European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

Title of the Research Paper: An Investigation into Impact of Repo Rate on Inflation Indices (WPI & CPI) in India during Pandemic and Post Pandemic phase

Sadaf Karim[1], Shital Bhusare[2],Vivek I Swami[3], Ashwini Arte[4], Bonnie Rajesh[5], Vidya Nakhate[6] , D. Kumar[7], Samrat Ray[8].

[1]Assistant Professor, AIMS, Pune, sadafzeba@gmail.com,
[2]Assistant Professor, SIBMT, Pune, bhusaresp@gmail.com,
[3]Assistant Professor, SIMMC, Pune, vivekiswami34@gmail.com,
[4]Director, MGM's IMSR, Navi Mumbai, ashwiniarte@yahoo.co.in,
[5]Assistant Professor, MIT SDE, Pune, bonnie.rajesh@mitsde.com,
[6]Director, SIBACA, Lonawala, vidya.nakhate10@gmail.com, [7]
Asso. Professor, SBIIMS, Pune, d.kumar@sbiims.edu.in,
[8]Dean, IIMS, Pune, samratray@rocketmail.com

Abstract

The Covid-19 pandemic brought a completely abnormal situation which influenced all the major economic activities. The central banks around the globe tried their best with their respective policies to stabilize the economic activities in their respective countries. The Reserve Bank of India also brought major changes in its monetary policy to stabilize the economic variables. Thus the research paper is based on investigating the impact of changes in repo rate by the RBI on WPI and CPI so as to compare its impact on these two indices. The findings of the research paper suggest that the impact on repo rate on CPI and WPI is less than moderate; which is even far less in context of WPI. Thus the RBI's policy of inflation targeting through changes in repo rates is far from effective during the period of study.

Key words: Covid-19, Repo rate, WPI, CPI

I. Introduction

The Repo rate is the rate under liquidity adjustment facility at which RBI provides liquidity to banks backed by government securities[1]. The change in repo rate is done in order to control inflation while maintaining stable economic growth. Monetary policy generally conducted by central banks is a meaningful policy tool for the attainment of achieving both inflation and growth objectives[3]. Rahul Anand et. al (2014) in their research study have contributed on impact of monetary policy on food inflation in India. They have focused in favour of contractionary monetary policy for a longer period of time in order to control inflation. A study by Susmita Das and Debjani Mitra has found a positive relation between Repo rate and Inflation. However they have considered inflation as independent variable and repo rate as dependent variable. Kaushik Basu (2011) in his study has found that while there is some association between repo rate and inflation, there is also a lot of noise. Bhavesh Salunkhe & Anaradha Patnaik (2017) has tried to estimate the association between monetary policy, growth and inflation. The findings of the study show that there is bi directional causality between policy rate and inflation as well as output. The impact of policy rate is of larger magnitude on growth as compared to inflation and hence the policy makers are very cautious in increasing policy rates. Troy Matheson (2017) has studied the linkage between interest rates and inflation in context of Brazil. The author has tried to test the conventional view of the relation between interest rates and inflation. Most of the advanced economies faced low inflation and lower interest rates after global financial crisis challenged the conventional view. The findings of the study in case of Brazil supported the challenge view of monetary policy transmission. The situation of lower inflation and lower interest rate can only be attained in the long run only by targeting lower rate of inflation. However this can only be achieved at higher interest rate leading to lower output and employment. Hossein Asgharpur et. al (2007) have studied the relationship between interest rates and inflation in context of developing countries. The authors have examined the causal relationship between the interest rate and inflation rate in 40 selected Islamic countries using new causality approach and applying panel data methodology. The findings of the study show that there is unidirectional causality from interest rate to inflation

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

in these countries. This confirms the fact that interest rate is important factor in macroeconomic policy decisions. Malcolm Sawyer (2009) has studied the linkage between interest rates and inflation. The findings of the study show that rate of interest targets the demand and further demand on inflation. If this linkage does not operate fully, then it becomes fatal for macroeconomic policies. Thus, based on past study, the researchers have tried to expand the study by specifically studying the effectiveness of the impact of repo rate on WPI and CPI during the period of pandemic and post pandemic.

II. Objectives of the study

a) To study the impact of Repo rate on WPI and CPI during pandemic and post pandemic phase.

b) To study the trend analysis of changes in WPI and CPI.

