Impact of Financial Inclusion on Monetary Policy Effectiveness in Nepal

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Abstract

The paper examines the influence of financial inclusion for effective implementation of monetary policy in Nepal, The deposits to GDP and loans and advance to GDP ratio are used as financial inclusion indicators. The study uses the money supply, loan rate, and exchange rate as primary monetary indicators. The research is based on secondary sources of data from 1975 to 2019.Unit Root test ,The Johnson Cointegration test, Vector Error Correction Model, and Granger Causality test have been applied in the study. The study concludes that financial inclusion have a significant role for effective implementation of the monetary policy both short-run and long-run. The application of digital technology and innovation, high penetration of financial literacy, and expansion of financial infrastructure may further enhance financial inclusion, thereby achieving monetary policy effectiveness in the nation. Besides this, the regulatory authority may adopt a strategy to diversify financial services in every corner of the country, focusing on poor and disadvantaged people to enhance financial inclusion.

Key Words: financial inclusion; financial literacy; financial services; monetary policy; regulatory authority

JEL Classification: E52, G29

Introduction

Financial inclusion refers toproviding affordable, accessible, and relevant financial products to unbanked people(Demirguc-Kunt et al., 2017; Sahay et al., 2015; Zins & Weill, 2016). Financial inclusion is defined by the World Bank (2008) as having access to financial services such as insurance, credit, payments, and deposits. The key financial inclusion indicators are timely and adequate access to credit, savings,loans, payments, money transfers, insurance, and deposits(Asian Development Bank, 2000; United Nations, 2006; Rangarajan, 2008).Financial inclusion is measured by several financial accessibility variables, such as geographic penetration, demographic penetration, and banking penetration (Chakravarty & Pal, 2013; Kumar, 2013).

Inclusive finance is considered important to promote inclusive growth and reduce poverty (Helms, 2006). Financial inclusion creates economic opportunities for deprived households and micro-enterprises (Al-Shami et al., 2017). There is no question about the importance of having a sound financial system in a nation that supports economic growth. No country in the world has achieved higher growth without having a developed and stable financial system (King & Levine, 1993). In developing nations like Nepal, inclusive finance has emerged as a crucial policy concern (Dhungana& Kumar, 2015).

Access to finance is crucial in developing nations where many individuals lack access to formal banking services (Beck, Demirgüç-Kunt, &Honohan, 2009; Kim, Yu, & Hassan, 2018).The growth of the economy is made possible by improved financial inclusion since it encourages capital formation and the use of savings in productive enterprises.(Neaime&Gaysset, 2018).Trading, risk hedging, and diversification are all made possible by an efficient financial system that encourages and supports investments. Finally, resources are used more effectively, capital (both human and physical) is accumulated quickly, and technical advancement is accelerated,whichleads to economic growth (Billah, 2019; Sarma, 2012).

One of the macroeconomic strategies employed by monetary authorities is to control the economy and regulate internal and external balances in an economy. It aims to maintain financial stability, control inflation, and achieve economic growth and development (Smets, 2014). The integrity of the central bank, the efficient and inclusive financial system, and the analytical capacity of the monetary authorities facilitate the achievementof the monetary objectives (Claessens, 2006). Financial inclusion provides financial services to the rural people and helps monetary authorities implement policy using a formal financial channel which ultimately helps to achieve macro-economic objectives (Layi, 1998).

Financial inclusion positively impactsthe effectiveness of monetary policy (Akanbi et al., 2020; Nayak, 2021). Financial inclusion is achieved through a sound financial system (Ozigbu& Ifeanyi, 2020) and helps to reduce the gap between rural and urban income disparity (Ran et al., 2020). Financial inclusion enhances access to bank credit, which is interest-sensitive and affected by policy rates(Nayak,2021). Saraswati et al. (2020) found that fintech (financial technology) helps overcome the financial inclusion problem for people inaccessible by banks.

Financial inclusion activities should be widened to the informal sector and rural areasin order to engage a significant number of economic agents.Financial inclusion is a driver of financial sector development (Anarfoet et al., 2019), policy convergences between expanding financial inclusion and preserving financial sustainability (Le et al., 2019), proxy by loans and advances to SMEs and increase in deposits to rural branches (Ajisafe et al., 2018) and increase stability in the banking sector (Sakarombe, 2018). By providing identical opportunities, financial inclusion aims to increase the capacity of the financially and socially deprived population.

