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ARTICLE

Option Pricing beyond Black-Scholes Model: Quantum Mechanics Approach

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ABSTRACT

Based on the analog between the stochastic dynamics and quantum harmonic oscillator, we propose a market force driving model to generalize the Black-Scholes model in finance market. We give new schemes of option pricing, in which we can take various unexpected market behaviors into account to modify the option pricing. As examples, we present several market forces to analyze their effects on the option pricing. These results provide us two practical applications. One is to be used as a new scheme of option pricing when we can predict some hidden market forces or behaviors emerging. The other implies the existence of some risk premium when some unexpected forces emerge.

1. Introduction

The option pricing is a crucial issue in finance. The Black-Scholes (BS) model gives a guideline to price options by the risk-free scheme, which assumes the portfolio satisfies the no-arbitrage condition, perfectly hedge, invariant interests, no transaction cost and the continuous evolution of prices [1]. However, recently one discovers that above assumptions cannot hold in the practical finance markets, such as inconstant the risk-free interest rate, or non-continuously evolution, and fluctuate volatility [2], which implies that the log return distribution (return is equal to the future price minus the original price) deviates normal (Guassian) distribution. These phenomena induce a lot of interests to modify the BS method [3-7]. Belal E. Baaquie proposed a path integral method to optimize the evaluation of path-dependent options [3]. By an elasticity variance model, Beni Lauterbach and Paul Schultz take the variant interest into account to give a new scheme of price [4]. Moreover, Louis O. Scott proved that the accurate option prices can be computed via Monte Carlo simulations when the variance changes randomly [4,5]. Interestingly, H. Kleinert and J. Korbel claimed that the prices of options can also be evaluated by the double-fractional differential equation and its solution provide a more reliable hedge comparing with BS formula [6]. Further, Lina Song and Weiguo Wang optimized the fractional BS Option pricing model by Finite Difference Method to give the solution of the difference equation [7]. More recently, Robert C. Merton generalized the stock return distribution to give an option pricing formula for the discontinuous returns [8]. Most importantly, considering the price distribution, R. N. Mantegna used Levy Walk

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instead of original random walk and he got a new price distribution deviating from normal distribution which can be applied into the BS Model [9]. These studies on the generalized BS model provide many ways to improve the BS model and to make the option price close the realistic finance market. In fact, there exist some hidden market forces, such as shorting or buying an underlying asset in finance market, which drive the dynamics of finance market and make the stochastic process of the finance market deviate Guassian distribution. This non-Guassian effect should modify the option pricing. Therefore, in this paper, we will propose the market-force concepts to describe the stochastic dynamics of finance market based on the quantum mechanics approach. The stochastic dynamics of finance market is described by the wave function, which follows the Schr¨odinger equation. The hidden market forces as the market potential driving the stochastic dynamics of finance market, which make the dynamics deviate the Guassian process and modify the BS model which give several schemes of option pricing. In Sec. II, we present the market-force model of option pricing based on quantum mechanics. In Sec. III, we propose several schemes of option pricing based on this model and discuss their advantages and financial meanings. Finally, we give the summary and conclusions in Sec. IV.

2. Market Force Model of Stochastic Dynamics

2.1 Black-Scholes Model

The dynamics of finance market is a stochastic process. The efficient market theory assumes that there does not exist the arbitrage space, which implies that the stochastic dynamics process is a Guassian process. The option pricing of the BS theory is based on the efficient market theory and the scheme of option pricing is assumed to be risk free. The European call and put options are priced by

$$c = S_0 N(d_+) - K e^{-rT} N(d_-) \qquad (1)$$

$$p = K e^{-rT} N(-d_-) - S_0 N(-d_+) \ , \qquad (2)$$

where

$$N(d_\pm) = \frac{\ln\left(\frac{S_0}{K}\right) + (r \pm \sigma^2/2)T}{\sigma\sqrt{T}} \qquad (3)$$

and $d_- = d_+ - \sigma\sqrt{T}$. S_0 is the current price of stock or asset and their corresponding delivery (strike) price K if the option is exercised. r is the risk-free rate and σ is the volatility of asset. T is the time to maturity of the option. $N(d_\pm)$ is the cumulative distribution function, which is expressed as

$$N(d_\pm) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{d_\pm} e^{-\frac{x^2}{2}} dx \ , \qquad (4)$$

where $N(d_-)$ is the probability for the call option exercised in a risk-free world. The expression $S_0 N(d_+) e^{-rT}$ is the expected stock price at time T in a risk-free world when stock prices less than the strike price are counted as zero.

It can be seen that the cumulative distribution function plays a role of probability in the risk-free market. When we consider a finance market driven by some market force, shorting or buying, the Guassian probability distribution of $N(d_\pm)$ can be generalized to non-Guassian probability distribution. We look for some hints from quantum mechanics how option pricing work in a non-Guassian dynamics.

2.2 Analog between Finance Market and Quantum Harmonic Oscillator

In general, the evolution of finance market is a stochastic dynamical process. The BS theory provides an option pricing scheme in a risk-free world, which implies that the dynamical process of finance market is a Guassian process. In quantum world the quantum state emerges also by a stochastic dynamics, in which the probability density is expressed in terms of the norm of wave function. The wave function evolution is driven by the Schr¨odinger equation. Therefore, we can find an analog between the finance market and quantum mechanics.

(1) The finance market corresponds to quantum bounded systems.

(2) The stochastic dynamics of finance market corresponds to the dynamics of quantum bounded systems.

(3) The hidden shorting or buying in finance market corresponds to the intrinsic force or potential in quantum bounded systems.

(4) The integrand function $\frac{1}{\sqrt{2\pi}} e^{-x^2/2} \equiv P_{BS}(x)$ of $N(d_\pm)$ corresponds to the probability density $P(x) = |\psi|^2$ of the quantum bounded systems. Further, the BS model corresponds to the ground state of quantum harmonic oscillator, namely, $P_{BS}(x) = P_{g,HO}(x)$. (See the following demonstration)

(5) The cumulative distribution function of the Black-Scholes model can be written as

$$N(d_\pm) = \int_{-\infty}^{d_\pm} P_{BS}(x)\,dx = \int_{-\infty}^{d_\pm} P_{g,HO}(x)\,dx. \qquad (5)$$

This analog between finance market and quantum me-

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chanics provides a way to modify the integrand function .of the BS model and give some new schemes of option pricing. Notice that this integrand function has the same form of the ground state wave function of quantum harmonic oscillator, we start from the one-dimensional quantum harmonic oscillator. The potential of the harmonic oscillator is

$$V(x)=\frac{1}{2}m\omega^2x^2 \tag{6}$$

and the Hamiltonian of the quantum harmonic oscillator is given by [12]

$$\hat{H}_0=-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}+\frac{1}{2}m\omega^2x^2\ . \tag{7}$$

The stationary Schr¨odinger equation is written as

$$\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2}+\left(E-\frac{m\omega^2}{2}x^2\right)\psi=0\ . \tag{8}$$

The wave function in the ground state can be solved [12]

$$\psi_{g,HO}(x)=\left(\frac{\alpha}{\sqrt{\pi}}\right)^{1/2}e^{-\alpha^2x^2/2}\ , \tag{9}$$

where $\alpha=\sqrt{\frac{m\omega}{\hbar}}$. For convenience we set $\alpha=\frac{1}{\sqrt{2}x_0}$, where $x_0=1$ for the dimensional consistency with *x*, we may redefine the variable $x\equiv x/x_0$ to a dimensionless variable such that the probability density in the ground state

$$P_{g,HO}(x)=\frac{1}{\sqrt{2\pi}}e^{-x^2/2}=P_{BS}(x). \tag{10}$$

Therefore, the ground state of quantum harmonic oscillator corresponds to the BS model. This correspondence between finance market and quantum harmonic oscillator provides a way to generalize the Black-Scholes model based on quantum mechanics approach. When we add some forces to generalize the quantum harmonic oscillator, the wave function in the ground state and its corresponding probability density deviates the Guassian form. This infers that some market forces emergence makes the finance market deviate the Guassian process and modify the BS option pricing.

The finance market force is defined by

$$F=-\frac{dV(x)}{dx}\ , \tag{11}$$

where $V(x)$ is the potential of the bounded system. General speaking, force describes any local or individual behavior making finance market deviate the equilibrium state, while potential describes the global effect induced from these local or individual behaviors. Thus, the finance market force describes the behaviors of shorting or buying the underlying asset or any economic news and psychological behaviors in finance market. $F=-\frac{dV(x)}{dx}>0$ means any market force pushing the asset or stock price high. $F=-\frac{dV(x)}{dx}<0$ means any market resistance bringing down the asset or stock price.

It should be pointed out that the finance market forces we introduce from quantum mechanics will modify the option pricing from two ways. One is to modify $P_{g,HO}(x)$, which means to modify $P_{BS}(x)$ and the cumulative distribution function, the other is to modify the volatility σ because the force drives the probability distribution deviating from the Guassian distribution. The effective volatility can be obtained by

$$\sigma_{eff}=\sigma\sigma_{QM}\ , \tag{12}$$

where $\sigma_{QM}=\sqrt{\langle x^2\rangle_{QM}-\langle x\rangle_{QM}^2}$ and $\langle f(x)\rangle_{QM}=\int f(x)P_{QM}dx$ with $P_{BS}(x)$ being the probability density from quantum mechanics. The volatility σ_{QM} in the BlackScholes formula (1) is 1 for the standard Guassian distribution.

In principle, we can design different forces to study or describe different market behaviors and modify the option pricing. When the force vanishes $F=1$, the quantum system reduces to the harmonic oscillator and our model reduces to the Black-Scholes Model. Thus, the standard harmonic oscillator potential $\frac{1}{2}m\omega^2x^2$ can be regarded as the natural boundary condition of finance market.

Based on this analog between the finance market and quantum harmonic oscillator, we can take different forces into account for the harmonic oscillator to generalize the BS option pricing for understanding their financial meaning.

3. Market Forces and Option Pricing

3.1 Constant Forces

Let us consider the market force be a constant *F*=-*k*. It corresponds to the potential

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$$V_k(x) = kx, \tag{13}$$

where $0 < k \ll 1$ is a small parameter describing the strength of the potential. Thus, the Schr¨odinger equation of the harmonic oscillator system with a linear potential can be written as

$$\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2} + \left(E - \frac{m\omega^2}{2}x^2 + kx\right)\psi = 0. \tag{14}$$

By solving the Schr¨odinger equation, we obtain the solution of the wave function in the ground state

$$\psi_g(x) = \left(\frac{1}{\sqrt{2\pi}}\right)^{1/2} e^{-(x-x_k)^2/4}, \tag{15}$$

where $x_k = \frac{k}{m\omega^2}$. The probability density defined by $P_k(x) = |\psi_k|^2$ can be given by

$$P_k(x) = \frac{1}{\sqrt{2\pi}} e^{-(x-x_k)^2/2}, \tag{16}$$

where x and x_k should be viewed as dimensionless variables. Using the corresponding relation in Eqs. (5) and (10) the probability density in (16) is viewed as the integrand function of a generalized BS model, namely $P_k(x) := P_{GBS}(x)$. The peak of the probability density is shifted to x_k, which is shown in Figure1(a). We plot numerically the call option price versus the shift x_k in Figure 1(b).

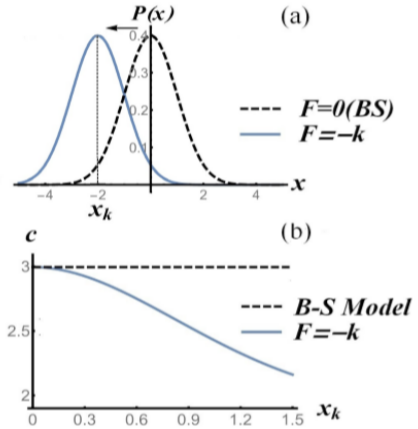

FIG. 1. (Color online)(a) Comparison of the probability densities $P(x)$ between the normal and the force-driven probability densities. The solid line of the probability density driven by a constant force and its shift depends on the strength of force k. (b) The dashed line is the option price for $F = 0$ (Black-Scholes model) The solid line is the option price modified by a constant force case $F < 0$. The variance of call option price along with x_k. The parameters we use are $r = 10\%$, $S_0 = 20$, $K = 20$, $T = 1$year and $\sigma = 25\%$.

It can be seen from Figure 1(a) that the shape of the probability density does not change and it moves to the left for the constant market force F<0. Similarly, it will move to the right for F>0. From the financial point of views, F<0 means that there exists shorting the asset in finance market and F>0. means buying behaviors in finance market. The option prices are shown in Figure 1(b), in which the dashed line is the option price for F=0. (the BS model) and the solid line for the constant force case F<0. When the force increases with k the call option price should decrease monotonically with k for F<0. It matches the market behavior that sorting the underlying asset will reduce its call option price. Similarly, it should increase with k for F>0.

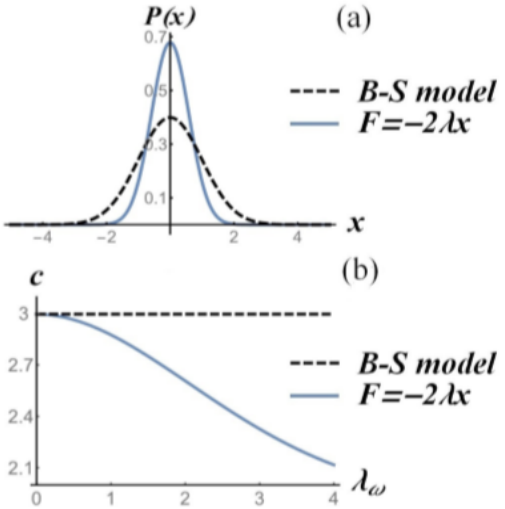

FIG. 2. (Color online)(a) Comparison of the probability densities $P(x)$ between the normal and the force-driven probability densities. The solid line of the probability density driven by a $-2\lambda x$ force. The volatility vary with the strength of force λ. (b) The dashed line is the option price for $F = 0$ (Black-Scholes model) The solid line is the option price modified by the force. The parameters we use are $r = 10\%$, $S_0 = 20$, $K = 20$, $T = 1year$ and $\sigma = 25\%$.

3.2 Linear Forces

When we consider the market force being proportional to x, F=-2λx , which induces the potential in finance market

$$V_\lambda(x) = -\lambda x^2, \tag{17}$$

where $0 < \lambda \ll 1$. The Schr¨odinger equation of the harmonic oscillator system with a quadratic potential can be written as

$$\frac{\hbar^2}{2m}\frac{d^2\psi}{dx^2} + \left(E - \frac{m\omega^2}{2}x^2 - \lambda x^2\right)\psi = 0. \tag{18}$$

Note that two potential terms are quadratic, by the standard quantum mechanical approach,[12] we introduce a

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λ-dependent parameter, $\alpha_\lambda = \sqrt{\frac{m\omega_\lambda}{\hbar}}$ with $\omega_\lambda = \sqrt{\frac{k+2\lambda}{m}}$ where k is the elastic constant of the harmonic oscillator model. The wave function in the ground state can be obtained by

$$\psi_g(x) = \left(\frac{\alpha_\lambda}{\sqrt{2\pi}}\right)^{1/2} e^{-\alpha_\lambda^2 x^2/2}. \qquad (19)$$

where we keep $\alpha_\lambda x$ is a dimensionless variable. Approximately, we have $\alpha_\lambda \approx \alpha(1+\frac{\lambda}{2k})$. Thus, the probability density is given by

$$P_\lambda(x) = \frac{\alpha_\lambda}{\sqrt{2\pi}} e^{-\alpha_\lambda x^2} \approx \alpha_\lambda e^{-\lambda x^2/8k} P_{BS}(x), \qquad (19)$$

where x returns to a dimensionless variable with neglecting x_0. It can be seen that the linear force modifies the probability density, namely generalizing the integrand function of the BS model.

Figure 2 (a) shows the comparison of the probability densities (the integrand function) between the standard BS model and the generalized harmonic oscillator with the linear force as a generalized BS model. It can be seen that the force modifies the peak height and the volatility of the probability density such that the option prices vary with the force strength seen in Figure 2 (b).

3.3 x^2 Forces

For the market force $F = -3\beta x^2$, which induces the potential in finance market

$$V_\beta(x) = \beta x^3. \qquad (20)$$

For small β, we use the perturbation method to obtain approximately the wave function in the ground state of the system (see Appendix A). The Hamiltonian of the system can be written as

$$\hat{H} = \hat{H}_0 + V_\beta(x). \qquad (20)$$

where $\hat{H}_0$ is the Hamiltonian of the harmonic oscillator in (7). We can give the first-order approximation solution of the wave function in the ground state by the perturbative method (see Appendix C)

$$\psi_\beta(x) = \frac{C_\beta e^{-x^2/4}}{(2\pi)^{1/4}}\left[1-\eta_\beta\left(2x+\frac{1}{3}x^3\right)\right], \qquad (21)$$

where $C_\beta = \left(1+\frac{29}{3}\eta_\beta^2\right)^{-1/2}$ is the normalized constant. $\eta_\beta = \frac{\beta x_0^3}{\hbar\omega}$ and $0 < \eta_\beta < 1$ can be viewed as a dimensionless small parameter. x in (21) is a dimensionless variable with neglecting x_0. Similarly, the probability density is given by

$$P_\beta(x) = P_{BS}(x) C_\beta^2 \left[1-\eta_\beta\left(2x+\frac{1}{3}x^3\right)\right]^2 \qquad (22)$$

It can be seen that the integrand function of the BS model is generalized to (22) based on the x^2-dependent force model. We plot the probability density versus β in Figure 3(a) and the corresponding call option price in Figure 3(b).

We can see from Figure 3(a) that the main peak moves to right. As β increase a sub-peak appears. This phenomenon can be interpreted by the collective effect in finance market in the natural boundary condition. Figure 3(b) shows the option price with β. As β increases the option price goes down with shorting force, which matches our expectation.

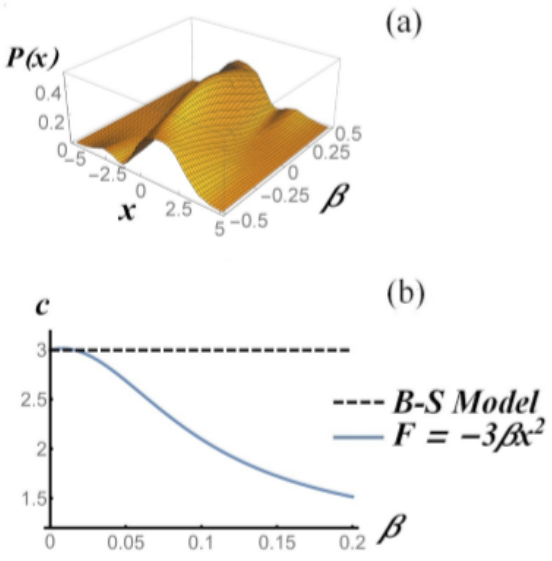

FIG. 3. (Color online)(a) The probability density versus β When $\beta = 0$ it reduces the normal distribution assumed in Black-Scholes Model. (b) The call option price versus β. The parameters we use are $r = 10\%$, $S_0 = 20$, $K = 20$, $T = 1year$ and $\sigma = 25\%$.

3.4 x^3 Forces

Further we can consider the market force $F = -4\gamma x^3$, which induces the potential in finance market

$$V_\gamma(x) = \gamma x^4. \tag{23}$$

The Hamiltonian for this case can be written as

$$\hat{H} = \hat{H}_0 + V_\gamma(x). \tag{24}$$

Similarly, for small γ, by the perturbative method we can obtain the first-order approximate solution of the wave function in the ground state. The solution of wave function in the first-order approximation can be given by (see Appendix C)

$$\psi_\gamma(x) = \frac{C_\gamma e^{-x^2/4}}{(2\pi)^{1/4}}\left[1+\xi_\gamma\left(\frac{9}{4}-\frac{3}{2}\left(\frac{x}{x_0}\right)^2-\frac{1}{4}\left(\frac{x}{x_0}\right)^4\right)\right], \tag{24}$$

where $C_\gamma = \left(1+\frac{39}{2}\xi_\gamma^2\right)^{-1/2}$ is the normalized constant. $\xi_\gamma = \frac{\gamma x_0^4}{\hbar\omega}$ and $0<\xi_\gamma<1$ can be viewed as a dimensionless small parameter. Similarly, x in (24) is a dimensionless variable with neglecting x_0. By the same way, the probability density is obtained by

$$P_\gamma(x) = P_{BS}(x)C_\gamma^2\left[1+\xi_\gamma\left(\frac{9}{4}-\frac{3}{2}\left(\frac{x}{x_0}\right)^2-\frac{1}{4}\left(\frac{x}{x_0}\right)^4\right)\right]^2, \tag{25}$$

Thus, we obtain the integrand function of the BS model generalized from the x^3-dependent force model.

In Figure 4(a), we plot the probability density versus γ and the corresponding call option price shown in Figure 4(b). It should be noticed that the finance market depends on both γ and x shown in Figure4(a). For γ>0, F<0 means that the force is resistant for x>0 and the force is active for x<0. For γ<0, F>0 means that the force is active for x<0 and the force is resistent for x>0. As |λ| increases, the original price could be unstable and there exist two symmetric attractors, which push price either up or down. Figure 4(b) shows the call option price versus γ. The call option price shows a minimum at $\gamma \approx 0.063$ and a maximum at $\gamma \approx -0.14$. When the price distribution becomes less homogeneous, the call option price will be lower. This perfectly matches the realistic situation that the less fluctuate price of underlying assets leads to a lower call option price. Furthermore, we can also apply this method to solve any other polynomial boundary conditions. For an arbitrary condition, we can expand the function with Taylor series and we can analyze the change of the call option price to an arbitrary hidden market force.

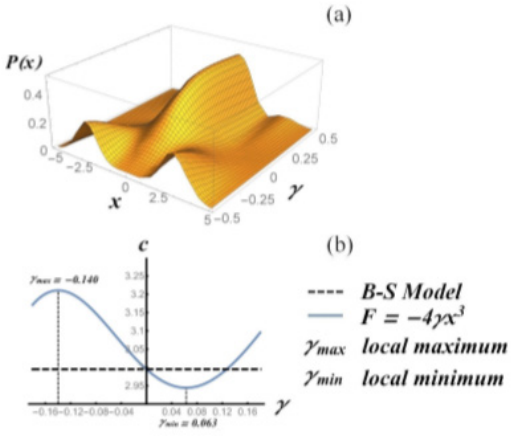

FIG. 4. (Color online)(a) The probability density versus γ When $\gamma = 0$ it reduces the normal distribution assumed in Black-Scholes Model. (b) The call option price versus γ. The plot we use $r = 10\%$, $S_0 = 20$, $K = 20$, $T = 1year$ and $\sigma = 25\%$.

3.5 Quantum Well

In finance market, if a company does not want its Underlying Asset price lower than S_n, it is equivalent to exist a boundary condition that makes the dealing of its asset stop. From the quantum mechanics point of view, we may set up a quantum well model to simulate this behavior. The potential of quantum well is [12]

$$V(x) = \begin{cases} 0 & for\ |x| < a \\ \infty & for\ |x| \geq a \end{cases} \tag{26}$$

where $a \propto \Delta S$. It implies when $x \leq X_n$ $(X_n \propto S_n - S_0)$ the finance market is in the normal state and the market will stop if some unexpected forces make the Underlying Asset price going beyond the lower or upper bound, namely lower than $S_0 - \Delta S$ or higher than $S_0 + \Delta S$. $|a|$ can be regarded as a boundary of finance market. The solution of wave function in ground state is obtained [12]

$$\psi_{QW}(x) = \frac{1}{\sqrt{a}}\sin\left[\frac{\pi}{2a}(x+a)\right], \quad x \in [-a,+a] \tag{27}$$

The probability density is expressed

$$P_{QW}(x) = \begin{cases} \frac{1}{a}\sin^2\left[\frac{\pi}{2a}(x+a)\right], & x \in [-a,+a] \\ 0, & x \in (-\infty,-a)\cup(a,\infty) \end{cases} \tag{28}$$

Since the boundary of the well prevents neither the underlying price increasing too very high nor decreasing too very low, the whole distribution will be squeezed within $-a<x<a$. The probability of the future underlying price still near current price significantly increases, but when

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$x \to \pm a$, the probability decreased below the normal distribution seen in Figure 5(a). By plugging the distribution function in Eq. (29), we can plot the c versus λ curve for the call option price with a. The figure 5(b) shows that when $a < 0.3$, the original price does not change. The call option price is equal to $S_0 - Ke^{-rT}$. As a increases the call option price will also increase. This result shows that as the price distribution becomes more homogeneous, the call option will be more expensive, which matches the realistic situation.

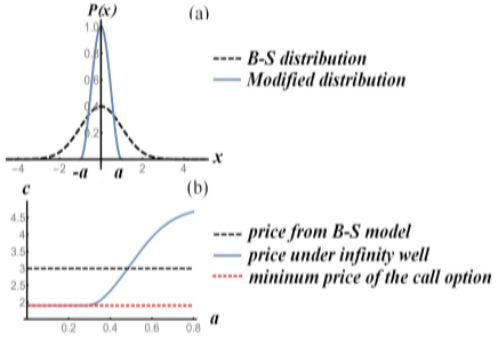

FIG. 5. (Color online)(a) Comparison of Probability Densities between the normal distribution and distribution in quantum well. $P(x)$: The half width of modified distribution is the half width between two barriers (infinity wells). Practical meaning of a is the width of price range for the underlying asset. (b) The call option price change along with a. We use $r = 10\%$, $S_0 = 20$, $K = 20$, $T = 1year$ and $\sigma = 25\%$. If there is no arbitrary chance, call option price should be no less than $S_0 - Ke^{-rT}$ which is regarded as the minimum price for call options.

As illustrative examples here we present the call option pricing based on this framework. Similarly, we can also give the modification of the put option pricing in the practical application.

4. Conclusion

The BS model gives a scheme of option pricing based on the risk-free, efficient market hypothesis and the standard Guassian stochastic dynamics of finance market. In the realistic finance market there exist various unpredictable factors, such as abnormal shorting or buying some assets, some rules or policy changes, some unexpected news and some psychological features of investors, which could break the efficient market hypothesis making the stochastic dynamics deviate from the standard Guassian stochastic dynamics of finance market. How do we take these factors into account to generalize the Black-Scholes model for the option pricing becomes a practical problem. We discover the analog between the Guassian stochastic dynamics and the probability density of the ground state of quantum harmonic oscillator. We propose a market force model to simulate various unpredictable market behaviors to modifying the Guassian dynamics based on quantum mechanics approach. Based on this model we give a new scheme of option pricing for various unpredictable market behaviors. The option pricing based on quantum mechanics provides a more systematic and explicit way to generalize the Guassian probability distribution for the BS model than other approaches [9].

As examples, we present several market forces to generalize the BS model and turn out their corresponding option pricing. In principle, we can generalize further this method to more complicated forces driving the finance market because any form of forces or potentials as a function of x can be expanded by Taylor series. By the perturbation method we can calculate arbitrary-order approximation of wave function based on the quantum mechanics approach. On the other hand, we can also generalize the one-dimensional oscillator to the multi-dimensional oscillators, which covers various market forces and their interactions which could modify the option pricing. This study on the option pricing provides two practical hints. One is that as a new scheme of option pricing we can modify the pure BS model-based option pricing when we can predict some unexpected force emergence. The other is that when one cannot predict these unexpected forces appearing. The prediction of the option pricing based on this scheme provides some risk premium.

5. Appendix

5.1 The Quantum Harmonic Oscillator

The Hamiltonian of the quantum harmonic oscillator is given by

$$\hat{H}_0 = -\frac{\hbar^2}{2m}\frac{d^2}{dx^2} + \frac{1}{2}m\omega^2 x^2. \tag{29}$$

The eigen wave function can be obtained by the standard quantum mechanical approach, [12]

$$\psi_n(x) = \left(\frac{\alpha}{\sqrt{\pi}2^n n!}\right)^{\frac{1}{2}} e^{-\frac{\alpha^2 x^2}{2}} H_n(\alpha x), \tag{30}$$

where $\alpha = \sqrt{\frac{m\omega}{\hbar}}$. $H_n(\alpha x)$ is the Hermit polynormal function. The corresponding eigen energies are

$$E_n = \hbar\omega\left(n + \frac{1}{2}\right), \tag{31}$$

where $n = 0, 1, 2, \cdots$.

5.2 The Perturbative Method

The eigen energies by the non-degenerate perturbation method are given by [12]

$$E_n = E_n^{(0)} + H_{nn}^{'} + \sum_{m\neq n} \frac{\left|H_{nm}^{'}\right|^2}{E_n^{(0)} - E_m^{(0)}} + \cdots, \tag{32}$$

and their corresponding wave functions are obtained by

$$\psi_n = \psi_n^{(0)} + \sum_{m\neq n} \frac{H_{nm}^{'}}{E_n^{(0)} - E_m^{(0)}} \psi_m^{(0)} + \cdots, \tag{33}$$

where $H_{nm}^{'} = \langle \psi_n | H^{'} | \psi_m \rangle$ is the matrix element of the perturbative Hamiltonian.

5.3 The Perturbative Wave Function in the Ground State of Harmonic Oscillator

The wave function in the ground state of the harmonic oscillator can be given by

$$\psi_g(x) = \left(\frac{\alpha}{\sqrt{\pi}}\right)^{1/2} e^{-\alpha^2 x^2/2}. \tag{34}$$

For convenience, we introduce the annihilation and creation operators in the Fock space, respectively [12],

$$\hat{a} = \frac{\alpha}{\sqrt{2}}\left(x + \frac{i}{\alpha^2}\hat{p}_x\right) \tag{35}$$

$$\hat{a}^{\dagger} = \frac{\alpha}{\sqrt{2}}\left(x - \frac{i}{\alpha^2}\hat{p}_x\right). \tag{36}$$

The occupation number representation of the position and momentum operators are given by

$$x = \frac{1}{\sqrt{2}\alpha}\left(\hat{a} + \hat{a}^{\dagger}\right) \tag{37}$$

$$\hat{p}_x = \frac{1}{i\sqrt{2}\alpha}\left(\hat{a} - \hat{a}^{\dagger}\right). \tag{38}$$

Note that the commutative relations of the creation and annihilation operators are $\left[\hat{a}, \hat{a}^{\dagger}\right] = 1$ and $\left[\hat{a}, \hat{a}\right] = \left[\hat{a}^{\dagger}, \hat{a}^{\dagger}\right] = 0$, they apply on the occupation-number states and satisfy the following equations [12],

$$\hat{a} \mid n\rangle = \sqrt{n} \mid n-1\rangle \tag{40}$$

$$\hat{a}^{\dagger} \left|n\right\rangle = \sqrt{n+1} \left|n+1\right\rangle, \tag{41}$$

where the occupation-number states satisfy the orthonormal relation $\langle n|m\rangle = \delta_{nm}$.

