Modeling and Forecasting Viet Nam Inflation

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Abstract

Viet Nam impressive economic growth suddenly came to a halt in 2020 when COVID-19

pandemic hit. The country has taken extraordinary measures to cope with the damage brought by

coronavirus. These measures aim to somewhat ease economic hardship for its citizens carry with

them a looming threat of an old wound from the past, raging high inflation rate. By using time

series analysis, this paper hope to visualize a realistic picture of Viet Nam inflation rate in 2021.

The forecasting of inflation performs with three data points, Gross Domestic Product (GDP),

GDP growth rate (GDPGR) and Consumer Price Index (CPI).

Keywords: GDP, CPI, Inflation

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Introduction

The economy of Viet Nam has seen some dramatic rise since 1986 Đổi Mới campaign aimed to transform the country. Viet Nam government adopted the "socialist-oriented market economy" policy which incentivized trading and foreign investment. However, Viet Nam Communist party, the country's only political party, still holds a tight rein over many sectors. Corruption, lack of efficient regulations and data transparency pose a difficulty to any independent research into the country, Vuong (2010).

In the first few years when the Đổi Mới policy first rolled out, Viet Nam caught up in soaring high inflation with rate peaked at 774% in 1988, Napier & Vuong (2013). It wasn't until 1994 when the United States lifted its 19-yearlong embargo on Viet Nam that the economy started to pick up. The ending of US embargo allowed Viet Nam to participate actively in trading. Throughout 1990s, Viet Nam exports increase at impressive rates between 20-30%. The improvement boosted GDP growth to 9.54% in 1995. From 2000-2019, GDP growth has performed consistently between 5-7%, Vuong & Tran (2009).

These positive improvements of Viet Nam economy have led to decline in inflation rate over the years. However, a noticeable dip in 2020 GDP caused by COVID-19 pandemic, raises serious concerns over the country steady performance. Especially when extraordinary measures were made by the government to ease the sudden burst of unemployment and rising prices due to scarcity. This study aims to use the available data, gross domestic product growth rate (gdpgr) and consumer price index (cpi), from 1995-2020 to forecast Viet Nam 2021 inflation rate.

Data

The data from this paper was retrieved from World Bank database and reports from the

General Statistics Office of Viet Nam. The data range from 1995-2020, documented in yearly

manner. The variable consumer price index (cpi) was documented from 1995 and only available

in annually. The quality of quarterly data could not be verified.

Dependent variable, "Infl", inflation is measured in percentage at annual rate.

Independent variables:

-gdpc1 represents the GDP of Viet Nam (1995-2020), measure in billion US dollars.

-gdpgr represents the growth rate of GDP, measured in percentage.

-cpi, all items, measured in units, base year 2010 = 100.

Data summary

	freq	gdpc1	gdpgr %	cpi	Infl %
Count	26	26	26	26	25
Mean	2007.5	110919.44	6.53	92.83	5.74
Std	7.65	84146.78	1.35	46.71	4.88
Min	1995	20736.16	2.91	40.17	-1.73
Max	2020	271158.44	9.54	168.78	20.80
25%	2001.25	33279.93	5.82	49.12	3.17
50%	2007.5	88272.36	6.55	77.75	4.03
75%	2013.75	182459	7.06	142.23	7.47

Methodology

The analysis in this study follows Stock & Watson Time Series model in "Introduction to

Econometrics", empirical exercise 15.1 and 17.2. Plotting *Infl* values were composed as

following equation:

