Journal of Trade Science

ISSN 2819-5793

Volume 10 Number 3 September 2022

CONTENTS

Page

1. Nguyen Thi Phuong Lien - Deposit Mobilization of Vietnam Commercial Banks in the Context of Covid-19 Pandemic: Current Situation and Issues 3

2. Nguyen Duc Nhuan and Nguyen Phuong Linh - The Impact of Multichannel Integration Capability on Customer Value and Satisfaction - An Empirical Study of Retail Enterprises in Hanoi 14

3. Trinh Thi Thu Huong and Nguyen Kim Huong and Le Thi Viet Nga - Factors Affecting the Service Quality of Lazada in Vietnam 26

4. Vu Xuan Dzung - Personal factors affecting the probability of overdue debt of individual customers at Bank for Agriculture and Rural Development of Vietnam, Tay Do branch 41

5. Pham Thi Ngoc Mai and Nguyen Thi Quy and Nguyen Thi Cong Dzung - Impact of the government's financial support policy on technology innovation decisions of small and medium enterprise in ho chi minh city 55

6. Vu Thi Thuy Hang and Dam Gia Manh - Research on the Relationship Between Attitude and Intention for the Development Sharing Economy Model of E-Tourism Enterprises in Vietnam 61

7. Le Hoang Vinh, Nguyen Hoang Minh, Nguyen Thai Thanh and Nguyen Phuoc Bao Thanh - Impact of The Covid-19 Pandemic on Loan Growth of Commercial Banks in Vietnam 82

8. Do Thi Hoa Lien and Hoang Vo Hang Phuong - Labour Demand Forecasting in Ben Tre Province - An Application of Bvar Model 93

9. Nguyen Thanh Hung - Barriers Affecting the Use of Blockchain by Freight Forwarders in Ho Chi Minh City 102

Journal of Trade Science 10:3 (2022) 93 - 101

ISSN 2819-5793

LABOUR DEMAND FORECASTING IN BEN TRE PROVINCE – AN APPLICATION OF BVAR MODEL

Do Thi Hoa Lien
The University of Labor and Social Affairs
(Campus Ho Chi Minh)
Email: dohoalien@yahoo.com.vn
Hoang Vo Hang Phuong
The University of Labor and Social Affairs
(Campus Ho Chi Minh)
Email: hoangvohangphuong@gmail.com

Received: *26th April 2021* ***Revised:*** *20th June 2021* ***Accepted:*** *25th June 2021*

The paper employs BVAR model in labor demand forecasting in Ben Tre province. The data used in the model were collected from 1986 to 2020. Forecast accuracy measured by MAPE and U Theil showed that the BVAR model is appropriate for forecasting labor demand in Ben Tre. In addition, the research findings also show that factors such as exports' value and capital investment construction and production of manufactured goods have a certain impact on labor demand in Ben Tre while the policy through the GDP deflator is only effective during a period of negative situation such as the Covid-19 pandemic in 2020. Under normal conditions, the price impact does not work for labor demand of the province. Finally, the study provides some policy implications from the findings.

Keywords*: forecasting, labor demand, BVAR, Ben Tre*

JEL Classifications*: J11, J21*

DOI*: 10.54404/JTS.2022.10.03.08*

1. Introduction

In the past ten years, Ben Tre province has gradually changed its mindset in improving and enhancing economic capacity to bridge the gap between the provinces and other areas in the Mekong Delta. One of the remarkable achievements is the growth rate of 7.85% in 2019, and the economic structure also progressively shifts towards industry & construction sector and services sector. The success is attained since the province has had a change in development orientation towards sustainability, combining maximum economic development resources, in which improving the quality of human resources and creating more jobs for local workers is considered a central task in the economic development of the province. This task is also considered as one of the three important stages creating a breakthrough in socio-economic development. Although there have been many vocational training projects to improve labor quality, which increases the number of employed workers, workers in Ben Tre are still assessed as lacking in quantity and quality in accordance with the requirements of enterprises in the province. The province also realizes that the human resource development plan for the period 2011-2020 is no longer suitable with the new requirements of domestic and international development. One of the limitations is that forecasting has not been done scientifically and regularly to have a long-term orientation in the labor supply of the province. Therefore, the article applies the BVAR model to forecast labor demand across Ben Tre province and assesses its limitations, thereby giving some policy implications for the province