Case 1: x^2 forces

The perturbation Hamiltonian is given by

$$\hat{H}^{'} = \beta x^3 = \frac{\beta}{2\sqrt{2}\alpha^3}\left(\hat{a} + \hat{a}^{\dagger}\right)^3. \tag{42}$$

The perturbation matrix elements in the ground state are expressed as

$$H_{0m}^{'} = \langle 0|H^{'}|m\rangle = \frac{\beta}{2\sqrt{2}\alpha^3}\langle 0|\left(\hat{a} + \hat{a}^{\dagger}\right)^3|m\rangle. \tag{43}$$

Note that $\langle 0|\left(\hat{a} + \hat{a}^{\dagger}\right)^3|m\rangle = 3\langle 0|m-1\rangle + \sqrt{6}\langle 0|m-3\rangle$, by using formula in Eq. (32), the wave function in the ground state can be given by

$$\psi_{\beta}(x) = \psi_0^{(0)}(x) - \eta_{\beta}\left(3\psi_1^{(0)}(x) + \frac{\sqrt{6}}{3}\psi_3^{(0)}(x)\right), \tag{44}$$

where $\eta_{\beta} = \frac{\beta x_0^3}{\hbar\omega}$. Note that the Hermit polynormal functions are $H_1(x) = 2x$, and $H_3(x) = 8x^2 - 12x$, the wave function can be expressed as

$$\psi_{\beta}(x) = \frac{C_{\beta} e^{-x^2/4}}{(2\pi)^{1/4}}\left[1 - \eta_{\beta}\left(2x + \frac{1}{3}x^3\right)\right], \tag{45}$$

where $C_{\beta} = \left(1 + \frac{29}{3}\eta_{\beta}^2\right)^{-1/2}$ is the normalized constant.

Case 2: x^3 forces

The perturbation Hamiltonian is given by

$$\hat{H}^{'} = \gamma x^4 = \frac{\gamma}{4\alpha^4}\left(\hat{a} + \hat{a}^{\dagger}\right)^4. \tag{46}$$

and the perturbation matrix element in the ground state is expressed as

$$H_{0m}^{'} = \langle 0|H^{'}|m\rangle = \frac{\gamma}{4\alpha^4}\langle 0|\left(\hat{a} + \hat{a}^{\dagger}\right)^4|m\rangle. \tag{47}$$

Similarly, we have

$$\langle 0|\left(\hat{a} + \hat{a}^{\dagger}\right)^4|m\rangle = 3\langle 0|0\rangle + 6\sqrt{2}\langle 0|m-2\rangle + 2\sqrt{6}\langle 0|m-4\rangle.$$

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Similarly, by using formula in Eq. (32), the wave function in the ground state can be given by

$$\psi_\gamma(x)=\psi_0^{(0)}(x)-\xi_\gamma\left(3\psi_2^{(0)}(x)+\frac{\sqrt{3}}{2}\psi_4^{(0)}(x)\right), \qquad (48)$$

where $\xi_\gamma=\frac{\gamma x_0^4}{\hbar\omega}$. Note that the Hermit polynormal functions are $H_2(x)=4x^2-2$, and $H_4(x)=16x^4-48x^2+12$, the wave function can be expressed as

$$\psi_\gamma(x)=\frac{C_\gamma e^{-x^2/4}}{(2\pi)^{1/4}}\left[1+\xi_\gamma\left(\frac{9}{4}-\frac{3}{2}\left(\frac{x}{x_0}\right)^2-\frac{1}{4}\left(\frac{x}{x_0}\right)^4\right)\right], \qquad (49)$$

where $C_\gamma=\left(1+\frac{39}{2}\xi_\gamma^2\right)^{-1/2}$ is the normalized constant.

References

[1] F.Black, M.Scholes. The Pricing of Options and Corporate Liabilities, Journal of Political Economy, 1973, 63759.

[2] J.C.Hull. Options, futures, and other Derivatives the 10th Edition, Pearson, 2011: 320-323.

[3] B. E. Baaquie. Quantum Finance, 2004, 316: 78-115.

[4] Lauterbach, Beni. Schultz, Paul, Journal of Finance, 1990, 45: 1181-1209.

[5] Scott, Louis O. Option Pricing when the Variance Changes Randomly: Theory, Estimation, and an Application, 1987, 22: 419-438.

[6] Kleinert, H., Korbel, J. Physica. A Statistical Mechanics & Its Applications, 2016, 449: 200-214.

[7] Song, Lina, Wang, Weiguo. Abstract & Applied Analysis, 2013, 1-16.

[8] Merton, Robert C., J. Financial Economics, 1976, 3: 125-144.

[9] Mantegna, Rosario Nunzio, Physica A. Statistical Mechanics & Its Applications, 1991,179: 232.

[10] B. E. Baaquie. Quantum Finance, 2004, 316: 76-77.

[11] B. E. Baaquie. Quantum Finance, 2004, 316: 73-76.

[12] W. Greiner. Quantum mechanics: An introduction, Springer, 2001.

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ARTICLE

Impacts of Foreign Direct Investment on Economic Growth in the East African Community (EAC): Empirical Evidence from Burundi

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ABSTRACT

This study analyzes how Foreign Direct Investment affects the rate of economic development among nations in the EAC with the empirical evidence of Burundi. The paper indicates that there is a link between foreign direct investment(FDI), gross domestic product(GDP), human capital, and openness with support of yearly time-series data from 1989 to 2017. The results from the Vector Error Correction Model (VECM) analysis technics discover that all the variables in long-term they move together. The findings also discovered that there is short-term causality running from GDP and human capital to FDI and no short-run causality found from openness to FDI as a result of Burundi's policies that do not implement market seeker FDI. For VECM validation, the paper went through some post estimation diagnostic tests such as Lagrange multiplier tests and Jarque-Bera test, the results did not indicate any autocorrelation among the variables as the residuals were normally distributed. Openness being an important factor to attracting foreign investors, it is very crucial for Burundi to revise its trade policies and encourage a conducive environment that promotes foreign investment penetration by promoting and encouraging both domestic and foreign investors and keep improving human capital for more FDI attraction as a goal for Burundi economic growth.

1. Introduction

Burundi as one of the states in the East African Community, it has traveled through different challenges such as civil wars which slowed down its economy since the period before and after its independence in 1962. As a result, this left behind the total destruction of infrastructures and caused poverty which put Burundi's economic situation in critical condition. Burundi like other East African countries exposes a potential land of doing business. Furthermore, Burundi Investment Promotion Agency was created in order to develop and promote investment in the country by welcoming, assisting, and supporting investors. The willingness of Burundians is attract foreign investors to exploit developmental sectors in services such as; tourism, minerals, and agricultural sectors so as to enhance economic growth and openness of the economy.

However, the liberalization of the investment environment for African countries has not succeeded to capture much FDI, and globalization provides a good working

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atmosphere when investors want to invest abroad. Generally, according to [27] the concern is that Burundi like other African countries still welcome FDI inflow in order to respond to its reform toward foreign investment. But political instabilities, corruption, etc. have remained the big challenges that prevented meaningful investors' interest. Foreign direct Investment appeared to be beneficial in different ways, it contributed to the integration of economic networks, increased exports and improved productivity which stimulates investment of human capital which all must depend on factors of a favorable business atmosphere [12]. Moreover, foreign direct investment attraction in developing countries has a significant role in their economies' sustainability and development once they implement the right policies which prevent barriers and promote investment [1].

However, as developing countries have been facing various challenges in developing a sustainable environment for FDI, through the reform to open up their economies to the private investment, a country may succeed to capture some amount of FDI in some sectors but it may be limited to other sectors due to different reasons [18]. Offering strong business opportunities for work creates a relationship with human capital formation in order to attract foreign direct investment [2].

Burundi being a member of the East African Community (EAC), makes FDI attraction key as a concern for development strategy, and then to encourage the economic growth for better competitiveness in the region [33]. Taken as a modernized tool to upgrade technological level lead to human capital formation, FDI was considered to be a remedy of economic development barriers [9]. FDI inflow is mentioned by previous studies to improve economic growth, ameliorate working environment conditions by enhancing the quality of education [27]. As Burundi needs to operate its economic activities regionally and internationally, FDI is necessary to advance its growth at the preferable level that at the end of the day, turns to be determined by a supply of Human capital. On the other hand, Human capital is one of the key elements required to attract FDI [21]. In globalization, the developing countries get help from the developed countries and the help ends up by being shared in both side, it is in that way foreign direct investment intervene by playing an important role in economic growth [19]. This study takes an advantage to explore whether FDI can overall affect economic growth, Human Capital, and openness in Burundi. However, since Burundi like other East African Countries avoids to receiving foreign aid which has hugely contributed to its economy, highlights the importance of FDI in rapid economic development, it would determine the way to bridge the economical gap made by those foreign aids in order to substitute them to FDI and continue to advance the pace for Burundi economic growth [6]. Furthermore, this research helps as guidance of how FDI can be used to improve economic growth in Burundi as it is located in a potential zone for investment. Since no other study has been conducted to evaluate the relationship of FDI on economic growth in Burundi. This study would rely on the past empirical and literature developed by different scholars to show how a country can use FDI to achieve its desired economic growth as it is indicated by the countries which have managed to attract it [7]. The paper also demonstrates the importance of openness, FDI, and human capital in strengthening the development of economic ties and the improvement of better trade relations with the rest of the world. For contribution, this study also comes to clarify the importance associated with FDI in economic growth once Burundi accepts all foreign direct investment to flow in its different sectors. This paper would be dedicated to the government of Burundi especially the policymakers and to researchers or academicians by enriching existing literature in the research field. The following part is described as the following: literature review, methodology, results, and conclusion.

2. Literature Review

Foreign direct investment in BURUNDI essential in reestablishing its economic growth. since the country adopted the law favoring foreign investors whose aim was to develop its relations with the local investors in order to attract more foreign direct investment. As the impact of FDI on economic growth appeared to depend on the nature of the growth and the characteristics of the recipient country [8,22]. Burundi has an unpredictable environment for foreign investors, this is in the logic that the impact of FDI on economic growth through microeconomic aggregate scale appears to be uncertain [23]. As different studies demonstrated that FDI contribution is seen in various aspects such as international trade, business environment competitiveness, technology development, human capital formation, and Enterprise development these come together as a tool to enhance economy especially in developing countries [19,24,25]. Thus, FDI in developing countries does not limit on development only it goes beyond on the non-economic activities and imposes some strict security policies for a hosting country which drives to a conducive business environment, rigorous control for heavy industries and may cause the loss of political sovereignty once FDI is abundant [5]. Therefore, Foreign Direct Investment(FDI) is one of the medium of investment in emerging countries, considered as the most source of funding

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for the economic growth of less developed countries [13,16].

[28] assessed the effect FDI may have on economic growth in Pakistan. They seek to find out the movement of GDP growth performance, the historical trends of FDI, and CPI, using the data ranging from 1980-2010. The results suggest that an increase of FDI leads to a rise in GDP which demonstrates a positive effect of FDI on GDP. Additionally, for the purpose of examining why Pakistan was unsuccessful in attracting FDI instead of its policy reform. The study sought to discover the determinant of FDI, taken FDI as Independent variable and GDP, terrorism, GNP, infrastructure, and exchange rate as independent variables over the period of 1970-2010. The findings showed that all independent variables have a positive and significant impact on FDI [32].

Due to inconclusive empirical evidence on the plausible theoretical grounds of a positive relationship of FDI and economic growth, [35] examined the relationship between FDI and the rate of growth of GDP in 45 countries during the period of 1997-2003. Using a scholastic frontier model, the study found only a positive impact of FDI inflow on economic growth in the presence of great skilled labor. Similarly, [4] examined the causality relationship between economic growth, foreign direct investment, and labor productivity in 19 OECD countries. Error correction model, via application of the generalized method of moments (GMM), applied for analysis to data got from nineteen OECD countries from the period 1980-2009; indicated a short-run causality establishes in the relationship between foreign direct investment, and economic growth. Moreover, the study found a long-run causality exists between foreign direct investment and economic growth. This is explained by the interaction role played by labor productivity in the link of FDI and economic growth in OECD countries.

[3] documented on FDI inflow and poverty reduction in two economies regions bloc such as the Association of Southeast Asian Nations (ASEAN) and the South Asian Association for Regional Cooperation (SAARC) economies. Using the data covering the period of 1990 to 2014. Due to the unavailability of poverty data, the study helped by Human Development Index (HDI) to overcome the challenge by taking welfare variable which captured the health, education, and income of a given country to measure poverty. Moreover, the regression analysis method was adopted to measure three FDI variables such as per capita FDI, the ratio of FDI to GDP, and the ratio of FDI to GCF which determines the effect FDI has on welfare. After applying different techniques, a continuity causality test indicates a positive impact of FDI on GDP. Overall, the results are seen to be positive to GDP except for debt ratio that showed a negative impact on GDP. In the same vain, multiple regression models by [29], explored the impact of foreign direct investment on growth (GDP) in SAARC countries using the data ranging from 2001 to 2010. The empirical results revealed also a positive and significant link between GDP and FDI. Although, human capital formation is the most important factor to determine FDI especially in developing countries, it also contributes to their economic growth. however, the study found that human capital formation alone can't determine the development of a country in order to continue to attract FDI; the important policies must be taken into consideration to attract more investment [26].

A study conducted by [10], in five countries of SAARC such as Bangladesh, India, Nepal, Pakistan, and Sri Lanka, investigated the relationship between GDP, FDI, openness, investment, tax policy and inflation over the period of 1990 to 2010. Their Co-integration analysis indicates the absence significance of investment and openness to international trade, and FDI on economic growth promotion. [36] evaluated the relationship between FDI and economic growth in nineteen countries of South-East Asia and Latin America. Using different technics such as the co-integration method, Granger causality test, and Error Correction Model, the study indicates that there is a unidirectional causality running from FDI to economic growth in five countries of Latin America and one from South East Asia. However, the paper showed a bi-directional short-run causality in the relationship between economic growth and FDI in five countries of East and South-East and in two countries of Latin America. Zhang found out that the recipient countries benefit from FDI through technology transfer and the benefit depends on the recipient countries' absorptive capabilities, which consider a liberal trade policy, a high human capital development state, and a conducive environment of export-oriented FDI policy. Additionally, [21] documented the association between FDI, trade, and growth rate per capita of GDP helped by the yearly time series data ranging from 1973-2014. The study applied the Vector Error Correction Model (VECM) which indicated a long-run relationship between FDI, trade, and growth rate per capita in Bangladesh. The study after passing through the post- estimation diagnostic tests, identified that the residuals of the regressions were normally distributed and no autocorrelation found among the variables. The findings highlighted that trade and FDI influences significantly the growth rate of GDP per capita in Bangladesh.

[31] analyzed the effects of foreign direct investment on economic growth in Mauritania using quarterly data covering the period from 1976-1995. The empirical findings

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stated that an increasing trend of FDI also increased the GDP. Moreover, the study mentioned that the Granger Causality test's result found no causality between the variables. In the same vain, [17] examined the causal connection between FDI and GDP growth for Ghana for the pre- and post-Structural Adjustment Program (SAP) periods using time series data for 1970-2002. The study applied different methods such as Toda-Yammoto (1995) Granger no-causality test which permit Granger test in an integrated system. The results uncovered no causality in the link of foreign direct investment and growth for the pre-SAP period. While the study indicated a contrast results in the post-SAP period. Similarly, [11] assessed the effect of FDI on economic growth in fourteen East African countries. After all diagnostic tests, the dynamic generalized method of moment (GMM) estimator employed to a panel data from 1996-2015; revealed a positive and marginally significant influence of FDI on economic growth in East African countries in the long run. Thus, a pairwise Granger causality test exhibited a unidirectional causality running from economic growth to FDI.

Furthermore, [20] evaluated FDI's determinant in Ethiopia for the period of 1981-2007. The study examined the data based on the two regime period (Socialist regime and the current region). After employing ordinary least square regression, a socialist regime the empirical results indicated a positive link between FDI, GDP per capita, and growth rate but which was statistically insignificant due to the reason that the most investment in a developing country has non-market-seeking FDI. But, openness and Credit played their roles in attracting investment were positive and statistically significant. However, in the current regime, GDP per capita expressed a negative sign in the coefficient but statistically significant while openness's coefficient was significant and positive.

[7] investigated the effects of foreign direct investment on growth in Africa by selecting randomly different African countries in the different parts of Africa in the following way: Nigeria by representing West Africa, Egypt in North Africa, Kenya (East Africa), South Africa (Southern Africa),and Central African Republic (Central Africa) using the data stretching from 1980 to 2013. By employing both ordinary least square (OLS) and generalized method of the moments (GMM) for analysis. The findings indicated that gross capital formation, human capital, and international technology transfer variables were not statistically significant to influence economic growth in central Africa. Overall, the results discovered that the effect of FDI on economic growth is limited or negligible. The statistic results described that an increase of one percent of FDI led to an increase of 0.12 percent of GDP in South Africa, 0.05 percent in Egypt, 0.03 percent in Nigeria, 0.02 percent of GDP in Kenya, and a one percent increase of GDP in the Central African Republic. The study mentioned that South Africa's economic growth was highly influenced by FDI comparable to the rest of countries due to its better use of FDI. The paper suggested that other African countries should take an example to South Africa as African economies in whole expose a great potential to attract the inflow of FDI.

[30] investigated the determinants of FDI and their effect on economic growth in one of East African Community countries; "Uganda", using the time series data spanning from 1975 to 1991. The study stated that Uganda promotes FDI through privatization and generous incentive packages like tax holidays and exemption. The concern of creating a favorable business environment, policy consistency, and improvement of political stability is more important for the government of Uganda to encourage FDI inflow than offering incentive schemes. However, the empirical result found that there is a positive impact of FDI on GDP growth in Uganda. Similarly, [34] examined the impact of FDI on economic growth, employment, and poverty reduction in Uganda over the period of 1985-2014. The study identified tourism as one of the sectors which contributed more foreign exchange to the country. For achieving more economic growth, the government of Uganda implemented fiscal, monetary, and commercial policies that favor openness, human capital, and inflation control. FDI was considered in Uganda as a solution to private capital limitations. After applying different technics for data analysis such as Vector Auto-regression (VAR) through Vector Error Correction Model (VECM), the empirical result demonstrated that FDI contributes to economic growth, employment opportunities, and poverty reduction in Uganda but the coefficient indicated a negative sign which mean that FDI negatively contributes to Uganda's economic growth in long and short-run. Whilst, tourism plays its role in promoting FDI and taken as well as a tool for openness which indirectly affects economic growth and improvement of Human capital in Uganda. Unfortunately, the study found that Uganda tourism FDI in short-run, negatively contributes to economic growth but the effect becomes positive and small in the long-run. In contrast, in the East African Community zone, [15] analyzed the contribution of FDI in the agricultural sector as one of the contributors to real GDP growth and employs more than seventy percent of the total labor force in Tanzania during the period of 1990-2015. The empirical results indicated no significant impact found in the relationship between FDI inflow and agriculture added value to GDP ratio in Tanzania due to the outstanding of FDI in-

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flow in Tanzania's economy during the two past decades. However, the study demonstrated a positive correlation of FDI inflows to GDP ratio and GDP growth rate. The existing mixture of findings enriches and improves the empirical growth literature.

3. Methodology

Model Specification

This study uses annual data got from the World Bank online database, United Nations Conference on Trade and Development (UNCTAD), and Burundi Investment Promotion Agency (API) which is arranging from the period of 1989 to 2017. The study employed the Johansen technique and Vector Error Correction Model (VECM) to assess the short-term and long-term association between Foreign Direct Investment (net inflows), Human Capital (Average of secondary and primary enrollment), Openness (openness was exhibited in Burundi foreign exchange law state, trade restriction policies, taxes) and Gross Domestic Product (GDP). For testing the related time series variables, we use STATA Software (stataMP-64). We firstly, pass through lag selection (optimal lag length (n) have been chosen), we continue by testing the stationarity of the variables, under Johansen test condition which states that variables must be non-stationary at level but after converting them into the first differenced level, they must be stationary. Secondly, we perform Johansen co-integration test with determined (n) lags, then we proceed by assuming that if there is no co-integration, we estimate the unrestricted VAR model but if we find co-integration, we specify the VECM with (n) lags. We write VAR structure as U = (FDI, Hum Cap, Openness, and GDP). Once the time series are integrated in the same order, the estimation of the following co-integration regression are:

$$\boldsymbol{FDI} = \alpha_{11} + \beta_{11}\text{GDP} + \beta_{12}\text{Hum Cap} + \beta_{13}\text{Openness} \quad (1)$$

$$\boldsymbol{GDP} = \alpha_{21} + \beta_{21}\text{FDI} + \beta_{22}\text{Hum cap} + \beta_{23}\text{Openness} \quad (2)$$

$$\boldsymbol{Hum\ cap} = \alpha_{31} + \beta_{31}\text{GDP} + \beta_{32}\text{FDI} + \beta_{33}\text{Openness} \quad (3)$$

$$\boldsymbol{Openness} = \alpha_{41} + \beta_{41}\text{GDP} + \beta_{42}\text{Hum cap} + \beta_{43}\text{FDI} \quad (4)$$

The Vector Error Correction Model;

According to [14], if it is nonstationary but L (1) time series are co-integrated, We can run the VECM to assess both the short and long-terms dynamics of the series.

Conventional VECM for co-integrated series is presented in the following model:

$$\Delta \boldsymbol{Y_t} = \boldsymbol{\sigma} + \sum_{i=1}^{n-1} \boldsymbol{\beta_i} \Delta \boldsymbol{Y_{t-i}} + \sum_{j=1}^{n-1} \boldsymbol{\delta_i} \Delta \boldsymbol{X_{t-j}} + \ldots + \boldsymbol{\lambda ECT_{t-1}} + \boldsymbol{e_t} \quad (5)$$

ECT_{t-1} is the lagged OLS residual got from long-run co-integrating equation:

$$Y_t = \sigma + \beta_j X_t + \ldots + e_t$$

Therefore: $ECT_{t-1} = [Y_{t-1} - \beta_1 X_{t-1} - \ldots]$, the co-integration equation,

The ECT means that the previous period's deviation from Long-run equilibrium (error) influences short-run movement in the dependent variable

Where λ the coefficient of ECT, is the speed of adjustment, and it is a measurement of the speed at which Y returns to the equilibrium after a change in independent variables. as it is recommended by Granger representation theorem which states that if two variables are co-integrated, there must be a long-run relationship, and then there exists a short term relationship. From (5) we write the following models:

$$\Delta\ \text{FDI}_t = \sigma + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_1 \text{ECT}_{t-1} + e_{1t} \quad (6)$$

$$\Delta \text{GDP}_t = \alpha + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_2 \text{ECT}_{t-1} + e_{2t} \quad (7)$$

$$\Delta \text{Hum Cap}_t = \theta + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Hum Cap}_{t-k} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_3 \text{ECT}_{t-i} + e_{3t} \quad (8)$$

$$\Delta \text{Openness}_t = \vartheta + \sum_{i=1}^{n-1} \beta_i \Delta \text{FDI}_{t-i} + \sum_{j=1}^{n-1} \delta_j \Delta \text{GDP}_{t-j} + \sum_{k=1}^{n-1} \rho_k \Delta \text{Empl}_{t-i} + \sum_{m=1}^{n-1} \tau_m \Delta \text{Openness}_{t-m} + \lambda_4 \text{ECT}_{t-i} + e_{4t} \quad (9)$$

Where *k*-1: is the length of the lag

Δ is the first difference operator.

β,δ,ρ,τ: are the short-term dynamic coefficients

λ_i: is a parameter with a negative sign (it is velocity adjustment parameters always with a negative sign when it is significant).

$\text{ECT}_{(t-1)}$: the error correction term (Contains long-run information derived from the long-run co-integrating rela-

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tionship).

e_{it}: residuals or stochastic error terms (in other words is innovations or shocks).

4. Empirical Results

Table 1. Summary statistics of variables

Variables Name	Mean	Standard Deviation	Min	Max
FDI	1.113157	0.296615	0.18332	1.37528
GDP	2.78965	0.0654896	2.604819	2.856475
Hum Cap	1.752692	0.1213394	1.555699	1.947385
Openness	1.78932	4.31565	-8	11.78318

Table 2. Correlation Matrix

Variable Name	FDI	GDP	Hum Cap	Openness
FDI	1			
GDP	0.8105	1		
Hum Cap	-0.3983	-0.3323	1	
Openness	0.1568	0.1996	0.2593	1

4.1 Autocorrelation and Partial Autocorrelation of the Variables

The study used Autocorrelation and partial autocorrelation to exhibit stationarity of the variables.

H_0 = Null hypothesis, we accept the null hypothesis once the variable is stationary at the level and we reject the null hypothesis once the variable is nonstationary at the level.

H_1= Alternative hypothesis, we accept hypothesis once the variable is stationary at the first differenced level and we reject it once it is nonstationary at first differenced level.

Table 3. Autocorrelation and Partial Autocorrelation of FDI (Corrgram FDI, Prob>Q is less than 5%)

LAG	AC	PAC	Q	Prob>Q
1	0.7856	0.8065	22.276	0.0000
2	0.5184	-0.3341	32.291	0.0000
3	0.3683	0.5105	37.514	0.0000
4	0.2774	0.0010	40.578	0.0000
5	0.1508	-0.5528	41.516	0.0000
6	0.0386	-0.1457	41.58	0.0000
7	-0.0485	-0.3990	41.684	0.0000
8	-0.1126	-0.8479	42.27	0.0000
9	-0.1162	-0.0556	42.919	0.0000
10	-0.1280	-0.4515	43.742	0.0000
11	-0.1561	-0.4769	45.021	0.0000
12	-0.1711	-0.2100	46.632	0.0000
13	-0.1452	-0.2426	47.849	0.0000
14	-0.1381	-1.0576	49.009	0.0000

Corrgram D.FDI (First differenced level) Prob>Q is greater than 5%

LAG	AC	PAC	Q	Prob>Q
1	0.0036	0.0119	0.00046	0.9828
2	-0.3368	-0.5989	4.1151	0.1278
3	0.0029	0.0052	4.1155	0.2493
4	0.1456	0.4293	4.9391	0.2936
5	-0.1399	-0.1576	5.7276	0.3336
6	-0.0179	0.0190	5.741	0.4528
7	-0.0257	0.4331	5.7699	0.5669
8	-0.1253	-0.4233	6.4818	0.5934
9	0.0412	-0.0194	6.5622	0.6826
10	0.0217	-0.1308	6.5856	0.7639
11	-0.0365	-0.4263	6.6546	0.8263
12	-0.0830	-0.3278	7.0296	0.8556
13	0.0444	0.3623	7.1426	0.8947
14	-0.0523	-1.3774	7.3079	0.9222

Table 4. Autocorrelation and Partial Autocorrelation of GDP (Corrgram GDP)

LAG	AC	PAC	Q	Prob>Q
1	0.7760	1.0470	21.737	0.0000
2	0.5101	-0.4630	31.432	0.0000
3	0.2663	0.0391	34.163	0.0000
4	0.0614	-0.1065	34.313	0.0000
5	-0.0887	0.2071	34.638	0.0000
6	-0.1559	-0.5192	35.677	0.0000
7	-0.1715	0.1010	36.984	0.0000
8	-0.1748	-0.2779	38.395	0.0000
9	-0.1612	-0.5012	39.646	0.0000
10	-0.1135	-0.1427	40.293	0.0000
11	-0.0889	-0.6657	40.707	0.0000
12	-0.0700	-0.3090	40.976	0.0000
13	-0.0579	0.2190	41.17	0.0001
14	-0.0316	0.8732	41.231	0.0002

Corrgram D.GDP

LAG	AC	PAC	Q	Prob>Q
1	0.3876	0.3911	5.2719	0.0217
2	0.0823	-0.0768	5.5176	0.0634
3	0.0303	0.0332	5.5521	0.1356

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4	-0.1192	-0.1678	6.1045	0.1915
5	0.0647	0.3577	6.2731	0.2805
6	-0.0528	-0.2330	6.3897	0.3810
7	-0.0992	0.0506	6.8176	0.4481
8	0.0578	0.1415	6.9691	0.5400
9	-0.0778	-0.2326	7.2553	0.6106
10	0.0490	0.3007	7.3739	0.6897
11	-0.0001	-0.2736	7.3739	0.7680
12	-0.2457	-0.6385	10.659	0.5585
13	-0.0946	-1.2809	11.17	0.5966
14	-0.0393	-2.5258	11.264	0.6652

Table 5. Autocorrelation and Partial Autocorrelation of Human Capital (Corrgram Hum Cap)

LAG	AC	PAC	Q	Prob>Q
1	0.9041	0.9678	29.502	0.0000
2	0.7925	-0.0706	52.901	0.0000
3	0.7018	0.0789	71.863	0.0000
4	0.5994	-0.1257	86.171	0.0000
5	0.5414	0.3134	98.26	0.0000
6	0.4923	-0.1375	108.63	0.0000
7	0.3986	-0.2691	115.69	0.0000
8	0.2925	0.0754	119.64	0.0000
9	0.1906	0.0981	121.39	0.0000
10	0.0744	0.4870	121.67	0.0000
11	-0.0092	0.0345	121.67	0.0000
12	-0.0777	0.1557	122	0.0000
13	-0.1776	-0.5023	123.83	0.0000
14	-0.2702	-0.1990	128.26	0.0000

Corrgram D. Hum Cap

LAG	AC	PAC	Q	Prob>Q
1	0.0340	0.0340	0.04068	0.8402
2	-0.1079	-0.1095	0.46323	0.7933
3	0.0747	0.0859	0.6724	0.8797
4	-0.2918	-0.3315	3.9802	0.4087
5	0.0434	0.1199	4.0562	0.5414
6	0.2872	0.2324	7.5073	0.2765
7	-0.1547	-0.1432	8.5487	0.2867
8	-0.0869	-0.1711	8.891	0.3516
9	-0.1551	-0.4650	10.03	0.3481
10	-0.1973	-0.0101	11.955	0.2881
11	0.0330	-0.1210	12.011	0.3628
12	0.0917	0.1823	12.469	0.4088
13	0.0255	-0.1490	12.506	0.4867
14	0.0558	-0.1339	12.694	0.5508

Table 6. Autocorrelation and Partial Autocorrelation of Openness (Corregram Openness)

LAG	AC	PAC	Q	Prob>Q
1	0.4853	0.4874	8.5003	0.0036
2	0.3476	0.1191	13.001	0.0015
3	0.2288	0.0543	15.016	0.0018
4	0.1277	-0.0193	15.666	0.0035
5	-0.1013	-0.3325	16.089	0.0066
6	-0.0188	0.2484	16.104	0.0132
7	-0.1279	-0.1701	16.831	0.0185
8	-0.2951	-0.3407	20.854	0.0075
9	-0.3308	-0.1723	26.345	0.0018
10	-0.2511	-0.1590	29.511	0.0010
11	-0.3308	-0.3718	35.255	0.0002
12	-0.1802	0.0769	37.041	0.0002
13	-0.1661	-0.3394	38.633	0.0002
14	-0.2068	-0.1448	41.233	0.0002

Corrgram D. Openness

LAG	AC	PAC	Q	Prob>Q
1	-0.2801	-0.2806	2.7539	0.0970
2	-0.0819	-0.1844	2.9975	0.2234
3	0.0079	-0.0808	2.9998	0.3917
4	0.2257	0.2319	4.9792	0.2894
5	-0.4095	-0.3848	11.735	0.0386
6	0.1921	0.0906	13.279	0.0388
7	0.1505	0.2267	14.264	0.0467
8	-0.0016	0.0026	14.264	0.0751
9	-0.1928	-0.0399	16.022	0.0664
10	0.2776	0.1359	19.833	0.0309
11	-0.2571	-0.3444	23.257	0.0163
12	0.0213	0.0753	23.282	0.0254
13	-0.0535	-0.1292	23.445	0.0366
14	0.0095	-0.5211	23.451	0.0533

As all the variables become stationary at the first differenced level this allows us to perform Johansen tests for co-integration. In the table below the row with rank 0 means that there is no co-integration among the variables such as FDI, GDP, Hum Cap, and Openness. Once the trace statistics are higher than the critical value, this alludes the rejection of the null hypothesis. When the trace statistics are smaller than critical value means that we cannot reject the null hypothesis rather, we accept the null hypothesis. In other words, there is a co-integration model in this system (the * in trace statistic column indicated that there is co-integration equation any lag you can put it brings to rank where * is) this reveal that our four vari-

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ables such FDI, GDP, Hum Cap, and Openness are co-integrated, the four variables have a long-run relationship or long-term, they move together. The condition is that when variables are co-integrated, we can run the VECM model but when they are not co-integrated we may run a VAR model.