There are long-term relationships between financial inclusion and the efficiency of monetary policy (Cihak et al., 2016; Evans, 2016; Lenka&Bairwa, 2016; Mehrotra &Yetman, 2015). In order to increase the scope and efficacy of monetary policy, financial inclusion is essential. Indicators of financial inclusion and inflation show a consistent trend and causality. Contrary to economic theory, the money supply and inflation have an inverse relationship (Lapukeni, 2015). Increasing financial inclusion enhances the efficiency of monetary policy (Mbutor& Uba, 2013). The transmission channels for monetary policy may be impacted by financial inclusion (Arshad et al., 2021; Subbarao, 2009).

In Nepal, financial inclusion is unsatisfactory, and about half of adults still lack bank accounts (The World Bank, 2022). Less access, poor usage and inadequate system of movilizing loan and deposit shows a lot of improvement is required for making inclusive financial system. Geographical conditions, scattered villages, illiteracy, and the digital knowledge gap caused mainly financial exclusion in Nepal (Shrestha, 2020). Some studies say thatfinancial development has long-term and short-term impacts on economic growth in Nepal (Dhakal, 2020; Gautam, 2014; Paudel, 2020).

The purpose of the study is to investigate how Nepal's monetary policy is affected by financial inclusion. The study aims to explore how the deposits to GDP and loans to GDP as financial inclusion indicators and lending rate, money supply, and exchange rate as monetary indicators affect CPI (consumer price index), the outcome of monetary policy effectiveness. This paper has addressed how financial inclusion variables and monetary indicators (such as exchange rate, broad money supply, and lending rate) affect the consumer price index, the ultimate measure of monetary policy effectiveness.

Research Methodology

The study aims to explore role of financial inclusion (taking proxy as deposit to GDP and loan and advance to GDP) on moneytory policy effetivenss controlling the effect of some macroeconomic variables(exchange rate, money supply and lending rate) . Study used secondary data collected through the Banking and Financial Statistics and Economic Survey published by the central bank of Nepal and the Ministry of Finance respectively from 1975 to 2019 related to inflation (CPI), deposits, loans, exchange rates, lending rates, money supply, and GDP. The data has been compiled from various sources, and the lending rate from 1975 to 2011 has been adjusted with a saving-deposit interest rate by considering a spread rate of an average of 5 percent due to the unavailability of data. The econometric tools such as Unit Root Test, Johnson Cointegration Test, Vector Error Correction Model, and Granger Causality Test have been applied in the study. Further, the study has a check for the validity of assumptions of regression for normality, autocorrelation, and homoscedasticity of the residual.

The Model Specification

The brief summary of test used and model specification is explained in this section.

Unit Root Test : This test examines how the data are integrated. By using differencing, non-stationary time series data can become stationary(Fanchette et al., 2020). The ADF test has been presented in equation (1):

$$\Delta Y_t = \beta_1 + \beta_{2t} + \delta Y_{t-1} + \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad \text{.....(1)}$$

Where εt is white noise term

Johnson Cointegration Test

Engle and Granger (1987) that if variable is not stationary but their linear combination is stationary, we called the variables are cointegrated. If variables are cointegrated, we can apply different test in level data without losing information. The equation of cointegration test has been presented in equation (2).

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-1} + e_t \quad \text{.....(2)}$$

Vector Error Correction Model (VECM)

VECM is used for identifying long and short term association of the time series variables after identifying the cointegating relationships(Fanchette et al., 2020).The VECM model has been presented in equation (3).

$$\Delta Y_t = \alpha_0 + \alpha_{1i} \sum_{i=1}^{m} \Delta x_{t-1} + \alpha_{2k} \sum_{k}^{n} \Delta z_{t-k} + \alpha_3 \vartheta_{t-1} + \varepsilon_t \quad \text{.....(3)}$$

Pair-Wise Granger Causality Test

Granger causality test is used to identify the causality of one timeseries variable to another in unidirection or bi-direction. Equation (4) and (5) provides the framework to measure the short-run causality among the variables.

$$X_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i X_{t-i} + \sum_{i=1}^{p} \beta_i Y_{t-i} + \mu_{1t} \quad \text{.....(4)}$$

$$Y_t = \delta_0 + \sum_{i=1}^{p} \delta_i X_{t-i} + \sum_{i=1}^{p} \gamma_i Y_{t-i} + \mu_{2t} \quad \text{.....(5)}$$

The study has used the following general but simple behavior model.