2. Literature review and methodology

2.1. Literature review

Several empirical studies in labor forecast have used quantitative methods such as Time series forecasting method; Top-down method; Bottom-up method. Of which, the time series was most exploited. This was affirmed by (Borjas, 2016) that the statistical technique commonly used is regression

ISSN 2819-5793

analysis. The method mainly examines the past characteristics of the information as the trend of the data, then combined with the forecaster's expectations at the present time. This is done by the belief of researchers that the past will continue to repeat the trend and maintain in the future. Some prominent econometric methods commonly used are time series method, which are Box-Jenkins, multivariate regression analysis, ARDL, VAR, BVAR, Error correction vector model (VEC). These methods were exploited to forecast labor demand in previous studies by (LeSage, 1990), (Crane, 1998), (Fauvel, 1999), (Sarantis, 1999), (Puri, 2000), (Krolzig, 2002), (Wong J. M., 2005), (Rapach D. E., 2005), (Wong J. M., 2007), (Ho P. H., 2010), (Wong J. M., 2011), (Bruha, 2011), (Ho P. H., 2012), (Rapach D. E., 2012), (Puri, 2000), (Krolzig, 2002), (Sarantis, 1999). These models are highly rated by ((CCL), 2007) in terms of research quality considering the scores calculated from the criteria of research data as well as the model and selected variables. In addition, recent studies by (Vereen, 2016), (Assaf, 2019) also highly appreciated the predictive results of the models, including the BVAR model.

The BVAR model is highly evaluated by empirical studies as providing accurate forecasting results both in the short and long term. The model solves the weaknesses of the VAR model such as allowing the model to perform on more parameters. This limits the removal of less important variables and/or variables with large lags in the model such as VAR. Instead of removing variables, BVAR will impose restriction on the coefficients to be close to zero, then doing the test with the null hypothesis that they are zero. If the less important variables and/or the variables with longer lags present a strong influence on the model, the null hypothesis can be not accepted. The restriction can be done by specifying a normal prior distribution with zero mean and small standard deviations for all coefficients whereby variables with larger lagged receive decreasing standard deviation, and the first lag has a prior mean of unity. The Minnesota prior is exploited to the analysis of BVAR model in forecasting labor demand in Ben Tre.

Coefficients in VAR model with Minnesota prior are specified as independent normal prior distribution. S(i,j,p) is the standard deviation with function

$S(i, j, p) = \{w \cdot g(p) \cdot f(i, j)\} si/sj$

$f(i, j) = 1$ if $i=j$ or $= \gamma$ if $i \neq j$ (γ: is a constant)

$g(p) = p^{-d}$, $d>0$

Where p is the lag for j^{th} variable in i^{th} equation

s_i is the standard error of a univariate autoregression of variable i. The ratio s_i/s_j considers the differences in units of measure and thus allows a priori information to be determined regardless of the magnitude of the variables.

w: describes the overall tightness and the standard deviation of the first lagged variable. The smaller the value of w, the tighter the priori (i.e., the posterior outcomes depend more on the a priori information than on the data).

g(p): is a function that describes the tightness of the p lag relative to the first lag. With the higher the value of d, the tightness is still to be achieved while lag is increased. g(p) must be chosen so that the confidence is increased on the coefficients with higher lags are closed to 0. There are two commonly such as harmonic functions $g(p) = p^{-d}$ and the geometry function $g(p) = d^{p-1}$. The harmonic function should be used rather than the geometric function (Doan, 1990).

f (i, j): representing the tightness of the j^{th} variable in the i^{th} equation is compared to the i variable. γ is a constant providing the relative tightness for other variables' coefficients in the i^{th} equation with the exception of the i^{th} variable

2.2. Methodology

2.2.1. Data

Most of the previous studies were conducted over a long period of at least 20 years for forecasting labor demand. Some examples of the authors' research time to forecast labor demand are (Briscoe, 1991): 34 years, (Wong J. M., 2007): 23 years, (Onwioduokit, 2009): 27 years, (Ho P. H., 2010): 16 years, (Fauser, 2011): 31 years, (Sing, 2012): 21 years, (Vereen, 2016): a 22-year period, (Assaf, 2019): over 29 years and 2 months. In order to make forecasts closer to reality, monthly or quarterly information is preferred rather than yearly. All of the above studies take data on a monthly or quarterly basis. However, the existence of quarterly and monthly data in a region or a province for a long time is not available especially in developing countries like Vietnam. Another disadvantage that also greatly hinders the research process over time is that the data in Vietnam do not have the synchronization and consistency between several periods. The reason is that the survey method, and the calculation of statistical criteria are changed from time to time to suit the purposes and needs of the state's analysis. Especially, the data of the first years of statistics are still very sketchy and flawed. This makes most sta-

tistical indicators inconsistent throughout all years, making it difficult to select many statistical indicators at the same time to implement the model.