4.2 The Results of Johansen Tests for Co-integration

Table 7. Johansen tests for Co-integration

Trend: Constant Number of Observation =29
Sample: 1989-2017 Lags =4

Upper Panel

Maximum rank	Parms	LL	eigenvalue	Trace statistic	5%critical value
0	52	80.618224		75.8613	45.21
1	59	100.8475	0.75220	35.4028	29.68
2	64	111.0813	0.50628	14.9353*	15.41
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.5489	0.06635		

Lower Panel

Maximum rank	Parms	LL	eigenvalue	Max statistic	5%critical value
0	52	80.618224		40.4585	27.07
1	59	100.8475	0.75220	20.4675	20.97
2	64	111.0813	0.50628	12.9442	14.07
3	67	117.55335	0.36004	1.9911	3.76
4	68	118.5489	0.06635		

Since the variables are co-integrated we run the VECM model. Firstly, we verify the sign and significance of the error correction term and we discover that there is long-run causality running from GDP, Hum Cap, and openness to FDI.

4.3 The Results of VECM

Table 8. The VECM model

Equation	Parms	RMSE	R-square	chi2	p>chi2
D_FDI	14	0.101676	0.8450	81.75148	0.0000
D_GDP	14	0.025198	0.5623	19.27035	0.1549
D_Hum cap	14	0.045285	0.4042	10.17645	0.7492
D_Openness	14	4.23517	0.3799	9.18947	0.8187

	Coefficient	Standard Deviation	z	p>|z|
D_FDI				
_cel				
L1.	***-0.0195373***	0.003981	-4.91	***0.000***
GDP				
LD.	0.8185652	1.064243	0.77	0.442
L2D.	3.449989	1.056048	3.27	0.001
L3D.	2.593446	1.056778	2.45	0.014
Hum Cap				
LD.	1.997876	0.6344983	3.15	0.002
L2D.	2.393092	0.6362846	3.76	0.000
L3D.	3.153222	0.6466822	4.88	0.000
Openness				
LD.	-0.0160466	0.0063409	-2.53	0.011
L2D.	-0.0102386	0.0062588	-1.64	0.102
L3D.	-0.0049194	0.006103	-0.81	0.420
_cons	0.0781149	0.038175	2.05	0.041
D_GDP				
_cel				
L1.	***-0.0010343***	0.0009866	-1.05	***0.294***
FDI				
LD.	0.0289839	0.0667213	0.43	0.664
L2D.	-0.0715233	0.0646167	-1.11	0.268
L3D.	0.0453252	0.0715899	0.63	0.527
Hum Cap				
LD.	0.253123	0.1572481	1.61	0.107
L2D.	0.0905745	0.1576908	0.57	0.566
L3D.	0.1247486	0.1602677	0.78	0.436
Openness				
LD.	-0.0016493	0.0015715	-1.05	0.294
L2D.	0.0018828	0.0015511	1.21	0.225
L3D.	-0.0000627	0.0015125	-0.04	0.967
_cons	0.0049268	0.0094609	0.52	0.603
D_Hum cap				
_cel				
L1.	***-0.0032644***	0.0017731	-1.84	***0.066***
FDI				
LD.	-0.1704707	0.1199084	-1.42	0.155
L2D.	-0.1982914	0.116126	-1.71	0.088
_L3D.	-0.093297	0.128658	-0.73	0.468
GDP				
LD.	0.1257098	0.4740026	0.27	0.791
L2D.	-0.495532	0.4703527	-1.05	0.292
L3D.	0.2636564	0.4706777	0.56	0.575
Openness				
LD.	-0.0026121	0.0028242	-0.92	0.355

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L2D.	-0.0011983	0.0027876	-0.43	0.667
L3D.	-0.0006495	0.0027182	-0.24	0.811
__cons	0.0299773	0.0170027	1.76	0.078
D_Openness				
__cel				
L1.	***-0.1252951***	0.1658217	-0.76	***0.450***
FDI				
LD.	-8.606463	11.21409	-0.77	0.443
L2D.	-18.60748	10.86035	-1.71	0.087
L3D.	-5.110784	12.03236	-0.42	0.671
GDP				
LD.	21.05301	44.32971	0.47	0.635
L2D.	28.85988	43.98837	0.66	0.512
L3D.	24.27435	44.01877	0.55	0.581
Openness				
LD.	13.9544	26.42924	0.53	0.598
L2D.	42.06984	26.50364	1.59	0.112
L3D.	26.62417	26.93674	0.99	0.323
_cons	-0.0130022	1.590131	-0.01	0.993

4.3.1 Long-run Causality

The cel. L1 (-0.0195373) which is Error correction term or speed of adjustment toward equilibrium has a negative sign and significant for D_FDI, we agreed that there is a long-run causality running from GDP, Hum Cap, and Openness to FDI as it is described in [21].

4.3.2 Short-run Causality

We check whether, GDP, Hum Cap, Openness can cause FDI or not. In other words, we can check whether, GDP, Hum Cap, and Openness their respective lags (LD., L2D., and L3D.) jointly can cause FDI or not. Firstly, we test if there is a short-run causality running from ([D_FDI]: LD.GDP, L2D.GDP, L3D.GDP). We find a significant result that indicates that in short-run GDP and FDI in Burundi can move together (Prob>chi2 is smaller than 5%) as indicated by [36].

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD.GDP=0		
[D_FDI]L2D.GDP=0	26.11	0.0000
[D_FDI]L3D.GDP=0		

Secondly, we test whether there is a short-run causality running from ([D_FDI]: LD. Hum Cap, L2D. Hum Cap, L3D. Hum Cap). We get also a significant result that means that there is a short-run causality running from Human capital to FDI in Burundi. (Prob>chi2 is less than 5%).

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD. Hum Cap=0		
[D_FDI]L2D. Hum Cap=0	34.56	0.0000
[D_FDI]L3D. Hum Cap=0		

Lastly, we verify a short-run causality running from ([D_FDI]: LD. Openness, L2D. Openness, L3D. Openness). We find that there is not short-run causality running from Openness to FDI in Burundi as it is documented by [15]. (Prob>chi2 is greater than 5%)

Coefficients	chi(3)	Prob>chi2
[D_FDI]LD. Openness=0		
[D_FDI]L2D. Openness=0	7.42	0.0595
[D_FDI]L3D. Openness=0		

We also applied the Lagrange Multiplier Test to assess whether there are serial auto-correlations or not. We found no auto-correlation at lag 2 as it also found by [11].

Table 9. Lagrange Multiplier Test

Lag	chi2	df	Prob>chi2
1	20.2791	16	0.20791
2	14.0117	16	0.59784
H0:	no autocorrelation at lag order		

For lag 1 and lag2 Prob>chi2 is higher than 5% what indicates that no autocorrelation found at lag 2. We proceed for testing residual normality (We check if the residuals of the model are normally distributed or not using the Jarque-Bera test. We discovered that the residuals were normally distributed. We concluded that the model was desirable [11,21].

Table 10. Jarque-Bera Test

Equation	chi2	df	Prob>chi2
D_FDI	1.84	2	0.39859
D_GDP	0.676	2	0.71316
D_Hum Cap	0.702	2	0.70399
D_Openness	0.430	2	0.80655
ALL	3.648	8	0.88743

Overall, we found Prob>chi2 (0.88743) is greater than 5% we conclude that we use a desirable model.

5. Conclusion

The study scrutinized the impact of foreign direct in-

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vestment on Burundian economic growth in one of the members of the East Africa Community country Burundi during the period of 1989 to 2017. By applying Vector Error Correction Model (VECM), we found that there is a long-term relationship between variables, this indicates that foreign direct investment has a positive and statistically significant impact on economic growth in Burundi these results are in accordance with [11,21]. However, we found that GDP and human capital have a short-term relationship to FDI but no short-term causality found from openness to FDI, this implies that no market seeking of FDI in the country and Burundi's economic activities are more domestically and less regionally. Moreover, Burundi still is caring more about political stability than opening up with the rest of the world to interact economically. After doing post estimation diagnostic tests and discovered that the residuals of regressions are normally distributed and no auto-correlation between the variables. We accepted the VECM model and the results from it suggest that Burundi should now implement policies which exhibit openness environment by lowering trade restriction, tariffs and applying tightly foreign exchange control laws which actually brake business activities in order to capture as much as possible amount of FDI inflow, this is in contrast with the study by [15]. The free primary and secondary education adopted by the Burundi government since 2005 improves human capital state [26] as it is a factor determinant of the labor force, and is predicted to be a vehicle of economic growth and attract more FDI in the country in short and long- terms [4]. Burundi since its integration in the East Africa Community (EAC) in 2009, adding to its natural resources, has been pointed out to be in the category of countries that can attract more FDI as well as all EAC countries members namely Burundi, Tanzania, Rwanda, Uganda, Kenya, and South Sudan. Burundi should also use all generated opportunities to create a conducive good investment atmosphere to attract and promote foreign investment and export more as it is constructing a special economic zone and extracting minerals. The policymakers should take the measurement which helps to attract more FDI by focusing on economic growth, openness, and human capital as it is shown that in the long-term can move together with FDI. For research, we suggest that further study should examine the contribution of FDI associated with natural resources in Burundi's economic growth.

Appendix

The Results Gotten from STATA MP-64:

```
        time variable:  Date, 1985 to 2017
                delta:  1 year

. varsoc GDP FDI HumCap Openess

  Selection-order criteria
  Sample:  1989 - 2017                              Number of obs      =        29
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5.84367				.000023	.678873	.737938	.867466
1	65.9088	143.5	16	0.000	5.0e-07*	-3.16612	-2.8708*	-2.22316*
2	75.4604	19.103	16	0.263	8.4e-07	-2.72141	-2.18982	-1.02408
3	95.0313	39.142	16	0.001	7.9e-07	-2.96768	-2.19984	-.515975
4	118.549	47.035*	16	0.000	7.1e-07	-3.48613*	-2.48203	-.280058

```
  Endogenous:  GDP FDI HumCap Openess
   Exogenous:  _cons

. varsoc GDP FDI HumCap Openess

  Selection-order criteria
  Sample:  1989 - 2017                              Number of obs      =        29
```

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5.84367				.000023	.678873	.737938	.867466
1	65.9088	143.5	16	0.000	5.0e-07*	-3.16612	-2.8708*	-2.22316*
2	75.4604	19.103	16	0.263	8.4e-07	-2.72141	-2.18982	-1.02408
3	95.0313	39.142	16	0.001	7.9e-07	-2.96768	-2.19984	-.515975
4	118.549	47.035*	16	0.000	7.1e-07	-3.48613*	-2.48203	-.280058

```
  Endogenous:  GDP FDI HumCap Openess
   Exogenous:  _cons
```

Stationarity Test:

```
. corrgram Openess
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	0.4853	0.4874	8.5003	0.0036		
2	0.3476	0.1191	13.001	0.0015		
3	0.2288	0.0543	15.016	0.0018		
4	0.1277	-0.0193	15.666	0.0035		
5	-0.1013	-0.3325	16.089	0.0066		
6	-0.0188	0.2484	16.104	0.0132		
7	-0.1279	-0.1701	16.831	0.0185		
8	-0.2951	-0.3407	20.854	0.0075		
9	-0.3378	-0.1723	26.345	0.0018		
10	-0.2511	-0.1590	29.511	0.0010		
11	-0.3308	-0.3718	35.255	0.0002		
12	-0.1802	0.0769	37.041	0.0002		
13	-0.1661	-0.3394	38.633	0.0002		
14	-0.2068	-0.1448	41.233	0.0002		

```
. corrgram D.Openess
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	-0.2801	-0.2806	2.7539	0.0970		
2	-0.0819	-0.1844	2.9975	0.2234		
3	0.0079	-0.0808	2.9998	0.3917		
4	0.2257	0.2319	4.9792	0.2894		
5	-0.4095	-0.3848	11.735	0.0386		
6	0.1921	0.0906	13.279	0.0388		
7	0.1505	0.2267	14.264	0.0467		
8	-0.0016	0.0026	14.264	0.0751		
9	-0.1928	-0.0399	16.022	0.0664		
10	0.2776	0.1359	19.833	0.0309		
11	-0.2571	-0.3444	23.257	0.0163		
12	0.0213	0.0753	23.282	0.0254		
13	-0.0535	-0.1292	23.445	0.0366		
14	0.0095	-0.5211	23.451	0.0533		

```
. corrgram HumCap
```

LAG	AC	PAC	Q	Prob>Q	[Autocorrelation]	[Partial Autocor]
1	0.9041	0.9678	29.502	0.0000		
2	0.7925	-0.0706	52.901	0.0000		
3	0.7018	0.0789	71.863	0.0000		
4	0.5994	-0.1257	86.171	0.0000		
5	0.5414	0.3134	98.26	0.0000		
6	0.4923	-0.1375	108.63	0.0000		
7	0.3986	-0.2691	115.69	0.0000		
8	0.2925	0.0754	119.64	0.0000		
9	0.1906	0.0981	121.39	0.0000		
10	0.0744	0.4870	121.67	0.0000		
11	-0.0092	0.0345	121.67	0.0000		
12	-0.0777	0.1557	122	0.0000		
13	-0.1776	-0.5023	123.82	0.0000		
14	-0.2702	-0.1990	128.26	0.0000		

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```
. corrgram D.HumCap

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]

1       0.0340   0.0340   .04068  0.8402
2      -0.1079  -0.1095   .46323  0.7933
3       0.0747   0.0859    .6724  0.8797
4      -0.2918  -0.3315   3.9802  0.4087
5       0.0434   0.1199   4.0562  0.5414
6       0.2872   0.2324   7.5073  0.2765
7      -0.1547  -0.1432   8.5487  0.2867
8      -0.0869  -0.1711    8.891  0.3516
9      -0.1551  -0.4650    10.03  0.3481
10     -0.1973  -0.0101   11.955  0.2881
11      0.0330  -0.1210   12.011  0.3628
12      0.0917   0.1823   12.469  0.4088
13      0.0255  -0.1490   12.506  0.4867
14      0.0558  -0.1339   12.694  0.5508
```

```
. corrgram FDI

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]

1       0.7856   0.8065   22.276  0.0000
2       0.5184  -0.3341   32.291  0.0000
3       0.3683   0.5105   37.514  0.0000
4       0.2774   0.0010   40.578  0.0000
5       0.1508  -0.5528   41.516  0.0000
6       0.0386  -0.1457    41.58  0.0000
7      -0.0485  -0.3990   41.684  0.0000
8      -0.1126  -0.8479    42.27  0.0000
9      -0.1162  -0.0556   42.919  0.0000
10     -0.1280  -0.4515   43.742  0.0000
11     -0.1561  -0.4769   45.021  0.0000
12     -0.1711  -0.2100   46.632  0.0000
13     -0.1452  -0.2426   47.849  0.0000
14     -0.1381  -1.0576   49.009  0.0000
```

```
. corrgram D.FDI

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]

1       0.0036   0.0119   .00046  0.9828
2      -0.3368  -0.5989   4.1151  0.1278
3       0.0029   0.0052   4.1155  0.2493
4       0.1456   0.4293   4.9391  0.2936
5      -0.1399  -0.1576   5.7276  0.3336
6      -0.0179   0.0190    5.741  0.4528
7      -0.0257   0.4331   5.7699  0.5669
8      -0.1253  -0.4233   6.4818  0.5934
9       0.0412  -0.0194   6.5622  0.6826
10      0.0217  -0.1308   6.5856  0.7639
11     -0.0365  -0.4263   6.6546  0.8263
12     -0.0830  -0.3278   7.0296  0.8556
13      0.0444   0.3623   7.1426  0.8947
14     -0.0523  -1.3774   7.3079  0.9222
```

```
. corrgram GDP

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]

1       0.7760   1.0470   21.737  0.0000
2       0.5101  -0.4630   31.432  0.0000
3       0.2663   0.0391   34.163  0.0000
4       0.0614  -0.1065   34.313  0.0000
5      -0.0887   0.2071   34.638  0.0000
6      -0.1559  -0.5192   35.677  0.0000
7      -0.1715   0.1010   36.984  0.0000
8      -0.1748  -0.2779   38.395  0.0000
9      -0.1612  -0.5012   39.646  0.0000
10     -0.1135  -0.1427   40.293  0.0000
11     -0.0889  -0.6657   40.707  0.0000
12     -0.0700  -0.3090   40.976  0.0000
13     -0.0579   0.2190    41.17  0.0001
14     -0.0316   0.8732   41.231  0.0002
```

```
. corrgram D.GDP

                                          -1       0       1 -1       0       1
 LAG       AC       PAC      Q     Prob>Q  [Autocorrelation]  [Partial Autocor]

1       0.3876   0.3911   5.2719  0.0217
2       0.0823  -0.0768   5.5176  0.0634
3       0.0303   0.0332   5.5521  0.1356
4      -0.1192  -0.1678   6.1045  0.1915
5       0.0647   0.3577   6.2731  0.2805
6      -0.0528  -0.2330   6.3897  0.3810
7      -0.0992   0.0506   6.8176  0.4481
8       0.0578   0.1415   6.9691  0.5400
9      -0.0778  -0.2326   7.2553  0.6106
10      0.0490   0.3007   7.3739  0.6897
11     -0.0001  -0.2736   7.3739  0.7680
12     -0.2457  -0.6385   10.658  0.5585
13     -0.0946  -1.2809    11.17  0.5966
14     -0.0393  -2.5258   11.264  0.6652
```

Performance of VECRANK (Johasen Test of Cointegration):

```
. vecrank GDP FDI HumCap Openess, trend(constant) lags(4) max

                       Johansen tests for cointegration
Trend: constant                                         Number of obs =      29
Sample:  1989 - 2017                                             Lags =       4
-------------------------------------------------------------------------------
                                                             5%
maximum                                      trace    critical
  rank    parms      LL        eigenvalue   statistic    value
    0      52     80.618224         .        75.8613     47.21
    1      59     100.84749     0.75220      35.4028     29.68
    2      64     111.08126     0.50628      14.9353*    15.41
    3      67     117.55335     0.36004       1.9911      3.76
    4      68     118.54889     0.06635
-------------------------------------------------------------------------------
                                                             5%
maximum                                       max     critical
  rank    parms      LL        eigenvalue   statistic    value
    0      52     80.618224         .        40.4585     27.07
    1      59     100.84749     0.75220      20.4675     20.97
    2      64     111.08126     0.50628      12.9442     14.07
    3      67     117.55335     0.36004       1.9911      3.76
    4      68     118.54889     0.06635
-------------------------------------------------------------------------------
```

Testing Long Run and Short Run Causality of the Variables

Long-run Causality:

```
. vec GDP FDI HumCap Openess, trend(constant) lags(4)

Vector error-correction model

Sample:  1989 - 2017                           No. of obs      =         29
                                               AIC             =  -2.886034
Log likelihood =  100.8475                     HQIC            =  -2.014828
Det(Sigma_ml)  =  1.12e-08                     SBIC            =   -.104294

Equation           Parms      RMSE     R-sq      chi2     P>chi2
----------------------------------------------------------------
D_GDP               14     .025198   0.5623   19.27035   0.1549
D_FDI               14     .101676   0.8450   81.75148   0.0000
D_HumCap            14     .045285   0.4042   10.17645   0.7492
D_Openess           14     4.23517   0.3799    9.18947   0.8187
----------------------------------------------------------------

------------------------------------------------------------------------------
             |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
D_GDP        |
        _ce1 |
         L1. |  -.0010343   .0009866    -1.05   0.294     -.002968    .0008994
             |
         GDP |
         LD. |   .4696517    .263752     1.78   0.075    -.0472927    .9865962
        L2D. |  -.3198873   .2617211    -1.22   0.222    -.8328512    .1930766
        L3D. |   .0546542    .261902     0.21   0.835    -.4586643    .5679726
             |
         FDI |
         LD. |   .0289839   .0667213     0.43   0.664    -.1017875    .1597554
        L2D. |  -.0715233   .0646167    -1.11   0.268    -.1981696    .0551231
        L3D. |   .0453252   .0715899     0.63   0.527    -.0949885    .1856388
             |
      HumCap |
         LD. |    .253123   .1572481     1.61   0.107    -.0550777    .5613237
        L2D. |   .0905745   .1576908     0.57   0.566    -.2184939    .3996429
        L3D. |   .1247486   .1602677     0.78   0.436    -.1893703    .4388675
             |
     Openess |
         LD. |  -.0016493   .0015715    -1.05   0.294    -.0047294    .0014307
        L2D. |   .0018828   .0015511     1.21   0.225    -.0011573     .004923
        L3D. |  -.0000627   .0015125    -0.04   0.967    -.0030272    .0029017
             |
       _cons |   .0049268   .0094609     0.52   0.603    -.0136163    .0234698
------------------------------------------------------------------------------
```


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D_FDI						
_cel						
L1.	-.0195373	.003981	-4.91	0.000	-.0273398	-.0117347
GDP						
LD.	.8185652	1.064243	0.77	0.442	-1.267312	2.904443
L2D.	3.449989	1.056048	3.27	0.001	1.380173	5.519805
L3D.	2.593446	1.056778	2.45	0.014	.522199	4.664692
FDI						
LD.	-1.293076	.2692215	-4.80	0.000	-1.82074	-.7654114
L2D.	-1.953872	.2607291	-7.49	0.000	-2.464891	-1.442852
L3D.	-1.360676	.2888662	-4.71	0.000	-1.926843	-.7945085
HumCap						
LD.	1.997876	.6344983	3.15	0.002	.7542828	3.24147
L2D.	2.393092	.6362846	3.76	0.000	1.145997	3.640186
L3D.	3.153222	.6466822	4.88	0.000	1.885749	4.420696
Openess						
LD.	-.0160466	.0063409	-2.53	0.011	-.0284746	-.0036186
L2D.	-.0102386	.0062588	-1.64	0.102	-.0225056	.0020284
L3D.	-.0049194	.006103	-0.81	0.420	-.016881	.0070422
_cons	.0781149	.038175	2.05	0.041	.0032934	.1529365
D_HumCap						
_cel						
L1.	-.0032644	.0017731	-1.84	0.066	-.0067396	.0002107
GDP						
LD.	.1257098	.4740026	0.27	0.791	-.8033181	1.054738
L2D.	-.495532	.4703527	-1.05	0.292	-1.417406	.4263423
L3D.	.2636564	.4706777	0.56	0.575	-.658855	1.186168
FDI						
LD.	-.1704707	.1199084	-1.42	0.155	-.4054869	.0645454
L2D.	-.1982914	.116126	-1.71	0.088	-.4258942	.0293114
L3D.	-.093297	.128658	-0.73	0.468	-.345462	.1588679
HumCap						
LD.	.2719398	.2825988	0.96	0.336	-.2819438	.8258233
L2D.	.1095076	.2833945	0.39	0.699	-.4459353	.6649506
L3D.	.4696802	.2880255	1.63	0.103	-.0948393	1.0342
Openess						
LD.	-.0026121	.0028242	-0.92	0.355	-.0081474	.0029232
L2D.	-.0011983	.0027876	-0.43	0.667	-.0066619	.0042653
L3D.	-.0006495	.0027182	-0.24	0.811	-.0059771	.004678
_cons	.0299773	.0170027	1.76	0.078	-.0033475	.063302
D_Openess						
_cel						
L1.	-.1252951	.1658217	-0.76	0.450	-.4502997	.1997094
GDP						
LD.	21.05301	44.32971	0.47	0.635	-65.83162	107.9377
L2D.	28.85988	43.98837	0.66	0.512	-57.35574	115.0755
L3D.	24.27435	44.01877	0.55	0.581	-62.00085	110.5495
FDI						
LD.	-8.606463	11.21409	-0.77	0.443	-30.58567	13.37274
L2D.	-18.60748	10.86035	-1.71	0.087	-39.89337	2.678406
L3D.	-5.110784	12.03236	-0.42	0.671	-28.69378	18.47221
HumCap						
LD.	13.9544	26.42924	0.53	0.598	-37.84595	65.75475
L2D.	42.06984	26.50364	1.59	0.112	-9.876342	94.01603
L3D.	26.62417	26.93674	0.99	0.323	-26.17087	79.41922
Openess						
LD.	-.4584344	.2641238	-1.74	0.083	-.9761075	.0592387
L2D.	-.1777171	.2607018	-0.68	0.495	-.6886833	.3332492
L3D.	-.1596221	.2542113	-0.63	0.530	-.6578671	.3386229
_cons	-.0130022	1.590131	-0.01	0.993	-3.129601	3.103597

Cointegrating equations

Equation	Parms	chi2	P>chi2
_cel	3	45.48774	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_cel						
GDP	1	.	.	.	.	.
FDI	-18.93634	7.069623	-2.68	0.007	-32.79255	-5.080132
HumCap	64.61977	10.69969	6.04	0.000	43.64877	85.59077
Openess	-.4101897	.2977042	-1.38	0.168	-.9936792	.1732998
_cons	-81.45272	.	.	.	.	.

Short-run Causality:

```
. test ([D_FDI]: LD.GDP L2D.GDP L3D.GDP)

 ( 1)  [D_FDI]LD.GDP = 0
 ( 2)  [D_FDI]L2D.GDP = 0
 ( 3)  [D_FDI]L3D.GDP = 0

           chi2(  3) =   26.11
         Prob > chi2 =    0.0000

. test ([D_FDI]: LD.HumCap L2D.HumCap L3D.HumCap)

 ( 1)  [D_FDI]LD.HumCap = 0
 ( 2)  [D_FDI]L2D.HumCap = 0
 ( 3)  [D_FDI]L3D.HumCap = 0

           chi2(  3) =   34.56
         Prob > chi2 =    0.0000

. test ([D_FDI]: LD.Openess L2D.Openess L3D.Openess)

 ( 1)  [D_FDI]LD.Openess = 0
 ( 2)  [D_FDI]L2D.Openess = 0
 ( 3)  [D_FDI]L3D.Openess = 0

           chi2(  3) =    7.42
         Prob > chi2 =    0.0595
```

Descriptive Statistics and Correlation Matrix:

```
. summarize FDI GDP HumCap Openess
```

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI	33	1.113157	.296615	.18332	1.37528
GDP	33	2.78965	.0654896	2.604819	2.856475
HumCap	33	1.752692	.1213394	1.555699	1.947385
Openess	33	1.78932	4.31565	-8	11.78318

```
. pwcorr
```

	Date	GDP	FDI	HumCap	Openess
Date	1.0000				
GDP	-0.4692	1.0000			
FDI	-0.5802	0.8105	1.0000		
HumCap	0.8747	-0.3323	-0.3983	1.0000	
Openess	-0.0059	0.1996	0.1568	0.2593	1.0000

Testing the Model:

```
. veclmar
```

Lagrange-multiplier test

lag	chi2	df	Prob > chi2
1	20.2791	16	0.20791
2	14.0117	16	0.59784

H0: no autocorrelation at lag order

```
. vecnorm, jbera
```

Jarque-Bera test

Equation	chi2	df	Prob > chi2
D_GDP	0.676	2	0.71316
D_FDI	1.840	2	0.39859
D_HumCap	0.702	2	0.70399
D_Openess	0.430	2	0.80655
ALL	3.648	8	0.88743

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References

[1] Adebola, S., Shahbaz, M. Natural gas consumption and economic growth : The role of foreign direct investment, capital formation and trade openness in Malaysia. Renewable and Sustainable Energy Reviews, 2015, 42: 835-845. https://doi.org/10.1016/j.rser.2014.10.075

[2] Adhikary, B. K. Dynamic Effects of FDI, Trade Openness, Capital Formation and Human Capital on the Economic Growth Rate in the Least Developed Economies : Evidence from Nepal. International Journal of Trade, Economics and Finance, 2015, 6(1): 1-7. https://doi.org/10.7763/IJTEF.2015.V6.432

[3] Ahmad, F., Draz, M. U., Su, L., Ozturk, I., Rauf, A., Ali, S. Impact of FDI Inflows on Poverty Reduction in the ASEAN and SAARC Economies. Sustainability, 2019, 11(2565): 1-24.

[4] Alam, A., Arshad, M. U., Rajput, W. Relationship of Labor Productivity, Foreign Direct Investment and Economic Growth: Evidence from OECD Countries. Business and Management Sciences, 2013, 1(6): 133-138. https://doi.org/10.12691/jbms-1-6-3

[5] Alfaro, L. Foreign Direct Investment and Growth: Does the Sector Matter? Boston, 2003.

[6] Asiedu, E. Policy Reform and Foreign Direct Investment in Africa : Absolute Progress but Relative Decline. Development Policy Review, 2004, 22(1): 41-48.

[7] Awolusi, O. D., Olufemi, A. P. Impact of foreign direct investment on economic growth in Africa. Problems and Perspectives in Management, 2016, 14(2): 289-297. https://doi.org/10.21511/ppm.14(2-2).2016.04

[8] Balasubramanyam, V. N., Salisu, M., Sapsford, D. Foreign Direct Investment and Growth in EP and is Countries. The Economic Journal, 1996, 106(434): 92-105. https://doi.org/10.1016/B978-0-12-397874-5.00016-6

[9] Balcerzak, A. P., Żurek, M. Foreign Direct Investment and Unemployment : VAR Analysis for Poland in the Years 1995-2009. European Research Studies, 2011, XIV(1): 1-12.