III. Research Methodology

The Research study is based on secondary data collected from the period of Oct 2019 to Feb 2023 on periodical basis. The study is largely descriptive and analytical. The linear regression analysis has been used to find the impact of changes in repo rate on WPI and CPI.

IV. Data Analysis and Interpretation

A. Trend Analysis of the movements of WPI, CPI

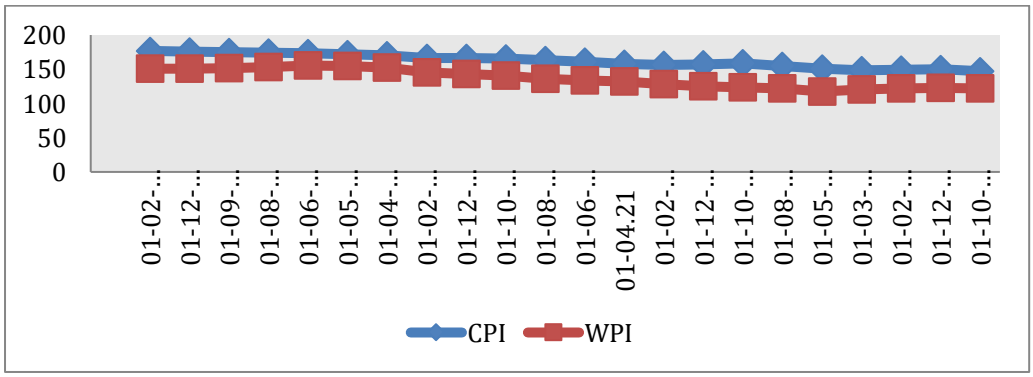

Chart no.1 Trend analysis of movements of WPI and CPI

Observation: The trend analysis shows that in the initial period of study there is sign of divergence between WPI and CPI due to methodology in calculation and different weights assigned to commodities under WPI and CPI but at the later part, there is convergence which shows that WPI and CPI numbers are moving in tandem. The larger divergence is seen during the peak of pandemic period in India i.e. 2020-21.

B. CPI and Repo Rate

Descriptive Statistics			
	Mean	Std. Deviation	N
CPI	162.2864	9.82874	22
Repo Rate	2.59	2.218	22

Correlations		
	CPI	Repo Rate

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

Pearson Correlation	CPI	1.000	.421
	Repo Rate	.421	1.000
Sig. (1-tailed)	CPI	.	.026
	Repo Rate	.026	.
N	CPI	22	22
	Repo Rate	22	22

Table no.1: Descriptive Statistics and correlation coefficients of Repo rate and CPI

Observation: The value of correlation coefficient between CPI and Repo rate shows a less than moderate association. Thus the initial findings suggest no such larger impact of repo rate on CPI.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics	
					R Square Change	F Change
1	.421[a]	.177	.136	9.13609	.177	4.305

Model Summary[b]

Model	Change Statistics			Durbin-Watson
	df1	df2	Sig. F Change	
1	1[a]	20	.051	.072

a. Predictors: (Constant), Repo Rate

b. Dependent Variable: CPI

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	359.322	1	359.322	4.305	.051[b]
	Residual	1669.364	20	83.468		
	Total	2028.686	21			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	157.455	3.036		51.863	.000		
	Repo Rate	1.865	.899	.421	2.075	.051	1.000	1.000

a. Dependent Variable: CPI

Table no.2: Model summary, Regression coefficients and Collinear Statistics

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

Observation and interpretation

A linear regression analysis was conducted to see the impact of repo rate on consumer price index. The Model Summary presents the R-Square and Adjusted R-Square values for each step along with the amount of R Square Change. The model summary shows that R Square = 0.177 (18% of the variance in CPI is accounted for by change in repo rate.

We refer to table coefficient to examine the contribution of predictors to the model. From the model it is observed that the impact of the predictor i.e. Repo rate on CPI is insignificant as the value of P (.051) is more than 0.05. Thus the null hypothesis regarding this predictor is accepted and hence can be concluded that Change in repo rate does not have a significant impact on CPI. The tolerance value is more than 0.1 and VIF is less than 10, hence collinearity is a not a problem with regression.

