A forecast evaluating using Dynamic forecasting and Static forecasting model

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Abstract

In economic sector, remittances plays an important role .Remittances has a great contribution in our GDP. So for the development of country Remittances is important. From different countries we earn different amount of remittances which have relation among them or may not. If we can forecast using an appropriate model then we can know how much remittances come in future years and contribute in economy. In our paper we work on forecasting remittances of Bangladesh using Dynamic forecasting model and Static forecasting model and finally we detect which model is better for forecasting.

***JEL Classification*:** C22, C51, C52
***Key Words*:** AIC, SIC, Accuracy, Forecast

Introduction

To conduct our analysis we will use two types of model. These are Static forecasting model and Dynamic forecasting model.

- Static forecasting model: $y_t = \beta_0 + \beta_1 x_{t1} + \beta_2 x_{t2} + \beta_3 x_{t3} + \beta_4 x_{t4} + \beta_5 x_{t5} + \varepsilon_t$ (SeeGujarati, Basic Econometrics fourth edition)

- In regression analysis involving time series data, if the regression model includes one or more lagged values of the dependent variable among its explanatory variables, is called Dynamic forecasting model.

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 x_{t1} + \alpha_3 x_{t2} + \alpha_4 x_{t3} + \alpha_5 x_{t4} + \nu_t$$

Akaike Information criterion:

The idea of imposing a penalty for adding regressors to the model has been carried is the AIC criterion ,which is defined as:

$$\text{AIC} = e^{\frac{2k}{n}} \frac{RSS}{n}$$

Where k= no. of regressors (including intercept)

n= no. of observations

In comparing two or more models, the model with the lowest value of AIC is preferred. One advantage of AIC is that it is useful for not only in sample but also out of sample forecasting performance of a regression model.

Schwarz information criterion:

Similar in spirit to the AIC, SIC criterion is defined as

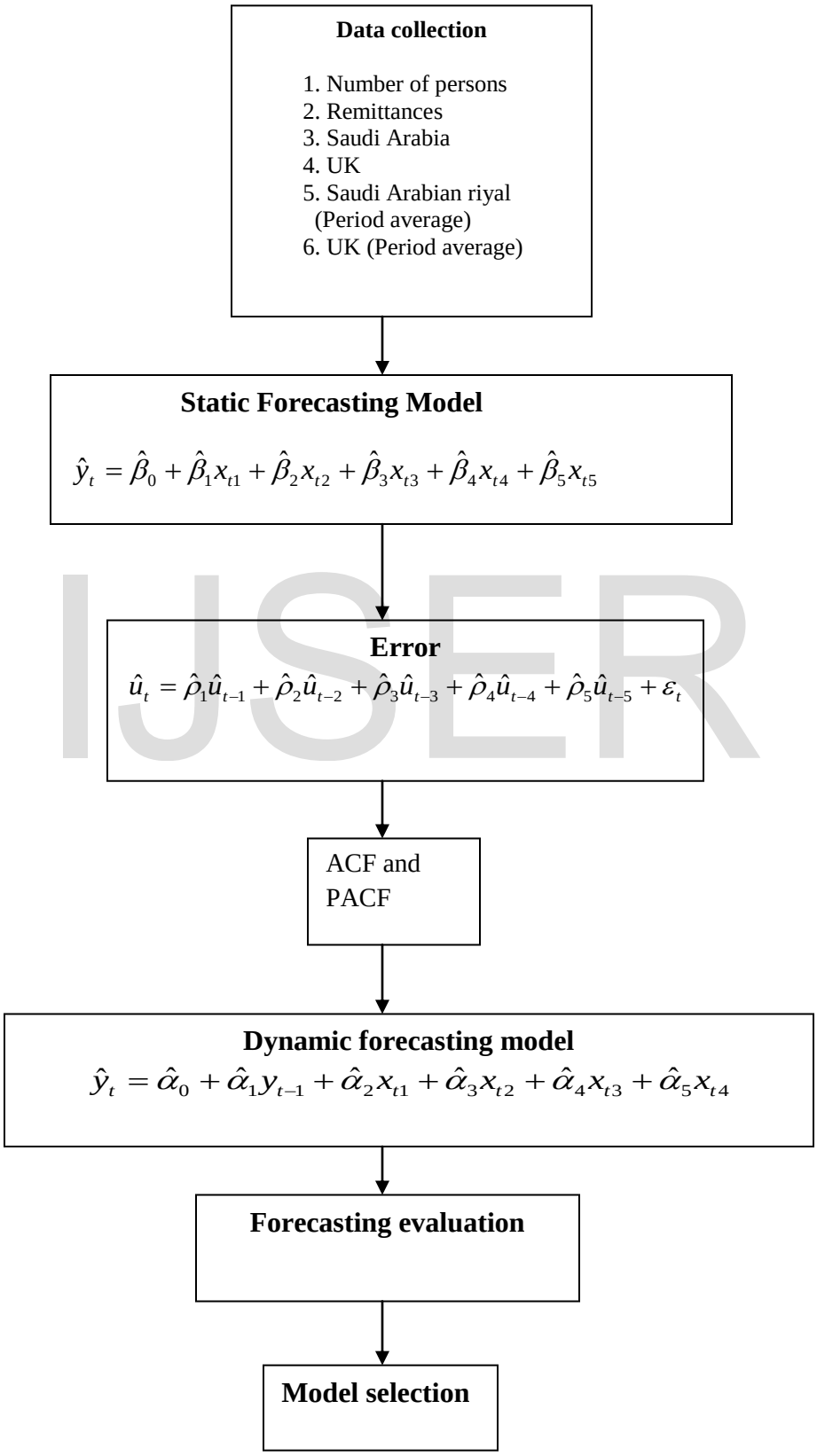
$$\text{SIC}= n^{\frac{k}{n}} \frac{RSS}{n}$$