DCPI = f (Deposit to GDP, Loan to GDP, Exchange rate, Lending rate, log M2)……(6)

Where,

- DCPI is the first difference of the Consumer Price Index as the proxy of the inflation rate
- Deposit to GDP is percentage of deposit of commercial bank with respect to GDP
- Loan to GDP is is percentage of loan disbursed of commercial bank with respect to GDP
- Exchange rate is expressed as Nepalese rupee value per dollar
- Lending rate is the average bank lending rates
- Log M2 is the money supply (Broad money)

Results and Discussion

Unit Root Test

The Augmented Dickey-Fuller (ADF) is the popular technique to identify stationarity of data. Data should be stationary in order to do further analysis. Unit root results are presented in Table 1.

Table 1: Unit Root Test using the Augmented Dickey-Fuller Test

Variables	Level	1st Difference
Dcpi	-1.2316	-8.5208
	(0.8904)	(0.0001)***
Deposit to GDP	-0.8794	-3.8497
	(0.9475)	(0.0251)**
Loan to GDP	-1.1815	-5.555
	(0.902)	(0.0002)***
Exchange rate	-1.9152	-6.0919
	(0.6297)	(0.0001)***
Lending rate	-2.4581	-5.1756
	(0.3463)	(0.0007)***
Log m2	-2.21116	-4.6299
	(0.4713)	(0.0031)**

Note: value in Parenthesis shows p-value; *** denotes significance at a 1 percent level of significance,** denotes significance at a 5 percent level of significance

Source: Authors' calculation by using Eviews software Version 8

Table 1 indicates that all the variables contain unit root or are non-stationary at I (0) or a level because, at the level P-value is insignificant. Similarly, the table further indicates that the variable is stationary the first difference indicated by I (1) as P-value is significant at the first difference.

Optimal Lag Selection Process

We use Eviews 8 to determine the maximum lag length using different lag length selection criteria. FPE, AIC, SC, and HQ criteriasuggest five lag length , and LR criteria suggest using three lags.

Table 2: Optimal Lag Selection

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-597.1029	NA	1089421.	30.92835	31.18428	31.02018
1	-322.0591	451.3538	5.291084	18.66970	20.46123	19.31248
2	-266.5228	74.04849	2.224327	17.66783	20.99496	18.86158
3	-209.5326	58.45147*	1.112114	16.59141	21.45413	18.33612
4	-154.4221	39.56650	1.010832	15.61139	22.00970	17.90705
5	-56.822	40.04106	0.333207*	12.45241*	20.38632*	15.29903*

Note: * Indicates lag order selected by the criterion
Where;
LR: sequential modified LR test statistic (each test at 5 percent level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: Authors' calculation by using Eviews software version 8.

Johnson Cointegration Test

The results of the Johnson cointegration test are presented in Table 3.

Table 3: Johnson Cointegration Test

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Probability
None *	0.824024	182.6433	95.75366	0.0001***
At most 1 *	0.642727	113.1471	69.81889	0.0001***
At most 2 *	0.566276	71.97682	47.85613	0.0001***
At most 3 *	0.479260	38.56295	29.79707	0.0038***
At most 4	0.240502	12.46277	15.49471	0.1360
At most 5	0.035815	1.458889	3.841466	0.2271

Note: Trace test indicates 4 Cointegrating equations at the 0.05 level
*** refers to significance at 1 percent level of significance
Source: Authors' calculation by using Eviews software version 8.

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.824024	69.49621	40.07757	0.0000
At most 1 *	0.642727	41.17025	33.87687	0.0057
At most 2 *	0.566276	33.41387	27.58434	0.0079
At most 3 *	0.479260	26.10018	21.13162	0.0092
At most 4	0.240502	11.00388	14.26460	0.1540
At most 5	0.035815	1.458889	3.841466	0.2271

Note: *** refers to significance at a 1 percent level of significance

Source: Authors' calculation by using Eviews software.

Table 3 shows that trace statistics and maximum Eigenvalue statistics suggest the presence of four cointegrating equations among the study variables at 5%. The test suggeststo apply error correction model in order to identify the correction mechanism of disequilibirium conditions. Thus, we proceed with the VECM approach to estimate the error correction coefficients.