C. WPI and Repo Rate

Descriptive Statistics			
	Mean	Std. Deviation	N
WPI	136.5727	13.49695	22
Repo Rate	2.59	2.218	22

Correlations			
		WPI	Repo Rate
Pearson Correlation	WPI	1.000	.381
	Repo Rate	.381	1.000
Sig. (1-tailed)	WPI	.	.040
	Repo Rate	.040	.
N	WPI	22	22
	Repo Rate	22	22

Table no.3: Descriptive Statistics and Correlation coefficients of WPI and Repo rate

Observation: The value of correlation coefficient between WPI and Repo rate also shows less than the moderate association. This also confirms not much impact of Repo rate on WPI.

Model Summary[b]										
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.381[a]	.145	.102	12.78870	.145	3.390	1	20	.080	.070
a. Predictors: (Constant), Repo Rate										
b. Dependent Variable: WPI										

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	554.506	1	554.506	3.390	.080[b]
	Residual	3271.017	20	163.551		
	Total	3825.524	21			
a. Dependent Variable: WPI						
b. Predictors: (Constant), Repo Rate						

Coefficients[a]

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	130.570	4.250		30.724	.000		
	Repo Rate	2.317	1.258	.381	1.841	.080	1.000	1.000
a. Dependent Variable: WPI								

Table no. 4: Model summary, Regression coefficients and Collinear Statistics (WPI and Repo)

Observation and Interpretation

A linear regression analysis was conducted to see the impact of repo rate on Whole sale price index. The Model Summary presents the R-Square and Adjusted R-Square values for each step along with the amount of R Square Change. The model summary shows that R Square = 0.145 (14.5% of the variance in WPI is accounted for by change in repo rate.

We refer to table coefficient to examine the contribution of predictors to the model. From the model it is observed that the impact of the predictor i.e. Repo rate on WPI is insignificant as the value of P (.080) is more than 0.05. Thus the null hypothesis regarding this predictor is accepted and hence can be concluded that Change in repo rate does not have a significant impact on WPI. The tolerance value is more than 0.1 and VIF is less than 10, hence collinearity is a not a problem with regression.

V. Conclusions

The researchers based on the findings have concluded that the change in repo rate does have less than moderate impact on WPI and CPI. Thus it can be concluded that as a key policy rate, repo rate did not have significant impact on inflation targeting i.e. CPI and WPI during the period of study. Thus there is a need to assess the reasons behind ineffectiveness of interest rate on inflation targeting. It might happen that there is not effective monetary policy transmission by the banks in between leading to less impact on demand and price indices.

VI. Limitations and Future Scope of Study

The limitation of the study is that the researchers have not considered the lag effect in studying the impact of changes in repo rate on WPI and CPI. The period of study largely experienced volatility in economic variables which may not give the authentic results. The researchers would have considered much better statistical tests to test the validity. The researchers in the future can rework on the subject by considering larger time period and lag effect so as to test the validity of impact of changes in repo rate on WPI and CPI.

References

1. Thommandru, A., Espinoza-Maguiña, M., Ramirez-Asis, E., Ray, S., Naved, M., & Guzman-Avalos, M. (2023). Role of tourism and hospitality business in economic development. *Materials Today: Proceedings*, *80*, 2901-2904.
2. Voumik, L. C., Islam, M. A., Ray, S., Mohamed Yusop, N. Y., & Ridzuan, A. R. (2023). CO2 emissions from renewable and non-renewable electricity generation sources in the G7 countries: static and dynamic panel assessment. *Energies*, *16*(3), 1044.
3. Bhargava, A., Bhargava, D., Kumar, P. N., Sajja, G. S., & Ray, S. (2022). Industrial IoT and AI implementation in vehicular logistics and supply chain management for vehicle mediated transportation systems. *International Journal of System Assurance Engineering and Management*, *13*(Suppl 1), 673-680.
4. Rakhra, M., Sanober, S., Quadri, N. N., Verma, N., Ray, S., & Asenso, E. (2022). Implementing machine learning for smart farming to forecast farmers' interest in hiring equipment. *Journal of Food Quality*, *2022*.
5. Al Ayub Ahmed, A., Rajesh, S., Lohana, S., Ray, S., Maroor, J. P., & Naved, M. (2022, June). Using Machine Learning and Data Mining to Evaluate Modern Financial Management Techniques. In *Proceedings of Second*

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

International Conference in Mechanical and Energy Technology: ICMET 2021, India (pp. 249-257). Singapore: Springer Nature Singapore.