[10] Basnet, H. C., Pradhan, G. Does the Inflow of FDI Stock Matter ? Evidence from SAARC Countries. Economic Society of Australia, 2014, 33(3): 305-312. https://doi.org/10.1111/1759-3441.12078

[11] Bekere, B., Bersisa, M. Impact of Foreign Direct Investment on Economic Growth in Eastern Africa. Determinants of Economic Growth in Africa, 2018, 4: 95-124. https://doi.org/doi.org/10.1007/978-3-319-76493-1_4

[12] Blomstrom, M., Kokko, A. The Impact of Foreign Investment on Host Countries : A Review of the Empirical Evidence, 2014.

[13] Egger, P., Merlo, V. The Impact of Bilateral Investment Treaties on FDI Dynamics. The World Economy, 2007: 1536-1549. https://doi.org/10.1111/j.1467-9701.2007.01063.x

[14] Engle, R. F., Granger, C. W. J. Co-Integration and Error Correction: Representation, Estimation, and Testing. Econometrica, 2012, 55(2): 251-276.

[15] Epaphra, M., Mwakalasya, A. H. Analysis of Foreign Direct Investment, Agricultural Sector and Economic Growth in Tanzania. Modern Economy, 2017, 8: 111-140. https://doi.org/10.4236/me.2017.81008

[16] Feils, D. J., Rahman, M. The Impact of Regional Integration on Insider and Outsider FDI. Management International Review, 2016, 51(1): 41-63.

[17] Frimpong, J. M., Oteng-abayie, E. F. Bivariate Causality Analysis between FDI Inflows and Economic Growth in Ghana. In International Research Journal of Finance and Economics, 2006, 351.

[18] Geel, J. C. G. What influences foreign direct investment into Africa. KPMG International, 2016: 1-56.

[19] Habib, M. D., Sarwar, S. Impact of Foreign Direct Investment on Employment Level In Pakistan : A Time Series Analysis. Law, Policy and Globalization, 2013, 10: 46-56.

[20] Haile, T. Determinants of foreign direct investment in Ethiopia (Arba Minch University), 2010. https://doi.org/10.13140/RG.2.1.3933.1288

[21] Hussain, M. E., Haque, M. Foreign Direct Investment, Trade, and Economic Growth : An Empirical Analysis of Bangladesh. Econimic, 2016, 4(7): 1-14. https://doi.org/10.3390/economies4020007

[22] Judson, R. A., Owen, A. L. Estimating dynamic panel data models: A guide for macroeconomists. Economics Letters, 1999, 65(1): 9-15. https://doi.org/10.1016/s0165-1765(99)00130-5

[23] Mencinger, J. Does Foreign Direct Investment Always Enhance Economic Growth? Kyklos, 2003, 56(4): 491-508.

[24] Messerlin, P. A. The impact of trade and capital movements on labour evidence on the french case. OECD Economic Studies, 1995, 24: 90-123.

[25] Michie, J. The Impact of Foreign Direct Investment on Human Capital Enhancement in Developing Countries, 2001.

[26] Miyamoto, K. Human Capital Formation and Foreign

DOI: https://doi.org/10.30564/jesr.v3i4.1937

Direct Investment, 2003, 211.
[27] Moss, T. J., Ramachandran, V., Shah, M. K. Is Africa ' s Skepticism of Foreign Capital Justified ? Evidence from East African Firm Survey Data, 2004.
[28] Muhammad, A., Umer, I., Ahmed, S. Impact of foreign direct investment on economic growth : A case study of Pakistan. Journal of Management and Social Sciences, 2012, 8(2):22-30.
[29] Naseem, M. A., Abbas, Q., Akbar, S., Nasir, A. S., Aman, H. U. Impact of Foreign Direct Investment on Gross Domestic Product. Global Journal of Management and Business Research, 2011, 11(8): 35-40.
[30] Obwona, M. B. Determinants of FDI and their Impact on Economic Growth in Uganda. African Development Review, 2001, 13(1): 46-81.
[31] Ould, L. An Investigation of the Impact of Foreign Direct Investment on Economic Growth : A Case Study of Mauritania. International Journal of Economics & Management Sciences, 2015, 4(2). https://doi.org/10.4172/2162-6359.1000224
[32] Raza, K., Bashir, F., Farah. Determinant of Foreign Direct Investment in Pakistan. Journal of Economics and Sustainable Development, 2015, 6(13): 74-84.
[33] UNCTAD. Investment Policy Review of Burundi. In Investment Policy Review of Burundi, 2010.
[34] Wakyereza, R. K. S. The Impact of Foreign Direct Investment on Economic Growth, Employment and Poverty Reduction in Uganda. Makerere University, 2017.
[35] Wijeweera, A., Villano, R., Dollery, B. Economic Growth and FDI Inflows : A Stochastic Frontier Analysis. Developing Areas, 2016, 43(2): 143-158.
[36] Zhang, K. H. Does Foreign Direct Investment Promote Economic Growth? Evidence from East Asia and Latin America. Contemporary Economic Policy, 2001, 19(2): 175-185.

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ARTICLE

Economic Policy Uncertainty and Corporate Mergers and Acquisitions

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M & A performance

ABSTRACT

In recent years, the frequent adjustment of the government's economic policies and the uncertainty of foreign economic situations have made the degree of uncertainty of China's economic policies rise continuously. The increasing degree of policy uncertainty will inevitably affect the investment and financing decisions of micro enterprises. Then, how does economic policy uncertainty (EPU) affect mergers and acquisitions (M&A) behavior? What's the mechanism? Based on the above questions, this paper uses the data of non-financial listed companies in the Shanghai and Shenzhen stock exchanges from 2008 to 2018 as a sample to explore the relationship between EPU and M&A. The study shows that rising EPU will promote corporate M&A behavior, and this effect is more significant in slow-growth companies. The relationship between EPU and M&A is affected by corporate governance, stock price volatility and financing constraints. Specifically, the company's M&A size is more sensitive to EPU with higher level of corporate governance, higher level of stock price volatility, and lesser financing constraints. Further research shows that the rise of EPU will significantly promote the improvement of M&A performance in the short-term, but this effect does not exist in the long-term. Various robustness checks do not change the empirical results of this paper.

1. Introduction

As an important means for the allocation of storage resources in the capital market, M&A plays an important role in promoting corporate strategic adjustment, resource integration and industrial upgrading. At the micro level, M&A have reallocated resources from low-productivity to high-productivity enterprises, and achieve cost reduction and efficiency improvement through the reorganization of resources within and between industries. According to statistics, the size of M&A deals of China's listed companies is on the rise as a whole since 2000. In 2018 alone, there were 6,283 new M&A deals with a total value of RMB180 million, a year-on-year increase of 2.7%. As a way of corporate development, M&A can optimize resource allocation, improve corporate performance and expand investment scale to a certain extent. However, problems such as the stock price crash risk caused by M&A and aggravated financial market volatility have also gradually highlighted. Through the integration and reorganization of resources among corporate departments, M&A can bring economy of scale, econ-

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omy of scope or synergies, so as to increase enterprise value and improve efficiency; at the sector level, M&A can reallocate resources within and between industries, achieve the goals of industry integration, industrial restructuring and upgrading in the case of high requirement for market access for different industries. At the national level, finding new economic growth points and preventing systematic financial risks are important economic issues in macro-finance in China. With China's economic growth entering a "new normal" stage, problems such as the shrinking market demand, high leverage ratio and the "living dead" of zombie companies have gradually become noticeable.

China's supply-side structural reform plays an active role in transforming the growth mode, optimizing the economic structure, and alleviating distortion of resource allocation. As the main method of resource allocation in the capital market, M&A have become an important task for the capital market to serve the national strategic adjustment and the real economy.

After the outbreak of the global financial crisis in 2008, China issued a series of fiscal policies, monetary policies and industrial policies to mitigate the negative impact of foreign economic recession on China's macro economy. As an important means of macro-control by government, economic policies, while adjusting investment structure, optimizing industrial structure, and improving the institutional environment, will also have an impact on the external operating environment of enterprises, which in turn affects micro-enterprise investment, R&D innovation, financial asset allocation, business credit supply and the analysts' earnings forecasts revisions [1-5]. The data of Baker et al. show that China's EPU level has been on the rise since 2012, which may be related to a series of policies that have been withdrawn in recent years [6]. On the one hand, the credit tight of commercial banks and the herd behavior of outside investors caused by the rise in EPU reduced the size of M&A deals by increasing the financing costs and operating risks of enterprises; on the other hand, while the rise of EPU brings more uncertainty to the investment and financing activities of enterprises, it also means that companies will achieve greater future benefits through industrial transformation, resource integration and seizing market share through R&D and innovation, M&A. In view of the above two diametrically opposed mechanisms, this paper attempts to explore this issue, using data from non-financial listed companies to empirically analyze the impact of EPU on M&A. This study attempts to reveal the impact of rising EPU on the size of M&A deals and M&A performance, with a view to revealing the mechanism of macroeconomic policies on the behavioral mechanism of micro-enterprises, and thus provide theoretical support and reference for the formulation and implementation of economic policies of the government sector.

Previous researches on M&A mostly focused on the motivation, influencing factors and economic effects of M&A. In terms of motivation of M&A, M&A can help improve the cooperative effect of enterprises by integrating the resources of both parties, which is reflected in the synergistic effects of management, finance, and operation [7]. M&A, as an important way to restructure resources in the capital market, is motivated by the stages of industry evolution[8]. In terms of influence factors and economic consequences, government intervention and political connections will act on M&A, and local officials will intervene in M&A activities to achieve specific political goals in consideration of social stability factors such as increasing real investment efficiency and employment rates. This leads to the phenomenon of "M&A performance paradox". Furthermore, the director ties will also affect the probability of successful M&A deals through business due diligence and value assessment mechanisms. Regional informal regulations will also increase the value of M&A deals by suppressing opportunistic behaviors among transaction subjects, and reducing the uncertainty of M&A. In addition, cultural differences between enterprises will also increase the difficulty of cultural financing for both sides of M&A and thus have a negative impact on M&A performance.

Regarding the impact of EPU on corporate behavior, scholars at home and abroad have also conducted a thorough research. Some scholars have found that under the influence of real options theory and financial frictions, the rise of EPU will discourage business investment [1,4,9]. EPU will also have an impact on cash holding levels, risk exposure and technological innovation [3,10,11]. However, few studies have revealed the relationship between EPU and M&A. On the one hand, the rise of EPU implies that the uncertainty of the business environment and banks' reluctance to lend have increased, weakening the synergistic effect caused by M&A, thereby inhibiting the size of M&A deals; on the other hand, the rise of EPU means that investors are more sensitive to the released negative information, and more inclined to "vote with their feet". The uncertainty of the financial market and the herd effect of investors imply that the value of some enterprises is underestimated, which make large-scale enterprises with strong anti-risk ability have motivation to expand operations, acquire patent technology and transform through M&A. However, there is a lack of EPU's in-depth analysis of M&A's influencing mechanism. In view of this, this paper intends to make up for the deficiency of existing

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literature and empirically analyze the effect of EPU on M&A behavior.

This paper uses the data of non-financial listed companies in Shanghai and Shenzhen stock exchanges from 2008 to 2018 to empirically analyze the impact of rising EPU on M&A. Specifically, this paper firstly explains the mechanism of EPU's rise on M&A theoretically, and proposes alternative hypotheses. Then, it analyzes the regulatory mechanisms of corporate governance, stock price fluctuations and financing constraints between EPU and M&A. Finally, it further discusses the impact of rising EPU on M&A performance. Compared with the existing research, our research contributes to the literature in three important ways. Firstly, our study breaks away from the traditional research, which is confined to study the impact of EPU's impact on corporate R&D investment, financial asset allocation, and cash holdings and reveals the effect of EPU's rise on M&A; secondly, our study analyzes the relationship between EPU and M&A, and find heterogeneous effects in companies with different levels of corporate governance, stock price volatility, and financing constraints; thirdly, it further explores the impact of the rising EPU on M&A performance.

The remainder of the paper is organized as follows: We present literature review and research hypothesis in Section II. Section III develops empirical predictions. Section IV presents empirical results. Section V further discusses the influence of EPU on M&A performance, and section VI concludes and put forward policy suggestions.

2. Literature Review and Research Hypothesis

2.1 EPU and M&A

The influencing mechanism of EPU on corporate investment and financing activities has always been the focus of domestic and foreign scholars. The introduction and adjustment of government fiscal, monetary, and industrial policies make it impossible for economic entities to predict with certainty whether, when and how the government will change the current economic policy [1], which in turn will affect behaviors of micro-firms [6,12]. As an important way of enterprise resource allocation, M&A also belong to the category of corporate investment behavior. From the perspective of the influencing mechanism, first, the rising EPU will increase the option value of M&A delay decisions [4,9], and reduce the positive effect of scale economy and scope economy caused by M&A activities on corporate performance, thus inhibiting M&A motivation. Second, the rise of EPU will also aggravate the phenomenon of banks' reluctance to lend, increase the difficulty of external financing, and amplify financial market fluctuations[3], thereby restraining the size of M&A deals at the capital level. Third, frequent adjustments of government economic policies and rising uncertainties in foreign financial market conditions will also make external investors become more sensitive to the release of negative news. Once institutional investors have a negative attitude towards M&A deals, it inevitably means that the market performance after M&A will be worse due to the herd behavior of outside investors and the "voting-with-their-feet" behavior, thereby weakening the willingness of M&A. Therefore, the rise in EPU may inhibit M&A activities.

The increase in policy uncertainty is often accompanied by the improvement of the difficulty for external investors to supervise the management, which will promote the tendency of excessive investment and self-interested behavior of the management [13]. Specifically, managerial compensation usually depends on the firm size. During periods of high EPU, managers may expand the firm size and improve the non-monetary benefits through M&A deals, and attribute the adverse impact of M&A to policy changes, so as to avoid the board's punishment mechanism for their poor management. In addition, the elevation of EPU levels has increased the difficulty of external financing and operational risks for enterprises, and enterprises are more inclined to achieve financial synergy and operational diversification through M&A. Based on the above viewpoints, this paper proposes two alternative hypotheses:

H1a: The rise of EPU will inhibit M&A activities.

H1b: The rise of EPU will promote M&A activities.

2.2 Heterogeneous Effects of EPU on M&A

The problem of information asymmetry between an acquirer and a target company often causes problems such as "free-riding", cultural conflicts and reverse allocation of resources in the M&A process[14,15]. A good corporate governance environment will help the integration of various resources between the acquirer and the acquired party, inhibit the opportunistic behavior of managers, and promote the rapid integration of differentiated cultures, thereby improving M&A performance. Corporate governance is an important means to ensure enterprises to operate effectively, prevent risks of assets, and achieve business management objectives. The study found that internal control can effectively improve the risk prevention capabilities of M&A activities so as to ensure the smooth progress of M&A activities and the realization of synergistic effects [16]. The M&A deal value is jointly determined by the value of the acquirer and the target company, and the value realization of both parties depends on the perfection of the internal control system. Therefore, compared with

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companies with poor corporate governance levels, the positive impact of the rising EPU on M&A is stronger in companies with sound corporate governance. In view of this, the second research hypothesis is proposed:

H2: The positive impact of the EPU on M&A is more significant in enterprises with a higher level of corporate governance.

In the securities markets, the signal transmission mechanism of stock value will promote the optimal allocation of resources. Compared with mature capital markets, the stock price of emerging market countries contains a lot of noise, so that the stock price cannot well reflect the fundamentals information of a company, and it is difficult to play the guiding role of resource allocation [17]. China's securities market has always been regarded as a "policy market", and macroeconomic information has an important impact on stock price changes. EPU significantly increases the volatility of corporate stock prices and the asymmetric relation between the stock market and macroeconomic dynamics [5,18]. Under the influence of information asymmetry, market incompleteness makes corporate value being misestimated more frequently. Compared with companies with more stable stock market performance, the increase in EPU makes external investors have a stronger tendency to overreact to enterprises with a high level of stock price volatility. Therefore, enterprises with a high level of stock price volatility make external financing internalized through M&A, diversify operations, boost investors' confidence, and have a stronger willingness to transform and upgrade their industries. As a result, the rising EPU will have a more significant promoting effect on M&A in such enterprises. In view of this, this paper proposes a third hypothesis:

H3: The positive impact of rising EPU on M&A is more significant in companies with a higher level of stock price volatility.

EPU acts on the investment decision-making behavior of enterprises through two channels: the degree of financing constraints and the availability of financing [19]. EPU means that the risk of loan is higher, and financial intermediaries will further allocate funds to state-owned and large-scale enterprises with implicit government guarantees and strong anti-risk capabilities to balance risk and return, thereby exacerbating credit differentiation [20]. Specifically, SOEs and large-scale enterprises have strong financing advantages, and they can raise sufficient funds from the capital market and banks, or even more money than is necessary for their operations, while private enterprises and small-scale enterprises are difficult to obtain financing from formal financial institutions. Companies that are subject to strong financing constraints can hardly absorb the funds needed for M&A from outside. Companies that are subject to weak financing constraints have relatively abundant funds and stronger motivation to engage in M&A. Therefore, this paper proposes hypothesis 4:

H4: The positive impact of the rising EPU on M&A is more significant in enterprises with less financial constraints

3. Empirical Design and Data

3.1 Sample Selection and Data Sources

This paper takes the M&A events of A-shares that are listed on either the Shanghai or Shenzhen stock exchanges from 2008 to 2018 as samples of initial research, and selects the samples of M&A events as follows: (1) M&A events in which the M&A transactions take place in the place of buyer; (2) Only successful transactions are retained; (3) Samples of related-party transactions are excluded; (4) Samples of M&A deals inn ST and the financial industry are excluded. Regarding EPU, we use the indices measured by Baker et al. (2016) based on keyword search over the *South China Morning Post*, which is, proportion of related reports with four keywords of "China", "Economy", "Uncertainty" and "Policy" in the total number of articles of the current month. Both M&A transaction data and corporate financial data come from China Stock Market & Accounting Research Database (CSMAR). In order to eliminate the interference of extreme values on empirical analysis, continuous variables are winsorized at level 1% at the firm level.

3.2 Empirical Design and Variable Definitions

To explore the impact of rising EPU on M&A, we construct the following empirical models:

$$\mathrm{MA}_{i,t} = \alpha + \beta EPU_t + \rho X_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \quad (1)$$

Wherein, the subscript i represents an enterprise and t represents the year. The independent variable MA represents the M&A behavior of the listed company i in year t, which is measured by the natural logarithm of the total value of all M&A deals of the company this year plus one. EPU stands for economic policy uncertainty, which is the core independent variable of this paper, and is measured by the twelve-month average of the year (divided by 100). If the estimated value of β is significantly less than 0, it indicates that the EPU will inhibit M&A activities (H1a); on the contrary, if the estimated value of β is significantly greater than 0, it indicates that the EPU will promote M&A activities (H1b).

$X_{i,t}$ refers to a series of control variables, including oth-

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er factors that affect M&A. We use the financial and entity's relative rate of return (Return_Gap), which is measured by the ratio of financial rate of return to the entity's rate of return; financial and entity's relative risk (Risk_Gap), which is measured by the ratio of three-quarter rolling standard deviation of financial rate of return and the entity's rate of return. In addition, we also use controls variables such as firm size (Size), free cash flow (CF), Tobin'Q (TobinQ), financial leverage (Lev), return on assets (ROA), and corporate growth (Salesgrowth).

μ_i refers to the firm's fixed effects, which is used to capture the individual consistent characteristics of the firm that does not change over time, so as to reduce the impact of omitted variables on the empirical results. δ_t represents time fixed effects. $\varepsilon_{(i,t)}$ is the unobserved residual. In a regression analysis, this paper uses cluster-robust standard errors to cluster the standard errors to the enterprise level. The detailed variable measurement is shown in Table 1.

To further examine the impact of EPU on M&A in companies with different levels of corporate governance, stock price volatility, and financing constraints, we introduce the interactions between EPU and the aforementioned regulated variables based on the baseline regression model (1), and construct a regression model as shown in equation (2).

$$\mathrm{MA}_{i,t} = \alpha + \beta EPU_t + \gamma EPU_t \times MV_{i,t} + \delta MV_{i,t} + \rho X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

Wherein, $\mathrm{MV}_{i,t}$ represents the regulated variable of enterprise i in period t. Specifically, we use a dummy variable CG_{it} measuring corporate governance levels, a dummy variable $VIX_{i,t}$ measuring the level of stock price volatility, and KZ index measuring financing constraints ($ConFKZ_{i,t}$), and solvency ratio ($ConFSy_{i,t}$) to interact with EPU index EPU_t.

Wherein, for the measurement of corporate governance levels, we use shareholding proportion of executives and the nature of corporate ownership. Specifically, if the shareholding proportion of executives is greater than the median level of the same industry in the same year, it is set as a company with a higher level of governance, that is, *CG*_CEOSHR=1, otherwise, it is assigned a value of 0. The second method reflects the corporate governance based on the nature of corporate ownership. It is generally believed that non-state-owned enterprises have better corporate governance than SOEs. Therefore, if it is a non-state-owned enterprise, *CG*_CEOSHR=1; if it is a SOE, the value is 0. In model (2), if the coefficient on the interaction term between EPU and corporate governance levels is significantly positive, it means that the rise of EPU will have a stronger role in promoting the size of M&A deals with a higher level of corporate governance, that is, hypothesis 2 holds.

Similarly, to examine how the relationship between EPU and M&A is affected by a company's level of stock price volatility, we add the interaction term between EPU and level of stock price volatility to the benchmark model. Specifically, we use the three-year stock price volatility (*VIX*) before M&A to reflect the level of stock price volatility. If the stock price volatility is greater than the median of the same industry in the same year, the value of *VIX* is 1, otherwise the value is 0. We use the KZ index [21] and the solvency ratio to reflect the degree of financing constraints. Specifically, if the KZ index is larger and the solvency ratio is smaller, it indicates that the degree of financing constraints is greater. If the interaction term between EPU and KZ index ($EPU_t \times ConFKZ_{i,t}$) is significantly negative, and the coefficient on the interaction term between EPU and solvency ratio ($EPU_t \times ConFSY_{i,t}$) is significantly positive, it indicates that the rising EPU has a positive impact on size of M&A deals, which is even greater in companies with less financing constraints.

Table 1. Variable Definitions

Variables	Description	Estimating method
MA	Value of M&A	Natural logarithm of the total value of all M&A deals of the company this year plus one
MAD	Whether M&A or not	The acquired company is assigned the value 1, otherwise it is 0
EPU	EPU	Arithmetic average of the twelve months of the year/100
Size	Company size	Natural logarithm of total assets
CF	Free cash flow	Free cash flow/total assets
TobinQ	Tobin's Q	Market value/total assets
Lev	Financial leverage (%)	Total liabilities/total assets
ROA	ROA (%)	Net profit/total assets
Salesg	Corporate growth (%)	Operating income of the current period / operating income of the previous period -1
Return_Gap	Financial and entity's relative rate of return	Financial rate of return/entity rate of return
Risk_Gap	Financial and entity's relative risk	Ratio of three-quarter rolling standard deviation of financial rate of return and the entity's rate of return
CG_CEOSHR	Corporate governance level Proxy variable 1	An indicator that equals 1 if shareholding proportion of executives is greater than the median level of the same industry in the same year, and 0 otherwise
CG_SOE	Corporate governance level Proxy variable 2	0 for state-owned enterprises, 1 for non-state-owned enterprises

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VIX	Level of stock price volatility	An indicator that equals 1 if the stock price volatility is greater than the median of the same industry in the same year, and 0 otherwise
ConFKZ	KZ index	Based on the method proposed by Kaplan &Zingales (1997)
ConFSY	Solvency ratio of financing constraints	Shareholders' equity/total liabilities

4. Analysis of Empirical Results

4.1 Baseline Regression

Table 2 reports the regression results of the impact of EPU on M&A. Where, columns (2) and (4) control the fixed effects on the basis of the columns (1) and (3) respectively. The results show that in columns (1) and (2), the EPU coefficients are 1.1530 and 2.0467, respectively, which are both statistically significant at the 1% level. This shows that the EPU has a positive impact on the size of M&A deals. Considering that size of M&A deals are affected by variables of other enterprise-level, columns (3) and (4) in the table further control variables such as firm size, free cash flow, leverage ratio, ROA, growth, financial and entity's relative rate of return and relative risk. The fixed-effect model shows that after adding control variables at an enterprise level, the coefficient of EPU (EPU) is still statistically significant at the 1% level, therefore, H1b holds.

Table 2. EPU and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	1.1530***	2.0467***	0.9619***	1.1792***
	(0.044)	(0.097)	(0.053)	(0.125)
N	26,196	26,196	26,196	26,196
R^2	0.032	0.069	0.040	0.083
Control Variables	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively, the same as below. Due to space limitations, regression coefficients of control variables are not reported in this paper. See the appendix for details, the same as below.

The impact of EPU on M&A behavior may also be related to the stage of a company. Generally speaking, companies at a start-up stage have more investment opportunities, greater potential for growth, and insufficient idle money [22]. However, as companies enter the stage of large-scale production, their market share has gradually expanded, capital sources have stabilized, and external investment opportunities and industry development momentum have weakened. Companies in the maturity stage are more inclined to acquire companies with good growth potential, financing difficulties, and in emerging industries for the purpose of expanding production, resource integration and industrial transformation. Therefore, EPU may have heterogeneous effects on M&A depending on the stage of enterprise growth.

Table 3. EPU and M&A: Sub-sample Test According to the Growth of Enterprises

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
	Initial Stage	Development Stage	Initial Stage	Development Stage
EPU	0.7583***	1.0621***	0.7244***	1.5188***
	(0.079)	(0.078)	(0.191)	(0.174)
N	12,876	12,856	12,876	12,856
R^2	0.025	0.051	0.060	0.092
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes

To further investigate the heterogeneous effects of the rising EPU on size of M&A deals, we will run a sub-sample regression according to the growth rate of main business revenue higher or lower than the median of the year and the industry. The empirical results are shown in Table 3. The first two columns in the table give the regression results of the fixed effects of uncontrol years, showing that the EPU coefficient is 1.0621 in the mature period and is statistically significant at the 1% level, which is higher than the EPU coefficient (0.7583) of enterprises in the start-up period. It can be seen that the positive impact of EPU on M&A is more significant in companies during the maturity stage. Columns (3) and (4) in the table further give the regression results after controlling the year fixed effects, and the results have not changed.

4.2 Analysis of Moderating Effect

(1) The moderating effect of corporate governance. To further verify the moderating effect of corporate governance levels on EPU and M&A, we introduce the interaction terms between corporate governance levels and EPU referring to model (2). The regression results are shown in Table 4.

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Table 4. EPU, Corporate Governance and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	0.7113***	0.9919***	0.3738***	0.7843***
	(0.065)	(0.130)	(0.073)	(0.130)
CG_CEO-SHR*EPU	0.6139***	0.5220***		
	(0.091)	(0.089)		
CG_CEO-SHR	-1.1804***	-1.1844***		
	(0.285)	(0.280)		
CG_SOE*EPU			1.0191***	0.8196***
			(0.092)	(0.092)
CG_SOE			-1.4550***	-0.6971
			(0.505)	(0.509)
N	26,196	26,196	26,196	26,196
R^2	0.043	0.085	0.046	0.087
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Columns (1) and (2) in Table 4 are the regression results with the shareholding proportion of executives as a proxy variable. The results show that the interaction term (CG_CEOSHR*EPU) between the dummy variable of executives' shareholding proportion and EPU is statistically significant at the 1% level, indicating that the improvement of corporate governance levels will magnify the positive relationship between EPU and size of M&A deals. We change the method of measuring the corporate governance levels and divide the corporate governance levels according to the nature of corporate ownership. The results show that the coefficient of CG_SOE*EPU interaction term is still statistically significant at the 1% level after adopting the nature of corporate ownership as the proxy indicator of corporate governance levels, and the conclusions are consistent, that is, hypothesis 2 is verified.

(2) The moderating effect of stock price volatility. To further examine the impact of level of stock price volatility on the dynamic relationship between EPU and M&A, we introduce a dummy variable VIX for the level of stock price volatility three years before M&A, and multiplies it with EPU. The regression results are shown in Table 5. Columns (1) and (2) use the reinvestment rate without considering cash dividends to measure the stock price volatility, and columns (3) and (4) use the reinvestment rate considering cash dividends to measure the stock price volatility. The results in the table show that regardless of whether the time fixed effect is controlled, the interaction term VIX*EPU between level of stock price volatility and EPU is statistically significant at the 1% level. It can be seen that the increase in level of stock price volatility will amplify the positive correlation between EPU and M&A, and the H3 holds.

Table 5. EPU, Stock Price Volatility and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	0.5469***	0.7563***	0.5273***	0.6969***
	(0. 075)	(0. 142)	(0. 078)	(0. 145)
VIX*EPU	0.3164***	0.2462**	0.3419***	0.2760***
	(0. 102)	(0. 100)	(0. 106)	(0. 104)
VIX	-0.3199	-0.2252	-0.3484	-0.2633
	(0. 263)	(0. 260)	(0. 277)	(0. 273)
N	20,002	20,002	18,567	18,567
R^2	0.020	0.048	0.019	0.046
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

(3) Moderating effect of financing constraints. We introduce the interaction term between the proxy indicators of the financing constraints and the EPU to investigate the heterogeneous effects of the rising EPU on the M&A behavior with different levels of financing constraints. The empirical results are shown in Table 6. In columns (1) and (2) of the table, the coefficient on the interaction term between EPU and KZ index is significantly negative at the 1% level, indicating that the EPU has a positive effect on size of M&A deals in companies with less financial constraints. The positive impact of size of M&A deals is stronger. In columns (3) and (4) of the table, the coefficient of the interaction term between EPU and the solvency ratio is significantly positive. The results show that reduction in financing constraints will magnify the effect of EPU on the size of M&A deals, that is, Hypothesis 4 holds.

Table 6. EPU, Financing Constraints and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	1.4729***	1.6310***	0.8410***	1.0298***
	(0.106)	(0.157)	(0.065)	(0. 131)
ConFKZ *EPU	-0.3237***	-0.2830***		
	(0.059)	(0.058)		

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ConFKZ	0.4982**	0.5487***		
	(0.199)	(0.201)		
ConFSY*EPU			0.0485***	0.0630***
			(0. 016)	(0. 015)
ConFSY			-0.1545***	-0.2021***
			(0. 047)	(0. 047)
N	26,196	26,196	26,196	26,196
R^2	0.042	0.084	0.041	0.084
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

4.3 Robustness Checks

(1) Replace the kernel variables

In this paper, we use M&A dummy variable M&AD as the independent variable in the robustness checks. If the company has M&A deals for the current year, M&AD is assigned a value of 1, and 0 otherwise. Furthermore, this paper uses the Logit model to regress the reference model, and the results are shown in Table 7. The first two columns in the table do not control other control variables, and the last two columns in the table control all control variables. The results show that regardless of whether the year fixed effects are controlled or not, the coefficient of EPU is significantly positive at the 1% level, and the previous conclusions are still valid.