$$Infl = 100 \times [\ln(cpi_t) - \ln(cpi_{t-1})]$$
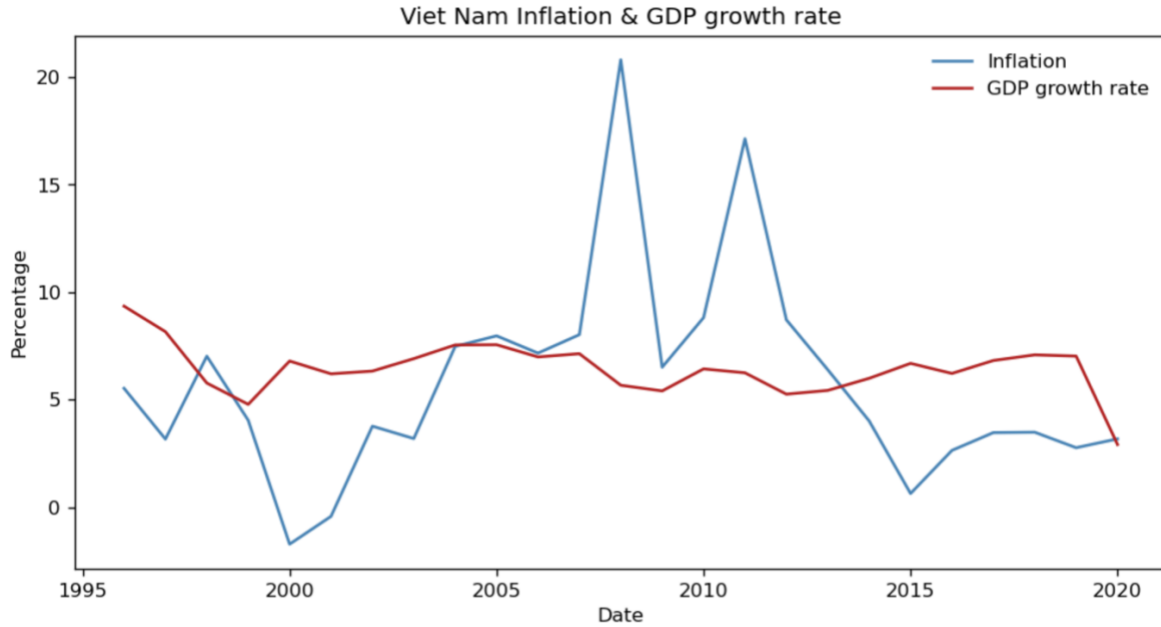
The first four autocorrelation of *ΔInfl* were computed to determine the consistency of the *ΔInfl* plot. OLS regression analysis of *ΔInfl_t* on *ΔInfl_{t-1}* runs using AR (1) and (2) models. Null hypothesis states that the coefficient on lagged inflation can help predict change in inflation over the next year. AR(p), p = 0,…,8, were estimated to verify the AIC and BIC lags length.

AR(1): $\widehat{\Delta Infl}_t = -0.044 - 0.369 \Delta Infl_{t-1}, \bar{R}^2 = 0.096$

AR(2): $\widehat{\Delta Infl}_t = -0.225 - 0.523 \Delta Infl_{t-1} - 0.442 \Delta Infl_{t-2}, \bar{R}^2 = 0.233$
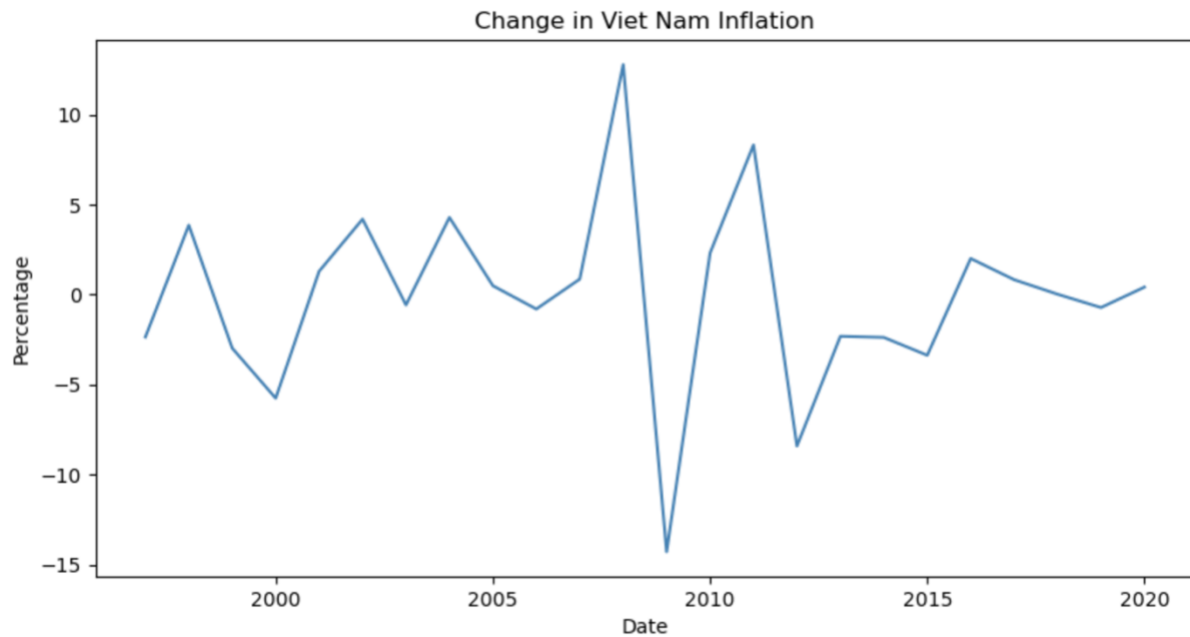
The estimate model GDP growth rate is:

