



温州肯恩大学
WENZHOU-KEAN UNIVERSITY

**A research study on the relationship between virtual economy and real economy according
to the key index**

In Partial Fulfillment of the Requirements
for the Bachelor of Science in Finance

By

CHEN Tianze

1025568

May, 2020

Abstract

With the development of the society and the innovation of the information technology, the virtual economy has made great progress. However, due to the research on virtual economy in China is lagging behind, the relevant policies and regulations are not sound enough. The non-benign development that looks like virtual economy gives real economy certain negative effect. With the outbreak of Bitcoin bubble and financial crisis in recent years, a group of people in China increasingly doubt whether the virtual economy has seriously separated from the real economy. Therefore, this paper intends to adopt the method of statistical comprehensive index to depict the virtual economy and real economy and do a research on the relationship between them through the econometric model.

Keyword: Virtual Economy; Real Economy; Financial indexes

Acknowledgements: I would like to thank my thesis advisor William Cheng for his advice and support throughout the whole writing process. I would also like to thank Dr. Metin Ilbasimis for reviewing my research paper and my friends for their helpful guidance.

Table of contents

Abstract.....	1
Introduction.....	2
Literature Review.....	4
Methodology	
Research Design.....	7
Data and Basic Information.....	7
Statistics about Data Processing.....	8
Results	
Sequence description.....	11
Comparation.....	12
Conclusion.....	14
Reference.....	15

Abstract

With the development of the society and the innovation of the information technology, the virtual economy has made great progress. However, due to the research on virtual economy in China is lagging behind, the relevant policies and regulations are not sound enough. The non - benign development that looks like virtual economy gives real economy certain negative effect. With the outbreak of Bitcoin bubble and financial crisis in recent years, a group of people in China increasingly doubt whether the virtual economy has seriously separated from the real economy. Therefore, this paper intends to adopt the method of statistical comprehensive index to depict the virtual economy and real economy and do a research on the relationship between them through the econometric model.

Keyword: Virtual Economy; Real Economy; Financial indexes

Introduction

Virtual economy and real economy are both part of modern market economy. The real economy refers to the economy that people create on earth through the use of tools, including economic activities such as material and spiritual products and services. It covers sectors such as agriculture, industry, transportation and communication, business services, construction, and cultural industries. Virtual economy is the inevitable product of economic virtualization. The essence of the economy is a set of value systems, including material price systems and asset price systems. The beginning of China's virtual economy is late. It seems that the imperfect policy system and bad development of virtual economy has a negative impact on China's real economy. With the spread of the global financial crisis, when people are enjoying the benefits virtual economy brings, it makes more people to think from a questioning perspective.

In this case, the hypothesis is put forward, which is the development of virtual economy of China has already been disengaged from real economy. This leads to a series of needs for in-depth research. One of the most fundamental problems is “What is the relationship between virtual economy and real economy?”

In the face of this problem, I will depend on the statistical technology to calculate and analyze comprehensive index in order to describe the virtual economy and the real economy correctly. Among them, the indexes representing the real economy include GDP, turnover of goods, electric energy production and fiscal revenue. While the indexes representing virtual economy include $m1/m2$, loan balances of financial institutions, 90-day weighted average interbank lending rate, bonds, P/E ratio, turnover rate, trading volume and Shanghai Stock Index. Then I will normalize it based on this data and build a model to verify the relationship between the virtual economy and the real economy.

I think this research has profound significance for the future development of virtual economy and how to coexist with real economy. At the same time, if financial crisis happens in the future, it has a certain guiding direction.

Literature Review

The virtual economy is relative to the real economy and is the inevitable outcome of economic virtualization. The virtual economy is characterized by high risks, high speculation, instability, and independence. As Aleksandra mentions the problem of taxing the virtual economy in Taxation of virtual currency. Due to the uncertainty of time and region, it is difficult for people to feedback this information in time when the virtual economy is materialized (Aleksandra, 2014). And because the virtual economy is relatively independent, Castronova believes that it may be more beneficial to human happiness than the real economy. The reason is that they have gained more attention and investment (Castronova, 2014).