Therefore, in order to select data for the model, the first criterion must ensure that the criteria are complete and consistent throughout the years can be employed in the forecasting model. In addition, annual data will also be studied.

Data are collected annually from 1986 to 2020. With the goal of forecasting, the data will be divided into two parts, with the first part data from 1986-2016 to estimate the model. The second part of the data for the remaining period from 2017 to 2020 is to evaluate the accuracy of the model's forecast results. The data is collected from the Ben Tre statistical yearbook over the years of the General Statistics Office, which is stored at the Ben Tre Statistical Office.

2.2.2. Model

The study was conducted on three models to illustrate the time series method, BVAR. The most suitable model will be assessed by the accuracy of the final outcomes among the models.

Based on the research and the available data, the model includes the following variables as annual employed population at 15 years of age and above, total Value added at basic prices, investment outlays, exports of goods, GDP deflator.

Annual employed population at 15 years of age and above (L): the number of employees aged 15 years to retired ages who are annually working. This number is used as a proxy for the Ben Tre economy's demand for labor in the past.

Total Value Added at Base Price (GTTT): The demand for outputs produced by different industries will be different and therefore will have different measurement. In addition, the demand for outputs can be replaced by the quantity of products produced. Empirical models in previous studies,

Especially Cobb Douglas model, were showed that output has been seen as the critical factor to produce more work for the economy. GRDP can be a proxy variable for economy's output. However, GRDP includes product tax and product subsidies then GRDP is not the suitable factor in the model. Moreover, there cannot be a unified unit of measurement among industries 'output, then the total value added was chosen.

Total value added at base price = GRDP – product tax minus product subsidies – import tax on goods and services.

Total value added represents the increase in output of the economy. An increase in output would produce more work and thus GTTT variable is expected to have positive effect on manpower demand in Ben Tre. Meanwhile, a rise in labor demand cannot be achieved when there is an increase in product value due to several reasons: (1) If labor in the market does not have enough skills and qualifications to adapt to the required job, it will be difficult for enterprises to recruit more workers to meet the increase in production output in the short term; (2) The variable GTTT is measured by currency based current prices instead of product unit. This does not exclude the currency devaluation, then GTTT may not be the most perfect variable, but due to data limitation GTTT still be chosen for the model.

Investment outlays (XDCB): it is undeniable that an economy with good investment in infrastructure will be an engine of economic development thereby creating more jobs. A comprehensive transportation which benefits the connection in traffic among parts of the country is necessary for the attraction of enterprises. This makes it more convenient and efficient to transit merchandises from places to places. Moreover, a clear industrial planning is a must to have a sustainable development in economic. Investment outlays are for the investment of construction, manufactures, warehouses, wharves, procurement of machinery and equipment and other outlays for public works. Besides, a good investment in public utilities also benefits residents for business expansion and attracting foreign investment. Thus, an increase in investment outlays is expected to cause a rise in labor demand.

Exports of goods (XK):

Merchandise export turnover indicates the scale and value of goods exported to foreign markets, then indicating the degree of trade internationalization of an economy. The higher the value of exports, the more local goods are exported, requiring more labor to produce these goods. Accordingly, the export value is expected to have a positive effect on the number of employees. The annual export value is converted into VND according to the average exchange rate of the years accessed from IMF data.

GDP deflator (DGDP): the representation for the government's policies in the face of the Covid-19 pandemic's impact on the economy. This index is a proxy for the decline of purchasing power of the country's currency. Enterprises and individual consumers carefully concern the price when they make

ISSN 2819-5793

an investment and consumption decisions. Furthermore, the Covid-19 pandemic has negatively and deeply affected the global economy and in Vietnam. The current measures to support the economy by Vietnam government are aimed at stimulating aggregate demand and production recovery. Vietnamese government has issued incentives in the form of tax breaks, most notably the drop in petrol and electricity prices, lower bank loan rates.

Forecasting model for labor demand in Ben Tre

The value of d and p are selected by considering U statistic in table 2 with 1 and 4 respectively for BVAR-1. The parameters d=0, p=4 make the lowest U statistics for BVAR-2. BVAR-3 has smallest U statistics with the value d=0 and p=4.