6. Pallathadka, H., Leela, V. H., Patil, S., Rashmi, B. H., Jain, V., & Ray, S. (2022). Attrition in software companies: Reason and measures. *Materials Today: Proceedings*, *51*, 528-531.
7. Sharma, A., Kaur, S., Memon, N., Fathima, A. J., Ray, S., & Bhatt, M. W. (2021). Alzheimer's patients detection using support vector machine (SVM) with quantitative analysis. *Neuroscience Informatics*, *1*(3), 100012.
8. Mehbodniya, A., Neware, R., Vyas, S., Kumar, M. R., Ngulube, P., & Ray, S. (2021). Blockchain and IPFS integrated framework in bilevel fog-cloud network for security and privacy of IoMT devices. *Computational and Mathematical Methods in Medicine*, *2021*.
9. Ray, S. (2020). How COVID-19 changed dimensions of human suffering and poverty alleviation: economic analysis of humanitarian logistics. *Вестник Астраханского государственного технического университета. Серия: Экономика*, (4), 98-104.
10. Akbar, A., Akbar, M., Nazir, M., Poulova, P., & Ray, S. (2021). Does working capital management influence operating and market risk of firms?. *Risks*, *9*(11), 201.
11. Dutta, A., Voumik, L. C., Ramamoorthy, A., Ray, S., & Raihan, A. (2023). Predicting Cryptocurrency Fraud Using ChaosNet: The Ethereum Manifestation. *Journal of Risk and Financial Management*, *16*(4), 216.
12. Polcyn, J., Voumik, L. C., Ridwan, M., Ray, S., & Vovk, V. (2023). Evaluating the influences of health expenditure, energy consumption, and environmental pollution on life expectancy in Asia. *International Journal of Environmental Research and Public Health*, *20*(5), 4000.
13. Sajja, G. S., Jha, S. S., Mhamdi, H., Naved, M., Ray, S., & Phasinam, K. (2021, September). An investigation on crop yield prediction using machine learning. In *2021 Third International Conference on Inventive Research in Computing Applications (ICIRCA)* (pp. 916-921). IEEE.
14. Ali, N. G., Abed, S. D., Shaban, F. A. J., Tongkachok, K., Ray, S., & Jaleel, R. A. (2021). Hybrid of K-Means and partitioning around medoids for predicting COVID-19 cases: Iraq case study. *Periodicals of Engineering and Natural Sciences*, *9*(4), 569-579.
15. Gupta, S., Geetha, A., Sankaran, K. S., Zamani, A. S., Ritonga, M., Raj, R., ... & Mohammed, H. S. (2022). Machine learning-and feature selection-enabled framework for accurate crop yield prediction. *Journal of Food Quality*, *2022*, 1-7.
16. Gupta, S., Geetha, A., Sankaran, K. S., Zamani, A. S., Ritonga, M., Raj, R., ... & Mohammed, H. S. (2022). Machine learning-and feature selection-enabled framework for accurate crop yield prediction. *Journal of Food Quality*, *2022*, 1-7.
17. Ma, W., Nasriddinov, F., Haseeb, M., Ray, S., Kamal, M., Khalid, N., & Ur Rehman, M. (2022). Revisiting the impact of energy consumption, foreign direct investment, and geopolitical risk on CO2 emissions: comparing developed and developing countries. *Frontiers in Environmental Science*, 1615.
18. Shukla, S. (2017). Innovation and economic growth: A case of India. *Humanities & Social Sciences Reviews*, *5*(2), 64-70.
19. Soham, S., & Samrat, R. (2021). Poverty and financial dearth as etiopathogen of psychotic and neurotic diseases. *Заметки ученого*, (4-1), 568-578.
20. Park, J. Y., Perumal, S. V., Sanyal, S., Ah Nguyen, B., Ray, S., Krishnan, R., ... & Thangam, D. (2022). Sustainable marketing strategies as an essential tool of business. *American Journal of Economics and Sociology*, *81*(2), 359-379.
21. Роков, А. И., Дубаневич, Л. Э., & Рэй, С. (2021). Повышение экономической эффективности труда за счет изменения системы оплаты. *E-Scio*, (9 (60)), 53-62.
22. Ray, S. (2021). How Emotional Marketing can help better understand the Behavioral Economic patterns of Covid-19 pandemic: Economic Judgments and Falsifications from India Samrat Ray-Alagappa University, Tamil Nadu, India. samratray@ rocketmail. com. *Вестник МИРБИС*, (2), 26-34.
23. Ravi, S., Kulkarni, G. R., Ray, S., Ravisankar, M., krishnan, V. G., & Chakravarthy, D. S. K. (2023). Analysis of user pairing non-orthogonal multiple access network using deep Q-network algorithm for defense applications. *The Journal of Defense Modeling and Simulation*, *20*(3), 303-316.