Therefore, the relationship between real economy and virtual economy has always been the focus of scholars at home and abroad. Bhaduri uses the stock market as an entry point for the virtual economy. Through a preliminary short-term model, it demonstrates how the wealth effect created by the stock market boom mainly leads to the expansion of demand and output through the private consumption of debt financing (Laski & Riese, 2006). However, the underlying cause of this expansion is the threat of subsequent contraction caused by increased debt service burden and reduced reputation. Even in the medium term, stock market wealth growth and real economic growth may run in the opposite position. Yudina, a Russian scholar, takes the digital economy as an example. She defines technological essence, parameters in the form of digital technologies and the role of digital economy as a digital segment of the real economy. The new practical and important result of the study is the correlation between the digital sector and the real economy (Yudina, 2019).

Compared with foreign researches, domestic researches are more systematic and diversified. Because of different methods, their conclusions are quite different. Yang Jiao uses VAR model to reflect the structural change of virtual economy and highlight its importance. The index reflecting price change is added into the model as exogenous variable. In addition, she

also introduced dummy variables to reflect the stage changes of the virtual economy. Through the residual of VAR, it is found that the coordination between the development of China's virtual economy and real economy is weakening (Yang, 2014). Through the empirical analysis of the regional financial crisis, Liu Yang concluded that the root cause lies in the influence of the divergence between the virtual economy and the real economy on the stability of the virtual economy. It will influence the financial crisis on the macro level. This partly reflects that the government must strengthen the supervision of the financial market while cautiously and moderately promoting the development of the virtual economy. (Liu, 2015) .

Compared with the previous two studies, the following study is more in-depth. Peng Dingyun constructed a vector auto-regressive model and performed unit root test, co-integration test, Granger causality test, impulse response function analysis and variance decomposition analysis. The results show that the virtual economy has deviated from the real economy; It is the main reason for the emergence of the real economy and the changes in the real economy are mainly determined by itself. (Peng, 2018). In addition, Sun firstly standardized the indicators reflecting the virtual economy and the real economy and obtained the comprehensive evaluation standard by combining subjective weight with objective weight through the first-level analytic hierarchy process of entropy weight. Then, he used the values of the coupling degree model and the coupling coordination degree model to calculate the coordination state of the relationship. In the end, the results show that 2007 is the critical point, and the coordinated development of the two has gradually deepened. The data processing techniques and models here are of great help to my research (Sun, 2018). Finally, Zhou Changfu analyzes the phenomenon of “de-substantiation to virtual” in China over the years and concludes that the key to dealing with the virtual economy and the real economy lies in the innovation of the market economy system. This paper believes that the "de-substantiation to virtual" is the product of the interlocking, progressive and joint effects of the overissuance of money, financial marketization and

economic transformation. Excess liquidity caused by overissuance of money is the root cause; In the process of financial marketization, RMB appreciation and local and foreign currency spreads are the inducement. In the process of economic transformation, it is essential to drive the law of profit margin decline, expand the contradiction between production and consumption, and mismatch resources between state-owned and non-state-owned economies (Zhou, 2016).

At present, the processing methods of domestic and foreign scholars mainly focus on the study of some factors or select representative data. Such practices are highly feasible and convenient. The index is also representative, so it can explain the problem from some aspects. But there is also the disadvantage of over-generalization. Therefore, I will try to establish a comprehensive index for the real economy and the virtual economy respectively to reflect their dynamic changes as comprehensively as possible and make the research results more convincing.

Methodology

Research Design

After reviewing the research results of foreign and domestic scholars, I find that due to the different methods and data selection, the conclusions obtained are not completely consistent. My research ideas of this paper mainly refer to the advantages and disadvantages of the existing literature. And then through the correction of its defects and innovation of its advantages, the research are combined with the actual situation to describe the relationship between the virtual economy and the real economy in China.

This paper attempts to establish a comprehensive index for the virtual economy and the real economy, which is more likely to comprehensively reflect the dynamic changes of the virtual economy and the real economy. And base on this, I will study the relationship between the virtual economy and the real economy. Compared with a single indicator, the advantage of establishing a comprehensive index is that it can simplify the research problem without ignoring any information and comprehensively reflect the actual situation of the virtual economy and the real economy. In short, this article will use the quarterly data to construct a comprehensive index representing the virtual economy and the real economy and use this to analyze

Data and Basic Information

As mentioned above, the selection of data should be both representative and comprehensive to fully reflect the real state of virtual economy and real economy. The data selected in this paper are as follows:

I. Indexes representing virtual economy: m1 / m2, loan balances of financial institutions, P / E ratio, turnover rate, 90 day weighted average inter-bank lending rate, bonds , trading volume and Shanghai Stock Index.