The models are finally specified with the value of parameters as follows:

BVAR-1: w = 0.1 and γ = 0.3, d = 1 and p = 4

BVAR-2: w=0.1 and, γ = 0.5, d=0, p=4

BVAR-3: w=0.1 and, γ = 0.3, d=0, p=4

$$\textbf{BVAR-1}\quad LL1_t = c + \sum_{i=1}^{p} A_{1,i} LL1_{t-i} + \sum_{i=1}^{p} A_{2,i} LXDCB_{t-i} + \sum_{i=1}^{p} A_{3,1} LXK_{t-i} + \sum_{i=1}^{p} A_{4,i} LGTTT_{t-i} + u_t$$

$$\textbf{BVAR-2}\quad LL2_t = c + \sum_{i=1}^{p} A_{1,i} LL2_{t-i} + \sum_{i=1}^{p} A_{2,i} LXDCB_{t-i} + \sum_{i=1}^{p} A_{3,1} LXK_{t-i} + \sum_{i=1}^{p} A_{4,i} LGTTT_{t-i} + \sum_{i=1}^{p} A_{5,i} DGDP_{t-i} + u_t$$

$$\textbf{BVAR-3}\quad LL3_t = c + \sum_{i=1}^{p} A_{1,i} LL3_{t-i} + \sum_{i=1}^{p} A_{2,i} LXDCB_{t-i} + \sum_{i=1}^{p} A_{3,1} LXK_{t-i} + \sum_{i=1}^{p} A_{4,i} DGDP_{t-i} + u_t$$

The variables such as L, XDCB, GTTT, XK are smoothed by taking the logarithm, except for DGDP.

The model parameters are estimated by Minnesota prior.

The value of w and γ must be carefully chosen to capture information in forecasting. If w receives large value, the model is simply VAR model. Otherwise, the lower value of γ will increase the tightness of the model parameters. The specification of what exact value of w and is not necessary but forecast is more important. Accordingly, the paper chooses three values by Spencer (1993) which are w (3.0; 0.2; 0.1) and (0.001; 0.3; 0.5). The values of w and γ are grouped to calculate U Theil for each group. Each U Theil value are calculated for data in each period as (1986 – 2016), (1986 – 2017), (1986 – 2018), (1986 – 2019). The parameters d and p have been remained at 0.0 and 4.0 respectively.

The appropriate value of w and that are selected above will help the choice d and p among the value d (0,1,2) and p (2,4,6).

3. Empirical results and discussion

The regressions were conducted by pairs of parameters' values. U Theil values are presented in Table 1.

There is no model that has the smallest U value in all forecasting periods, so the model with the smallest U value in most forecasting periods will be selected. Table 1 shows that the BVAR-1 model is selected with w = 0.1 and γ= 0.3; Model BVAR - 2 with w=0.1 and γ= 0.5; Model BVAR - 3 with w=0.1 and , γ= 0.3.

The results show that the initial model with the variables LXDCB, LXK, LGTTT gives better forecasts with higher accuracy than the BVAR-2, BVAR-3 models. In addition, the percentage error in 2020, a year of pandemic affected economy, for the forecast indicates that the inclusion of the variable for representing government response to the pandemic which is DGDP in the model causes the percentage errors of the two models BVAR-2 and BVAR-1 are close to the same. Although the effect of DGDP is not clear enough, the results affirm that government policy did have a certain influence on the economy's province in the context of 2020 Covid-19 outbreak. On the contrary, the price factor does not have much effect on the labor demand when there is no fluctuation in the economy. The government direct intervention will be decreased once the pandemic is ended, giving way to the regulation of supply and demand of the market. In the period when the economy has government intervention, the BVAR-2 model can also be a suitable choice to forecast the labor demand of the economy. Out of the three models, the BVAR-1 is the most suitable model which does not consider the price factor. Thus, BVAR-1 model was chosen for forecasting labor demand in Ben Tre province.