24. Priya, P. S., Malik, P., Mehbodniya, A., Chaudhary, V., Sharma, A., & Ray, S. (2022, February). The relationship between cloud computing and deep learning towards organizational commitment. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 21-26). IEEE.
25. Ray, S., & Leandre, D. Y. (2021). How entrepreneurial university model is changing the Indian COVID–19 Fight?. *Путеводитель предпринимателя*, *14*(3), 153-162.
26. Inthavong, P., Rehman, K. U., Masood, K., Shaukat, Z., Hnydiuk-Stefan, A., & Ray, S. (2023). Impact of organizational learning on sustainable firm performance: Intervening effect of organizational networking and innovation. *Heliyon*, *9*(5).
27. Rajendran, R., Sharma, P., Saran, N. K., Ray, S., Alanya-Beltran, J., & Tongkachok, K. (2022, February). An exploratory analysis of machine learning adaptability in big data analytics environments: A data aggregation in the age of big data and the internet of things. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 32-36). IEEE.
28. Elkady, G., & Samrat, R. (2021). An analysis of Blockchain in Supply Chain Management: System Perspective in Current and Future Research. *International Business Logistics*, *1*(2).
29. Korchagina, E., Desfonteines, L., Ray, S., & Strekalova, N. (2021, October). Digitalization of Transport Communications as a Tool for Improving the Quality of Life. In *International Scientific Conference on Innovations in Digital Economy* (pp. 22-34). Cham: Springer International Publishing.
30. Kumar, A., Nayak, N. R., Ray, S., & Tamrakar, A. K. (2022). Blockchain-based Cloud Resource Allocation Mechanisms for Privacy Preservation. In *The Data-Driven Blockchain Ecosystem* (pp. 227-245). CRC Press.
31. Wawale, S. G., Bisht, A., Vyas, S., Narawish, C., & Ray, S. (2022). An overview: Modeling and forecasting of time series data using different techniques in reference to human stress. *Neuroscience Informatics*, *2*(3), 100052.
32. Batool, A., Ganguli, S., Almashaqbeh, H. A., Shafiq, M., Vallikannu, A. L., Sankaran, K. S., ... & Sammy, F. (2022). An IoT and Machine Learning-Based Model to Monitor Perishable Food towards Improving Food Safety and Quality. *Journal of Food Quality*, *2022*.
33. Verma, K., Sundararajan, M., Mangal, A., Ray, S., & Kumar, A. (2022, April). The Impact of COVID-19 to the Trade in India Using Digital, IOT and AI Techniques. In *2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 01-05). IEEE.
34. Bangare, J. L., Kapila, D., Nehete, P. U., Malwade, S. S., Sankar, K., & Ray, S. (2022, February). Comparative Study on Various Storage Optimisation Techniques in Machine Learning based Cloud Computing System. In *2022 2nd International Conference on Innovative Practices in Technology and Management (ICIPTM)* (Vol. 2, pp. 53-57). IEEE.
35. Kiziloglu, M., & Ray, S. (2021). Do we need a second engine for Entrepreneurship? How well defined is intrapreneurship to handle challenges during COVID-19?. In *SHS Web of Conferences* (Vol. 120, p. 02022). EDP Sciences.
36. Samajpaty, S., & Ray, S. (2020). Innovation strategies in health economics: a force that makes blood move and game of gravity in it-futuristic economic plans. *Московский экономический журнал*, (9), 397-409.
37. Nikam, R. U., Lahoti, Y., & Ray, S. (2023). A Study of Need and Challenges of Human Resource Management in Start-up Companies. *Mathematical Statistician and Engineering Applications*, *72*(1), 314-320.
38. Yanbin, X., Jianhua, Z., Wang, X., Shabaz, M., Ahmad, M. W., & Ray, S. (2023). Research on optimization of crane fault predictive control system based on data mining. *Nonlinear Engineering*, *12*(1), 20220202.
39. Ray, S., Abinaya, M., Rao, A. K., Shukla, S. K., Gupta, S., & Rawat, P. (2022, October). Cosmetics Suggestion System using Deep Learning. In *2022 2nd International Conference on Technological Advancements in Computational Sciences (ICTACS)* (pp. 680-684). IEEE.
40. Bhaskar, T., Shiney, S. A., Rani, S. B., Maheswari, K., Ray, S., & Mohanavel, V. (2022, September). Usage of Ensemble Regression Technique for Product Price Prediction. In *2022 4th International Conference on Inventive Research in Computing Applications (ICIRCA)* (pp. 1439-1445). IEEE.
41. Kanade, S., Surya, S., Kanade, A., Sreenivasulu, K., Ajitha, E., & Ray, S. (2022, April). A Critical analysis on Neural Networks and Deep Learning Based Techniques for the Cloud Computing System and its Impact on Industrial Management. In *2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 325-331). IEEE.