II. Indexes representing real economy: GDP, goods turnover, power generation and fiscal revenue.

	2017	2016	2015	2014	2013	2012	2011	2010	2009
GDP	820754.30	740060.80	685992.90	641280.60	592963.20	538580.00	487940.20	412119.30	348517.70
TVFT	197372.65	186629.48	178355.90	181668.00	168013.80	173804.46	159323.60	141837.42	122133.31
EEP	62379.00	58474.00	52414.02	48128.18	42336.48	39316.56	32657.04	32460.97	28037.04
FR	172592.77	159604.97	152269.23	140370.03	129209.64	117253.52	103874.43	83101.51	68518.30
m1	543790.15	486557.24	400953.44	348056.41	337291.05	308664.23	289847.70	266621.54	221445.80
m2+m1	1690235.31	1550066.67	1392278.11	1228374.81	1106524.98	974148.80	851590.90	725851.80	610224.50
m2	1146445.16	1063509.43	991324.67	880318.40	769233.93	665484.57	561743.20	459230.26	388778.70
m1/m2	0.47	0.46	0.40	0.40	0.44	0.46	0.52	0.58	0.57
LA	1201320.99	1066040.06	939540.16	816770.01	718961.46	629909.64	547946.69	479195.55	399684.82
ED	2657768.00	2387096.00	1309219.00	935357.00	678405.00	403426.00	216417.00	1522585.20	1180369.13
LR	2.77	2.18	2.26	3.00	3.51	2.92	3.34	1.74	1.07
PE	16.30	15.90	18.90	16.90	11.00	12.30	13.40	21.60	28.70
TR	180.50	158.40	489.60	242.00	123.60	101.60	124.80	198.00	499.40
VT	1124625.00	1277680.00	2550541.00	742385.00	468071.34	314583.27	421644.59	545633.55	535987.00
SHSI	3307.20	3103.60	3539.20	3234.70	2116.00	2269.10	2199.40	2808.10	3277.10
	2008	2007	2006	2005	2004	2003	2002	2001	2000
GDP	319244.60	270092.30	219438.50	187318.90	161840.20	137422.00	121717.40	110863.10	100280.10
TVFT	110300.00	101419.00	88839.85	80258.00	69444.96	53859.00	50686.00	47710.00	44321.00
EEP	26354.84	22718.84	20804.84	19239.08	17313.05	14442.20	13752.38	12973.40	10669.87
FR	61330.35	51321.78	38760.20	31649.29	26396.47	21715.25	18903.64	16386.04	13395.23
m1	166217.13	152560.10	126028.10	107278.80	95969.70	84118.60	70881.80	59871.60	53147.20
m2+m1	475166.60	403442.20	345577.90	298755.70	254107.00	221222.80	185007.00	158301.90	134610.30
m2	308949.47	250882.10	219549.80	191476.90	158137.30	137104.20	114125.20	98430.30	81463.10
m1/m2	0.54	0.61	0.57	0.56	0.61	0.61	0.62	0.61	0.65
LA	303394.64	261690.88	225347.20	194690.39	178197.78	158996.23	131293.93	112314.70	99371.07
ED	956855.15	628787.97	382839.23	228456.96	127849.02	151368.51	106321.69	41030.69	16363.02
LR	2.53	2.38	2.13	1.67	2.26	2.25	2.15	2.47	2.42
PE	14.90	59.20	33.30	16.30	24.20	36.50	34.40	37.70	58.20
TR	392.50	927.20	541.10	274.40	288.70	250.80	214.00	269.30	492.90
VT	267112.66	460556.23	90468.89	31664.78	42333.95	32115.27	27990.46	38305.18	60826.65
SHSI	1820.80	5261.60	2675.50	1161.10	1266.50	1497.00	1357.70	1646.00	2073.50

