

Analysis of Crypto-assets, Blockchain Investor Protection, and U.S. Market Risks using the Mlogit Classifier Model

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Abstract

We present insights into novel and complex issues regarding cryptocurrency activities, the related investor protection, and blockchain market risks. Crypto digital assets embody global economic ambition with their significant growth and creativity levels. This study employs a novel research approach using multinomial logit (mlogit) classifier modeling techniques to present unique findings regarding crypto-assets. The machine learning model confirmed better accuracy compared to previous research studies. These findings could contribute to a better understanding of the impact of business consumers on cryptocurrencies and blockchain used by business experts and policymakers worldwide. The research results should help future studies develop more machine learning models to ensure more accurate findings and discussions. The mlogit method research presented here confirms that business artificial intelligence methods and human domain knowledge interpretation can help current business leaders to better understand essential business decisions and their significant role in modern business behavioral prescriptive analytics. We derive important perspectives about cryptocurrency and blockchain strategy improvements, which may produce positive policy changes by enhancing the quality of investor protection in blockchain worldwide.

Keywords: Cryptocurrency, Consumer Risk, Investor Protection, Market Risk, Machine Learning,

Introduction

This study on consumer behaviors and market developments can provide relevant findings to understand issues, the blockchain market risks and challenges arising, and finally to develop evidence-based corporate policy. Therefore, this research study needs to be of value to business owners worldwide who wish to significantly improve their behavioral business crypto-assets insight for daily business blockchain strategy management decisions. Financial education in the United States plays a critical role in supporting financial consumers and investors understand key investing fundamentals, such as customer risk and return. The federal and state

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frameworks for crypto digital assets are very different and not fully established in the U. S. Given the rapidly changing nature of all cryptocurrencies, evaluating them is not a simple task. It may be helpful to study from the practices of current crypto participants. The U.S. federal government should also consider the significance of communicating the current applicable regulatory requirements to all market participants. Blockchain market risk is the highest and the most significant risk in the global market due to the factors that affect the entire market and digital assets. It is also known as undiversifiable market risk because it affects all digital assets and is unpredictable.

Research Questions & Hypothesis

RQ1: Does the understanding of crypto-assets help significantly predict cryptocurrency investor protection for business consumers in the U.S.?

H0: The understanding of crypto-assets does not significantly predict cryptocurrency investor protection for business consumers in the U.S.

H1: The understanding of crypto-assets significantly predicts cryptocurrency investor protection for business consumers in the U.S.

RQ2: Does the understanding of crypto-assets help consumer businesses in the U.S. significantly predict blockchain market risks?

H0: The understanding of crypto-assets does not significantly help U.S. consumer businesses predict blockchain market risks.

H1: An understanding of crypto-assets significantly helps U.S. consumer businesses predict blockchain market risks.

Literature Review

To apply effective cryptocurrency and blockchain strategy improvements first requires knowledge of the types of individuals who will utilize this investment strategy. Currently, Japan has the most open market for this type of investment (Kyzy, 2019). Researchers have identified the socio-demographic characteristics that individual cryptocurrency investors consistently show and how these elements impact their investment (Xi et al., 2020). These characteristics may change based on national character and interests (Fujiki, 2020). Researchers emphasize that successful investments are supported by knowledge of cryptocurrency markets, and an ideological motivation for participation (Ante, et al., 2022). The first decade of this investment type has illustrated worldwide dependency on the interconnected impact of the timing of prices, observed through Bitcoin's evolution (Sfitchi, 2018). This concept is known as financial literacy (Panos et al., 2020).

Those who are investing in this way must manage their expectation by understanding the limitations of the field. Ultimately, this type of investment is more insecure than others, which provides large opportunities along with large risks (Bellavitis et al., 2021). One current limitation of blockchain technologies is that they are more secure than cryptocurrency but less effective in distribution and prone to possible manipulation (Clayton, 2017; Kim Lee, 2018). These risks