Table 7. Alternative dependent variables

Dependent Variable	(1)	(2)	(3)	(4)
	MAD	MAD	MAD	MAD
EPU	0.1832***	0.3781***	0.2002***	0.3910***
	(0.010)	(0.023)	(0.010)	(0.024)
N	26,196	26,196	26,196	26,196
R^2	0.094	0.0336	0.0186	0.0446
Control Variables	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

We further change the measuring method of EPU, taking the EPU index in December at the end of the year as a proxy indicator of the EPU of the current year. The results show that after replacing the core independent variables, the EPU coefficient is still statistically significant at the 1% level, which is consistent with the baseline regression results, namely, rising EPU promotes M&A activities.

Table 8. Replace the Measurement Method of EPU Index

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU_12M	0.6040***	0.8199***	0.5482***	0.4724***
	(0.018)	(0.039)	(0.020)	(0.050)
N	26,196	26,196	26,196	26,196
R^2	0.048	0.069	0.057	0.083
Control Variables	No	No	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

(2) Endogenous problems. To further investigate the impact of model endogenous problems on the empirical results, the method of instrumental variables (IVs) is used to regress the reference model. Regarding the selection of instrumental variables, Wang et al. believe that macroeconomic fluctuations such as interest rates and exchange rates in emerging countries are related to the introduction and changes of the US monetary policy. Considering that the economic policy uncertainty of US only affects the innovation activities of enterprises by influencing the EPU in China, therefore, the first instrumental variable in this paper is the US EPU index as the instrumental variable for China's EPU. Taking into account that the EPU of other major economies will also affect China's EPU through trade channels, which in turn will affect the investment and financing behavior of China's companies, we use the global EPU index and the EPU index weighted by the trade share of major trading countries of China as the second and third instrumental variables. Specifically, seven countries, namely the United States, Japan, South Korea, The United Kingdom, France, Germany and Italy, are selected in this paper. The proportion of import-export volume of these countries is taken as the weight, and the EPU index of China's major trading countries is obtained by using the weighted average method.

Table 9. IV

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	0.8970***	6.4008***	1.3289***	6.4008***
	(0.053)	(0.196)	(0.089)	(0.196)
N	26,096	26,096	26,096	26,096
R^2	0.040	0.083	0.038	0.083
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes

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Year FE	No	Yes	No	No
Anderson Test	0.0000		0.0000	
Cragg-Donald Test	2.0e+04		7320.248	

The results of instrumental variable regression of EPU and M&A are shown in Table 9. The results show that the first two columns in the table use the US EPU index as the IV. The results show that the EPU coefficient is still significantly negative at the 1% level, and the baseline results are still valid. Using global EPU index and the EPU index weighted by the trade share of major trading countries of China as the IVs, the EPU coefficient is still significantly positive at the 1% level, that is, the positive relationship between EPU and M&A size has not changed.

(3) Sub-sample regression. Due to differences in resource endowments and policy intensity, China's economic development has long been confronted with the problem of regional imbalance. There are big differences in the developed degree of economy, financial market perfection and financial intermediary development in different regions. In the Robustness checks, this paper adopts the method of sub-sample regression to examine the influence of the relationship between EPU and M&A in different regions. In this paper, the sample is divided into two sub-samples in the east and central west, and the reference model is regressed respectively. The empirical results are shown in Table 10. There are 17,900 samples from the eastern region and 8,293 samples from the central and western regions. The regression results in Table 10 show that the EPU coefficient is still statistically significant at the 1% level, that is, the previous conclusion has not substantially changed.

Table 10. Regression of Sub-samples: According to the Region of Company Address

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MA	**MA**	**MA**	**MA**
	East Regions	**East Regions**	**Central and Western Regions**	**Central and Western Regions**
EPU	0.9814***	1.2611***	0.8859***	0.9632***
	(0.064)	(0.158)	(0.092)	(0.209)
N	17,900	17,900	8,293	8,293
R^2	0.047	0.097	0.032	0.061
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

According to the different degree of industry competition, this paper regresses the sample according to the samples with high and low degree of industry competition. We calculate the Herfindahl index based on total assets, and classify the industries whose Herfindahl index is lower than the median level into highly competitive industries, and those higher than the median level as less competitive industries. The empirical results are shown in Table 11. The results show that the EPU coefficient is statistically significant at the 1% level in industries with high or low degree of industry competition. The empirical results are still valid, namely, the previous conclusions are still valid.

Table 11. Regression of Sub-samples According to the Degree of Industry Competition

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MA	**MA**	**MA**	**MA**
	Fierce competition	**Less competition**	**Fierce competition**	**Less competition**
EPU	0.9955***	0.9564***	1.1610***	1.2610***
	(0.078)	(0.077)	(0.204)	(0.182)
N	13,029	13,167	13,029	13,167
R^2	0.043	0.031	0.092	0.068
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes

5. EPU and M&A Performance

Whether M&A can create corporate value and achieve a long-term increase in operating performance have always been a concern to both domestic and foreign scholars. Most existing studies argue that it is difficult to improve corporate performance through M&A. Specifically, taking China's capital market as an example, most listed companies have negative excess returns when declaring M&A [14,23,24]. However, it is worth noting that under the premise that mergers and acquisitions cannot effectively improve corporate performance, the number of M&A deals and size of M&A deals are still showing an upward trend year by year. Studies have found that the strengthening of resource integration, the improvement of internal control means, and director ties will all have an impact on M&A performance. However, cultural differences, political connections, and the size of acquirers will have a negative effect on M&A performance [8,16].

Whether a target company selected by the acquirer and the timing are appropriate are the main factors affecting M&A performance. The rise of EPU means that the volatility of the financial market has risen, investor confidence

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has fallen, and the future industry development trend is even more unclear. In the context of EPU enhancement, the market value of some listed companies is undervalued, which provides space for the acquirers to expand product line, improve market share and acquire core technologies through M&A. Therefore, in the short term, with the rise of EPU, the internalization of external financing, expansion of production capacity and core technical capabilities brought by M&A can achieve the improvement of short-term performance. However, in the long run, the friction between an acquiring party and an acquired party over cultural differences, personnel coordination and resource integration will have a negative impact on the production and operation activities of enterprises, thereby reducing operating performance. So, how will the rise of EPU affect M&A performance? Does this influence have heterogeneity in term. This paper will further discuss the impact of rising EPU on M&A performance. Drawing on the research of Wang and Li, the difference of the return on assets between 1 year and 3 years before and after the acquisition of the target company is used as the proxy indicator of the M&A performance, the effect of EPU rise on M&A performance was investigated by adding the interaction item of EPU and M&A ($EPU_t \times MA_{i,t}$). The results are shown in Table 12.

Table 12. EPU and M&A Performance

Dependent Variable	(1)	(2)	(3)
	DROA_Y1	DROA_Y2	DROA_Y3
EPU*MAA	0.0001***	0.0000	-0.0000
	(0.000)	(0.000)	(0.000)
EPU	0.0054***	0.0109***	0.0167***
	(0.001)	(0.001)	(0.001)
MAA	-0.0002**	-0.0001	0.0000
	(0.000)	(0.000)	(0.000)
N	22,810	16,613	11,562
R^2	0.464	0.314	0.265
Control Variables	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

Column (1) in Table 12 takes the difference of the return on assets 1 year after M&A and 1 years before M&A as the proxy indicator of M&A performance. The results show that the interaction term (EPU*MAA) between EPU and size of M&A deals is statistically significant at the 1% level, indicating that the EPU will promote the improvement of short-term business performance. The last two columns in the table measure the M&A performance by the difference between the return on assets 2 and 3 years before and after the merger. The results show that the EPU*MAA interaction coefficient is not significant, indicating that there is no positive effect of EPU on M&A performance in the long run.

6. Conclusion and Recommendations

This paper examines the impact of EPU on M&A behavior. We found that the rise of EPU will promote M&A activities, and this effect is more significant in mature companies. The impact of EPU on size of M&A deals is affected by the level of corporate governance, stock price volatility, and financing constraints. Specifically, for a company with higher level of corporate governance and stock price volatility, and lesser financing constraints, its size of M&A deals is more sensitive to changes in EPU. Further study shows that the rise of EPU will promote the improvement of M&A performance in the short-term, but this effect is not significant in the long-term.

We come to the following policy suggestions: Firstly, the formulation of relevant economic and industrial policies of government sectors should fully consider the periodicity of the industries. For companies in different life stages, their M&A behavior has a different sensitivity to EPU. To better play the important role of M&A in resource allocation, when formulating relevant economic and industrial policies, government sectors should give full consideration to the characteristics of the industries in which enterprises are located, so as to better play the positive role of economic policies in adjusting industrial structure and enhancing economic vitality. Secondly, government sectors should stabilize investor expectations, improve the effectiveness of the capital market, and strengthen the information disclosure mechanism. The increase in EPU makes some companies more likely to be mispriced and viciously acquired, and emotional fluctuations of external investors will further amplify the above-mentioned effects. Therefore, how to guide investors to rationally anticipate, improve the effectiveness of the capital market, and strengthen the information disclosure mechanism in a period of high uncertainty in the foreign economic and financial environment and China's policy will have a strong role in achieving financial stability and promoting the development of high-tech industries. Financial regulatory authorities should further regulate M&A behavior, protect investors' interests, strengthen education on investors, and improve the financial statement disclosure mechanism. Thirdly, the coordination, pertinence and effectiveness of policies should be enhanced so as to form a resultant force in supervision. The increase in EPU has caused banks' reluctance to lend, which will raise corporate financing costs and affect the effectiveness of economic policy implemen-

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tation. Therefore, the formulation and implementation of policies by relevant departments should take full account of the coordination, coherence, and comprehensiveness of the policies, so as to promote the steady development of China's real economy. Fourth, enterprises should improve the corporate governance levels, increase the effect of human resources and financial capital allocation, and restrain the negative impact of management's opportunistic behavior on business operations. Specifically, enterprises should continue to improve their own corporate governance, strengthen resource allocation and integration capabilities, and enhance the inclusiveness of internal culture to suppress the negative impact of management's self-interested motivation on the business long-term value.

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Appendix Tables

Table 2. EPU and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	1.1530***	2.0467***	0.9619***	1.1792***
	(0.044)	(0.097)	(0.053)	(0.125)
Size			0.6799***	1.5158***
			(0.121)	(0.152)
CF			0.3869	0.1212
			(0.499)	(0.500)
TobinQ			0.3037***	0.6239***
			(0.050)	(0.054)
lev			3.1563***	1.9788***
			(0.556)	(0.560)
ROA			0.7443	1.0059
			(1.338)	(1.314)
salesg			0.4166***	0.4467***
			(0.117)	(0.117)
Return_Gap			0.0019***	0.0019***
.			(0.000)	(0.000)
Risk_Gap			-0.0000	-0.0000*
			(0.000)	(0.000)
N	26,196	26,196	26,196	26,196
R2	0.032	0.069	0.040	0.083
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 3. EPU and M&A: Sub-sample Test According to the Growth of Enterprises

	(1)	(2)	(3)	(4)
Dependent Variable	**MA**	**MA**	**MA**	**MA**
	Initial Stage	Development Stage	Initial Stage	Development Stage
EPU	0.7583***	1.0621***	0.7244***	1.5188***
	(0.079)	(0.078)	(0.191)	(0.174)
Size	0.5968***	0.7574***	1.6129***	1.2886***
	(0.172)	(0.173)	(0.218)	(0.212)
CF	-0.1431	0.7061	-0.0810	0.2312
	(0.767)	(0.751)	(0.763)	(0.748)
TobinQ	-0.0165	0.5157***	0.3015***	0.7913***
	(0.077)	(0.072)	(0.085)	(0.079)
lev	2.5070***	3.4771***	0.9889	2.6346***
	(0.885)	(0.771)	(0.913)	(0.768)
ROA	5.8601***	-0.1940	5.2113**	0.7164
	(2.118)	(1.930)	(2.128)	(1.894)
Salesg	0.2444	0.3878**	0.2559	0.5045***
	(0.166)	(0.184)	(0.165)	(0.189)
Return_Gap	0.0011*	0.0023***	0.0011*	0.0024***
	(0.001)	(0.001)	(0.001)	(0.001)
risk_gap	-0.0001	0.0000	-0.0001**	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
N	12,876	12,856	12,876	12,856
R2	0.025	0.051	0.060	0.092
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 4. EPU, Corporate Governance and M&A

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	0.7113***	0.9919***	0.3738***	0.7843***

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	(0. 065)	(0. 130)	(0. 073)	(0. 130)
CG_CEO-SHR*EPU	0.6139***	0.5220***		
	(0.091)	(0.089)		
CG_CEO-SHR	-1.1804***	-1.1844***		
	(0.285)	(0.280)		
CG_SOE*EPU			1.0191***	0.8196***
			(0. 092)	(0. 092)
CG_SOE			-1.4550***	-0.6971
			(0.505)	(0. 509)
Size	0.6514***	1.4559***	0.5939***	1.3412***
	(0.121)	(0.153)	(0.121)	(0.153)
CF	0.4099	0.1361	0.4626	0.1450
	(0.499)	(0.499)	(0.500)	(0.499)
TobinQ	0.2977***	0.6073***	0.2773***	0.5768***
	(0.050)	(0.054)	(0.050)	(0.054)
lev	2.9959***	1.8633***	2.8298***	1.8502***
	(0.555)	(0.559)	(0.553)	(0.555)
ROA	1.0785	1.4002	1.6506	1.8962
	(1.332)	(1.311)	(1.331)	(1.313)
Salesg	0.4134***	0.4492***	0.3787***	0.4290***
	(0.116)	(0.116)	(0.116)	(0.116)
Return_Gap	0.0019***	0.0019***	0.0019***	0.0018***
	(0.000)	(0.000)	(0.000)	(0.000)
risk_gap	-0.0000	-0.0000*	-0.0000	-0.0000*
	(0.000)	(0.000)	(0.000)	(0.000)
N	26,196	26,196	26,196	26,196
R2	0.043	0.085	0.046	0.087
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 5. EPU, Stock Price Volatility and M&A

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MA	**MA**	**MA**	**MA**
EPU	0.5469***	0.7563***	0.5273***	0.6969***
	(0.075)	(0.142)	(0.078)	(0. 145)
VIX*EPU	0.3164***	0.2462**	0.3419***	0.2760***
	(0. 102)	(0. 100)	(0. 106)	(0. 104)
VIX	-0.3199	-0.2252	-0.3484	-0.2633
	(0.263)	(0.260)	(0.277)	(0. 273)
Size	0.2117	0.9121***	0.1463	0.8795***
	(0.140)	(0.171)	(0.144)	(0.177)
CF	-1.0488*	-0.9636*	-1.1705**	-1.0949*
	(0.564)	(0.567)	(0.579)	(0.582)
TobinQ	0.0430	0.2131***	0.0290	0.2186***
	(0.058)	(0.063)	(0.061)	(0.066)
lev	3.3227***	2.1449***	3.5321***	2.3520***
	(0.648)	(0.667)	(0.673)	(0.692)
ROA	8.3899***	8.1557***	9.3341***	9.0704***
	(1.484)	(1.471)	(1.520)	(1.505)
Salesg	0.0392	0.1077	0.0470	0.1063
	(0.122)	(0.122)	(0.124)	(0.124)
Return_Gap	0.0020***	0.0020***	0.0020***	0.0020***
	(0.000)	(0.000)	(0.000)	(0.000)
risk_gap	-0.0000*	-0.0001*	-0.0000*	-0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)
N	20,002	20,002	18,567	18,567
R2	0.020	0.048	0.019	0.046
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 6. EPU, Financing Constraints and M&A

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MA	**MA**	**MA**	**MA**
EPU	1.4729***	1.6310***	0.8410***	1.0298***
	(0.106)	(0.157)	(0.065)	(0. 131)
ConFKZ*EPU	-0.3237***	-0.2830***		
	(0.059)	(0.058)		
ConFKZ	0.4982**	0.5487***		
	(0.199)	(0.201)		
ConFSY*EPU			0.0485***	0.0630***
			(0. 016)	(0. 015)
ConFSY			-0.1545***	-0.2021***

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			(0. 047)	(0. 047)
Size	0.6594***	1.4854***	0.6917***	1.5384***
	(0.121)	(0.153)	(0.121)	(0.152)
CF	0.4584	0.0888	0.3575	0.0879
	(0.515)	(0.513)	(0.499)	(0.499)
TobinQ	0.3533***	0.6354***	0.2911***	0.6094***
	(0.065)	(0.068)	(0.050)	(0.054)
lev	3.9059***	2.2744***	2.6652***	1.3209*
	(0.772)	(0.780)	(0.693)	(0.700)
ROA	0.7169	1.1986	0.8111	1.0524
	(1.359)	(1.330)	(1.336)	(1.312)
Salesg	0.3437***	0.4110***	0.3965***	0.4171***
	(0.122)	(0.120)	(0.117)	(0.117)
Return_Gap	0.0019***	0.0019***	0.0019***	0.0019***
	(0.000)	(0.000)	(0.000)	(0.000)
risk_gap	-0.0000	-0.0000*	-0.0000	-0.0000*
	(0.000)	(0.000)	(0.000)	(0.000)
N	26,196	26,196	26,196	26,196
R2	0.042	0.084	0.041	0.084
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Table 7. Alternative dependent variables

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MAD	**MAD**	**MAD**	**MAD**
EPU	0.1832***	0.3781***	0.2002***	0.3910***
	(0.010)	(0.023)	(0.010)	(0.024)
Size			-0.0075	0.0247**
			(0.012)	(0.012)
CF			-0.1201	-0.2429**
			(0.119)	(0.121)
TobinQ			0.0687***	0.1106***
			(0.010)	(0.011)
lev			0.7001***	0.6174***
			(0.075)	(0.077)
ROA			-0.8680***	-0.7975***
			(0.259)	(0.266)
Salesg			0.2466***	0.2889***
			(0.027)	(0.028)
Return_Gap			0.0006***	0.0006***
			(0.000)	(0.000)
risk_gap			-0.0000	-0.0000
			(0.000)	(0.000)
N	26,196	26,196	26,196	26,196
R2	0.094	0.0336	0.0186	0.0446
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 8. Replace the Measurement Method of EPU Index

Dependent Variable	**(1)**	**(2)**	**(3)**	**(4)**
	MA	**MA**	**MA**	**MA**
EPU_12M	0.6040***	0.8199***	0.5482***	0.4724***
	(0.018)	(0.039)	(0.020)	(0.050)
Size			0.6703***	1.5158***
			(0.112)	(0.152)
CF			0.4291	0.1212
			(0.498)	(0.500)
TobinQ			0.3597***	0.6239***
			(0.050)	(0.054)
lev			3.0633***	1.9788***
			(0.553)	(0.560)
ROA			1.2326	1.0059
			(1.317)	(1.314)
Salesg			0.4352***	0.4467***
			(0.117)	(0.117)
Return_Gap			0.0019***	0.0019***
			(0.000)	(0.000)
risk_gap			-0.0000	-0.0000*
			(0.000)	(0.000)
R2	0.048	0.069	0.057	0.083
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

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Table 9. IV

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
EPU	0.8970***	6.4008***	1.3289***	6.4008***
	(0.053)	(0.196)	(0.089)	(0.196)
Size	0.7496***	1.5158***	0.2861**	1.5158***
	(0.102)	(0.121)	(0.127)	(0.121)
CF	0.4293	0.1212	0.1471	0.1212
	(0.483)	(0.474)	(0.486)	(0.474)
TobinQ	0.3027***	0.6239***	0.3094***	0.6239***
	(0.047)	(0.051)	(0.047)	(0.051)
lev	3.0853***	1.9788***	3.5578***	1.9788***
	(0.506)	(0.499)	(0.512)	(0.499)
ROA	0.5468	1.0059	1.8608	1.0059
	(1.256)	(1.239)	(1.276)	(1.239)
Salesg	0.4117***	0.4467***	0.4443***	0.4467***
	(0.110)	(0.109)	(0.111)	(0.109)
Return_Gap	0.0019***	0.0019***	0.0019***	0.0019***
	(0.000)	(0.000)	(0.000)	(0.000)
risk_gap	-0.0000	-0.0000*	-0.0000	-0.0000*
	(0.000)	(0.000)	(0.000)	(0.000)
N	26,096	26,096	26,096	26,096
R2	0.040	0.083	0.038	0.083
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	No
Anderson-Test	0.0000		0.0000	
Cragg-DonaldTest	2.0e+04		7320.248	

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 10. Regression of Sub-samples: According to the Region of Company Address

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
	East Regions	East Regions	Central and Western Regions	Central and Western Regions
EPU	0.9814***	1.2611***	0.8859***	0.9632***
	(0.064)	(0.158)	(0.092)	(0.209)
Size	0.8298***	1.6635***	0.4437**	1.2793***
	(0.154)	(0.187)	(0.199)	(0.261)
CF	1.7508***	1.3586**	-1.9618**	-2.0573**
	(0.597)	(0.595)	(0.893)	(0.897)
TobinQ	0.2486***	0.5874***	0.3771***	0.6495***
	(0.061)	(0.066)	(0.087)	(0.094)
lev	2.5037***	1.3448*	4.0431***	2.7907***
	(0.695)	(0.695)	(0.912)	(0.939)
ROA	-2.8381*	-1.4134	7.1279***	5.4745**
	(1.667)	(1.618)	(2.237)	(2.266)
Salesg	0.6098***	0.6421***	0.1157	0.1244
	(0.153)	(0.152)	(0.178)	(0.180)
Return_Gap	0.0018***	0.0016***	0.0024***	0.0025***
	(0.001)	(0.001)	(0.001)	(0.001)
risk_gap	-0.0000	-0.0000	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)
R2	0.047	0.097	0.032	0.061
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	Yes	No	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 11. Regression of Sub-samples According to the Degree of Industry Competition

Dependent Variable	(1)	(2)	(3)	(4)
	MA	MA	MA	MA
	Fierce competition	Less competition	Fierce competition	Less competition
EPU	0.9955***	0.9564***	1.1610***	1.2610***
	(0.078)	(0.077)	(0.204)	(0.182)
Size	0.7517***	0.5274***	1.6493***	1.3342***
	(0.181)	(0.194)	(0.232)	(0.248)
CF	0.9612	-0.0313	0.6826	-0.2534
	(0.703)	(0.729)	(0.701)	(0.732)
TobinQ	0.1364**	0.4553***	0.4618***	0.7508***
	(0.069)	(0.080)	(0.077)	(0.086)
lev	3.7783***	2.5901***	2.3234***	1.6230*
	(0.842)	(0.838)	(0.850)	(0.852)
ROA	-1.3109	2.2689	-0.2471	2.4922
	(1.867)	(1.990)	(1.807)	(1.987)

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Salesg	0.2791*	0.5174***	0.3488**	0.5214***
	(0.162)	(0.175)	(0.164)	(0.174)
Return_Gap	0.0022***	0.0016**	0.0021***	0.0016**
	(0.001)	(0.001)	(0.001)	(0.001)
risk_gap	-0.0000	-0.0000	-0.0000	-0.0000
	(0.000)	(0.000)	(0.000)	(0.000)
N	13,029	13,167	13,029	13,167
R2	0.043	0.031	0.092	0.068
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes

Notes: Robust standard errors are clustered at the industry level, which are reported in parentheses. *, **, and *** denote statistical significance at the 10, 5, and 1 percent significance levels, respectively.

Table 12. EPU and M&A Performance

Dependent Variable	**(1)**	**(2)**	**(3)**
	DROA_Y1	**DROA_Y2**	**DROA_Y3**
EPU*MAA	0.0001***	0.0000	-0.0000
	(0.000)	(0.000)	(0.000)
EPU	0.0054***	0.0109***	0.0167***
	(0.001)	(0.001)	(0.001)
MAA	-0.0002**	-0.0001	0.0000
	(0.000)	(0.000)	(0.000)
Size	-0.0174***	-0.0253***	-0.0294***
	(0.001)	(0.002)	(0.002)
CF	-0.0060	-0.0353***	-0.0404***
	(0.004)	(0.005)	(0.004)
lev	0.0818***	0.0791***	0.0741***
	(0.005)	(0.007)	(0.008)
ROA	0.8419***	0.5474***	0.3970***
	(0.016)	(0.013)	(0.013)
Salesg	0.0125***	0.0137***	0.0124***
	(0.001)	(0.001)	(0.001)
Return_Gap	0.0000***	0.0000***	0.0000*
	(0.000)	(0.000)	(0.000)
risk_gap	-0.0000***	-0.0000	-0.0000*
	(0.000)	(0.000)	(0.000)
N	22,810	16,613	11,562
R2	0.464	0.314	0.265
Firm FE	Yes	Yes	Yes
Year FE	No	No	Yes

References

[1] Gulen, H., M. Ion. Policy Uncertainty and Corporate Investment[J]. The Review of Financial Studies, 2016, 29(3): 523-564.

[2] Wang, H., Q, Li, F, Xing, Economic Policy Uncertainty, Cash Holdings and its Market Value[J]. Journal of Financial Research, 2014(9): 53-68.

[3] Peng, Y., X, Han, J, Li. Economic Policy Uncertainty and Enterprise Financialization[J]. Chinese Industrial Economy, 2018(1): 137-155.

[4] Julio, B., and Y. Yook. Political Uncertainty and Corporate Investment Cycles[J]. The Journal of Finance, 2012, 67(1): 45-83.

[5] Chen, S., Zhan, Li. Economic Policy Uncertainty and Analysts' Earnings Forecast Correction [J].World Economy, 2017(7):169-192

[6] Baker, S., N. Bloom, S. Davis. Measuring Economic Policy Uncertainty[J]. Quarterly Journal of Economics, 2016, 131(4): 1593-1636.

[7] Zhang, W, A, Qi, A Review of Theoretical Research on Merger[J]. Nankai Management Review, 2002(2): 21-26.

[8] Zhou., X, S, Li. Research on the Influencing Factors of M&A Value Creation[J]. Management World, 2008(5): 134-143.

[9] Tan, X, W, Zhang. Analysis on the Channels of Enterprise Investment Influenced by Economic Policy Uncertainty[J]. World Economy, 2017(12): 3-26.

[10] Wang, Y. Z., C. R. Chen, and Y. S. Huang. Economic Policy Uncertainty and Corporate Investment. Evidence from China [J]. Pacific-Basin Finance Journal, 2014, 26(1): 227-243.

[11] Liu, Z., C, Wang, T, Peng, Policy Uncertainty and Corporate Risk-taking: Opportunity Expectation Effect or Loss Avoidance Effect[J]. Nankai Management Review, 2017(6): 15-27

[12] Li, Feng., Feng, Li, Z, Yang. Will Economic Policy Uncertainty inhibit Corporate Investment? An Empirical Study based on China's Economic Policy Uncertainty Index[J]. Journal of Financial Research, 2015(4): 115-129.

[13] Shen, H, P, Yu, L, Wu, State-owned Equity, Environmental Uncertainty and Investment Efficiency[J]. Economic Research, 2012(7): 113-126.

[14] Zhang., X, Does M&A and Reorganization Create Value?-An Theoretical and Empirical Research on

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China's Securities Market[J]. Journal of Economic Resarch, 2003(6): 20-29

[15] Bagnoli, M., B. Lipman. Successful Takeovers without Exclusion[J]. Review of Financial Studies, 1988, 1(1): 89-110.

[16] Zhao., Xi, X, Zhang. Internal Control, Executive Power and M&A Performance: Empirical Evidence from China's Securities Market[J]. Nankai Management Review, 2013(2): 75-81.

[17] Durnev, A., R. Morck, Y. P. Zarowin. Does Greater Firm-Specific Return Variation Mean More or Less Informed Stock Pricing?[J]. Journal of Accounting Research, 2003, 41(5): 797-836.

[18] Pastor, L., P. Veronesi. Political uncertainty and Risk Premier[J]. Journal of Financial Economics, 2013, 110(3): 520-545.

[19] Wang, Y, M, Song, Macroeconomic Uncertainty, Capital Needs and Company Investment[J]. Journal of Economic Research, 2014(2): 4-17.

[20] Allen, F., J. Qian, M. Qian. Law Finance and Economic Growth in China [J]. Journal of Financial Economics, 2005, 77(1):116-157.

[21] Kaplan, S., L. Zingales. Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?[J]. Quarterly Journal of Economics, 1997, 112(1): 169-215.

[22] Zhou., S, H, Wen. Research on M&A Performance Evaluation System Based on Industry Evolution and M&A Motivation[J]. Accounting Research, 2013(10): 75-82

[23] Bruner, R. F. Does M&A Pay? A Survey of Evidence for the Decision-Maker[J]. Journal of Applied Finance, 2002, 12(1): 48-68.

[24] Bhaumik, S.K., E. Selarka. Does Ownership Does ownership concentration improve M&A outcomes in emerging markets?: Evidence from India[J]. Journal of Corporate Finance, 2012, 18(4): 77-726.

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ARTICLE

Research on Teaching Innovation of Property Insurance Course: Based on the Perspective of Big Data Development

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ABSTRACT

The development of big data has brought unprecedented challenges and opportunities to the teaching reform of higher education. Property insurance course is the core course of economics and management, and it is the guarantee for the supply of talents in the health financial market. Big data technology and data economy put forward innovative requirements for its teaching objectives, teaching content, and teaching system. In China's new round of double-first-class universities and disciplines, big data is an important foundation and driving force. The comprehensive integration of property insurance and big data is reflected in: Cultivate students' big data thinking; Cultivate students' practical application ability based on market employment needs; Build a new discipline system of applied economics, and achieve good coordination between property insurance courses and other disciplines; The government, enterprises and universities form a strategic partnership to jointly participate in the development and construction of courses; The formulation of government policies can have a better governance effect on the development of higher education and talent training.

1. Introduction

The combination of education and big data lay a solid foundation for the comprehensive realization of the deep integration of big data and university curriculum teaching. Big data reshapes the new pattern of education reform, promotes the reform of curriculum teaching mode, improves the construction of school curriculum system, and enriches the form and depth of students' knowledge acquisition. "Property Insurance" is the main professional course for economics and management undergraduates. Its purpose is to guide students to systematically master the theory of property insurance, understand the basic operating mechanism of the property insurance market, and cultivate the ability to observe and analyze property insurance. In 2020, China's insurance depth was 4.22%, and the insurance density was 2,724.49 yuan/person. This shows that China's property insurance market has great development potential and high demand for professional talents. In the context of the construction of double first-class disciplines, colleges and universities should combine big data and property insurance courses to develop specialty applied economics. In September 2020, there are mainly 5 courses related to property insurance on the MOOC website of Chinese University, and there is no special course that combines big data and property insurance.