(Table 1. Essential data of virtual economy and real economy)

2008	2007	2006	2005	2004	2003	2002	2001	2000
0.303917198	0.235695046	0.165388851	0.120807657	0.085443865	0.051552019	0.029754431	0.014688937	0
0.431089766	0.373063603	0.290874682	0.234803088	0.164153474	0.062318832	0.041587268	0.022142852	0
0.303330766	0.233014363	0.195999623	0.165719477	0.12847209	0.072952881	0.05961249	0.044547839	0
0.301104653	0.238235779	0.159330163	0.114662953	0.081667342	0.05226224	0.0346011	0.018786785	0
0.333549875	0.268734457	0.201781431	0.158114946	0.114443799	0.059877316	0.041681876	0.025354446	0
0.554917386	0.827595966	0.695063692	0.641531669	0.822853374	0.848772006	0.878147009	0.828253938	1
0.18514777	0.147302347	0.114321103	0.086500592	0.071533841	0.054108775	0.028969429	0.011746115	0
0.356057529	0.231855757	0.138742909	0.080295881	0.042207083	0.051111242	0.034057129	0.009338844	0
0.598495212	0.538635431	0.433994528	0.245212038	0.487004104	0.485632695	0.443909029	0.57626197	0.554025308
0.080912863	1	0.462655602	0.109958506	0.273858921	0.529045643	0.485477178	0.553941909	0.979253112
0.352349806	1	0.532340116	0.209302326	0.226623062	0.180717054	0.136143411	0.203125	0.473958333
0.094793819	0.171479526	0.02476796	0.001456589	0.005686106	0.001635174	0	0.004089004	0.013017059
0.160882819	1	0.369320815	0	0.025704182	0.081916839	0.047945373	0.118253871	0.22250945
0.270065377	0.446344334	0.243865647	0.113257148	0.145367246	0.163346531	0.140163174	0.157554477	0.220269825
2008	2007	2006	2005	2004	2003	2002	2001	2000
0.333549875	0.268734457	0.201781431	0.158114946	0.114443799	0.059877316	0.041681876	0.025354446	0
0.270065377	0.446344334	0.243865647	0.113257148	0.145367246	0.163346531	0.140163174	0.157554477	0.220269825

(Table 2. Data after nondimensionalization)

Results

Data Sources. The above data are annual data from 2000 to 2017, mainly from the China National Bureau of Statistics and the Information Network of the Development Research Center of the State Council.

Data preprocessing. Because the dimensions of the raw data reflecting the indicators of the virtual economy and the real economy are different. Therefore, before the comprehensive weighting, I use a nondimensionalization process to make it a value between 0 and 1. The formula is as follows: $X=(X-X_{min}) / (X_{max}-X_{min})$.

	AVG均值	STDEV 标准差	Variable Coefficient	变异系数	Weight 权重
GDP	0.39	0.26		0.67	0.22
货物周转量 turnover volume of freight transport (TVFT)	0.40	0.29		0.73	0.24
发电量 electric energy production (EEP)	0.41	0.32		0.78	0.26
财政收入 fiscal revenue (FR)	0.32	0.27		0.84	0.28
RE=0.22GDP+0.24TVFT+0.26EEP+0.28FR					
m1/m2	0.60	0.26		0.43	0.04
贷款额 loan amounts (LA)	(0.03)	0.08		2.80	0.25
债券 bond (BD)	(0.07)	0.18		2.74	0.24
拆借率 Lending rate (LR)	(0.14)	0.14		0.99	0.09
市盈率 PE ratio (PE)	0.45	0.29		0.65	0.07
换手率 Turnover Ratio (TR)	0.23	0.20		0.85	0.08
交易量 Value of trade (VT)	0.18	0.25		1.44	0.13
上证股指 The Shanghai stock index (SHSI)	0.21	0.23		1.11	0.10
VE=0.04m1/m2+0.25LA+0.24BD+0.09LR+0.07PE+0.08TR+0.13VT+0.10SHSI					

(Table 3. Establishment of comprehensive index)

Data processing. In order to make each participating index more scientific weight adjustment and reasonably reflect the impact and effect of each index, I use the coefficient of variation method. The coefficient of variation is the quotient of the ratio of the standard deviation of the indicator to the absolute value of the mean. Then normalize them and finally I get the weight of each indicator.