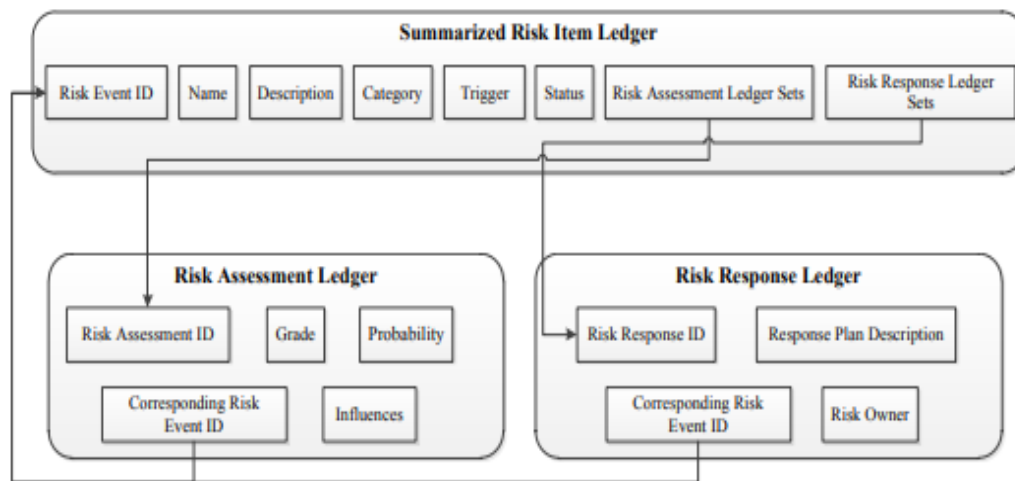
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could be significantly lowered by adopting eXtensible Business Reporting Language (XBRL), which has shown to increase reliability, reduce workflow, decrease human errors, and lower the risk of fraud (Monsteanu & Faccia, 2020). Blockchain was designed to enable the decentralization of data and can manage investor concerns of trust, identity, and privacy through its evolving architecture (Sharma et al., 2020).

Investor protection in cryptoasset investment is being proposed by policymakers who are familiar with the evolving market (Smith, 2019). One aspect that is key to this process is developing accurate standards for a market that is largely based on speculation (Massad, 2019). However, those who invest in this market may be resistant to its regulatory framework that could inhibit returns in non-traditional ways. Regulation is driven by the capacity for cryptocurrency to be used for financing illegal activity (Almaqableh et al., 2022; Murphy et al., 2015). Also, the banking industry supports regulation as cryptocurrency undermines its hold on financial management (Ng & Griffin, 2018). Those analyzing the value of regulation recommend the solution of point regulation as the most appropriate method (Demertzis & Wolff, 2018). One of the benefits of crypto-assets is that they are without borders, but governing bodies may want to limit this aspect through nationalistic-based regulation, especially in the European Union (EU) (Ferrari, 2020).

Blockchain risk reporting management activities are informed by an information control framework to help investors manage risk and expectation (Figure 1) (Ma et al., 2018). Assigning different blockchain investments with risk IDs may help track the lifespan of the investment. (Ma et al., 2018).

Figure 1
Summarized Risk Item Ledger



Source: Compiled by the author.

Analyzing the use of distributed ledgers (a distributed database) in blockchain investments, researchers discuss standardization protocols (Deshpande et al., 2017). Machine

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learning intelligent software that can follow these investments (especially in the context of the Internet of Things) is being developed to support privacy and success (Boussard et al., 2019). Ultimately the future of cryptocurrency is unknown because it will be set by the investors and those regulators who seek to control investment behavior (Ashoor & Sandhu, 2021).

While the market has contributed to the regulation of information and inflation of cryptocurrency assets, this may not always be the case (Shanaev et al., 2020). Having created the context for new investors and new spaces for investing, cryptocurrency may evolve beyond regulation capacities (Anders, 2021). This emerging market may therefore set new standards for investment possibilities in the future. (Ćosić & Čeh Časni, 2019).

Methodology: Research Design and Data Analysis Process

To examine the research question, a multinomial logistic regression will be conducted to investigate whether understanding crypto-assets significantly predict cryptocurrency investor protection. The multinomial logistic regression is an appropriate statistical analysis to use when the purpose of research is to assess if a set of nominal, ordinal, or interval/ratio predictor variables can predict a dependent variable with more than two levels. The sample size is 202 responses from the survey data collection instrument.

Multinomial logistic regressions, by design, overcome many of the restrictive assumptions of linear regression. For example, the normality and homoscedasticity of the residuals are not assumed. Logistic regression does require that there should be no multicollinearity among the independent variables. Multicollinearity will be assessed by calculating variance inflation factors (VIF). VIF values over 10 will suggest the presence of multicollinearity (Menard, 2009).