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This research has academic and practical significance. Integrating the undergraduate big data talent training model with the risk society is an expansion of the concept of serving the society and diversified cooperation. Data resources have become an important factor of production, and data-driven innovation has expanded to all areas of society, which is an extension of digital governance and refined governance. This article closely follows the viewpoint of "establishing and improving big data-assisted scientific decision-making and social governance mechanisms, and advancing the innovation of government management and social governance models", and provides experience for solving the problems of undergraduates' big data thinking and application ability.

2. Literature Review

Big data changes people's lives, work and thinking. Global digital economy governance is becoming increasingly important [1,2]. Big data is a source of people gaining new cognition and creating new value; big data is a way to change markets, organizations, and the relationship between government and citizens. By comprehensively narrating the fields of religion, philosophy, art, technology and finance, it presents the contradictory picture of the times. Big data expands real-time data systems and best practices [3]. Big data transcends human limitations and reduces the digital divide [4]. Big data can better serve the public interest. Big data has cultural significance, involving legal, economic and statistical frameworks and other knowledge fields, which is conducive to reducing data risks. The development of big data requires human resources protection, and business insights and operation integration can be obtained from data analysis and teaching [5]. Big data is a major theme based on simple principles. The use of big data will better create future work and lifestyle [6]. Big data architects build end-to-end solutions and adopt strategic approaches to solve business problems [7].

Big data brings opportunities and challenges to the rule of law and social governance. Property insurance courses should focus on the four major topics of data governance, algorithm governance, digital market competition governance, and network ecological governance [8]. In terms of talent training that combines big data and property insurance, universities should train big data analysis professionals to follow up the application of big data technology [9]. Big data and machine intelligence have a comprehensive impact on society, and blockchain must be deeply integrated with big data. Colleges cultivate professional talents who combine big data and property insurance from teaching goals, teaching methods, and professional curriculum settings [10]. Big data embodies strategic thinking, and attention should be paid to students' data awareness, data thinking, data ethics and data ability [11]. Based on the advantages of big data development in Guizhou Province, university curriculum reform should be conducive to the promotion of the big data industry strategy [12].

Teaching research provides a reference for setting up big data courses across disciplines. Big data will promote teaching reforms, educational research reforms, educational management reforms, and educational evaluation reforms [13]. The property insurance curriculum reform can be combined with the application cases of big data education in the United States [14]. The major postgraduate education of big data in the United States focuses on the development and application of big data, training data scientists and engineers, and companies and research institutions actively cooperate [15]. The government provides financial, material and human support in the construction of university big data platforms and application of talent training, and encourages research institutions to carry out interdisciplinary cooperation.

From the above research summary, academic research mainly discusses the important trends of digital economy and global digital economy governance, the necessity of big data curriculum, and the reform of application talent training. There is little research on the combination of property insurance courses and big data strategy. Scholars rarely study big data talent training goals and benign ecosystems at the undergraduate level; property insurance courses pay less attention to big data thinking and application capabilities.

3. Analysis of Curriculum Design Combining Big Data and Property Insurance

3.1 Content Innovation Requirements of Integrating Big Data into Property Insurance Courses

This paper studies the case of universities training big data talents, and explores influencing factors and effects. The university attaches great importance to the teaching reform of property insurance professional courses under the background of big data. It takes humanism theory and behavior design theory as the main guiding ideology, and takes the quality education theory as the guidance to establish and improve the classroom teaching model, and integrate quality education and innovation. The concept of curriculum reform is internalized into daily teaching behavior. In the context of big data, the basic connotation of property insurance curriculum reform is to form a rigorous and scientific theoretical system for property insurance by regulating the functions, legislation, basic concepts, nature, and research methods of the property insurance law.

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Curriculum reform and the construction of double first-class disciplines focus on the research direction of property insurance curriculum, teachers, research institutions, international cooperation and exchanges, talent training, and social services. Based on the literature method, social survey, and case analysis method, this research summarizes the current situation of Chinese property insurance curriculum teaching, explores to enhance students' learning interest and ability, and builds a high-quality property insurance professional curriculum (table1).

Table 1. The important content of the combination of big data and property insurance courses

Reform requirements of property insurance curriculum	Specific contents
Understand big data	Directly generate data in teaching activities
	Data collected in educational management activities
	Data collected in academic research
Actively respond to big data challenges	Rationally recognize and apply big data
	Utilize the value of big data resources
	Explore the internal laws of big data development
	Recognize big data and its limitations
	Promote the deep integration of big data and property insurance education
Explore the teaching integration path of big data and property insurance courses	Pay more attention to students' learning status in course teaching
	Dynamic analysis of students' learning based on big data
	Process evaluation of students' growth and development based on big data
	Adjust teaching tasks based on big data analysis and teaching needs
Use big data technology and thinking in property insurance practice	Curriculum System Construction of University Property Insurance
	Develop teaching resources for courses
	Explore the strategies and modes of curriculum implementation
Utilize existing network resources to promote the transformation of curriculum teaching mode	Reconstruct a new learning ecology based on micro-classes, MOOCs and flipped classrooms
Use big data resources to improve school property insurance curriculum system	Specific course objectives
	Rich content of property insurance courses
	Good atmosphere of property insurance classroom environment
	Efficient property insurance course

In terms of literature research methods, it reviews current academic research on property insurance courses in the context of big data, analyzes research deficiencies and important enlightenments. In terms of case study method, the research object is financial lease engineering insurance. The curriculum combines educational theory to test and deepen understanding in practice.

3.2 Case Analysis of Property Insurance for International Financial Lease of Engineering Equipment

In the reform of property insurance curriculum in the context of big data, universities should incorporate practical cases into the curriculum. This study analyzes the case of property insurance for international financial leasing of engineering equipment. In the One Belt One Road strategy, Chinese companies are increasingly participating in infrastructure construction in Africa, and international trade in engineering equipment is an important area. The financial leasing of engineering equipment has become an important way for Chinese companies to participate in infrastructure construction in African countries, and is also an important case of using big data technology and thinking. Incorporating the engineering insurance case of equipment financing lease in the property insurance course can enhance the students' understanding of international trade practice and increase the learning effect of the classroom.

According to the 2012-2020 African Infrastructure Development Plan of the African Union, the areas of infrastructure construction are mainly energy, transportation, water resources, and communications [16]. The investment scale of East Africa reached 23.3 billion U.S. dollars and is a key area for infrastructure investment in the African continent. By 2025, the expected expenditure on roads in Africa is US$200 billion, with an average annual growth rate of 8.2%. Most countries in Africa are underdeveloped countries and generally cannot afford to purchase a large amount of engineering equipment. Therefore, the financial leasing of engineering equipment has become an important way for African countries to carry out infrastructure construction [17]. The risk of cross-border financial lease insurance for engineering equipment has become an unavoidable problem.

Lease involves the rights and obligations between the property owner, lessor and lessee. Equipment leasing started in the 1950s. There are huge differences between the various lease types. Equipment leasing is divided into two categories: financial leasing and operating leasing. Finance lease is generally a long-term lease commitment, and the total rent is basically close to the purchase cost of the equipment. Other financial leases are equipment leases, collectively referred to as operating leases.

Financial leasing is the most common method of equipment leasing, with a long period, and the lessee has to bear the necessary owner responsibilities, such as repairing equipment, paying necessary insurance, asset custody obligations, and paying taxes. The basic obligation of the

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lessor is to purchase equipment and lease it to the lessee during the agreement period. The financing lessor must protect its investment in the event of lease default or equipment damage. Finance leases usually include some "unconditional" rent guarantees. This kind of guarantee requires the tenant to pay in full when due. In the context of big data, the advantages of financial leasing are more prominent, which can minimize the risk of equipment depreciation, the lessee has low capital costs, and can obtain value-added technologies or services. Engineering insurance is conducive to hedging inflation risks. Finance lease includes a finance lease contract and a supply contract, and the two contracts are interrelated. Financial leasing is a combination of service and trade[18]. The transnational financial leasing business of engineering equipment is more complicated, and big data technology is an important measure for Chinese companies to participate in international trade.

The property insurance course analyzes the cross-border financial lease insurance risks of Tanzania construction equipment through theory, empirical data and practical operation management, and proposes prevention strategies based on big data. In the property insurance case of the financial leasing of engineering facilities, the explanation is combined with the Tanzania case. In the financial leasing of construction equipment in Tanzania, we must first consider the legal provisions of China and Tanzania property insurance. Tanzania's insufficient equipment information protection will create potential risks for Chinese companies participating in the financial leasing of Tanzania's engineering equipment. Big data technology can be introduced to monitor the maintenance of leased items and prevent the theft of engineering equipment spare parts.

Different types of risk factors should be considered in the design of property insurance products for financial lease engineering equipment. In terms of risk responsibility subjects, the risk management and control of contractors in government procurement is not comprehensive; the risk awareness and risk identification capabilities of construction contractors are insufficient. Engineering insurance based on big data effectively reduces the probability and loss of risk accidents in financial leasing. The current insurance products for international engineering equipment financial leasing are insufficiently targeted, and insurance companies have insufficient engineering insurance underwriting experience and expertise. The introduction of big data thinking in engineering insurance will facilitate the development of financial leasing activities. The property insurance course sorts out the problems of financial leasing engineering insurance, and clarifies the problems of innovative product design and low risk factors of insurance companies. Big data technology is an important technical tool to make up for the lack of professionalism, so as to comprehensively and systematically evaluate the risks of the entire project and accurately calculate the underwriting rate. The social survey method will be mentioned in the explanation. The property insurance course is a practical subject, and the development trend of property insurance is tracked by designing questionnaires. The comparative analysis of big data and the comparative research of property insurance disciplines can help students better grasp the general laws of property insurance courses and obtain new discoveries.

4. The Optimization Strategy of Undergraduates' Big Data Talent Thinking and Application Ability

Under the digital economy, universities should build a new type of big data talent development system, and promote the formation of strategic partnerships between universities and cooperative enterprises through digital governance. Under the construction of dual first-class universities and disciplines, the government reshapes the training of big data talents in universities based on Internet capital. The university optimizes the content of big data courses and enhances the ability of teachers to accelerate the important role of China's undergraduate education in the cultivation of big data talents, so that undergraduate students have the thinking ability and basic knowledge structure required by the digital economy. The government's policy support for the cultivation of big data talents in universities is an important guarantee.

4.1 Innovative Content of the Combination of Big Data and Property Insurance Courses

Governments, enterprises and universities actively participate in the promotion of theoretical innovation of course content. The construction of double first-class courses should conform to the trend of social development and higher education teaching reform, meet the talent needs of big data and property insurance development, and promote the rapid transformation and development of financial institutions. In the era of big data, it is more convenient for people to obtain knowledge and information, and new technologies continue to promote classroom teaching reform as an external cause. University classroom teaching is not just a simple knowledge transfer, self-organized learning will rely on open high-quality online education resources. Course teaching should integrate quality education theory, humanistic learning theory, behaviorist learning theory, multiple intelligence theory, and develop-

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mental evaluation theory.

Innovation in the practice of big data courses. Big data and property insurance are important specialty courses of economic management. Students participate in competitions to improve their professional and big data application capabilities. Teachers encourage students to participate in the "Banking Insurance and Wealth Management Comprehensive Business Competition, Internet Financial Innovation and Operation Management Competition, New Financial Product Innovation and Creative Design Competition". The competition activities are conducive to improving the practice of student property insurance skill.

The online course system of property insurance courses has been upgraded. Big data skills and thinking habits are incorporated into the teaching objectives of the "Property Insurance" course, and professional training is provided from students' learning autonomy, case study analysis, and learning methods, which can improve students' ability to use property insurance network teaching resources. The university optimizes the evaluation of teaching methods of big data and property insurance courses, focusing on individual differences, scientific evaluation methods, and incentive evaluation methods.

Teachers summarize the expected value of teaching practice and research results. Teachers summarize the research results of the subject, promote experience in teaching practice, and improve students' learning quality and ability. Teachers collect first-hand information about the reform of property insurance curriculum, and combine classroom practice data to discuss and analyze problem-solving strategies; teachers form teaching research reports and academic papers to give play to the value of social communication.

4.2 Basic Consensus on the Combination of Big Data and Property Insurance Courses

An important consensus to be formed in property insurance teaching is that employment is a testing tool. The training of big data talents is an important guarantee for the digital economy and effective employment. Big data talents realize diversified changes in the employment field, obtain higher-level employment opportunities, and realize active participation in employment. The traditional single teaching goal is difficult to meet the needs of compound talents. Under the background of the development of the digital economy, undergraduates' big data thinking and ability training is of urgency.

Digital economy and technology expand employment scale, optimize employment structure, and promote flexible employment, which also brings risks of technical unemployment. Undergraduates' big data thinking and ability training have become an important position to resolve the impact of technical unemployment in the short and medium term. Universities give full play to their comparative advantages in undergraduate talent training. Undergraduate general education strengthens industrial upgrading and social demand curriculum content, and cultivates undergraduate talents with the spirit of digital craftsman. Undergraduate education attaches great importance to the cultivation of basic knowledge of computer, networking and digitization. The university attaches importance to students' science, technology, engineering, art and mathematics abilities, and cultivates students' teamwork, creativity and lifelong learning skills.

4.3 Build a New Type of Big Data Talent Development System

Universities train talents with strategic vision and basic innovation. Universities are market-oriented, establish the concept of "dynamic development" talents, and provide "diversified opportunities for talent". Colleges and universities play a new type of big data learning platform to enhance students' competitiveness in the era of digital economy and build a sustainable talent system. The government, universities, enterprises and talent service organizations form a multi-party linkage to jointly improve the construction of the big data talent system. Universities and enterprises cooperate to achieve "integration of production and education", and integrate multiple resources to form complementary advantages.

Teachers value the versatility of big data courses and stimulate undergraduate students' interest in the digital economy. Curriculum design should be based on the research ideas of big data and complex system thinking, condense the laws of economic development and key scientific issues of theoretical research, and form "typical facts of China's economic development based on big data", "laws of Chinese economic development based on complex systems", "Important research fields in the future, such as the construction of China's economic development theory system, and the application of China's economic development theory and policy practice".

The digital economy should integrate multiple professional resources, cooperate with third-party institutions for talent training, and continue to provide teaching support for superior subjects. The university actively responds to the challenge of the digital divide and has formed a talent training system with high teaching standards, strong teaching staff, and guaranteed course quality in terms of teaching content, teaching resources, and teacher motivation. Policy makers and implementers give full consideration to the decision-making behavior of stakeholders and value

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the governance effectiveness of talent training. The talent training goals of the combination of big data and property insurance include: cultivating big data thinking and innovative talents; cultivating broad vision and serving big data talents; meeting the society's demand for compound big data talents. Big data teaching includes: providing a multi-module course system for students to learn big data knowledge, cultivate big data thinking and practice innovation, and strengthen students' comprehensive quality. The curriculum system related to the property insurance course covers: Introduction to Big Data, Data Ethics; Data Thinking, Big Data Management and Innovation, Big Data Governance and Policy. Based on the construction of double first-class disciplines and the new requirements of the digital economy, the university continuously cultivates urgently needed talents for the society.

4.4 Innovative Measures in Important Aspects of Big Data and Property Insurance Courses

In order to cope with the lack of students' big data collection ability and awareness, teachers should make full use of the large amount of data generated by the practical teaching of property insurance courses, cultivate students' data acquisition ability in the course arrangement, increase students' ability to collect and process property insurance big data, and attach importance to students' sensitivity and integration capabilities of various data types.

Course assessment is an important link to ensure the quality of teaching and talent training. In order to solve the single problem of the property insurance course assessment method, in the course assessment standards, it is necessary to increase the students' learning attitude, data information search, big data thinking, insurance marketing and other practical ability and independent inquiry learning ability assessment.

Teaching emphasizes the cultivation of students' practical ability. The curriculum should increase the importance of students' learning about property insurance and strengthen the integration of property insurance courses and professional knowledge. The course teaching content should cover research hotspots, make good use of the existing network platform and training environment, and integrate existing software and virtual simulation experiment teaching projects into teaching. Curriculum teaching should cultivate students' ability to practice property insurance. The "big data + insurance industry" application model has become an important area of research and practice.

The era of big data has had a profound impact on the development environment and operation and management of property insurance. The property insurance course combines big data to re-examine all aspects of property insurance, in order to innovate and cultivate talents suitable for social needs. There are higher requirements for the data thinking ability and data sensitivity analysis ability of insurance students. There are new requirements for risk identification and risk management in property insurance business management. In the teaching process of property insurance, existing data resources should be used to cultivate students' ability to analyze customer behavior, customer credit analysis, and customer risk status.Teachers use existing resource websites in the classroom to let students understand the current development of big data in China and cultivate students' interest in big data. In terms of data analysis and processing, students can improve the inertia of big data thinking by writing data analysis reports or experience. Teachers train students to develop innovative divergent thinking through insurance practice simulation experiments. Property insurance marketing is developing towards individualization. In property insurance teaching, students can be guided to analyze the insurance needs of different customers through existing self-media software and cultivate students' marketing service thinking.

5. Conclusion

Based on literature review, case analysis, comparative research and other methods, this research analyzes the plight of university big data property insurance talent training, the reasons for its formation, and proposes optimization strategies. There are obstacles in the training of big data talents in universities in accordance with the standards of digital economy and double first-class discipline construction: the big data talent training system is not perfect; the curriculum pays little attention to students' big data thinking and interest; extensive management makes it difficult for universities and enterprises to establish strategic partnerships Relationship: Universities do not have big data evaluation standards that meet the needs of society, and there is a gap between macro policy formulation and micro implementation. The digital economy puts forward reform requirements for the training and employment of college undergraduates. Universities should analyze the impact of digital economy on undergraduate talent training models, curriculum settings, and employment services; in-depth evaluation of the effects and transmission of university training goals and corporate participation and cooperation on university undergraduates' big data thinking and application capabilities.

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References

[1] Armah N. Big Data Analysis: The Next Frontier[J]. Bank of Canada Review, 2013.

[2] Galbraith J, Thacz G. Nowcasting GDP: Electronic Payments, Data Vintages and the Timing of Data Release[R]. CIR-ANO, 2013.

[3] Akhtar S M F. Big Data Architect's Handbook: A guide to building proficiency in tools and systems used by leading big data experts[M]. Packt Publishing, 2018.

[4] Ceron A, et al. Politics and Big Data: Nowcasting and Forecasting Elections with Social Media[M]. Routledge, 2016.

[5] Watanabe K, Watanabe T. Estimating Daily Inflation Using Scanner Data: A Progress Report[R]. University of Tokyo, Graduate, Gratuate School of Economics, 2014.

[6] Stephenson D.Big Data Demystified: How to use big data, data science and AI to make better business decisions and gain competitive advantage[M]. FT Publishing International, 2018.

[7] Prevos, P. Principles of Strategic Data Science: Creating value from data, big and small[M]. Packt Publishing, 2019.

[8]Li Siming Conglin Yang Yanqing. China Financial Leasing Industry 2014 Annual Report[M]. China Economic Publishing House, 2014.

[9] Huang Jin. Thinking and Exploration on the Training of Big Data Talents[J]. Education Teaching Forum, 2014(45).

[10] Lane J, et al. Privacy, Big Data, and the Public Good: Frameworks for Engagement[M]. Cambridge University Press, 2014.

[11] Deshpande A, Kumar M. Artificial Intelligence for Big Data: Complete guide to automating Big Data solutions using Artificial Intelligence techniques[M]. Packt Publishing, 2018.

[12] JiangYu Huang, Chengqian Xie. Research on Engineering Insurance Issues in Public Procurement in China[J]. Wop in Economics and Management, 2020(17): 340-345.

[13] Medimagh S. Public-Private Partnership and the Power of the Big Data[J]. International Journal of Economics & Strategic Management of Business Process, 2016.

[14] Fuguo Cao, Jiangyu Huang. The Current Situation, Problems and Future Paths of Energy Law Education in China, International Journal of Vocational Education and Training Research[J]. 2018, 04(01).

[15] Calero A J, et al. Leading innovations towards 5G: Europe's perspective in 5G infrastructure public-private partnership(5G-PPP)[C]. 2017 IEEE 28th Annual International Symposium on Personal, Indoor and Mobile Radio Communications (PIMRC). IEEE, 2017.

[16] Richard M. Contino. Complete manual for equipment rental[M]. China Finance Press: 11

[17] Ministry of Commerce, China Representative Office in Tanzania. Country (Region) Guide for Foreign Investment Cooperation-Tanzania, retrieved from: https://img.imsilkroad.com/a/10001/202002/edbdd7d7fbffd9dbc8fbdb63afc77696.pdf?sign=429ff09d8e747b7176fd3dbb0661ebee, 2020/10/02.

[18] Zhonghua Li. Financial leasing operation practice and legal risk prevention[M]. Law Press CHINA, 2012.

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ARTICLE

Opportunities, Challenges and Countermeasures proposed for the new retail industry in The COVID-19

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ABSTRACT

It has been four years since the concept of "new retail" was proposed, and the layout of "new retail" of several major domestic enterprises has been intensified, which has a "unique landscape" compared to the foreign retail landscape. The trend, however, the sudden outbreak and continued spread of the COVID-19 has dealt a serious blow to the global economic development, from the domestic point of view, the epidemic caused by the decline in GDP, leading to a negative year-on-year growth in the total retail sales of consumer goods, the new retail industry is still in the development stage suffered a blow. On the other hand, however, the sinking of the new retail market driven by the consumer economy, the surge of private domain traffic on platforms and the rise of the "house economy" prompted the new retail industry to create new development opportunities during the epidemic, clarifying the development of the new retail industry in the post-epidemic era and pointing out the direction.

1. Introduction

The year 2020 is a milestone year for building a moderately prosperous society in all respects and the closing year of the 13th Five-Year Plan, as well as achieving the first century goal, but at the same time it is a "tragic" year. On January 31, 2020, the World Health Organization announced that the new coronavirus epidemic would be listed as a public health emergency of international concern (PHEIC), and China, which was plagued by the virus, showed a strong fighting spirit in the fight against the epidemic, but its economy was still hit hard. According to the National Bureau of Statistics (NBS), GDP growth in the first quarter of 2020 fell by 6.8% year-on-year [1]. In terms of retail department stores, the cumulative growth in retail sales of supermarkets above the limit was 1.9% in the first quarter, down 6.6 percentage points compared to the previous year. And the cumulative growth of retailing of above-limit department stores was a horrible -34.9%, compared to 0.9% in the previous year. Behind the data is the harsh reality, but also indicates the adjustment changes in structure and volume.

Although the epidemic has dealt a huge blow to the restaurant, hotel, tourism and entertainment industries, and even led to the meltdown of the stock market, but it has made the online education, online office, e-commerce live streaming with goods and other industries flourish, and thus gave birth to the "house economy", which, the most benefit is undoubtedly the new retail industry [2]. As a typical example of "new retail", fresh food e-commerce

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has performed particularly well in this epidemic. Due to the spread of the epidemic, the whole country was closed cities and neighborhoods, residents could not go out to buy food, forcing users to go online shopping and consumption, the gathering of consumer crowds brought order growth for online retail platforms, but also brought the signal of the transformation of traditional retail. Secondly, in terms of policy, the National People's Congress held in May this year fully affirmed the role of e-commerce platforms, and the Government Work Report pointed out that new businesses such as e-commerce online shopping and online services have played an important role under the COVID-19, playing an important role in cross-provincial material allocation, maintaining commodity supply, safeguarding residents' lives, raising relief funds, and stabilizing employment absorption. At the same time, it was pointed out that policies should continue to be issued to support the further development of e-commerce platforms, comprehensively promote Internet+, and create new advantages in the digital economy. Against such a background, it is of great guidance and significance to discuss the opportunities and challenges facing the development of "new retail". This paper first reviews the meaning and implementation trajectory of "new retail", then discusses the opportunities for the new retail industry against the background of the epidemic, and finally analyzes the challenges that the new retail industry may encounter in the post-epidemic era, and puts forward our humble opinion accordingly.

2. The Theoretical Framework and Implementation Dynamics of "New Retailing"

2.1 Meaning and Internal Logic of "New Retail"

The concept of "new retail" was first proposed by Jack Ma, the founder of Alibaba in China. He believes that in the coming decades, there will be no e-commerce, but only "new retail", which means that individuals and enterprises will rely on the Internet and use big data and AI as the power points to upgrade and transform the whole process of commodity production and sales, to create a new ecosystem and business model, and combine the online, offline and logistic systems to create a new retail environment. Only through deep integration can we create "new retail" [3]. However, in recent years, many scholars have carried out theoretical exploration of "new retail" in various aspects, which has greatly enriched "new retail" [4]. "we list the definitions of "new retail" by several representative scholars (see Table 1). According to Joe Weinman, an expert on cloud economy in the United States who is regarded as the "Father of New Retail", the key points of "New Retail" are profitability, customer satisfaction, loyalty and customer experience. This differs from traditional retailing in its emphasis on store layout, product fashion, and product line integrity. He also points out that the implementation of "New Retail" lies in the use of information technology to serve the retail industry, using algorithms and data to enable real-time monitoring of the supply chain and inventory forecasting, with the ultimate goal of maximizing customer benefits and maximizing customer loyalty. The extent to which the service experience is improved.

Table 1. The meaning of "new retail"

Scholars	Viewpoints
Fu.W (2019)	The so-called "new retail" is an enterprise relying on mobile social networks, using artificial intelligence and other advanced technology to embed scenario elements in the production, circulation and sales of goods, and configure business situations in a specific time and space based on user consumption expectations, thus reshaping the business format structure and business ecosystem, as well as the online services, offline experience and A new retail model with deep integration of modern logistics
Shumei. Z (2019)	"New retail" refers to a new type of retail business that includes and exceeds omnichannel, integrates online and offline, is driven by new technologies, and is centered on consumer experience.
Kar-po. W (2018)	The "New Retail" is a consumer-centric retail model that combines big data and artificial intelligence to break the shortcomings of pure online e-commerce, to truly share online and offline data, to bring into play the dual advantages of online and offline retail, and to achieve a new online and offline integration.
Ali Research Institute (2017)	The "New Retail" is a data-driven pan-retail centered on consumer experience, which is from "goods - field - people" to "people". The transformation of the "goods - field", reflecting the essence of consumer-centric demand satisfaction

In essence, "new retail" is still retail, but not traditional retail [5] but a more efficient way of retailing, which is considered as "new retail" in this paper. It can be summed up in the words more, quicker, better and more save, the inherent logic of which is shown in the following table.

Table 2. The internal logic of the "new retail"

More	No spatial or geographical limitations, and the addition of information technology; the rise of major platforms has led to more products, more prices, and more space.
Quicker	The speed of new infrastructure accelerates, the speed of data transfer, the speed of platform response and the speed of logistics.
Better	The upgrade of consumption forces the industry to upgrade, the technology and manufacturing process of the enterprise has been upgraded and the relevant laws and regulations have been further improved, and the products have been better polished and transformed.
More save	The new retail lies in the emphasis on reducing transaction costs, from improving the transaction structure of retail to eliminating intermediate distribution links and increasing the efficiency of connectivity from factories to users. The ultimate goal is to reshape the retail value chain.

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2.2 Traditional Retail and "New Retail"

According to the retail wheel theory developed by Professor Mike McNair of Harvard Business School in 1958, there is a cyclical trend of retail change that resembles a spinning wheel [6]. This theory suggests that retail innovators always enter the market as a low-cost, low-price, low-margin proposition, and after gaining some advantage and closing the gap with other retailers, as the format evolves further, these retailers continue to acquire new equipment by adding product categories and improving product quality, as well as selecting better store layout locations, adding additional services, enhancing the consumer experience, and ultimately leading to the The cost of doing business has increased, and has gradually evolved into a high-cost, high-price, high-profit traditional retailer, and finally a declining retailer, leaving the leap field for the development of the "new retail" to take root.

In the process of transitioning from Industry 1.0 to Industry 4.0 in a big way, Retail 1.0 is also quietly making great strides towards Retail 4.0. Traditional retailing does not narrowly refer to traditional retailing in the era of Retail 1.0, but includes modern retailing in the era of Retail 2.0 as well as e-commerce retailing in the era of Retail 3.0. The reason is that due to the uneven development of local economies, retail methods that represent these three retail eras still exist. Traditional retailing is the beginning of the retail industry, which can be roughly divided into three formats: grocery stores, wholesale markets, and department stores. At this stage, the retail infrastructure such as commercialization, information technology and supply chain was still in its infancy. Constrained by the infrastructure and the level of urbanization, these three traditional forms of retailing could only satisfy consumers' needs for convenience, affordability, and choice, which form a retail triangle (see Figure 1). From Retail 1.0 to Retail 3.0, the development of this retail triangle is inseparable from the construction of the retail triangle. After entering the era of Retail 2.0 - modern retailing, the format of retailing has undergone some changes: from grocery stores to category "killers", from wholesale markets to discount chain stores, from multi-category department stores to large superstores selling catalogs. Modern retail, the first leap forward in the development of the retail industry, has an infrastructure that is booming and capable of meeting either side of the retail triangle. E-commerce retailing, the second leap in retailing, has swept the entire retail industry with a devastating force and its format is dominated by e-commerce platforms, vertical e-commerce and micro-businesses. In terms of satisfying consumer demand, e-commerce retail attempts to occupy the entire retail triangle because, compared to the previous two stages of retail development, the merchandising, informatization and supply chain infrastructure of e-commerce retail has reached its peak.

While e-commerce retailing meets all the needs of the Retail Triangle, it has not reached the dome of retail development. In fact, e-commerce retailing still has its limitations: (1) the "retail triangle" is over-performing. Cheapness is exhaustive, and as income levels rise, people are less sensitive to the price of goods than in the previous two stages, and more interested in quality of life. Cheap as the main sales gimmick of the platform, such as Ping Duoduo, although the main play cheap this card, but the quality of goods can not escape people's brand image of the spoof, such as "spelling Eve", "and more and more". (2) Difficult access to non-standard goods and services, such as fresh food. Fresh food has complicated categories, short storage time and high loss rate caused by non-standardization, making fresh food a pain point of e-commerce retail, and also a breakthrough. (3) Lack of scenario-based experience and offline environment. In the era of e-commerce retail, most platforms only do pure online e-commerce, with a single scene and lack of offline interaction, resulting in the failure to achieve effective integration of online and offline traffic. In such an environment, the new retail was born.

In terms of business format, new retail belongs to "borderless retail", that is realizing online and offline integration. While focusing on the flow brought about by online efficiency fission, it also pays more attention to offline consumer experience, reflecting the core concept of "people-oriented" in new retail. Secondly, new retail attempts to overturn and reshape the entire retail triangle in meeting consumer demands. In e-commerce retailing, e-commerce retailing has met all the needs of the retail triangle, which can satisfy cheapness, convenience and multiple choices, while in new retailing, the traditional retail triangle has failed to meet new customer needs and find a new balance of scale economy.