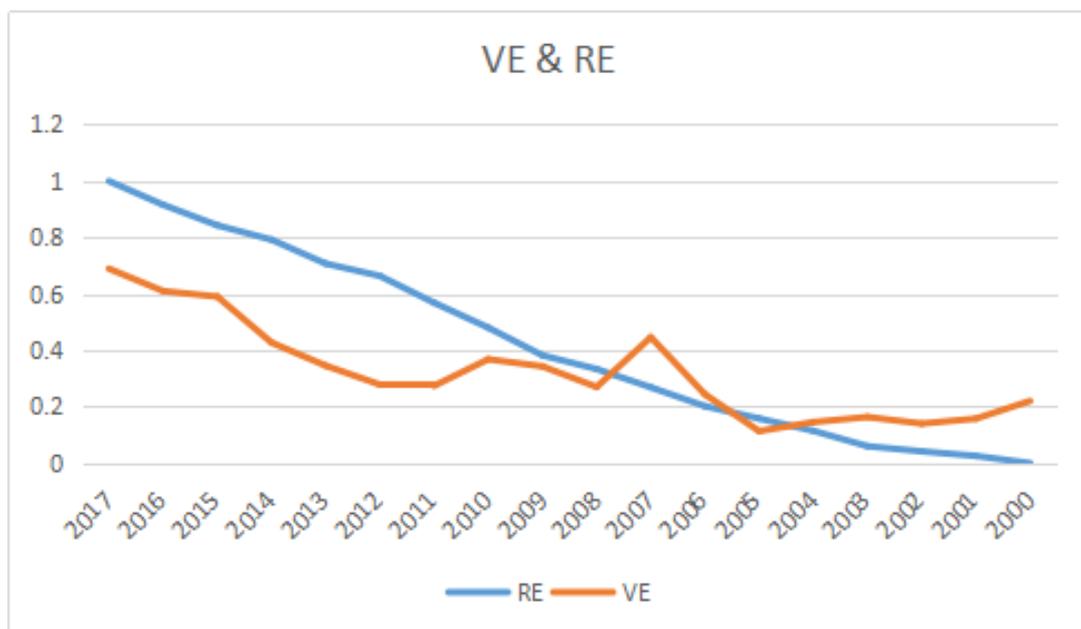
According to table 3, real economy and virtual economy can conclude as:

$$RE=0.22GDP+0.24TVFT+0.26EEP+0.28FR$$

$$VE=0.04(m1/m2)+0.25LA+0.24BD+0.09LR+0.07PE+0.08TR+0.13VT+0.10SHSI$$

Sequence description. The sequence RE is generally positively related to GDP, transport turnover, electric energy production and fiscal revenue. When the real economy is booming, output increases, and fiscal revenue continues to increase. This in turn leads to increased power consumption and increased cargo turnover. Therefore, the index representing real economy is also increasing.

The virtual economic sequence VE is also positively correlated with indicators such as m1 / m2, loan amount, and bonds, etc. When the virtual economy is rapidly rising, more and more currencies are in circulation, financial institutions' loan balances have increased, and transactions have become more frequent, resulting in higher turnover rates and price-earnings ratios. On the contrary, during the low speed period, the loan balance decreased. Under the transaction stagnation, the turnover rate and the P / E ratio became low and the Shanghai stock index and trading volume were at a low level. It is worth noting that because China's current borrowing rate is regulated by the central bank according to the economic situation, it is often against the economic situation. When the virtual economy is inflated excessively, we can curb the momentum of inflation by increasing the borrowing rate. When the virtual economy is in recession, we can lower the borrowing rate to stimulate the development of the virtual economy.