The model is the sum of two components: $U_j = V_j + \epsilon_j$.

Alternative l is chosen if:

(1)

$$\begin{cases} U_1 - U_l = (V_1 - V_l) + (\epsilon_1 - \epsilon_l) < 0 \\ U_2 - U_l = (V_2 - V_l) + (\epsilon_2 - \epsilon_l) < 0 \\ \vdots \\ U_J - U_l = (V_J - V_l) + (\epsilon_J - \epsilon_l) < 0 \end{cases}$$

Source: Hausman, J., & McFadden, D. (1984) Specification Tests for the Multinomial Logit Model

which implies, denoting $V_{lj} = V_j - V_l$

(2)

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$$\begin{cases} \epsilon_1^l = (\epsilon_1 - \epsilon_l) < -V_1^l \\ \epsilon_2^l = (\epsilon_2 - \epsilon_l) < -V_2^l \\ \vdots \\ \epsilon_J^l = (\epsilon_J - \epsilon_l) < -V_J^l \end{cases}$$

Source: Hausman, J., & McFadden, D. (1984) Specification Tests for the Multinomial Logit Model

The covariance matrix of the error differences is obtained using the following matrix:

$$V(\epsilon^l) = V(Ml\epsilon) = MlV(\epsilon)Ml^T = Ml\Omega Ml^T$$

The probability of choosing l

is then:

$$Pl = P(\epsilon_1^l < -V_1^l \& \epsilon_2^l < -V_2^l \& \dots \& \epsilon_J^l < -V_J^l)$$

with the hypothesis of distribution, which is written as:

$$Pl = \int_{-V_1^l - \infty}^{-V_1^l} \int_{-V_2^l - \infty}^{-V_2^l} \dots \int_{-V_J^l - \infty}^{-V_J^l} \phi(\epsilon^l) d\epsilon_1^l d\epsilon_2^l \dots d\epsilon_J^l$$

with:

$$\phi(\epsilon^l) = \frac{1}{(2\pi)^{(J-1)/2} |\Omega^l|^{1/2}} e^{-\frac{1}{2} \epsilon^l \Omega^l \epsilon^l}$$

Source: Hausman, J., & McFadden, D. (1984) Specification Tests for the Multinomial Logit Model

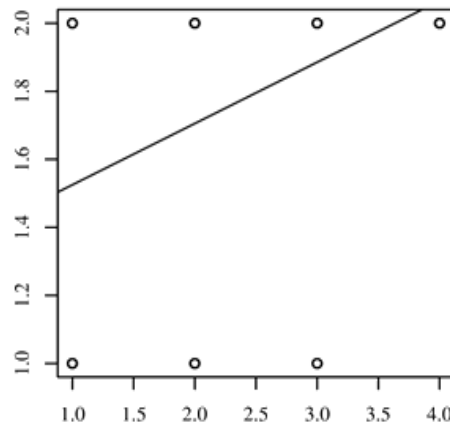
The overall model significance for the multinomial logistic regression will be examined by the collective effect of the independent variable(s) using the χ^2 omnibus test of model coefficients. McFadden's R^2 will be used to estimate the variability accounted for by the independent predictor variable. Individual predictors will be assessed by the Wald coefficient. Predicted probabilities of an event occurring will be determined by $\text{Exp}(B)$, the odds ratio. For significant predictors, an odds ratio greater than one indicates that for one unit in the independent variable, the dependent variable will be X times more likely to be coded 1. Significant predictors with an odds ratio less than 1 will be evaluated by $1/\text{Exp}(B)$, meaning that a one unit increase in the independent variable will be X times more likely to be coded 0.

A Spearman correlation analysis was conducted between q0006 and q0007. Cohen's standard was used to evaluate the strength of the relationship, where coefficients between .10 and

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.29 represent a small effect size, coefficients between .30 and .49 represent a moderate effect size, and coefficients above .50 indicate a large effect size (Cohen, 1988). A Spearman correlation requires that the relationship between each pair of variables does not change direction (Conover & Iman, 1981). This assumption is violated if the points on the scatterplot between any pair of variables appear to shift from a positive to negative or a negative to positive relationship. Figure 2 presents the scatterplot of the correlation. A regression line has been added to assist the interpretation.