$$gdpgr_t = 100 \times [\ln(gdp_t) - \ln(gdp_{t-1})]$$

GDP growth rate AR(2) model with GARCH (1,1) were used to understand the performance of volatility.

Empirical Result

Inflation has a stochastic trend. The inflation rates before 2015 were volatile, especially during global recession 2008. After 2015, inflation started to increase in stability.

The four autocorrelations are: -0.369, -0.250, 0.409, -0.129, which means the changes in inflation is negatively correlated.
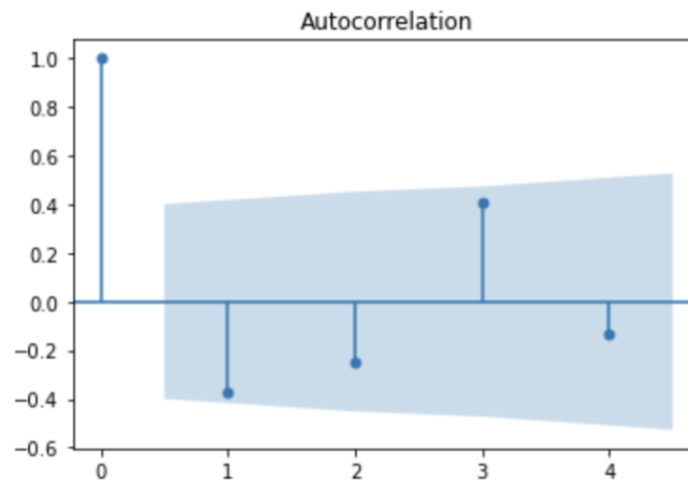
OLS regression of $\Delta Infl_t$ on $\Delta Infl_{t-1}$ shows the coefficient on lagged inflation is statistically significant. Therefore, we accept the null hypothesis that lagged inflation can help

predict change in inflation over the next year. When added $\Delta Infl_{t-2}$ AR(2) model became more preferable to AR(1). $\bar{R}^2$ also increases significantly from 0.096 in AR(1) to 0.233 in AR(2). AR(2) model predicts that the change in 2021 inflation will go down 0.12%, marking the inflation rate at 3.05%.

AIC and BIC values are shown in the table below:

P	BIC(p)	AIC(p)
1	3.447	3.348
2	**3.398**	**3.249**
3	3.564	3.366
4	3.707	3.458
5	3.910	3.612
6	4.132	3.786
7	4.351	3.959
8	4.380	3.946

Both BIC and AIC assume p = 2 lags.