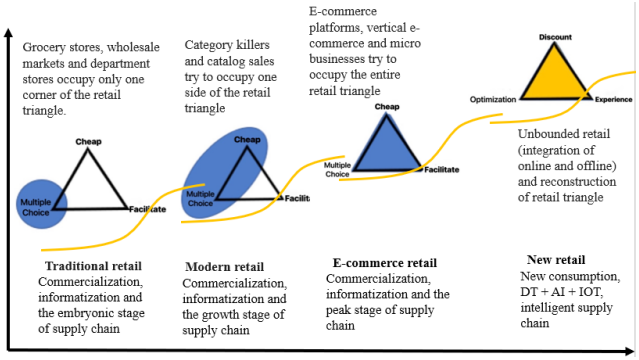

Figure 1. Retail evolutionary history

2.3 The Dynamics of "New Retail" Practice

The practice of "new retail" can be studied from both macro and micro perspectives [7], from a macro perspective, it is mainly reflected in the relevant policies and strategies issued by the state, such as the State Council issued the Opinions on Promoting Innovation and Transformation of Physical Retail in 2016, which put forward 5 categories and 16 specific measures to promote the transformation of physical retail enterprises. Upgrading and releasing development vitality. Among them, measures such as promoting online and offline integration, innovating business mechanisms and decentralization, promoting fair competition and reducing the tax burden on enterprises have become important guarantees to support the development of "new retail". At the micro level, it is mainly reflected in the dynamic implementation of the "New Retail" by major enterprises. This article takes Ali, Tencent and Jingdong as the object of study, and lists the implementation dynamics of "New Retail" in the three major systems respectively (see Table 2). Since Jack Ma put forward the concept of "new retail" in 2016, major retail enterprises have been "catching up with the new wave" and wading into "new retail", and 2017 can be said to be China's first year of "new retail". In the first year of "new retail" [8] Ali, Tencent, and Jingdong have respectively seized the first opportunity with various forms of "new retail" layout. Summing up the layout battle, we can find that online and offline collaboration is the basic feature of "new retail", while omnichannel development and the use of big data and the Internet to empower brick-and-mortar retailers are the key means [9]. Although the characteristics of "new retail" is mainly online development, but the physical store did not reduce, but speed up the construction of physical retail, it can be seen that the concept of "new retail" feeds the new development of retail, with corporate capital and efficiency as an endorsement. Further promote the integration of market resources as well as the construction of new market entities [10]. Ali, Tencent, Jingdong and other enterprises through a series of acquisitions and equity participation, not only close relations with the real retail, but also cooperation in the business, such as Ali's participation in Yonghui, after the launch of the Yonghui Super Species, which is the benchmark of Boxma Fresh, Yonghui laid stores online, relying on Ali's platform and data, to achieve fresh to home or to the store ready to eat, the core concept of people, goods, field is reflected most vividly [11].

Table 3. Layout of "New Retail" field of three major departments

Faculty	Implementation dynamics
Ali system	In January 2016, Ali 150 million U.S. dollars to lead investment in Boxmar Fresh, the main food Alipay member stores, to build online and offline omnichannel business model, and plans to open 2,000 stores in the country in the future.In February 2017, Alibaba in Shanghai announced a strategic cooperation with Bailian Group, the two sides will be based on big data and Internet technology, the integration of innovation in all formats, and "New retail" technology research and development, efficient supply chain integration, membership system interoperability, payment and financial interconnection, logistics system collaboration and other six areas to carry out all-round cooperation. In November 2017, Alibaba announced that it had invested about HK$22.4 billion, directly and indirectly acquiring 36.16% of the shares of Gao Xin Retail, becoming the second largest The two sides will take big data and commercial internet as the core, and complete the reconstruction and upgrade of "people, goods and field" through comprehensive digitalization.
Jingdong system	In August 2015, Jingdong announced a strategic stake of 4.3 billion in 10% of Yonghui Supermarket, the two sides hope to strengthen cooperation in the field of 020.In June 2016, Jingdong acquired the main assets of Walmart's One Store, and Walmart will receive Jingdong's newly issued 145 million Class A common shares, with a total value of up to 1 billion yuan, the two sides reached a strategic cooperation to expand the online and offline retail business. In July 2017, Jingdong put forward the fourth retail revolution, the retail industry will usher in the fourth retail revolution will be coming, the retail future will evolve around the three elements of cost, efficiency and experience.In October 2017, Jingdong announced the launch of unmanned convenience stores and unmanned supermarkets two unmanned retail projects, in November of the same year, Jingdong's first unmanned supermarket was officially unveiled.
Tencent system	In November 2017, Tencent launched "smart retail solution" to accelerate the pace of opening up for the retail industry, empowering the majority of brands, offline retail platforms and commercial real estate, exploring the complete path of digital transformation of the retail industry.In December 2017, the de facto controller of Yonghui intended to transfer 479 million shares at RMB 8.81/share to billion shares to Tencent, accounting for 5% of the total share capital, and in addition, Tencent intends to increase the capital of Yonghui Yunchuang and obtain 15% of the equity after the capital increase of Yunchuang. Everfai Supermarket 947 million yuan to transfer 12% of the shares of the red flag chain.

Source: Collated from this article

3. The Development of "New Retail" in the Face of the COVID-19

In 2020 the COVID-19 swept the world, impacting the entire retail industry, breaking the original trajectory of retail development. In the face of the epidemic, supermarket enterprises played an important role in protecting people's

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livelihood and stabilizing prices, while also accelerating the process of their own digital transformation. Combining the information and data available, this paper chooses two typical enterprises, Yintai Department Store and Suning Department Store, as the object of analysis to discuss their development under the epidemic.

3.1 Industry "New Benchmark" Yintai Department Store

Since Yintai backed by Ali, it marks the beginning of Yintai's upgrade and reform road. Ali's acquisition of Yintai, "new retail" and digitalization is naturally the core of Yintai's upgrade reform. Before backing Ali, Yintai also tried to upgrade online but with poor results, until 2017, Yintai department store's data system and Ali database officially opened, thus making It's management mode for consumers and goods officially enter the digital era. After the epidemic, Yintai Department Store through Yintai Meow Street "cloud shopping" and "contactless shopping" enabling consumers to still be able to achieve shopping consumption at home without leaving home, on the other hand, Yintai Department Store through the joint Taobao live and invite guides to do online shopping at home More than 6,000 Yintai department store guides participated, with an average of over 200 daily broadcasts and a peak value of 52 simultaneous online sessions. This is undoubtedly a model of "new retail" under the epidemic. Yintai to achieve contrarian growth during the epidemic, undoubtedly because of the help of Ali big data in advance to complete a deep digital transformation, just a few years, Yintai has completed the digitalization of people, and quickly enter the digitalization of goods and warehouses of the data stage. In terms of the digitization of people, Yintai members and Ali members to achieve full interoperability, digital members of more than 10 million; the digital presence, Yintai Department Store online and offline two fields have been fully covered; and in terms of the digitization of goods, but also let Yintai realize the "people find goods" to "goods find People" of the upgrade. It is through the people, goods, field upgrade, making Yintai Department Store under the epidemic to achieve a contrarian development, a "new retail" and "new benchmark".

3.2 Suning's All-scene Retailing

In early 2019, Suning Tesco announced the establishment of Suning Fashion Department Store Group; in February of the same year, Suning acquired all 37 department stores under the Wanda Department Store; in June of the same year, Suning also invested heavily in the acquisition of Carrefour China, to further improve its department store retail format, from then on to build online and offline to store to home all channels, the whole scene of the department store retail format. So far, Suning Tesco in the department store category has achieved the integration of the whole scene, online department store channel, offline with Suning Department Store, Suning Plaza physical stores, the whole scene retail system is basically formed. Under the epidemic, Suning is taking advantage of its own full-scene Internet operation capabilities and self-managed logistics, launched a technology-enabled, online operation guidance as the core of the out-of-store sales model, supplemented by live streaming, Suning push customers, online micro stores, community and cloud clerks and other Internet tools to vigorously develop out-of-store sales, to protect the normal operation of the stores, to achieve a slight increase in the scale of merchandise sales year-on-year, including department stores. The scale of merchandise trading on online platforms, such as supermarkets and home appliances, increased by 12.78% year-on-year. Among them, the former Wanda Department Store and Carrefour China's home business sales accounted for a higher proportion of sales in the first quarter month by month, accounting for nearly 10% in March and achieving profitability.

4. Opportunities and Challenges of the "New Retail" under the COVID-19

As a major "black swan" event, the COVID-19 has not only impacted the macro economy, but also given new opportunities for the development of "new retail". Forced by the epidemic, the order quantity of supermarket and superstore retail enterprises experienced explosive growth, which accelerated the iteration and renewal of the "new retail" model and the establishment of new business formats. On the other hand, the challenges of "new retail" are everywhere. Based on the industry outlook and relevant theories, this paper considers that the opportunities and challenges brought by the epidemic to the "new retail" include the following.

4.1 The COVID-19 Brings Opportunities for "New Retail"

4.1.1 The Consumer Economy has Driven the Sinking of the New Retail Market, the Surge of Private Domain Traffic and the Rise of the "Home Economy"

In the past 2019, e-commerce online shopping has gradually become a key driver of economic growth. According

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to the National Bureau of Statistics, the country's online retail sales reached 10.63 trillion yuan in 2019, accounting for 20.7% of the total retail sales of consumer goods, and contributing 45.6% to the growth of the total retail sales of consumer goods. In addition, the contribution of consumer spending to economic growth reached 57.8%, driving GDP growth by 3.5%. At the same time, the rapid advancement of new infrastructure under national policy has led to the rapid development of rural e-commerce, further boosting consumption growth in rural areas. According to data released by the Ministry of Commerce, the country's rural online retail sales reached 1.7 trillion yuan in 2019, up 19.1% year-on-year, 2.6% higher than the year-on-year growth of national online retail sales; the national online retail sales in poor counties reached 148.99 billion yuan, up 18.5% year-on-year. At the same time, new e-commerce models such as community groups, short videos and live broadcasts are expanding to rural areas, providing strong support for rural revitalization. In the next few years, e-commerce will face important opportunities such as unleashing the potential of sinking markets, collaboration between production and sales, and market globalization.

The COVID-19 has brought private domain traffic to the eyes of more retailers, making the retail industry begin to re-examine the importance of private domain traffic. The epidemic led to the tightening of offline stores, while through the major public, build groups, live broadcast to build their own private domain traffic pool, offline guides turned into online band anchors, hiring well-known band bloggers to attract fans, revitalize fans, de-stocking, de-centralized, digital physical network smaller, denser, closer to the user, deep plowing users, increasing user viscosity, but also for the second half of the epidemic to accumulate popularity. The online traffic will be diverted to offline stores, empowering physical stores. Private domain traffic building due to low initial cost investment, low threshold access, will be an effective means to carry out online and offline integration of the new retail industry after the epidemic.

Finally, the COVID-19 has also brought about the rise of the "home economy". Take Meituan as an example, according to the "Contactless Delivery Report" released by Meituan, orders using "contactless delivery" accounted for more than 80% of the total orders during the epidemic. The unexpected popularity of "contactless" may push the retail business model to change, and the future "new retail" will be more to C2S2B (Customer To Service Platform To Business) paradigm shift is a huge opportunity for the new retail industry.

4.1.2 The COVID-19 has Accelerated the Pace of Consolidation in the Retail Industry, and the Leading Companies will Get a Bigger Share of the "Cake"

During the epidemic, a large proportion of retail enterprises gained a large wave of fan traffic through their own established coping mechanisms and private domain traffic pools, but this traffic is not always fading. With the disappearance of the Internet demographic traffic dividend, Internet companies and major e-commerce platforms are actively looking for ways to respond, constantly using technology and services to try to attract consumers, but the results are poor. Under the epidemic, such as the above-mentioned Yintai Department Store, Suning Department Store, are able to endorse the brand and thus against the "epidemic", but most of the majority of retail enterprises passively accepted industry integration, the survival of the fittest market mechanism is self-evident.

After the COVID-19, the pace of consolidation in the new retail industry will be accelerated, with the better-performing leading enterprises taking away a portion of the user traffic and gaining most of the market "cake", while other small enterprises will go bankrupt and be acquired. Industry consolidation will drive the retail market to sink, and retail companies will gain development opportunities.

4.1.3 The COVID-19 has Led to a Change in the Consumer Profile, Creating Opportunities for "New Retail"

Standing in the era of consumer sovereignty, the user consumption image of thousands of people, supported by technology, service-oriented while paying attention to the scene experience is the result of consumption upgrade[12]. How to depict such changes in the era of consumer economy is a problem that the new retail industry needs to solve.

Consumption downgrade under the epidemic is mainly manifested by consumers' reduced spending power, reduced incomes of residents, companies facing layoffs, employees facing unemployment, and cutbacks becoming inevitable. According to the National Bureau of Statistics (NBS) (see Figure 2), total retail sales of consumer goods in January-February 2020 fell by 20.5% year-on-year, 19% year-on-year in March and 16.2% year-on-year in April. According to McKinsey's 2020 China Consumer Survey, demand for non-essential goods is on a downward trend in the face of the epidemic, especially in first-tier cities such as Beijing, Guangzhou, Shenzhen, where consumers are more cautious about spending, and in second- and third-tier cities, where the cost of living is lower and consumer confidence is maintained. A decline in spend-

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ing power does not mean that consumers are willing to give up cost-effective goods, and some retail enterprises happen to be aware of this consumer characteristic and stimulate consumption by issuing electronic consumption coupons, which not only satisfy consumers' pursuit of cost-effective consumption behavior, but also ensure their own profitability, becoming a major "grasping hand" to "stimulate consumption under the epidemic".

With the orderly progress of the resumption of work and production, consumer confidence will gradually rise, such as the emergence of "retaliatory" consumption, in the face of post-epidemic changes in consumer behavior again, the new retail industry to withstand the test of consumption from downgraded to upgraded, fully integrated online and offline, through offline logistics and scene experience coupled with online traffic to attract. Create a new retail format to gain a greater advantage.

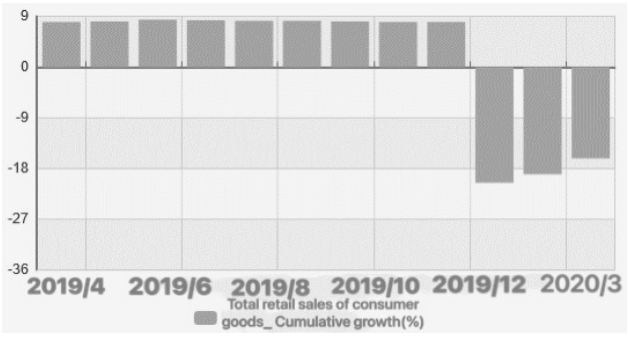

Figure 2. Total retail sales of consumer goods, April 2019 - April 2020

4.2 The COVID-19 Poses a Challenge for the "New Retail"

4.2.1 The COVID-19 Slow down Logistics and Increase the Risk of Supply Chain Disruptions due to High Logistics Costs

The importance of logistics to the retail industry is self-evident. In the era of high homogeneity in the commodity economy, logistics speed and cost have become the last straw that breaks the camel's back in the retail industry. The retail supply chain and logistics system has provided strong support for the normal operation of retail enterprises, however, the impact of the epidemic has posed a huge challenge to the normal operation of the retail industry, which is mainly manifested in the increasingly obvious bottlenecks in the supply chain and the tightness of inventory. With the closure of major transportation routes, serious obstruction of transport routes, highway blockades, aviation ban, especially the closure of a large area of foreign airline flights, a large proportion of domestic enterprises required raw materials are sourced from abroad, resulting in the procurement of raw materials can not be completed, supply chain disruption crisis rising, the back-end and mid-range supply chain nodes enterprises caused by waste of resources, while the front-end inventory shortages, unable to Normal supply, resulting in frequent incidents of returns, and even damage to corporate reputation, which is almost devastating to many small and medium-sized enterprises before the epidemic to establish a weak advantage of the blow, while large enterprises such as Ali, Jingdong and other large enterprises to establish a digital, information-based supply chain model can help it through the "dark period" [13], which also is the challenge that the retail industry will face in the future.

4.2.2 The COVID-19 Forces Traditional Retail to Accelerate Transformation

The COVID-19 has forced consumers to switch from offline to online, and for traditional retailers, wandering in the still unplowed land of "new retail" is full of crises and challenges. Especially for pure offline retailers, it is not feasible to put all eggs in one basket, and online + offline is the future trend of retail. The epidemic is bound to force traditional retail to accelerate the speed of transformation, prompting the retail industry to reconstruct Internet thinking, build a big data chain, explore industry information, dig deep into user data, user-oriented, data-supported, service-oriented reconstruction of the supply chain and marketing model. However, the current interaction and integration of new finance, new technology and "new retail" is not deep enough, and the relevant policies and legal provisions are not perfect, resulting in low data sharing, lack of information interaction and serious user data leakage. enterprises, there are also many problems, Alipay, for example, it is undeniable that the emergence of Alipay people to a large extent into the electronic consumer era, to facilitate people's payment methods, however, its interface is complex and diverse, filled with a variety of induction information, a slight lack of attention is easy to fall into the "trap" of financial products, greatly reducing the feeling of customer experience. The "new retail" needs the support of new finance, and the transformation of the retail industry needs the integration of the two. However, 1% immaturity will cause 99% change, which is the opportunity and challenge of "new retail".

5. Countermeasures and Suggestions for the Development of "New Retail" under The COVID-19

As a major "black swan" event, the COVID-19 has had

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a serious impact on the economic development of China and even other countries around the world. From a macro point of view, the country's tax revenue has been reduced and fiscal expenditure has been difficult; from a micro point of view, enterprises have faced layoffs and employees have lost their jobs. While the epidemic has brought development opportunities to the new retail industry, there are also some current and future challenges and difficulties that need to be solved, and how to recover and revitalize the economy in the event of a public health emergency is an issue that both the government and enterprises have to face.

5.1 Public Health Policies go Hand in Hand with Economic Development Policies

The COVID-19 prevention and control work to be the first, while the orderly organization of production resumption. At present, the season has come to a hot summer, according to previous expert predictions, the epidemic or in the summer to get effective control, however, from the current situation, whether domestic or foreign, the epidemic still exists spread trend. Domestic point of view, the macro level, the prevention and control of epidemic work can not have a sloppy, government departments in the focus of epidemic prevention and control to foreign imports at the same time, but also to pay close attention to the development of domestic epidemics, to prevent the rise of epidemics, to do a good job of epidemic prevention and control of epidemic prepared for a long-term battle, increase investment in research and development of vaccines, organize the construction of a good health care system, at the same time to implement a good epidemic prevention and control of epidemic management, the introduction of related Public health policies should be implemented in multiple sectors and coordinated in multiple positions. On the other hand, it is also necessary to proceed with macroeconomic development. After the outbreak of the epidemic, the State quickly introduced a series of fiscal and financial policies to reduce taxes and fees, provide financial capital and credit for enterprises, and strive to minimize the damage caused by the epidemic to enterprises.

Grasping the main aspects of the main contradictions, implementing financial policies to address enterprises' internal and external demand. In order to resist the impact of the epidemic on the economy, there is an urgent need to stimulate economic potential, purify a good business environment, enhance enterprises' willingness to invest and their ability to innovate, and restore economic production as soon as possible. China's economy has tremendous advantages, such as strong human and material resources, a wide range of manufacturing sectors, and a huge depth of market demand. These positive factors provide important support for economic recovery. To minimize the impact of the epidemic on the economy, two issues need to be addressed, one is to increase momentum, and the most important task at present is to solve the problem of enterprise survival and restoring economic production. Through policy support, we will alleviate the difficulties of enterprises. On the one hand, it is necessary to play the key role of effective investment and raise the per capita capital stock and all-factor growth rate. On the other hand, it is necessary to stimulate the potential of economic development, expand effective investment as a source of power, optimize the investment environment, expand investment space, and solve the problems of unstable enterprise expectations, lack of power and resource constraints. Second, to improve efficiency, we should make resources flow and allocate them to sectors with high efficiency and reduce the allocation of resources to inefficient enterprises. In the case of the retail sector, resources flow more quickly than in other sectors, thus giving it a greater advantage in restoring economic development.

5.2 Businesses and Governments Themselves need to Make a Difference

Companies should actively build private domain traffic pools and integrate resources to create a community super retail ecosystem. Under the pressure of the epidemic, many retail enterprises are facing a supply chain rupture crisis[14], a wave of physical store closures, in their own lack of technology and data to support the situation, retail enterprises need to think about the future of the road, transformation or transfer. During the epidemic, there is no lack of outstanding performance of retail enterprises, such as Yintai Department Store, Suning Department Store, Meituan Take-Away, and Ziduo, etc. These industry benchmarks all have a common competitive advantage, that is, they have their own private domain traffic pool, through the establishment of private domain traffic to increase consumer viscosity, through the distribution of household coupons to establish a subsidy mechanism, in addition to the good performance of the logistics system also won them the pursuit of customers. These features have provided development ideas for the transformation of traditional retail. In the post-epidemic era, based on the original ecosystem, the new retail industry can establish a new retail ecosystem by plowing into community superstores, seeking new business circles on the one hand, integrating community resources and gathering consumer traffic through online apps on the other, while optimizing logistics speed, reinforcing supply chain stability, reduc-

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ing service radius and improving service efficiency.

Governments should invest in reinforcing the operational stability of the supply chain and commit to supply chain resilience management. In this epidemic, the supply chain has been challenged from all aspects, whether it is the supply of raw materials, the orderly development of the resumption of work or the impact on the overall supply chain logistics and domestic and foreign markets all show the importance of the supply chain, but also show the public health emergency outbreak on the supply chain caused by the crisis and damage. Therefore, strengthening the resilience management of the supply chain has become an issue that the government needs to face now. Usually, in economics, resilience is considered to be the property of one variable that changes with another variable. Resilience is generally considered as a dynamic ability of an organization to cope with the risk of disruption and its ability to withstand the risk. Conducting supply chain resilience management is carried out in two main ways, resilience on the one hand and resilience on the other. Based on this, from the government level, on the one hand, the government should establish a comprehensive and coordinated supply chain risk prediction and defense system, currently, from the central to local levels of government are actively issued a series of policies to deal with epidemic prevention and control, but from a global perspective, inconsistent standards of supply chain risk prevention and control will lead to poor supply chain operation, especially for the retail industry under globalization, the issues involved include not only Epidemic prevention, but also includes resumption of work and production, cross-border procurement of raw materials, customs and foreign exchange, because the development of a coordinated supply chain resilience management mechanism for the retail industry is very urgent and important. On the other hand, the government should ensure the orderly development of the resumption of work and production of retail enterprises in the supply chain resource system. The guarantee of resources is more realistic and direct than the guarantee of system, and all kinds of enterprises are carrying out the resumption of work and production at present. The government should implement a flexible supply chain resource guarantee mechanism according to different regions, encourage small and medium-sized retail enterprises to establish their own supply chain system, and promote the integration of supply chain nodes, thereby reducing the risk of supply chain disruption.

5.3 Making Full Use of Information Technology Support

With the three major domestic basic telecom operators obtaining 5G commercial licenses and the successive release of major brands of 5G cell phones, marking the official start of the commercial experience of 5G customers, 2019 is seen as the first year of 5G commercialization[15]. For the new retail industry, which is currently advocating the Boundaryless New Retail Enablement Program, both mobile terminals and PC terminals must rely on high-speed and developed networks in order to achieve deep integration between online and offline; on the other hand, new retail must rely on big data AI systems, and the popularity of 5G networks is conducive to accelerating the transmission of data between them, which can further reduce the time difference in accessing information within enterprises and improve the Work efficiency. With the control of the epidemic, the business environment has been further optimized, and fierce market competition requires retailers to fully utilize the support of technology to build an advantageous platform. With the support of 5g technology, the retail system should be upgraded from demand, design, production to logistics, channel, sales and after-sales service to explore a new retail era of "high quality, high experience and high intelligence".

At present, from a global perspective, China is ahead of other countries in both the development and application of 5G technology and the practice of "new retail", but in terms of technology integration, the new retail industry needs to break away from conservative thinking. However, in terms of technology integration, the new retail industry needs to break away from conservative thinking. The lack of integration between new technology and new retail leads to "volatile" enterprise traffic, which greatly reduces profitability and eventually forces enterprises to change jobs. Therefore, new retail enterprises should speed up to catch up with the train of technological innovation, take their own resources as the basis, take technology as the support, and constantly optimize the height of the industry, so as to build the real "new retail" era.

References

[1] Hong,L., Jiawei, Z. Opportunities, Challenges and Coping Strategies for the New Retail Industry in the Context of Xincrown Epidemic. J. Southwest Finance., 2020, (6): 1-14.

[2] Jianghuai, Z. F., Jin, T. The Impact of the New Coronary Pneumonia Epidemic on the Consumer Economy and Countermeasures Analysis. J. Consumer Economics, 2020, 36(2): 3-9.

[3] Caizhen, H., Baoyi, W. Research status and trend of new retail. J. China's circulation economy, 2018, 32(12): 20-30

[4] Chuanxi,L., Mingde, Q. Restructuring of "New Re-

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tail" Business Model under the Modern Value Chain: A Nine-Element Canvas Based on "Boxma Xiangsheng". J. Enterprise Economy, 2020, 20(4): 15-26.

[5] Baoyi, W. Trend Analysis and Critique of the Evolution and Iteration of the "New Retail", J. China Circulation Economy, 2019, 33(10): 13-21.

[6] Fei, L., XiMing. H. Theoretical research review and outlook on retail business evolution. J. Technoeconomics, 2015, 34(11): 34-46.

[7] Fu,W. New retail circulation supply chain business model innovation system construction. J. Contemporary Economic Management, 2020, 20(6):1-14.

[8] Rongrong, Z. Research on the driving mechanism and upgrade of China's new retail business model. J. Management Modernization, 2020, 40(02): 52-55.

[9] Ting-Ting, W., Ang-Ang,Z. The Impact of the New Coronary Pneumonia Epidemic on China's Economy and Coping Strategies. J. Nanfang Finance, 2020, 35(5): 156-164.

[10] Liang, W. Opportunities, experiences and development strategies of online and offline interaction and integration in the retail industry. J. Business Economic Research., 2019, 19(11): 69-72.

[11] Baoyi, W. Review and Prospect of China's "New Retail" Practice--Based on the "Demand Side" in the First Half and "Supply Side" in the Second Half "Transition Perspective", J. China Circulation Economics, 2019, 33(3): 19-30.

[12] Jianlin, P. Review of literature on new retailing theory: A concurrent discussion of the four-constituent business mode. J. Business Economic Research., 2019, 38(5): 9-11.

[13] Ruiyun, D., Kan, J. Characteristics, Influencing Factors and Implementation Dimensions of New Retail". J. Business Economic Research, 2018, 45(4): 5-7.

[14] Hua, S. Implications of the new coronary pneumonia epidemic for supply chain resilience management. J. China Circulation Economics, 2020, 34(3): 11-16.

[15] Shumei, Z., Yinqing, L. The innovative development of "new retail" services in the 5G era. J. China Circulation Economy, 2019, 33(9): 3-14.

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REVIEW

Review of Financial Pressure

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ABSTRACT

Different from foreign capital markets, china's domestic capital markets are special, which also determines that the research on financial pressure starts from the reform of state-owned enterprises, and draws lessons from the relevant theories of financial risk and financial fraud, thus gradually forming a more diversified research results.

1. Concept of Financial Pressure

The concept of financial pressure has not yet formed a definite definition, but scholars have expounded it from different perspectives. Guoping Wu, Jun Zhu [10], Guoping Wu, Shi Ma [14] believe that the financial pressure is essentially the behavior pressure on the company from the financial point of view, and the main financial pressure should include debt service pressure, cash flow pressure, shell pressure, profit preservation pressure and signal pressure, caused by the decline of profitability. The debt service pressure shows that the enterprise itself has short-term or long-term debt, and whether the business activities of the enterprise can guarantee the most basic debt service ability is the guarantee to enhance the reputation. Shell preservation pressure, as one of the most concerned financial pressure indicators of listed companies, determines the acceptance of investors to the enterprise, and as an effective way of financing for listed companies, it is very attractive.

In our country, the shell pressure of (Listed Company Under Special Treatment) by ST company is huge, and the pressure of maintaining profit can better reflect the position of the enterprise in the industry, find the gap and improve the core competitiveness. Huayou Duan, Rui Wang, Shengdao Gan [3], Huayou Duan, Shengdao Gan, Quanyuan Xu [4] first applied the concept of pressure in physics and psychology to the explanation of enterprise financial pressure. It holds that the enterprise financial pressure is formed by the external environment and internal environment of the enterprise acting on the financial activities of the enterprise, that is to say, the pressure that the financial activity of the enterprise must bear is the pressure that the financial activity of the enterprise must bear. This force will affect the financial activities and business activities of the enterprise to a certain extent, and will also cause cer-

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tain psychological pressure to the management authorities, especially the managers. In the source and control of its financial pressure, Shengdao Gan [5] points out that financial pressure is a certain measure of financial and non-financial indicators imposed by controlling shareholders on enterprise operators. Wang Shujun [20] pointed out that financial pressure refers to the financial pressure necessary for an enterprise to operate in the internal and external environment and available resources, according to the demands of various interest groups. Hong Wang, Chunyan Liao and Yutong Liu [9] point out that the financial pressure is the result of the internal and external interaction of the enterprise, which is generally influenced by the environmental transmission mechanism in the business activities of the enterprise, but acts on the financial level.

2. Research on Financial Pressure

State-owned enterprises, as China's economy with public ownership as its main body The foundation of the system plays an important role in the reform of the market economy. Because of the new and old system, the financial pressure of the state-owned enterprises is increasing, the economic benefits are declining, more enterprises are in trouble, and it is difficult to find a solution to the financial pressure of the state-owned enterprises under the influence of the macro policy to become a major problem related to the national economy and the people's livelihood [1].

With the reform of market economy, China's securities capital market has become active, many state-owned enterprises have been reformed and listed, and there have been more financial fraud. Bo Yu and Jinhui Deng [2], based on the analysis of the causes of financial fraud, point out that the lack of control environment and the drive of financial pressure are the important causes of corporate fraud. The relationship among them is that in the "soil" of the lack of control environment, the "seed" of financial pressure will germinate the "bud" of fraudulent financial report.