Figure 1 shows that there is a similar trend on the impact of the shocks of the quantity of manufactured goods, investment outlay and export value on the labor demand of the province. The magnitude of the impact of the output is more obvious than investment outlay and export value (see table 4). In the

ISSN 2819-5793
© TMU's JTS

Table 1: *U Theil statistics for BVAR-1, BVAR-2, BVAR-3 with value d=0, p=4*

w	γ	1 step	2 step	3 step	4 step
BVAR-1					
3.0	0.001	0.149488353	0.147271586	0.136345008	0.121899394
3.0	0.3	0.257665013	0.289502472	0.294334728	0.268798831
3.0	0.5	0.244852252	0.305317685	0.308402367	0.315034391
0.2	0.001	0.243645332	0.244789583	0.23508142	0.223704891
0.2	0.3	0.054563571	0.056991491	0.027344231	0.003919078
0.2	0.5	0.099204759	0.095966507	0.062587565	0.000933655
0.1	0.001	0.272377024	0.276735559	0.269136647	0.259812651
0.1	0.3	0.022792903	0.025660379	0.006055329	0.011648399
0.1	0.5	0.038416561	0.041713201	0.016430584	0.008678894
BVAR-2					
3.0	0.001	0.14915505	0.147007744	0.136004156	0.121731122
3.0	0.3	0.325111717	0.430603401	1.140898444	0.011934979
3.0	0.5	0.320957398	0.488853327	1.396297938	0.064371463
0.2	0.001	0.243620459	0.244752239	0.235056719	0.223680417
0.2	0.3	0.041182424	0.04585702	0.018149803	0.007250364
0.2	0.5	0.121533511	0.109674377	0.061907727	0.007239294
0.1	0.001	0.272377024	0.276722792	0.269123956	0.259800053
0.1	0.3	0.023931924	0.014516896	0.027351884	0.040944906
0.1	0.5	0.021014792	0.024368862	0.004868885	0.015406852
BVAR-3					
3.0	0.001	0.171537413	0.170237326	0.159092023	0.142703531
3.0	0.3	0.23725703	0.219019112	0.469609398	0.132284169
3.0	0.5	0.240205205	0.178186703	0.565376751	0.157192672
0.2	0.001	0.243869208	0.245038565	0.235328461	0.219739009
0.2	0.3	0.046558341	0.060146021	0.036611323	0.023212368
0.2	0.5	0.117961523	0.125870604	0.077299042	0.052235596
0.1	0.001	0.272453369	0.276812165	0.269212797	0.255541403
0.1	0.3	0.004552562	0.007847319	0.001581674	0.011931172
0.1	0.5	0.029442117	0.007847319	0.025855662	0.0144099

Source: Authors' works

period of five years the labor force explains 99.77% of the variation in the current one. Meanwhile, the variation in output explains only 0.1756%, while the investment and export variables do not explain much of the labor variation.

When there is a shock of goods produced increase, the response of the variable labor demand is most obvious. The labor demand rapidly rises in the first two years, peaking in the second year, then showing a drop in the following two years, the fifth year onwards displays a slight decrease to achieve the initial balance.

For a shock in export, the first two year see rapid increases in labor demand to reach peak, the figure shows a marginal decrease in the third year, then become weaker in the fourth and fifth years to move back to the original state. It cannot be found a homogeneous relationship among export value and the number of labors employed in the province. Export value is generated by a modest number of workers. Workers are mainly unskilled, rather than skilled workers working in production and export enterprises. Although the export growth rate increased sharply in 2020 (22.3%) as compared to that in 2019, and the proportion of exports over the province's GRDP in the past five years has reached from above about 43% to nearly 60 %, the majority of laborers in the province have qualifications and professional skills that are not suitable for positions in the manufacturing, which is the key export field,

ISSN 2819-5793

Table 2: *U Theil statistics for BVAR-1, BVAR-2, BVAR-3*

d	p	1 step	2 step	3 step	4 step
BVAR-1 (w = 0.1 and γ = 0.3)					
0	2	0.101593	0.10759	0.098348	0.080078
0	4	0.022793	0.02566	0.024322	0.011648
0	6	0.006919	0.003061	0.003228	0.020171
1	2	0.102022	0.109253	0.093373	0.077963
1	4	0.008278	0.003617	0.020177	0.031849
1	6	0.06012	0.050845	0.061932	0.071167
2	2	0.103533	0.111318	0.092892	0.078416
2	4	0.012129	0.006582	0.023571	0.033638
2	6	0.057437	0.048992	0.063984	0.072532
BVAR-2(w = 0.1 and γ = 0.5)					
0	2	0.082071	0.089345	0.08059	0.058807
0	4	0.021015	0.027436	0.004869	0.015407
0	6	0.037296	0.054586	0.038396	0.008731
1	2	0.080289	0.090218	0.072098	0.055678
1	4	0.049894	0.037876	0.055503	0.065643
1	6	0.063421	0.043096	0.060176	0.070154
2	2	0.079651	0.090458	0.069196	0.054465
2	4	0.040652	0.032937	0.052476	0.059371
2	6	0.056323	0.04518	0.052476	0.067696
BVAR-3 (w=0.1 and γ = 0.3)					
0	2	0.108033659	0.116419415	0.109963352	0.092046172
0	4	0.004552562	0.007847319	0.001581674	0.008490525
0	6	0.090193108	0.050037983	0.041851883	0.035086442
1	2	0.116877627	0.127053387	0.113298239	0.097849377
1	4	0.004472923	0.004115135	0.008952606	0.021560934
1	6	0.040701446	0.028071746	0.036721689	0.046329212
2	2	0.121455007	0.132385649	0.115817136	0.101103823
2	4	0.011209393	0.017874554	0.00292133	0.010045972
2	6	0.020255002	0.011447275	0.024829461	0.037255056