Vector Error Correction Model

Vector Error correction model is used to identify the error correction mechanism(long term adjustment) and short term relationship of the time series variables. The equation of error correction is shown in following equation.

$$D(DCPI) = C(1)*(DCPI(-1) + 0.0715*DEPOSIT\_TO\_GDP(-1) - 0.147*LOAN\_TO\_GDP(-1) + 0.1316*EXCHANGE\_RATE(-1) + 0.346*LENDING\_RATE(-1) - 3.198*LOG\_M2(-1) - 0.127)$$

The coefficient of model, negative and the p-value is significant (shown in the appendix), shows a long-run association between deposit to GDP, loan to GDP, exchange rate, lending rate, and log m2 with DCPI (Lapukeni, 2015). The coefficient -0.684439 suggest that the rate of disequilibrium on the consumer price index of last year is corrected by 68.4439 percent this year.

Further, the Wald test statistics is used to identity the short-term joint effect of explanatory variable to response variable, hypothesizing no short-term joint impact of explanatory variable to response variables. The following null hypothesis has been formulated for short-term causal relationships.

Null Hypothesis:

C(5)=C(6)=C(7)=C(8)=C(9)=C(10)=C(11)=C(12)=C(13)=C(14)=C(15)=C(16)=C(17)=C(18)=C(19)=0

The outcome of the Wald test statistics has been presented in Table 4

Table 4: Wald Test Statistic

Test Statistic	Value	df	Probability
F-statistic	5.738227	(15, 20)	0.0002***
Chi-square	86.07340	15	0.0001***

Note: *** refers to significance at a 1 percent level of significance

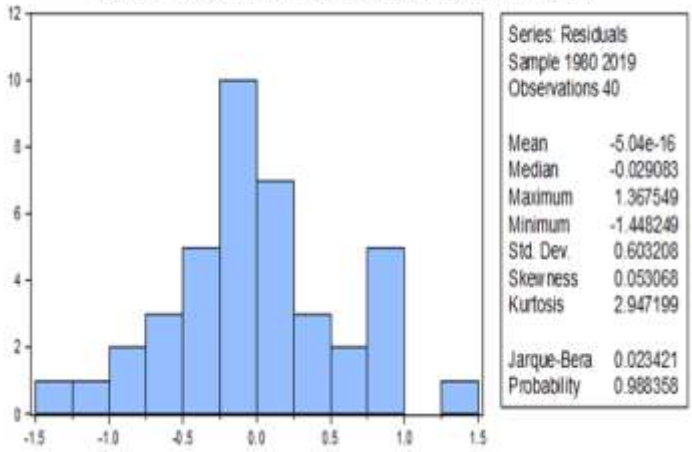
Source: Authors' calculation by using Eviews software Version 8.

Table 4 suggests that there is short term causal relationship between DCPI and other independent variables as the null hypothesis is rejected (deposit to GDP ratio, loan to GDP ratio, lending rate, exchange rate, and log M2). That implies that inflation can affected by financial inclusions controlling the impact of macronomic variables(Lapukeni, 2015).

Diagnostic Test of Residuals

For further validation of the model, the residual should be normally distributed and should have homoscedasticity and no serial correlation. This assumption of the regression model has been presented below.

Figure 1: Histogram and Jarque-Bera Statistics for Normality Test



From figure 1, the Normality test is performed to identify the residual from the model is usually distributed or not. The Jarque-Bera test has been performed to identify the normality of the model (Akanbi et al., 2020). The Jarque-Bera statistics are 0.023, and its p-value is 0.988, suggestingrormal distribution of residuals and validating the assumption of the model.

Table 5: Breusch-Pagan-Godfrey Test

F-statistic	0.744423	Prob. F(24,15)	0.7479
Obs*R-squared	21.74413	Prob. Chi-Square(24)	0.5945
Scaled explained SS	5.29252	Prob. Chi-Square(24)	1

Source: Authors' calculation by using Eviews software Version 8.

The Breusch Pegan Godfrey test has is a popular test for testing homoscedasticity of residual(Dufour et al.,2004). If the probability value is more than 5 percent, we have sufficient evidence that residuals are homoscedastic (Akanbi et al., 2020).From Table 5, the p-value is 1, so we can accept the null hypothesis. It suggests that residuals are homoscedastic,which validates the assumption of the model (Lenka & Bairwa, 2016).