Like AIC , SIC can be used to compare in sample or out of sample forecasting performance of a model.

Objectives of the Paper

Our main objective is to forecasting remittance of Bangladesh – a forecast evaluating using Dynamic forecasting and Static forecasting model.

Methodology



Results and Discussion

For forecasting we use the following two model:

Static forecasting model:

$y_t = \beta_0 + \beta_1 x_{t1} + \beta_2 x_{t2} + \beta_3 x_{t3} + \beta_4 x_{t4} + \beta_5 x_{t5} + \varepsilon_t$ (SeeGujarati, Basic Econometrics fourth edition)

Dynamic model:

$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 x_{t1} + \alpha_3 x_{t2} + \alpha_4 x_{t3} + \alpha_5 x_{t4} + \nu_t$

According to our methodology, after analyzing using our data the results are as follows:

Computation:

Static model

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.998461
R Square	0.996924
Adjusted R Square	0.993848
Standard Error	419.6276
Observations	11

ANOVA

	df	*SS*	*MS*	*F*
Regression	5	285328226.3	57065645.3	324.0758
Residual	5	880436.6921	176087.338	

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-4288.15	4981.752159	-0.86077239	0.4287
X Variable 1	0.00722	0.010830074	0.66663638	0.534527
X Variable 2	1.140319	0.69770509	1.6343853	0.163106
X Variable 3	3.938488	1.276451911	3.08549635	0.027299
X Variable 4	713.3404	631.6891532	1.12925864	0.310036
X Variable 5	-46.5094	73.5753789	-0.63213302	0.555073

$$\hat{y}_t = -4288.15 + 0.00722X_{t1} + 1.140X_{t2} + 3.938X_{t3} + 713.340X_{t4} - 46.50943X_{t5}$$

AIC= $e^{\frac{2k}{n}} \frac{RSS}{n}$

= 238276.519

SIC= $n^{\frac{k}{n}} \frac{RSS}{n}$

= 297241.86

Dynamic model:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.998718
R Square	0.997438
Adjusted R Square	0.994236
Standard Error	403.2489

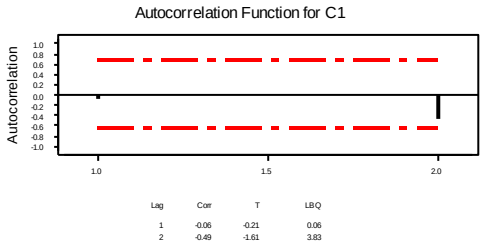
Observations	10

ANOVA

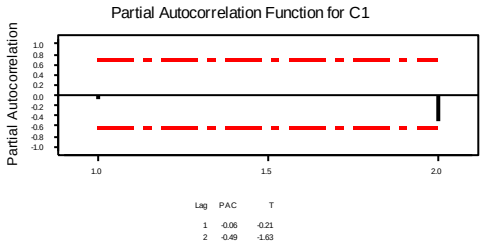
	df	*SS*	*MS*	*F*
Regression	5	2.53E+08	50648682.96	311.474036
Residual	4	650438.6	162609.6468	
Total	9	2.54E+08		