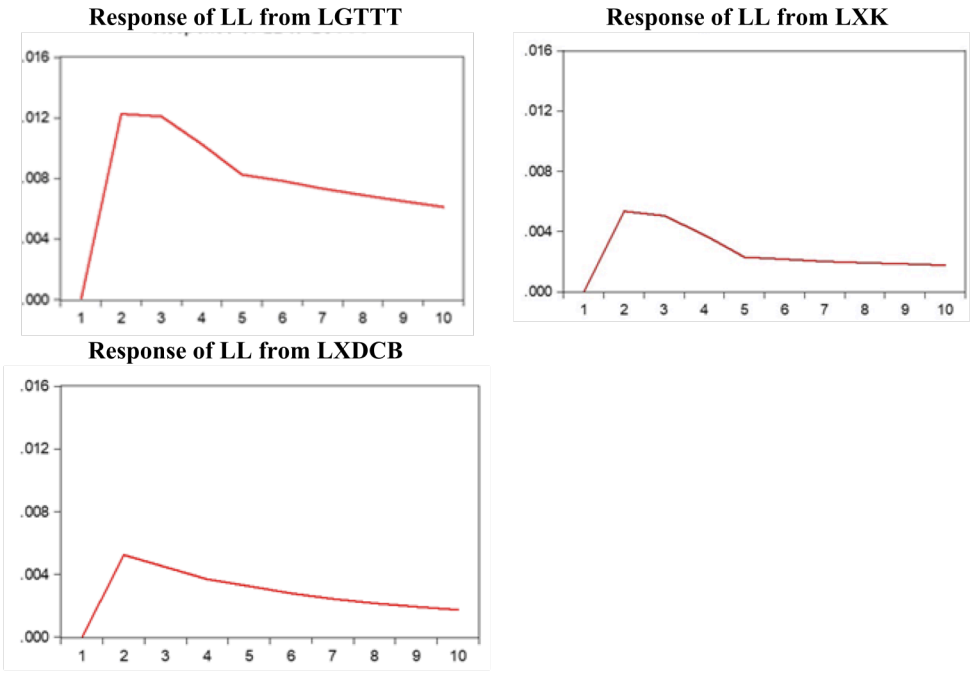
Source: Authors' works

Table 3: *Accuracy of forecasts*

Year	Critical value	BVAR-1		BVAR-2		BVAR-3	
		forecast	Percentage error	forecast	Percentage error	forecast	Percentage error
2017	798753	805420	0.83%	782312	-2,06%	802406	0.457%
2018	810800	809166	-0.20%	789338	-2,65%	807283	-0.434%
2019	815003	812507	-0.31%	804607	-1,28%	819558	0.559%
2020	817841	815820	-0.25%	815388	-0,30%	828407	1.292%
MAPE			0.020010%		-1.570152%		0.469%
Theil			0.004674		0.018213		0.00771889

Source: Authors'

ISSN 2819-5793
© TMU's JTS



Source: Authors'

Figure 1: *Impulse response function of BVAR-1*

Table 4: *Variance decomposition of BVAR-1*

Period	S.E.	LL	LGTTT	LXDCB	LXK
1	0.516689	100.0000	0.000000	0.000000	0.000000
2	0.516910	99.92266	0.056306	0.010317	0.010718
3	0.517097	99.85106	0.110904	0.017769	0.020270
4	0.517226	99.80132	0.150226	0.022869	0.025587
5	0.517308	99.77002	0.175608	0.026817	0.027556

Source: Authors'

cause a shortage of labor for several years. This can be seen clearly in the number of laborers working in the manufacturing sector, which has increased slowly over the years, while the export value has increased sharply for many years. The limitation of adequate skilled and specialized local workers working in enterprises result in the recruitment of labor in other areas. Another reason to the province shortage of skilled workers is labor export issue. There were 4,588 workers working abroad in the five-year period from 2016 to 2020 (Ben Tre Provincial Party Committee, 2021). Qualifications and professionalism are require for workers to be eligible to work abroad, then a large number of well trained workers is drained away, thereby reducing the number of workers who can meet jobs in enterprises in Ben Tre. Employers must recruit workers from other regions. Thus, increasing exports does not have much impact on job growth for local workers.