Table 6: Breusch-Godfrey Serial Correlation LM Test

F-statistic	0.242755	Prob. F(3,17)	0.8653
Obs*R-squared	1.643173	Prob. Chi-Square(3)	0.6496

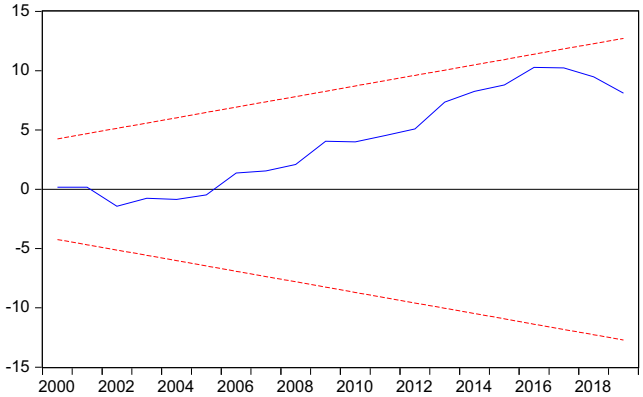
Source: Authors' calculation by using Eviews software version 8.

From Table 6, the p-value is 0.6596, suggesting that there is no auto correlation, which is required for a valid model, among the residuals that validate the model's assumption.

Stability Test of the Model

The authors performed the CUSUM test for the stability diagnostic of the model. The result of the CUSUM test is presented in figure 3.

Figure 3: Stability Test of Model



The above figure shows the result of stability of model.The figure clearly shows that the curve line (blue in color) is located between two red lines. When the blue line is located within two red lines, we are confident that our model is stable at a 5 percent significance level.

Pairwise Granger Causality Test

Table7 displays the results of the pairwise Granger causality test.

Table 7: Pairwise Granger Causality Test

Null Hypothesis:	Obs	F-Statistic	Prob.
DEPOSIT TO GDP does not granger cause DCPI	41	16.1348	0.0001***
DCPI does not granger cause DEPOSIT TO GDP		0.76561	0.5213
LOAN TO GDP does not granger cause DCPI	41	4.11626	0.0136***
DCPI does not granger cause LOAN TO GDP		2.18873	0.1073
EXCHANGE RATE does not granger cause DCPI	41	0.97494	0.4159

DCPI does not granger cause EXCHANGE RATE		6.20205	0.0018***
LENDING RATE does not granger cause DCPI	41	3.01729	0.0432**
DCPI does not granger cause LENDING RATE		1.72216	0.1809
LOG M2 does not granger cause DCPI	41	2.63757	0.0653*
DCPI does not granger cause LOG M2		1.57227	0.214

Note: *** refers to significance at a 1 percent level of significance, ** refers to significance at a 5 percent level of significance, and * refers to significance at a 10 percent level of significance

Source: Authors' calculation by using Eviews software Version 8.

From Table 7, financial inclusion variables (deposit to GDP ratio and loan and advance to GDP ratio) granger causes DCPI in a unidirectional way. Similarly, the lending rate and broad money supply cause DCPI, but DCPI granger causes the exchange rate.

Discussion

This study used the deposit-to-GDP ratio and loan and advance-to-GDP ratio as proxy of financial inclusion. The effectiveness of monetary policy is measured by consumer price index, proxy of inflation rate. We took control such as lending rate, money supply and exchange rate. The results from VECM show that financial inclusion plays a significant role for controlling inflation both in long and short term. The result of the present study is matched with the previous study byAkanbi et al. (2020), Lenka and Bairwa (2016), Joseph et al. (2021), and Saraswati et al. (2020).

Furthermore, granger causality tests show that financial inclusion indicators cause the consumer price indexunidirectionaly. The result further suggests that inflation is directly associated with the loan to GDP in the long which is supported by Lenka and Bairwa (2016). Further, inflation is directly associated with a broad money supply in the long run, and this is supported by Hung (2016). Further, this study found that inversely related deposit to GDP is supported by Lenka and Bairwa (2016). Additionally, the study confirms that inflation is negatively associated with the exchange and lending rates in the long run, which is supported by Lenka and Bairwa (2016).