Figure 2
Scatterplots with the Regression Line added for q0006 and q0007



Source: Compiled by the author.

Results

The result of the correlation was examined based on an alpha value of .05. A significant positive correlation was observed between q0006 and q0007, with a correlation of .42, indicating a moderate sized effect ($p < .001$, 95.00% CI = [.30, .53]). This suggests that as q0006 increases, q0007 tends to increase as well. Table 1 presents the results of the correlation.

Table 1

Spearman Correlation Results Between q0006_Ordinal.2 and q0007_Ordinal

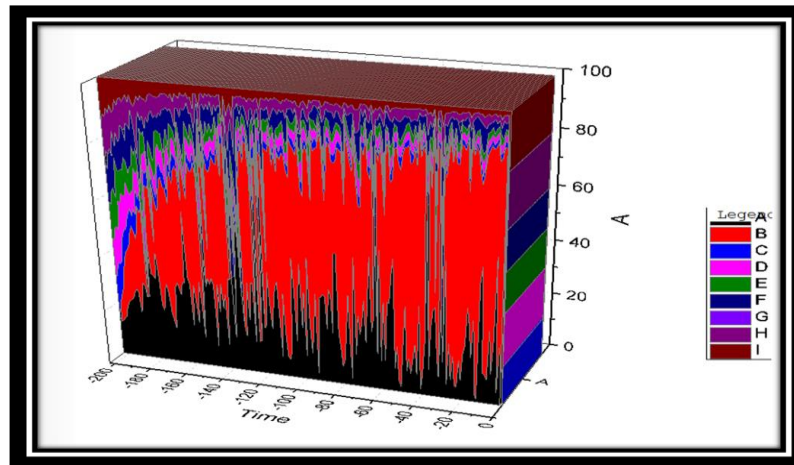
Combination	<i>r</i>	95.00% CI	<i>n</i>	<i>p</i>
q0006 & q0007	.42	[.30, .53]	202	< .001

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A binary logistic regression was conducted to examine whether “q0006” and “Respondent” had a significant effect on the odds of observing the “a. Don't Know” category of q0007. The reference category for q0007 was b. _____% [Free response – up to 1 decimal place allowed].

The assumption of absence of multicollinearity was examined. Variance Inflation Factors (VIFs) were calculated to detect the presence of multicollinearity between predictors. High VIFs indicate increased effects of multicollinearity in the model. VIFs greater than 5 are cause for concern, whereas VIFs of 10 should be considered the maximum upper limit (Menard, 2009). All predictors in the regression model have VIFs less than 10. Table 2 presents the VIF for each predictor in the model.

Figure 3



*Mlogit
Classifier
Model
Results in
3D graph*

Source:
Compiled

by the author

Table 2

Variance in Inflation Factors for q0006_Ordinal.2 and RespondentID

Variable	VIF
q0006	1.02
Respondents	1.02

Results

The model was evaluated based on an alpha of .05. The overall model was significant, $\chi^2(4) = 45.02, p < .001$, suggesting that q0006 and Respondents had a significant effect on the

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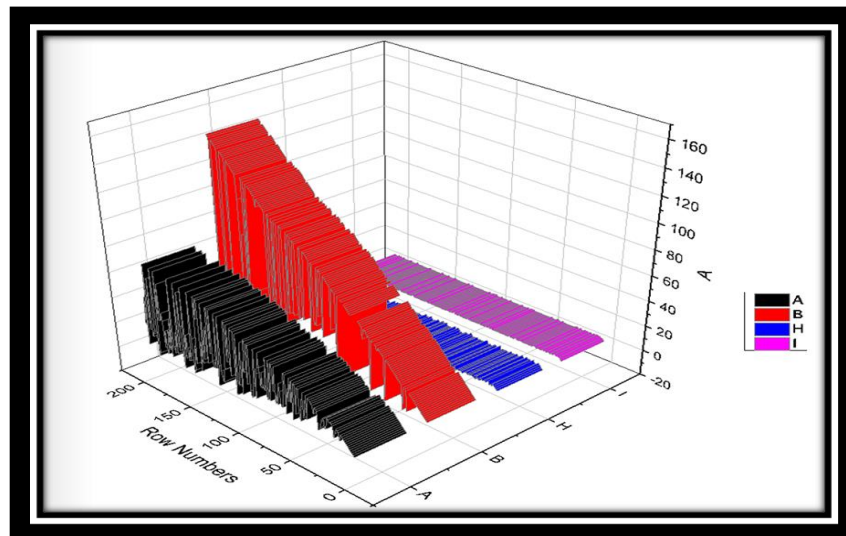
odds of observing the a. Don't Know category of q0007. McFadden's R-squared was calculated to examine the model fit, where values greater than .2 are indicative of models with an excellent fit (Louviere et al., 2000).