The GDP growth rate model is:

$$\Delta \widehat{gdpgr}_t = 3.18 + 0.709\Delta gdpgr_{t-1} - 0.188\Delta gdpgr_{t-2}$$

GDP growth rate model AR(2) residuals with GARCH (1,1) bands plotted below show the GARH standard deviations bands stabilized significantly after the 2008 global recession.
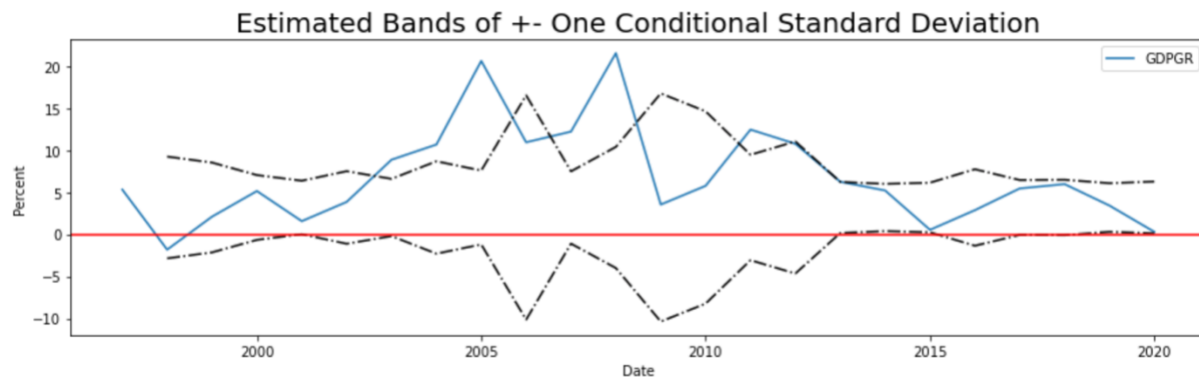
Conclusion

Forecasting inflation rate is an important but difficult task. Economists over the past decade has documented considerably numbers of forecasting models, for example Cogley and Sargent (2002, 2005), Cogley, Primiceri, and Sargent (2010), Levin and Piger (2004), and Stock and Watson (2007). This paper used Time Series Analysis technique proposed in "Introduction to Econometrics" 4th edition by Stock & Watson to predict Viet Nam 2021 inflation rate. The sample data ranges from 1995-2020. Although a wider range of data is more desirable, Viet Nam CPI data were only available after 1995.

Despites the challenge, the AR(2) model developed in this study is enough to predict the change of -0.12 percent in inflation rate. The model forecasts that inflation will reach a moderate rate of 3.05%. The AR(2) model for GDP growth rate also suggests a decrease in volatility since 2015.

Although a decline in 2021 inflation rate is a positive news for Viet Nam, at the time of writing this study, the COVID-19 situation has worsened during the first three quarters of 2021. The country vaccination rate only picked up its pace in Q4/2021. Further examination with updated data will help forecasting the inflation at a more accurate rate.

References

Consumer price index (2010 = 100) - vietnam. Data. (n.d.). Retrieved December 12, 2021, from

   https://data.worldbank.org/indicator/FP.CPI.TOTL?end=2020&locations=VN&start=1995

   &view=chart.

GDP (current US$) - vietnam. Data. (n.d.). Retrieved December 12, 2021, from
   https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=VN.

GDP growth (annual %) - vietnam. Data. (n.d.). Retrieved December 12, 2021, from
   https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=VN.

Monthly Consumer Price Index by Months and Years. General Statistics Office of Vietnam.
   (2020, October 14). Retrieved December 12, 2021, from https://www.gso.gov.vn/en/px-
   web/?pxid=E0830&theme=Trade%2C+Price+and+Tourist.

Napier, Nancy K.; Vuong, Quan Hoang (2013). What we see, why we worry, why we hope:
   Vietnam going forward. Boise, Idaho: Boise State University CCI Press. p. 140.

SSRN.com Vuong Quan Hoang and Tran Tri Dung, 2009

Stock, J., & Watson, M. (1999). Forecasting inflation. https://doi.org/10.3386/w7023

Stock, J., & Watson, M. (2010). Modeling inflation after the crisis.
   https://doi.org/10.3386/w16488

Stock, J. H., & Watson, M. W. (2020). 15. In *Introduction to econometrics* (pp. 512–555). essay,
   Pearson.

Vuong, Quan-Hoang, Financial Markets in Vietnam's Transition Economy: Facts, Insights,
   Implications. ISBN 978-3-639-23383-4, VDM Verlag, Feb. 2010 Saarbrücken, Germany.