42. Pallathadka, H., Tongkachok, K., Arbune, P. S., & Ray, S. (2022). Cryptocurrency and Bitcoin: Future Works, Opportunities, and Challenges. *ECS Transactions*, *107*(1), 16313.
43. Li, Y. Z., Yu, Y. H., Gao, W. S., Ray, S., & Dong, W. T. (2022). The Impact of COVID-19 on UK and World Financial Markets. *Jundishapur Journal of Microbiology*, 373-399.
44. Samrat, R., Elkadyghada, E. G., Rashmi, N., & Elena, K. (2022). UPSKILLING AND RESKILLING FOR A GREENER GLOBAL BUSINESS ECOSYSTEM: WEB 4.0 PERSPECTIVE. *Журнал прикладных исследований*, *1*(11), 49-60.
45. Ray, S. (2022). Fraud detection in e-Commerce using machine learning. *BOHR International Journal of Advances in Management Research*, *1*(1).
46. Samrat, R. (2021). WHY ENTREPREUNERAL UNIVERSITY FAILS TO SOLVE POVERTY ERADICATION?. *Вестник Тувинского государственного университета.№ 1 Социальные и гуманитарные науки*, (1), 35-43.
47. Ray, S. (2021). Are Global Migrants At Risk? A Covid Referral Study of National Identity. In *Трансформация идентичностей: опыт Европы и России* (pp. 26-33).
48. Saravanan, A., Venkatasubramanian, R., Khare, R., Surakasi, R., Boopathi, S., Ray, S., & Sudhakar, M. POLICY TRENDS OF RENEWABLE ENERGY AND NON RENEWABLE ENERGY.
49. Varma, A., & Ray, S. (2023). The case of amazons E-commerce digital strategy in India.
50. Ray, S. (2023). Can Change Management Be Disrupted Through Leadership Stretegies?: Evidence From Start-Up Firms in Asia. In *Change Management During Unprecedented Times* (pp. 100-127). IGI Global.
51. Al Noman, M. A., Zhai, L., Almukhtar, F. H., Rahaman, M. F., Omarov, B., Ray, S., ... & Wang, C. (2023). A computer vision-based lane detection technique using gradient threshold and hue-lightness-saturation value for an autonomous vehicle. *International Journal of Electrical and Computer Engineering*, *13*(1), 347.
52. Nayak, N. R., Kumar, A., Ray, S., & Tamrakar, A. K. (2023). *Blockchain-Based Cloud Resource Allocation Mechanism for Privacy Preservation* (No. 9700). EasyChair.
53. Ray, S. (2023). XA-GANOMALY: AN EXPLAINABLE ADAPTIVE SEMI-SUPERVISED LEARNING METHOD FOR INTRUSION DETECTION USING GANOMALY IN GLOBAL ECONOMIC DYNAMIC SHIFTS©. *ЭКОНОМИЧЕСКАЯ СРЕДА*, 4.
54. Zamani, A. S., Rajput, S. H., Bangare, S. L., & Ray, S. (2022). Towards Applicability of Information Communication Technologies in Automated Disease Detection. *International Journal of Next-Generation Computing*, *13*(3).
55. Korchagina, E. V., Barykin, S. E., Desfonteines, L. G., Ray, S., Shapovalova, I. M., & Repnikova, V. (2022). Digitalisation of Ecosystem-Based Management and the Logistics Potential of the Arctic Region. *Journal of Environmental Assessment Policy and Management*, *24*(03), 2250034.
56. Zamani, A. S., Rajput, S. H., Bangare, S. L., & Ray, S. (2022). Towards Applicability of Information Communication Technologies in Automated Disease Detection. *International Journal of Next-Generation Computing*, *13*(3).
57. Ray, S., Korchagina, E. V., Druzhinin, A. E., Sokolovskiy, V. V., & Kornev, P. M. (2022, April). Emergence of the New Start Up Ecosystem: How Digital Transformation Is Changing Fintech and Payment System in Emerging Markets?. In *International Scientific Conference "Digital Transformation on Manufacturing, Infrastructure & Service"* (pp. 621-638). Cham: Springer Nature Switzerland.
58. Wagh, S., Nikam, R., & Ray, S. (2022). Exploration of the Higher Education System's Mechanism and Impact on More Than Just the Effective Growth of the Indian Economy. *Globsyn Management Journal*, *16*(1/2), 85-91.
59. Ray, S., Korchagina, E. V., Druzhinin, A. E., Sokolovskiy, V. V., & Kornev, P. M. (2022, April). Emergence of the New Start Up Ecosystem: How Digital Transformation Is Changing Fintech and Payment System in Emerging Markets?. In *International Scientific Conference "Digital Transformation on Manufacturing, Infrastructure & Service"* (pp. 621-638). Cham: Springer Nature Switzerland.
60. Chakraborty, T., & Ray, S. (2022). STRATEGIES OF CYBERLOAFING AND PHUBBING WHICH AFFECT WORKPLACE DIGITAL TRANSFORMATION. *Московский экономический журнал*, (10), 430-446.
61. Ray, S., & Pal, R. P. (2022). IMPORTANCE OF ENTREPRENEURSHIP AND INNOVATION IN THE HEALTHCARE INDUSTRY DURING THE COVID-19 PANDEMIC. *Beneficium*, (2 (43)), 85-93.