The McFadden R-squared value calculated for this model was 0.23. The effect of the b. To some extent category of q0006 was significant, $B = 1.73$, $OR = 5.66$, $p < .001$, indicating that observing the b. To some extent, category of q0006 increases the odds of observing the a. Don't Know category of q0007 by approximately 466.10% relative to the a. Very well category of q0006. The effect of the c. Not very well category of q0006 was significant, $B = 2.74$, $OR = 15.51$, $p < .001$, indicating that observing the c. Not very well category of q0006 increases the odds of observing the a. Don't Know category of q0007 by approximately 1,450.59% relative to the a. Very well category of q0006.

The effect of the d. Not at all category of q0006 was not significant, $B = 19.04$, $OR = 1.86 \times 10^8$, $p = .986$, indicating that observing the d. Not at all category of q0006 did not have a significant effect on the odds of observing the a. Don't Know category of q0007. The effect of the Respondents was not significant, $B = 5.60 \times 10^{-08}$, $OR = 1.00$, $p = .304$, indicating that Respondents did not have a significant effect on the odds of observing the a. Don't Know category of q0007. Table 3 summarizes the results of the regression model.

Figure 4

Mlogit Classifier Model Significance Results with 3D Graph Solution



Source: Compiled by the author.

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Table 3

Logistic Regression Results

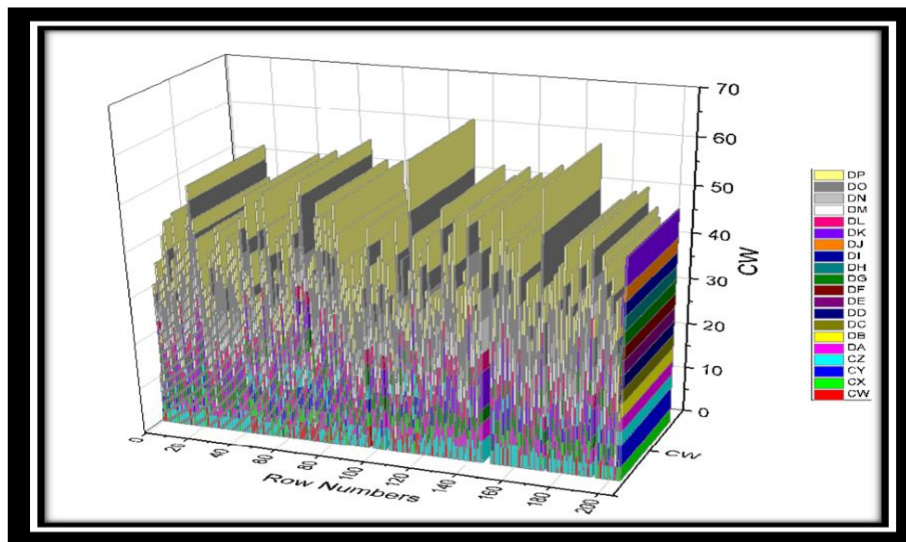
Variable	<i>B</i>	<i>SE</i>	χ^2	<i>p</i>	<i>OR</i>	95.00% CI
(Intercept)	-753.58	732.36	1.06	.303	-	-
2b. To some extent	1.73	0.49	12.35	< .001	5.66	[2.15, 14.89]
2c. Not very well	2.74	0.59	21.69	< .001	15.51	[4.89, 49.15]
2d. Not at all	19.04	1,058.10	0.00	.986	1.86×10^8	[0.00, Inf]
Respondents	5.60×10^{-08}	5.45×10^{-08}	1.06	.304	1.00	[1.00, 1.00]

Note. $\chi^2(4) = 45.02, p < .001, McFadden R^2 = 0.23.$

Results and Discussion

According to the findings, those who use cryptocurrencies as major payment tools, and have a superior understanding of the process of digital currencies, reduce the blockchain market risks and protect cryptocurrency investors. Most people create cryptocurrency accounts for investment purposes. We observe the increase of investors and sellers who prefer payments with cryptocurrency, and how this market situation will help digital assets become globally known across all-industry sectors. The customers prefer cryptocurrency payment methods when they know it is advantageous. Our model shows 86% accuracy; therefore, we can say that is reliable, and that we can trust our findings and contribution to blockchain market risks.

