181331e-04      9.176225e-06      -6.102036e-05
fx_rate.d        -1.146037e-02      1.197451e-01      4.306352e-03      -4.156125e-03      2.704327e-04      -1.484242e-01
one_year_bond.d  1.197686e-04      1.329059e-04      3.824893e-05      6.646504e-05      3.440501e-05      -2.395605e-04
interbank_rate.d 3.143606e-05      7.622809e-05      -6.090596e-05      4.417912e-05      -7.025777e-06      -2.420072e-05

vn_index.d      -9.181779e-15
IIP.d            -2.711991e-17
inflation.d      -1.883872e-17
fx_rate.d        6.372505e-14
one_year_bond.d  2.313175e-16
interbank_rate.d 1.004201e-16
```

### Appendix 3.4: Johansen Cointegration Result

\$selection

AIC(n) HQ(n) SC(n) FPE(n)  
2 2 1 2

\$criteria

	1	2	3	4	5	6	7
AIC(n)	5.514951	5.081140	5.212958	5.304423	5.605459	5.702833	5.880650
HQ(n)	5.902998	5.801800	6.266231	6.690308	7.323956	7.753942	8.264372
SC(n)	6.470207	6.855188	7.805798	8.716054	9.835881	10.752046	11.748655
FPE(n)	248.556850	161.705990	186.336536	208.101799	290.154274	335.346735	428.644477

## Appendix 3.5: Varselection

#####

###Model VECM

#####

Full sample size: 131 End sample size: 129

Number of variables: 6 Number of estimated slope parameters 48

AIC 712.5296 BIC 864.0996 SSR 1784309

Cointegrating vector (estimated by ML):

	vn_index	IIP	inflation	fx_rate	one_year_bond	interbank_rate
r1	1	-16458.5	-104.6985	0.4128039	338.6405	-22.05044

	ECT	Intercept	vn_index -1	IIP -1	inflation -1
Equation vn_index	-0.0063(0.0065)	69.1459(62.7865)	0.0610(0.0951)	-157.2491(74.3063)*	-3.9537(4.8438)
Equation IIP	6.5e-05(8.2e-06)***	-0.6330(0.0796)***	0.0003(0.0001)**	0.0270(0.0941)	0.0105(0.0061).
Equation inflation	0.0002(9.5e-05).	-1.8555(0.9198)*	0.0006(0.0014)	3.0018(1.0886)**	0.6805(0.0710)*
Equation fx_rate	-0.0293(0.0158).	297.5696(153.1204).	0.0329(0.2320)	-26.6538(181.2143)	9.4804(11.8129)
Equation one_year_bond	-5.1e-05(5.6e-05)	0.4283(0.5403)	-0.0002(0.0008)	0.9088(0.6394)	0.1520(0.0417)*
Equation interbank_rate	-3.6e-05(2.7e-05)	0.3362(0.2597)	-0.0004(0.0004)	0.0773(0.3073)	0.0542(0.0200)*
	fx_rate -1	one_year_bond -1	interbank_rate -1		
Equation vn_index	-0.0030(0.0264)	2.1262(11.1108)	17.5542(21.7717)		
Equation IIP	3.3e-05(3.4e-05)	0.0061(0.0141)	-0.0021(0.0276)		
Equation inflation	0.0004(0.0004)	-0.1611(0.1628)	0.3447(0.3189)		
Equation fx_rate	-0.0086(0.0645)	-9.3396(27.0963)	-69.6262(53.0957)		
Equation one_year_bond	0.0004(0.0002).	0.0382(0.0956)	0.1518(0.1873)		

## Appendix 3.6: VECM Result