European Economic Letters
ISSN 2323-5233
Vol 13, Issue 3 (2023)
https://doi.org/10.52783/eel.v13i3.607
http://eelet.org.uk

62. Samrat, R., Pratap, P. R., & Korchagina, E. V. (2022). WORLD ECONOMY AND INTERNATIONAL COOPERATION· МИРОВАЯ ЭКОНОМИКА И МЕЖДУНАРОДНОЕ СОТРУДНИЧЕСТВО.
63. Ray, S., & Pal, R. P. (2021). ARE WE TRANSFORMING OUR PAYMENT THROUGH INNOVATION IN FINTECH AND THE DIGITAL ECONOMY? PERSPECTIVES FROM ASIAN DRAMA IN FINTECH INNOVATION©.
64. Samrat, R. (2021). NEUROMARKETING EVIDENCES FROM THE ECONOMICS OF BOOKSELLERS ON THE STREETS: COVID-19 PERSPECTIVES AND IMPLICATIONS ON LUXURY BRANDS GLOBALLY. *Экономика и управление инновациями*, (2), 83-90.
65. Korchagina, E. V., & Ray, S. (2021). TRIPLE HELIX CONCEPT IN INNOVATIVE UNIVERSITY DEVELOPMENT MODEL.
66. Ray, S., & Pal, R. P. (2021). ARE WE TRANSFORMING OUR PAYMENT THROUGH INNOVATION IN FINTECH AND THE DIGITAL ECONOMY? PERSPECTIVES FROM ASIAN DRAMA IN FINTECH INNOVATION©.
67. Самрат, Р. (2021). НЕЙРОМАРКЕТИНГ В ЭКОНОМИКЕ КНИЖНЫХ МАГАЗИНОВ НА УЛИЦАХ: ПЕРСПЕКТИВЫ ГЛОБАЛЬНОГО ВЛИЯНИЯ COVID-19 НА ЛЮКСОВЫЕ БРЕНДЫ. *ЭКОНОМИКА И УПРАВЛЕНИЕ*, (2), 83-90.
68. Ray, S., Muhammad, G., & Adnan, M. The administrative role of principals: Insights and implication in secondary schools of.
69. Pradhan, D., Ray, S., & Dash, A. A Critical Review on Sustainable Development of Green Smart Cities (GSCs) for Urbanization. *communities (Fig. 1)*, *13*, 15.
70. Van Minh, N., Huu, N. N., & Ray, S. Responses of varied quinoa (Chenopodium quinoa Willd.) genotypes grown in Central Highlands, Vietnam.
71. Ray, S., Nikam, R., Vanjare, C., & Khedkar, A. M. Comparative Analysis Of Conventional And Machine Learning Based Forecasting Of Sales In Selected Industries.