Figure 5
Accuracy of Mlogit Model with All Variables



Source: Compiled by the author.

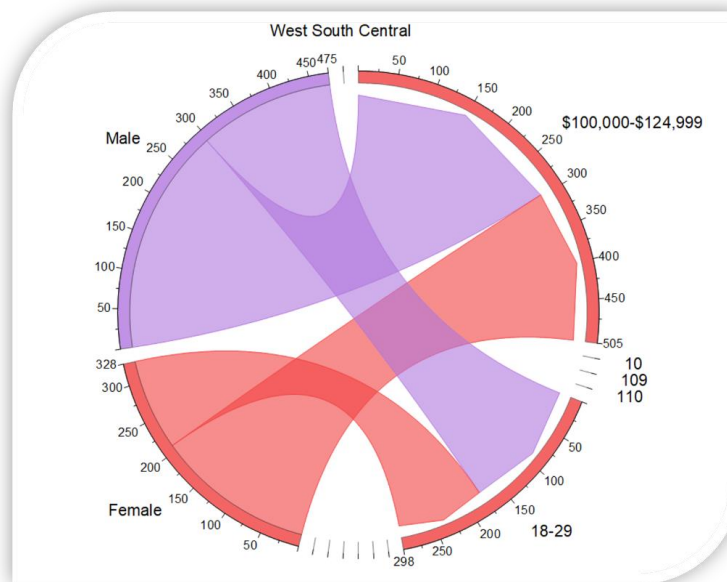
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We found that appropriate financial education will decrease the blockchain technology market risk on which crypto-assets are built and thereby increase transparency, immutability, and traceability trust information.

Conclusion and Recommendations

Our findings show that more federal laws and regulations should intervene with digital currency usage and that corporations offer who different payment methods increase customer satisfaction. The studies enable researchers to offer a better model about understanding cryptocurrency in the U.S. As a result of our analysis, we prove that the new modern machine learning modeling helps in understanding the cryptocurrency demand and provides data-driven insights to support business decisions. These digital assets could be implemented in credit cards and mortgage transactions. The integration will provide customers with many advantages; however, they must understand the cryptocurrency process with government education and its impact on taxes. Figure 6 shows of the undiscovered patterns of the survey respondents, namely most of our participants characteristics are: West South-Central Region, Male, Household Income Range \$100,000 - \$124,999

Figure 6
Survey Participants according to Gender, Age, Household Income and Region



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Digital transformation is a major trend, which not only changes traditional financial products and services, but leads to digital-driven modern technology in Fintech corporations. Effective financial education about consumer protection strategies are a critical component of the worldwide digitalization of financial products and services.

Digital assets policy makers have already raised concerns and issued warnings to the public about their varying approaches across different jurisdictions. We believe that this study supports global leadership in the fields of financial education and financial consumer protection and provides guidance on the practical implications of digital transformation to support policy makers around the world. The federal governors need to work with their Consumer Protection Agency to improve the financial knowledge all consumers and, at the same time, increase investor protection to reduce the blockchain market risk involved in this process.

The government should start conducting communication campaigns to alert consumers about the market risks of blockchain investor protection when dealing with overseas operators around the world. Our research indicates that many consumers are aware that they do not understand digital assets as “investment contracts” as defined by the Securities and Exchange Commission (SEC) , and are not aware of the significance of diversification when investing. A low level of understanding of cryptocurrencies by current and future consumers might lead to the increase of fraud cases and scams where consumers can be harmed by the cryptocurrency transactions without the required domain knowledge from reliable sources.

Policymakers around the world should work together to ensure they coordinate all consumer awareness insights about current blockchain technology and emerging challenges. The sharing of good practices and solutions, such as guidance and global standards, will lead to the establishment of consistent approaches to cryptocurrency transactions.

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