A shock in investment outlay increasing causes the immediate rise in labor demand for the first year, then getting peak in the second year. After the second year, the effect decreases with the number gradually decreases towards equilibrium. This can be explained by investment in infrastructure has not been focused, there is a lack of funding to invest in a comprehensive way. The rate of increase and

ISSN 2819-5793

decrease of local construction investment over the years has fluctuated erratically, showing the lack of orientation and long-term development strategy in infrastructure. Growth for investment outlay has decreased again in the past 4 years.

4. Conclusion and policy implication

BVAR model was proved to be superiority when the percentage errors of all three models are low compared to the normal criteria (U<0.55 and MAPE<10%). Simultaneously, the error of the forecast over the years is also very low. This shows that BVAR is a suitable model for forecasting labor demand in Ben Tre province. Based on the model, the authors have some observations and policy implications as follows:

Firstly, although the export of goods is considered a bright spot and also a strategic goal of economic development in Ben Tre province in recent years, the contribution of exports to employment creation for laborers in the area is very limited. The underlying cause comes from the quality of local human resources. Therefore, in order to achieve synchronous development that is economic development coupled with employment creation, the province needs to invest more, and must invest selectively and focus on human resources that are definitely committed to stay in the locality to work regardless of the public or private sector.

Secondly, the province needs to further promote investment in building infrastructure to create a solid premise for economic investment in the province. For economic development, it is necessary to have a synchronous improvement of all aspects of society. However, the budget for capital construction investment is still limited, so it's essential that the province accept the trade-off between focusing on investing in a few key objectives in order to have quality and large quantity to keep up with the needs of the province and other places with the limited quality. At the same time, with limited budgets from central and local governments, capital from private individuals, organizations and businesses becomes very important. Accelerating the liberalization of investment policies in the province and using that capital to first invest in infrastructure and transport help the investment enterprises themselves build factory facilities and operate transportation and goods delivery fast and conveniently.

Thirdly, it's recommended that the province continue to promote the production of export products that are the advantages of local production and products from local staples. This helps to take advantage of workers who have not been trained in the profession but have long-term experience in the profession to create value for Ben Tre exports, and at the same time create temporary jobs for laborers in the province.◆

References:

1. (CCL), C. C. (2007). *Is it possible to accurately forecast labour market needs?* Ottawa: Ontario: Canadian Council on Learning.

2. Assaf, A. G. (2019). Modeling and forecasting regional tourism demand using the Bayesian global vector autoregressive (BGVAR) model. *Journal of Travel Research*, 383-397.

3. Borjas, G. J. (2016). *Labor Economics.* MacGraw-Hill Education.

4. Briscoe, G. &. (1991). Explanations of the demand for labour in the United Kingdom engineering sector. *Applied Economics*, 913-926.

5. Bruha, J. (2011). An empirical Small labor market model for the Czech economy. *finance a Uver: Czech Journal of Economics & Finance*.

6. Crane, S. E. (1998). Improving local manufacturing employment forecasts using cointegration analysis. *Growth and Change*, 175-195.

7. Doan, T. A. (1990). *Regression analysis of time series.* Evanston.

8. Fauser, S. G. (2011). Modeling regional labor markets in Germany: insights not only for German policy makers. *Empirica*, 169-201.

9. Fauvel, Y. P. (1999). *Short-Term Forecasting of National and Provincial Employment in Canada.* Canada: Applied Research Branch-Strategic Policy-Human Resources Development Canada.

10. Ho, P. H. (2010). Forecasting construction manpower demand by gray model. *Journal of Construction Engineering and Management*, 1299-1305.

11. Ho, P. H. (2012). Comparison of the grey model and the Box-Jenkins model in forecasting manpower in the UK construction industry. *In Proceedings of the 28th Annual ARCOM Conference* (pp. 369-379). Edinburgh: Edinburgh: Association of Researchers in Construction Management.