At present, many enterprises are facing financial pressure, the reasons for these pressures are various, especially the particularity of small and medium-sized enterprises in our country, the problem of financing difficulties exists for a long time, resulting in difficult to bear huge financial pressure and go to the brink of bankruptcy, so high financial leverage is particularly prominent in the financial pressure of small and medium-sized enterprises [3]. In terms of the sources of financial pressure in SMEs, Huayou Duan, Shengdao Gan and Quanyuan Xu [3] pointed out that the information asymmetry between shareholders, creditors and managers is the only reason, and the result of this asymmetric information is not all negative, which may encourage interest groups to abide by the contract rules [4]. Similarly, the financial transparency of listed companies is high, and the contradiction between financial efficiency and financial equity must be properly handled, otherwise the disharmony of company labor relations may lead managers to abandon contracts and choose financial fraud in the face of higher financial pressure [5]. The goal of enterprise development is not only to gain the maximum market share and profit maximization, but also to accept the supervision of the public and gain a good reputation, so [6] to demonstrate corporate social responsibility and R&D investment-agency cost mitigation or financial pressure with 3,791 full samples of A-shares and 2412 samples of disclosure R&D investment between 2012 and 2014? The empirical results show that the investment of social responsibility and R&D will increase the financial pressure of the enterprise and exert a heavy burden on the enterprise. In order to reduce the financial pressure of the enterprise and reduce the investment of social responsibility properly, the enterprise should set up a special fund to ensure the division of financial resources with the enterprise.

With the continuous improvement of China's capital market and the experience of foreign developed capital market, the application of derivative financial instruments in the financial management of domestic listed companies is generalized. [7] from 2012 to 2014, 500 manufacturing listed companies were selected, and the return on net assets (ROE) was used as the index to measure the financial pressure, and the model was established to verify that the investment behavior of the enterprises with high financial pressure was cautious and be ware of further financial risks. And [8] through the concrete derivative financial instrument, explained the listed company under the financial pressure influence, according to the demand and the market operation trend, the rational choice derivative financial instrument. Financial pressure can not only affect the financial situation of the enterprise as a whole, induce the possible financial risk, but also play a guiding role in the business activities of the enterprise together with other variables as one aspect. Hong Wang, Chunyan Liao, Yutong Liu [9]. This paper comprehensively studies the relationship among the two major financial pressures (performance pressure and tax pressure), corporate governance efficiency and earnings management. It is found that under the condition of high corporate governance efficiency, the financial pressure of enterprises is relatively small. It is necessary to avoid the financial crisis caused by financial pressure agglomeration and guide enterprises to enter a benign growth road [9]. At the same time, because of the high pressure of performance and tax burden, it may trig-

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ger the motivation of management earnings management.

3. Research on the Evaluation Method of Financial Pressure

The existing scholars have different evaluation methods of financial pressure, through the construction of different models and index system to evaluate and analyze the financial pressure.

An empirical study. Guliang Tang, Zhao Fan (2009) first extended the pressure test mechanism widely used in financial enterprises to industrial and commercial enterprises, using free cash flow (FCF) as the enterprise risk early warning test model, divided into four modules: operating net cash flow, working capital, long-term investment and external financing (especially debt financing) [10]. Shuofeng Wu [7] takes 500 companies listed in manufacturing industry as the research object, from the source of financial pressure, using the return on net assets (ROE) as the factor of financial pressure, choosing three measures of solvency, profitability and operational ability to analyze the more reasonable investment behavior of enterprises. Fangfang Wu (2018) based on the change of financial pressure in the coal industry before and after the supply-side structural reform, constructed the index system of debt service pressure, shell protection pressure, earnings protection pressure, operating pressure, cash flow pressure, and analyzed the current financial pressure state of the coal industry as a whole. Wang Hong, Liao Chunyan, Liu Yutong [9] extended the evaluation index of financial pressure from performance pressure to tax burden pressure, taking legal tax rate, average tax rate and actual tax rate as tax burden pressure index, constructing different empirical models to study the relationship between financial pressure, earnings management and corporate governance efficiency.

Logistic regression model. Ma Shi [14], Zeng Yueming, Cui Yanlai, Chen Yun [12] all through empirical research, the financial pressure of listed companies and the relationship of information disclosure. In addition to the fact that the cash flow pressure is not significant to the information disclosure violation, the other debt service pressure and the shell-keeping pressure are significantly related, while the latter takes 74 listed companies with the information disclosure violation of the Shenzhen Stock Exchange from 2006 to 2009 as the sample, using the logistic regression model as an explanatory variable and the characteristics of the company's equity board of directors to analyze the factors of information disclosure violation. The results show that the relationship between the debt service and the company's information disclosure is positive, and the former is consistent with the empirical results [11,12]. On the basis of using the former two analytical frameworks for reference and using the model, Junqing Zhang [13] selected the illegal listed companies disclosed by CSRC and stock exchange from 2007 to 2009 as large samples, and again proved the consistency of the above two research results by using Logistic regression model. Using the logistic regression model to examine the influence of various factors on the behavior of derivative financial instruments in listed companies from 2012 to 2014, Shi Ma [14] proved that the greater the financial pressure of listed companies, the more likely they are to use derivative financial instruments to resolve the financial pressure.

Enterprise management entropy model. The idea of managing entropy comes from the law of entropy proposed by Clausius. Peiyu Ren, Li Zhang, Yong Song [15] pioneered the application of the law to complex management science by proposing the concept of management entropy [16], that is, the management system represents the integrated nonlinear efficiency ratio state of energy state and order degree in air at a certain time. The greater the management entropy value of the enterprise system, the more disordered the internal management is; on the contrary, it indicates that the internal management of the enterprise is more orderly, which indicates that the financial situation of the enterprise reflects the operation activity of the enterprise very well. Ling Wu, Peiyu Ren, Weizheng Chen, et al. [17], Peiyu Ren, Miao Wang, Jingfei Ren, et al. [19] systematically describe the development of entropy theory, put forward the law of decreasing management efficiency, and evaluate the comprehensive performance of enterprises under the framework of entropy theory and stakeholders through comprehensive rating index. Shujun Wang [20], based on the perspective of management entropy, compares the existing financial pressure evaluation framework and puts forward the superiority of management entropy evaluation of financial pressure.

Domestic research is consistent with China's social-economic development and follows this research sequence. State-owned enterprises, as the foundation of socialist system, play an important role in the reform of market economy. In the 1990s, China began to establish a modern market economic order and gradually developed capital market. Policy the research on small and medium-sized enterprises is constantly on the rise, forming the current multi-level research, thus seeing that the scope of domestic research is constantly expanding and the level is more in-depth. Whereas the evaluation methods of financial pressure, more empirical research, logistic regression model, research object for large samples, or a certain industry, have integrity.

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References

[1] Kexiong Wang, Tazhang Sun. Reflections on the Work of State-owned Enterprises to Turn Profit and Increase Profit [J]. Shanghai Accounting, 1995(07): 27-29.

[2] Bo Yu, Jinhui Deng. The cause of formation theory of fraud financial report[J]. Journal of Guangzhou Institute of Economic and Management cadres, 2002(03): 35-40.

[3] Huayou Duan, Rui Wang, Shengdao Gan. The road to success. Analysis on mechanism and countermeasure of financial pressure of small and medium-sized enterprises [J]. 2014(1): 99-102.

[4] Huayu Duan, Shengdao Gan, Quanyuan Xu. Literature review of financial pressure in SMEs [J]. Monthly Journal of Accounting (Part 2), 2014(10): 110-112.

[5] Jinke Liu, Shengdao Gan, Shanshan Yang. A Comparative Study on Capital Financial Equity Measurement - Taking Listed Companies in High-Tech Industries as an Example [J]. Managing the World, 2016(1): 180-181.

[6] Bo Yang, Chuan Lin. Corporate social responsibility and R&D investment-agency cost relief or financial pressure?[J]. Journal of Yunnan University of Finance and Economics, 2016, 32(4): 124-131.

[7] Shuofeng Wu. An empirical analysis of investment behavior under financial pressure [J]. Chinese market, 2018 (11): 65-66.

[8] Jianxiong He. Financial pressure of listed companies and the use of derivative financial instruments[J]. Chinese business theory, 2019, 778(03): 205-206.

[9] Hong Wang, Chunyan Liao, Yutong Liu. Financial pressure, corporate governance efficiency and earnings management[J]. Financial monthly journal, 2019, 853(09): 11-18.

[10] Guliang Tang, Zhao Fan. The "pressure test" was introduced to construct the risk "physical examination" mechanism of industrial and commercial enterprises[C]. 2009 academic annual meeting of the Financial Management Committee of China Accounting Institute, 2009.

[11] Guoping Wu, Marsh. An empirical study on financial pressure and information disclosure violations of listed companies[J]. Financial theory and practice, 2010, 31(2): 59-63.

[12] Yueming Zeng, Yanlai Cui, Yun Chen. Research on the Influencing Factors of Information Disclosure Violation of Listed Companies in China - An Empirical Analysis Based on the Data from 2006 to 2009[J]. Economic Problems, 2011(1): 116-120.

[13] Junqing Zhang. An Empirical Study on Financial Pressure and Information Disclosure Violation of Listed Companies [J]. 2013(21): 32-33.

[14] Marsh. Research on Financial Pressure and Application of Derivative Financial Instruments in Listed Companies[J]. Modern Management Science, 2017(01): 117-119.

[15] Peiyu Ren, Li Zhang, Song Yong. Management entropy based on complexity science, management dissipative structure theory and its role in enterprise organization and decision making [J]. 2001(06): 142-147.

[16] Peiyu Ren. On the strategic decision of reengineering organization in management efficiency[J]. Economic system reform, 1998(3): 98-101.

[17] Peiyu Ren, Weiping Yu, Anhua Yang. Research on Life Cycle and Ability Strategy of Chinese Listed Companies Based on Management Entropy[J]. 2004(10): 76-82.

[18] Ling Wu, Peiyu Ren, Weizheng Chen. Entropy Theory in Management System and Entropy Value Evaluation of Enterprise's Comprehensive Performance under the Framework of Stakeholders [J]. Soft Science, 2004(01): 39-42+46.

[19] Peiyu Ren, Miao Wang, Jingfei Ren. From Natural System to Management System - The Stage of Entropy Theory Development and Management Entropy Law [J]. Managing the World, 2013(12): 188-189.

[20] Shujun Wang. Research on the Evaluation Framework of Enterprise Financial pressure from the Perspective of Management Entropy[J]. A New academic Vision of Sichuan Institute of Commerce and Industry, 2017(2): 47.

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ARTICLE

Research on the Development Path of Zigong Salt Culture and Creative Industry in the Era of Digital New Media

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Virtual technology

ABSTRACT

Salt culture is the main component of traditional culture in Zigong, Sichuan.With centuries of history, it has accumulated rich cultural connotations. At present, Zigong salt culture, as a precious traditional cultural wealth, has taken cultural and creative industries as a new carrier of communication in the rapid development of digital new media technology, giving full play to the resource advantages of its traditional culture. This article focuses on the study of the development path of Zigong salt cultural and creative industry in the new digital media era. Combining digital new media technology with cultural and creative industries, Zigong salt culture actively uses virtual technology to realize the innovative development of cultural and creative industries, promote the cultivation of cultural and creative brands based on digital new media technology. This article aims to give relevant strategies with reference value, so as to make corresponding contributions to the development path of Zigong salt culture in the future.

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1. Introduction

With a unique advantage of traditional cultural resources in Sichuan Province, Zigong salt culture is irreplaceable in the cultural and creative industries. As our country is entering the 21st century, the science and technology field of our country is facing new opportunities for development. At the same time, the innovation of Zigong salt culture is also gradually accelerating. In the future social economy, the development of cultural and creative industries will become an indicator, which plays an important role and directly determines whether the economic development is healthy and sustainable. New ways of development and thinking are all provided by cultural and creative industries. Therefore, cultural and creative industries will gradually hold a leading position with the advent of new digital media era.

2. The Influence of Cultural Creative Industry on Zigong Salt Culture

Culture is a resource for development, creativity is a train of thought for development, and industry is a way for development. The above three factors constitute cultural and creative industries. As a breakthrough in the whole process of China's economic transformation and develop-

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ment, the cultural and creative industry takes innovation and creativity as its internal driving force and constructs a brand-new industrial model and development thinking [1] in the process of continuously influencing the traditional Zigong salt culture.

2.1 Carrier

As a primitive resource, Zigong salt culture has successfully realized industrialization in the framework of cultural and creative industries. Scientific use of communication carriers and communication methods in cultural and creative industries can effectively promote the creative transformation and innovative development of Zigong salt culture.

2.2 Expression

The important function of a culture is expression, as each culture has different characteristics and connotations. Therefore, the ultimate goal of cultural expression is to express those cultural characteristics and connotations. Besides, cultural and creative industry is the carrier of spreading Zigong salt culture, which enables this kind culture to be expressed. In the process of value innovation, the competitiveness and added value of Zigong salt culture are improved.

2.3 Service Object

The emergence of cultural and creative industries is closely related to the gradual personalization of people's cultural consumption direction at the present stage. Therefore, cultural and creative industries have become the communication carrier of Zigong salt culture, giving personalized platform services throughout the process of communication and development of Zigong salt culture. Besides, Zigong Salt Culture also provides good content services to cultural and creative industries. Thus, both sides play the roles of "providing services" and "being served" respectively, going hand in hand in the development process to achieve a win-win situation [2].

3. The Influence of Digital New Media Technology on Cultural and Creative Industries

3.1 Access to New Transmission Routes

Digital new media technology provides a platform for the development and innovation of cultural and creative industries, and at the same time promotes the integration and upgrading of these industries through transformation development. In the great era of digital new media, it is the new thinking of cultural creativity that determines the future evolution and development of cultural and creative industries. The new way for Zigong salt cultural and creative industries certainly have the connotations in both intension and extension integration [3].

3.2 Access to Cross-industry Applications

Digital new media technology can not only develop and disseminate cultural and creative products, but also create technological achievements of new cultural formats, thus realizing the innovations of cultural and creative industries. At the same time, those cultural and creative industries, in turn, have promoted the cross-industry dissemination and application of digital new media technology.

3.3 Access to Industrial Integration

The new driving force for economic development is industrial integration, which can exert strong composite economic effects on industrial edges. To realize the development of cultural and creative industries, we should rely on a complete industrial chain, with digital new media technology as the leading mode and cultural resources as the foundation. At the same time, we should combine cultural innovation industry and digital new media technology in an all-round way to speed up the creation of new industrial clusters, integrate and optimize resources, thus obtaining the maximum benefits through the power of those clusters [4].

4. The Carrier of Digital New Media Technology to Develop Cultural and Creative Industries

Relevant departments should attach importance to the development of cultural innovation industry. Although industrial integration is constantly going on and changing rapidly, the most important thing is always cultural and creative industries. Therefore, when developing cultural and creative related industries, they should be applied and promoted imperceptibly. New cultural consumption is not only reflected in software, but also in hardware. Both virtual technology dissemination and physical intelligent equipment are undergoing continuous development, making up for the shortcomings of traditional media, overcoming the limitations of space or time, and turning the two-way dissemination of information into reality.

4.1 Electronic Sports Games

With the increasing significance of various intelligent and virtual technologies in game research and development, the electronic sports games of China have entered

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a new stage. As a combination form of digital new media technology and cultural and creative industris, electronic sports games have been gradually paid considerable attention. Zigong salt culture can make entertainment communication as a means to continuously innovate communication forms and contents, so that people can understand its unique charm when having fun.

4.2 Film, Television and Animation

As another representative of the combination of digital new media technology and cultural and creative industries,Zigong salt culture can be implanted in the image design, story plot and scene design of film, television and animation. The government should strongly support the construction and improvement of the original platform so as to deeply integrate those industries. In the development of the market and the production of related products, film, television and animation can create a variety of profit models, thus further tapping the development potential of the cultural and creative industry market.

4.3 Cultural Tourism

Tourism operators create certain viewing objects or entertainment styles as consumption content for tourists. Besides, in this process, they integrate rich cultural learning and participation methods into them,thus making tourists have a strong effect of consumer culture. The above description is know as cultural tourism. In the process of operation, tour operators can rely on face recognition, intelligent hot spots, three-dimensional panorama and artificial intelligence in virtual technology to improve the quality and experience of cultural tourism services, build a signboard of "intelligent cultural tourism", shape cultural tourism with popular IPs, and encourage innovative cultural tourism.

4.4 Virtual Technology

In many fields, virtual technology has been applied for the performance or efficiency possessed by virtual technology can be recognized by ordinary people, thus giving full play to its value. The wide application of virtual technology in education field presents the general trend. People have developed it into various teaching products through virtual scenes, intelligent search, emotion recognition and other technologies to bring about great changes in cultural education. Zigong salt cultural and creative industry can also be promoted through virtual technology. The whole process and results of educational activities can be fed back to teachers, when students are receiving guidance, thus truly realizing cultural education [5]

5. Development Strategy of Cultural Creative Industries under Digital New Media Technology

As a new type of industry, the cultural and creative industry in the era of digital new media organically combines scientific and technological innovation with content innovation to achieve all-round development. Content creativity, production and marketing together form an industrial chain for the development of cultural creativity. Every part should integrate digital new media technology, so as to finally innovate the resources of Zigong salt culture itself. Besides, this positions the core of development to the manufacturing of cultural and creative industry so as to better serve the platform of digital new media technology institutions. At the same time, all middlemen serve the marketing and the government introduces comprehensive supporting policies.

5.1 Innovating on the Basis of Existing Traditional Culture

The development of cultural and creative industries will change the form of capital from tangible to intangible, which presents the development concept of cultural and creative industries. It is an important task for the development of our cultural and creative industries to put content innovation in the first place unswervingly, at the same time to take the content of cultural and creative industries as a guide, and finally to expand the digital new media business.

5.2 Strengthen the Construction of Cultural and Creative Industries

Through innovative forms and the promotion of cultural content, the interaction and conflict of industrial integration will be displayed in the process of product form construction. At the same time, active capital will be attracted to invest and capital from some non-cultural sectors also will be attracted. Efforts will be made to build carriers of cultural and creative industries and to support innovation and research and development in the field of industrial technology.

5.3 Optimizing and Developing Services Related to Cultural and Creative Industries

Cultural and creative industries are defined as "high-end new service industry" by the State Council of China. Therefore, the cultural and creative industry can use virtual technologies such as intelligent wearable devices and VR to carry out in-depth development, so that their ex-

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periential and immersive services can be realized. At the same time relevant experiences can be optimized, and user experience can be taken as the design core, thus reflecting the charm of Zigong salt culture and satisfying people's needs [6]

5.4 Efficient Output of Products Related to Cultural and Creative Industries

The development of digital new media technology directly promotes the advent of cultural and creative products. Therefore, new media technology can transform Zigong salt culture into cultural and creative products and affect the marketing process of these products. The reason is that the cultural and creative industries have a high degree of industrial correlation and a strong ability of integration and penetration.

5.5 Exploiting Consumption Ways through New Media Platform

The development of new media platforms must be paid attention to by relevant departments. At the same time, relevant sales and promotion platforms should be developed to further explore the sales routes of cultural and creative industries, so as to further expand the usable range of cultural and creative products and realize economic benefits transformation in effective utilization of products.

5.6 Conducting Intelligent Management of All Cultural and Creative Related Industries

In order to realize a smooth production and management process, cultural and creative industries should attach importance to two major sectors, namely information and network. After the vertical integration of cultural industries, the managers of cultural and creative industries will formulate relevant guidelines. With the market serving as the guide of relevant departments, those managers should industrialize all cultural and creative products, have the courage to accept people's inspection, and make timely use of new media technologies when information is fed back, so as to realize intelligent management.

5.7 Creating Cultural and Creative Industry Brand of Digital New Media Technology

Zigong salt culture has the distinct regional nature that cannot be copied. Therefore, it has become an excellent resource that can be maximized in the era of digital new media. The modern economic system with cultural and creative related industries in the city will improve and update the city's positioning and finally cultivate distinctive cultural and creative industry brands. Reasonable allocation of relevant resource chains should be carried out around the value chain. At the same time, the resource chain should be continuously improved to obtain industrial integration and development in the era of digital new media, thus forming the final industrial ecological chain.

Cultural and creative industries should seize all kinds of opportunities in the new media era. In this context, cultural and creative industries should realize top-level design of their brands, continuous integration of cultural resources, extraction of cultural symbols, formulation of relevant brand strategies. In addition, based on regional characteristics, they should create new cultural and creative brands and then gain international influence through international communication by the use of new media technologies.

5.8 Actively Use Virtual Technology to Realize Industrial Innovation and Development

Virtual technology plays a very important role in the inheritance and innovation of salt culture. That makes the inheritance of salt culture become possible. In order to innovate and inherit salt culture, virtual technology can be used to construct an interactive platform, so that people can use interactive technology and three-dimensional technology to experience the historical connotation of salt culture in the process of visiting. For example, in salt culture sites, interactive technology can be used to improve people's visual experience. Through traveling and exploring virtual scenes, people can truly feel the historical connotation and cultural accumulation of salt culture. Users can also increase their understanding of this culture through scene changes. As another example, some audiences can increase their knowledge of ancient buildings or historical development through the virtual technology experience of salt culture. Designers should attach importance to the collection of opinions and actively improve the system. Only in this way can the demands of the audience be met to the greatest extent. In short, on the basis of strengthening innovation, those industries should fully combine virtual technology with cultural industry innovation, realize the inheritance and innovation of salt culture, thus making Zigong City regain the vitality and charm of a modern city.

6. Conclusion

As a development label of Sichuan traditional culture, the development and inheritance of Zigong salt culture can greatly promote the innovation of cultural and creative industries, which is also a major task at present. In the era of digital new media, the spread and development of Zigong

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salt culture organically integrates digital new media technology and cultural and creative industries, obtaining unprecedented innovation in communication carriers. This creates platforms for the spread and development of Zigong salt culture in various fields, builds cultural brands specially possessed by Sichuan Province, and finally realizes the inheritance and development of Zigong salt culture.

Reference

[1] Li Shan. Research on the Promotion of Zigong Salt Culture from the Perspective of New Media[J]. Media Forum, 2019, 2 (03): 24-27 .

[2] Hou Yan. Research on the Development of Henan Cultural Industry in the New Media Era[J]. Journalism Lover, 2017 (09): 48-50.

[3] Chen Peijia. Research on Cultural Creativity in the New Media Era[J]. TV Guide, 2018 (10): 146.

[4] Yan Feng. Innovation of Urban Cultural and Creative Industries in the New Media Era-Based on Interface Perspective[J]. New Media and Society, 2016 (01): 85-87.

[5] Ji Tao, Sun Dongmei. Research on the Development of Digital Art Creative Industry in the New Media Era[J]. Industrial & Science Tribune, 2012, 11 (03): 30-31.

[6] Niu Jiaran. Research on the Development of Animation Creation Industry in New Media Environment[J]. Art Education Research, 2019 (13): 102-103.

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ARTICLE

Predicting on Chinese Consumers' Organic Wine Purchase Intention

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ABSTRACT

There is very little research on the perception and willingness of Chinese consumers to purchase organic wine.The research aims to understand the factors which influence Chinese consumers' willingness on organic wine purchase. Based on the TRA and TPB, combine with SCT, a conceptual model is established to solve research problems.

1. Introduction

The Chinese people's consumption of wine is increasing, and now it already become as the fifth largest wine consumer market in the world. According to relevant international grape and wine-related organizations, China's wine production has reached 2.92 billion liters in 2018; wine consumption reached about twenty liters, it has almost become the fastest growing market in the world.

1.1 The Organic Wine Market

IWSR's 2018 report shows that the share of global organic wine has risen to 2.4%, which is equivalent to nearly 690 million bottles of wine. As consumers become more environmentally aware, the market share of organic wine has huge growth potential. However, there is very little research on the perception and willingness of Chinese consumers to purchase organic wine and imported organic wine[6].

1.2 Purpose

The research aims to understand the factors which influence Chinese consumers' willingness on organic wine purchase. Based on the theory of rational action(TRA) and the theory of planned behavior(TPB), combine with status consumption theory(SCT), a conceptual model is established to solve research problems.

2. Literature Review and Hypothesis

In 1975, Ajzen and Fishbein put forward the TRA to clarify the reason behind decision making through psychological theory and whether a particular behavior is adopted or

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not. The theory has widely explained some behavioral and psychological research work in the marketing section, and also applied to organic food marketing in many environments.

Likewise the perceived behavioral control variable has been includes into the TPB, for better explaining individual decision behavior. The theory is widely applied on energy saving, green consumption and intentions to organic food purchasing.

Furthermore SCT refers to the consumption of status goods by consumers in order to maintain or improve their social status and thereby express their desired social status and social level to themselves or other important people around them [1]. At social events, wine consumption reflects the drinker's social status, lifestyle and personality.

The researcher believes that environmental concern is the essential prerequisite for perceiving the value of organic food [2]. At the same time, research has proved that consumers' concern for ecology and the environment has led to the continuous growth of global organic food and beverages [4].

H1. China Consumers' environmental awareness has a significant effect on the Chinese consumer's attitude toward organic wine

Mei et al. [5] believe that knowledge and beliefs affect all stages of decision-making. Research shows that environmental knowledge significantly affects attitudes towards green purchases. When people understand or master some knowledge about organic wine, they may change their buying attitude.

H2. Knowledge of organic wine has a significant effect on the China consumer's attitude toward organic wine

In China, consumers are beginning to pay more attention to topics related to health and their dietary habits, such as choosing healthy foods in their daily life. The focus on chemical residues in food has led to the notion of healthier organic food, which has increased the purchase intention of organic food. Positive attitudes and beliefs about healthier organic foods may enhance individuals' willingness to purchase organic wine. Therefore, the following assumptions are made [8].

H3. The health concern of Chinese consumehas a significant effect on the China consumer's attitude toward organic wine

Organic food is considered high-quality food because of its high-standard planting requirements and production methods, making it healthier. At the same time, certification and verification from an authoritative organization or government can ensure its quality and safety. The quality assurance of organic food is easier to win the trust of consumers and promote consumer purchase behavior.

H4. The quality of organic wine has a significant effect on China consumer's attitude toward organic wine

Organic food's price needs to be seriously considered as well. Its price is an important aspect when consumers making purchasing decisions process, because the price of organic food is directly related to purchasing power. The price of organic food is often more expensive than that of non-organic food [3]. The high price of organic food in the literature is one of the biggest obstacles to its consumption. If the price of organic food is too over, consumers will not have the ability to purchase it.

H5. The price of organic wine has a negative effect on the China consumer's attitude toward organic wine

The researcher considered the social norms as an imperative driving force for consumption of the organic food [2]. For example, if buying organic food is considered a socially recognized behavior, then individuals are more likely to buy organic food for themselves or their family members.

H6. The subjective norm has a positive impact on the China consumers intention to purchase the organic wine

The TPB explained the behavior lies on the willingness to process the act considered with perceived behavior control. Perceived behavioral control is the degree to which an individual believes that people can control their behavior. According to the study, consumers' green purchase behavior in European Union countries was well explained by the TPB. Researcher also applied the TPB to evaluate the intention of consumer to purchase organic food.

H7. Perceived behaviour control has a significant effect on the China consumers purchase intention toward the organic wine

Organic food consumption is also considered as a luxury fashion purchase, which is beyond the basic needs, likewise represents symbolic meanings. According to Sector Trend Analysis (2016) report, wine, especially imported wine, in China is considered a status symbol and is mainly used in social interactions such as business and other important occasions. Furthermore Chinese wine purchase behaviour reflects the symbolic and social value of wine.

H8. The status consumption has a significant impact on the intention to purchase the organic wine

The organic food product does not have any chemicals or pesticides, thereby enhancing consumers' positive attitudes towards organic food. In terms of personal behavior, the more positive the consumer's attitude towards food, the more likely it is that consumers will purchase the food. In accordance with the TRA theory, this research gave us a framework of basic psychological concepts, because the behavior is directly affected by the intention, that why the

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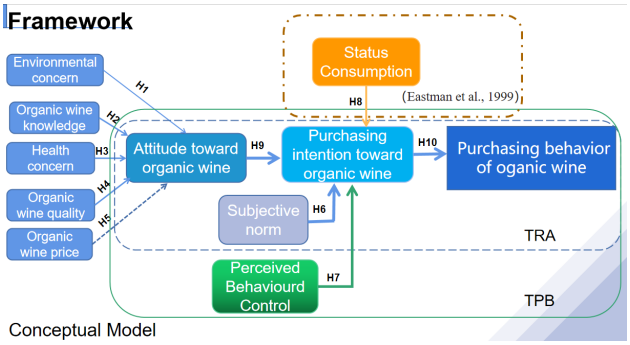
intention is also called behavioral intention [8].

H9. The positive attitude of China consumers toward organic wine has a significant effect on the purchase intention of the organic wine

H10. The China consumers' positive purchase intention of the organic wine has a significant influence on the China consumers purchasing behavior of organic wine

3. The Model and Framework

Based on relevant information, the conceptual model is proposed to analyze purchase behavior of Chinese consumers' organic wine.



Conceptual Model

4. Methodology

Questionnaire survey was used for the research's data collection, which was filled out online by scanning the code. The respondent need to be a consumer who is over 18 years old, lives in Beijing and has an awareness of buying organic wine. The survey method was to ask consumers before the exit of the largest organic food supermarket in the center of Beijing. The simply size was decided by running G.Power software, all the collected survey data was going to be entered by using SPSS for final analysis. The measurement model.will be tested by using Smart PLS.

5. Conclusions

Establish a conceptual model by studying all direct and indirect variables to predict the purchase behavior of Chinese consumers for organic wine. This study shows that the most important predictive attitude factor is health concern. Meanwhile the subjective norms are the most important factor affecting attitudes, organic wine knowledge is the most important personal factor that affects people's attitudes towards organic wine purchases.

References

[1] Eastman, J.K., R.E. Goldsmith, L.R. Flynn. Status Consumption in Consumer Behavior: Scale Development and Validation. Journal of Marketing Theory and Practice, 1999, 7: 41-52.

[2] Groening, C., Sarkis, J., Zhu, Q. Green marketing consumer-level theory review: a compendium of applied theories and further research directions. Journal of Cleaner Production, 2018, 172(2): 1848-1866.

[3] Lea, E., Worsley, T. Australians' organic food beliefs, demographics and values. British Food Journal, 2005, 107(10): 855-869.

[4] McCarthy, B., Liu, H.B., Chen, T. Innovations in the agro-food system: adoption of certified organic food and green food by Chinese consumers. British Food Journal, 2016, 118(6): 1334-1349.

[5] Mei, O.J., Ling, K.C., Piew, T.H. The antecedents of green purchase intention among Malaysian consumers. Asian Social Science, Organic Trade Association, 2012, 8(13): 248-263. Available at: www.ota.com/resources/market-analysis

[6] Rana, J., Paul, J. Consumer behavior and purchase intention for organic food: a review and research agenda. Journal of Retailing and Consumer Services, 2017, 38: 157-165.

[7] Thøgersen, J., de Barcellos, M.D., Perin, M.G., Zhou, Y. Consumer buying motives and attitudes towards organic food in two emerging markets: China and Brazil. International Marketing Review, 2015, 32(3/4): 389-413

[8] Zhang, K.Z., Benyoucef, M. Consumer behavior in social commerce: a literature review. Decision Support Systems, 2016, 86(1): 95-108.

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