	Coefficients	Standard Error	t Stat	P-value
Intercept	-3483.14	4834.922	-0.72041369	0.51112284
X Variable 1	0.010144	0.010694	0.948557721	0.39655817
X Variable 2	1.091767	0.671714	1.625344862	0.17941489
X Variable 3	4.605651	1.348819	3.414579862	0.02691384
X Variable 4	845.8048	617.167	1.370463429	0.24241811
X Variable 5	-88.7397	79.11932	-1.12159286	0.32481433

$$y_t = -3483.14 + 0.010144 y_{t-1} + 1.091767 X_{t1} + 4.60565 X_{t2} + 845.8048_4 X_{t3} - 88.7397 X_{t4} + \nu_t$$



Comments: There is no lag.



Comments: There is no lag.

From the above two graphs Since there is no lag so our estimated dynamic model

$$y_t = -3483.14 + 0.010144 y_{t-1} + 1.091767 X_{t1} + 4.60565 X_{t2} + 845.8048_4 X_{t3} - 88.7397 X_{t4} + \nu_t$$

$$\text{AIC} = e^{\frac{2k}{n}} \frac{RSS}{n}$$

$$= 263765.854$$

$$\text{SIC} = n^{\frac{k}{n}} \frac{RSS}{n}$$

$$= 325991.5161$$

Selection of best model: Considering the value of AIC and SIC of two model we see that Static model is better than dynamic model to purpose of forecasting since the value of AIC and SIC is small.

Using Static model the forecasting model is

year	Remittance (y_t)	Forecast(F_t)
2004	23646.97	23598.45
2005	32274.63	32751.12
2006	41298.54	44521.28

2007	54295.16	51864.7
2008	66676.51	52150.01
2009	63564.89	62142.01

Measuring Forecast accuracy :

If y_t is the actual observation for time period t and F_t is the forecasti for the same period .Then the error is defined as

$$e_t = y_t - F_t$$

Calculation of ME, MAE,MSE

Method 1

remittances	forecast	error	absolute error	squared error
23646.97	23598.45	48.5164	48.5164	97.0328
32274.63	32751.12	-476.494	476.4942	952.9884
41298.54	44521.28	-3222.74	3222.739	6445.477
54295.16	51864.7	2430.464	2430.464	4860.927
66676.51	52150.01	14526.5	14526.5	29052.99
63564.89	62142.01	1422.88	1422.88	2845.76
Total		14729.12	22127.59	44255.18

ME	MAE	MSE
2454.854	3687.932	7375.863

Calculation of MPE,MAPE:

remittances	forecast	error	Percent error	Absolute percent error
23646.97	23598.45	48.5164	0.20517	0.20517
32274.63	32751.12	-476.494	-1.47637	1.476374
41298.54	44521.28	-3222.74	-7.80352	7.803517
54295.16	51864.7	2430.464	4.476391	4.476391
66676.51	52150.01	14526.5	21.78653	21.78653
63564.89	62142.01	1422.88	2.238468	2.238468
Total		14729.12	19.42667	37.98645

MPE	MAPE
3.237778%	
	6.331075%

Method 2

remittances	NF1-forecast(Ft)	error	absolute error	Absolute percent error
23646.97	19869.9	3777.07	3777.07	377707
32274.63	23646.97	8627.66	8627.66	862766
41298.54	32274.63	9023.91	9023.91	902391
54295.16	41298.54	12996.62	12996.62	1299662
66676.51	54295.16	12381.35	12381.35	1238135
63564.89	66676.51	-3111.62	3111.62	311162
Total			49918.23	4991823

MAE	MAPE
8319.705	831970.5%

Comparing forecast methods: Calculation of MAPE or MAE provides a basis for evaluating the relative accuracy of those results. In this case the first forecasting method achieved a MAPE of 6.331075% compared to 831970.5% .The value of MAPE of first forecasting method is small and also MAE (3687.932)compared to 8319.705 .Clearly the first method provides much better forecasts.

Conclusion

We see that Static model is better than dynamic model to purpose of forecasting.

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