12. Krolzig, H. M. (2002). A Markov-switching vector equilibrium correction model of the UK labour market. In Advances in Markov-Switching Models. *Physica*, 91-112.

13. LeSage, J. P. (1990). A Comparison of the Forecasting Ability of ECM and VAR Models. *The review of Economics and Statistics*, 664-671.

14. Onwioduokit, E. T. (2009). Macroeconomic Determinants of the Labor Market in Nigeria. *Journal of Monetary and Economic Integration*, 68-95.

15. Puri, A. &. (2000). Forecasting industrial employment figures in Southern California: A Bayesian vector autoregressive model. *The Annals of Regional Science*, 503-514.

16. Rapach, D. E. (2005). Forecasting employment growth in Missouri with many potentially relevant predictors: an analysis of forecast combining methods. *Federal Reserve Bank of St. Louis Regional Economic Development*, 97-112.

17. Rapach, D. E. (2012). Forecasting US state-level employment growth: An amalgamation approach. *International Journal of Forecasting*, 315-327.

18. Sarantis, N. &. (1999). Modelling and forecasting regional service employment in Great Britain. *Economic Modelling*, 429-453.

19. Sing, C. P. (2012). Multiplier model for forecasting manpower demand. *Journal of Construction Engineering and Management*, 1161-1168.

20. Spencer, D. E. (407-421). Developing a Bayesian vector autoregression forecasting model. *International Journal of Forecasting*, 1993.

21. Tre, C. t. (1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019). *Niên giám thống kê các năm*. Bến Tre: Cục thống kê Bến Tre.

22. Tre, C. t. (2020). *Báo cáo tình hình kinh tế - xã hội tỉnh Bến Tre quý IV và năm 2020*. Bến Tre: Cục thống kê tỉnh Bến Tre.

23. Tre, T. Ủ. (2021). Đề án Phát triển nguồn nhân lực đáp ứng yêu cầu phát triển kinh tế - xã hội tỉnh Bến Tre giai đoạn 2020 - 2025, tầm nhìn 2030. *Đề án Phát triển nguồn nhân lực đáp ứng yêu cầu phát triển kinh tế - xã hội tỉnh Bến Tre giai đoạn 2020 - 2025, tầm nhìn 2030*. Ben Tre, Ben Tre, Vietnam: Tỉnh Ủy Bến Tre.

24. Vereen, S. C. (2016). Application and Results of a Skilled Labor Demand Forecast Model for the US Construction Industry. *International Journal ò Engineering Science Invention*, 37-48.

25. Wong, J. M. (2005). time series forecasts of the construction labour market in Hong Kong: The Box-jenkins approach. *Construction Management and Economics*, 979-991.

26. Wong, J. M. (2007). Forecasting construction manpower demand: A vector error correction model. *Building and Environment*, 3030-3041.

27. Wong, J. M. (2011). Construction manpower demand forecasting: A comparative study of univariate time series, multiple regression and econometric modelling techniques. *Engineering, Construction and Architectural Management*.

Summary

Bài viết ứng dụng mô hình BVAR vào dự báo cầu lao động tại tỉnh Bến Tre. Nguồn dữ liệu sử dụng trong mô hình được thu thập từ năm 1986 đến 2020. Các sai số của dự báo được tính toán và cho thấy mô hình BVAR phù hợp để dự báo cầu lao động tại Bến Tre. Bên cạnh đó, kết quả nghiên cứu cũng cho thấy các yếu tố như xuất khẩu và vốn đầu tư xây dựng cơ bản và sản lượng hàng hóa sản xuất có tác động đến cầu lao động tại Bến Tre. Trong khi chính sách nhà nước thông qua chỉ số giảm phát chỉ có tác dụng trong thời kì có biến động tiêu cực đến nền kinh tế chung như đại dịch Covid-19 năm 2020. Trong điều kiện bình thường thì biến chỉ số giảm phát không tác động đến cầu lao động của tỉnh. Cuối cùng nghiên cứu đưa ra một số hàm ý chính sách từ kết quả nghiên cứu.

ĐO THI HOA LIEN

1. Personal Profile:

- Name: ***Do Thi Hoa Lien***
- Date of birth: 3rd January 1977
- Title: **PhD**
- Workplace: The University of Labour and Social Affairs (campus 2)
- Position: lecturer

2. Major research directions:

Labour market, economic development, entrepreneurial ecosystems

3. Publications the author has published his works:

- Journal of economics & development
- Review of regional sustainable development
- Journal of economic studies