Conclusion and Suggestions

Globally, financial inclusion is a major problem, especially in developing nations where many individuals still rely on unregulated financial services. A sound financial architecture is important for promoting financial inclusion which will be a mechanism for effectiveness of monetary policy in Nepal. Financial inclusion helps control inflation, a tool for measuring monetary policy effectiveness. The results obtained from the analysis shows that increasing bank deposit will help to reduce inflation in the long run. However, increasing loans and advances may increase inflation. This shows that loans and advances provided by the bank and financial institutions may not be used productive sector. So, regulatory authorities and loan-providing institutions should monitor whether a loan is provided for unproductive or productive sectors. Overall, financial inclusion has short and long run impact for achieving target of monetary policy. So it is recommended to government and regularity body for developing basic financial infrastructure, expanding digital technology, and developing viable institutions to reduce financial exclusion thereby achieving monetary policy effectiveness as suggested by Qamruzzaman and Wei (2019).

Additional Information and Declarations

Authors' Contribution

BRD, RKC, and BKdesigned and performed thestatistical

analysis. BRD wrote a manuscript with a significant contribution toRKC, BK, OPP and LKS. All the authors contributedto the analysis and interpretation of the results, including the literature review and final revision of the manuscript.

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Sample (adjusted): 1980 2019
Included observations: 40 after adjustments

D(DCPI) = C(1)*(DCPI(-1) + 0.071511992387*DEPOSIT_TO_GDP(-1) - 0.147078304173*LOAN_TO_GDP(-1) + 0.131602230526 *EXCHANGE_RATE(-1) + 0.346284491103*LENDING_RATE(-13.19805950347*LOG_M2(-1) - 0.127378035343) + C(2)*D(DCPI(-1)) + C(3)*D(DCPI(-2)) + C(4)*D(DCPI(-3)) + C(5) *D(DEPOSIT_TO_ GDP (-1)) + C(6)*D(DEPOSIT_TO_GDP(-2)) + C(7)*D(DEPOSIT_TO_GDP(-3)) + C(8)*D(LOAN_TO_GDP(-1)) + C(9)*D(LOAN_TO_GDP(-2)) + C(10)*D(LOAN_TO_GDP(-3)) + C(11)*D(EXCHANGE_RATE(-1)) + C(12)*D(EXCHANGE_RATE(-2)) + C(13)*D(EXCHANGE_RATE(-3)) + C(14)*D(LENDING_RATE(-1)) + C(15)*D(LENDING_RATE(-2)) + C(16)*D(LENDING_RATE(-3)) + C(17)*D(LOG_M2(-1)) + C(18) *D(LOG_M2(-2)) + C(19)*D(LOG_M2(-3)) + C(20)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.684439	0.325824	-2.100639	0.0486
C(2)	0.012711	0.327024	0.038870	0.9694
C(3)	0.019609	0.298503	0.065690	0.9483
C(4)	0.899411	0.400880	2.243591	0.0363
C(5)	0.084149	0.019720	4.267160	0.0004
C(6)	0.054001	0.024742	2.182576	0.0412
C(7)	0.012721	0.032366	0.393037	0.6985
C(8)	0.224676	0.070348	3.193801	0.0046
C(9)	-0.066864	0.079757	-0.838344	0.4117
C(10)	0.169665	0.087508	1.938860	0.0668
C(11)	0.205947	0.119072	1.729595	0.0991
C(12)	0.134503	0.086837	1.548906	0.1371
C(13)	-0.075904	0.064758	-1.172118	0.2549
C(14)	-0.407396	0.282463	-1.442301	0.1647
C(15)	0.637901	0.262738	2.427896	0.0247
C(16)	-0.143580	0.198567	-0.723080	0.4780
C(17)	-16.54025	12.59833	-1.312893	0.2041
C(18)	-24.07363	9.657896	-2.492637	0.0216
C(19)	14.73310	8.819596	1.670496	0.1104
C(20)	0.512628	0.981139	0.522483	0.6071

R-squared	0.893007	Mean dependent var	0.315000
Adjusted R-squared	0.791364	S.D. dependent var	1.844124
S.E. of regression	0.842334	Akaike info criterion	2.801573
Sum squared resid	14.19053	Schwarz criterion	3.646012
Log-likelihood	-36.03145	Hannan-Quinn criteria.	3.106895
F-statistic	8.785729	Durbin-Watson stat	1.936300
Prob(F-statistic)	0.000005		