(Figure. Relationship between virtual economy and real economy)

Comparison. As can be seen from the figure, the changes in the sequence VE representing the virtual economy and the sequence RE representing the real economy are generally the same throughout the sample period, but there are certain differences in individual years, especially from 2007 to 2010. This is actually consistent with our theoretical knowledge. The 2007-2008 financial crisis spread across the world, and China was not accidentally plunged into the mud of the financial crisis. Due to China's high degree of dependence on foreign countries, exports to Europe and the United States have fallen sharply. In addition, China's investment in US dollar assets is exposed to risk. The direct consequence of the financial crisis caused by the United States to mainland China is the sharp decline in wealth. During the large-scale inflow and withdrawal of stock market funds during the period, the virtual economy was severely shaken. China's economic situation is facing severe tests. However, it can be seen from the figure that the financial crisis has not affected the Chinese real economy as much as the virtual economy. After analyzing the sequence factors and data, it can be inferred that the indicators used to describe the real economy did not change significantly during the financial crisis. This also reflects a series of decisions made by China on the economic crisis. The first is the transformation and upgrading of trade policies, from external exports to stimulating domestic demand. Therefore, the impact of freight turnover is not so great. At the same time, stimulating domestic demand can improve the development of domestic productivity, and power consumption has not fallen significantly. Finally, the government has continuously increased investment to optimize the investment structure. At the same time, the government has also issued a series of economic policies to promote sustainable development, making fiscal revenues rise without falling.

Conclusion

This paper uses descriptive analysis to analyze the relationship between the real economy and the virtual economy. From the experimental statistical results, it can be seen that the fluctuations of the two have the same trend throughout the sample period. Meanwhile, the magnitude of change in the virtual economy is higher than in the real economy.

However, there are also some deficiencies in this study. The sample data is annual data, which will lead to large errors in the results and the changes are not sufficiently sensitive to reflect. Since the virtual economy and the real economy contain a wide range of content, it is difficult to directly collect the data in the process of empirical research on the relationship

between the two and to make the statistical indicators in the model reach the ideal state at the same time. At present, domestic scholars' methods mainly focus on the study of certain factors or select a representative indicator, such as stock index, industrial index, etc. to represent the virtual economy, and GDP or industrial added value to represent the entity. The economy, although simple and feasible, the indexes are also representative, and can explain the problem to a certain extent, but there may be a partial suspicion.

At present, although the development of the virtual economy and the real economy in China is still in a coordinated state, which one is more prominent or is the interaction between the two relatively relative? And how close is the relationship between the two? I need to further study these.

Reference

Bal, A. M. (2014). Taxation of virtual currency. Institute of Tax Law and Economics, Faculty of Law, Leiden University.

Bhaduri, A., Laski, K., & Riese, M. (2006). A model of interaction between the virtual and the real economy. *Metroeconomica*, 57(3), 412-427.

Castronova, E. (2014). *Wildcat currency: How the virtual money revolution is transforming the economy*. Yale University Press.

Changfu, Z., Li, Z., Jianzhong, M., & Branch, C. C. B. J. (2016). Analyze on Performance, Causes and Mechanisms of ‘off Real to Virtual’ [J]. *Journal of Regional Financial Research*, 3, 69-76.

Lehdonvirta, V., & Castronova, E. (2014). *Virtual economies: Design and analysis*. MIT Press.

LIU, Y. (2015). Research on the Influence of Virtual Economy and Real Economy Deviation on Modern Financial Crisis. *Economic Issues*, (3), 14.

PENG, D. Y., ZHANG, F. P., & LIANG, S. H. (2018). Research on the Relation Ship Between Generalized Virtual Economy and Real Economy. *Research on the Generalized Virtual Economy*, (1), 10.

Ramanathan, J., & Purani, K. (2014). Brand extension evaluation: real world and virtual world. *Journal of Product & Brand Management*, 23(7), 504-515.

SUN, C., SHU, F. J., & MIN, Z. L. (2018). Research on the coupling of virtual economy and real economy. *Qingdao University Journal*. 1006-1037(2018)03-01 16-06

YANG, J., & Xi, J. (2014). Research on the relation between virtual economy and real economy in China——Empirical Analysis Based on Composite Index VAR.

Yudina, T. N. (2019). Digital segment of the real economy: digital economy in the context of analog economy. St. Petersburg State Polytechnical University Journal. Economics, 12(2), 7.

Appendix

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000
GDP	820754.30	746960.80	685993.90	641280.60	592963.20	538586.00	487940.20	412118.30	348517.70	312444.60	270062.80	219438.90	187318.90	161949.20	137422.00	121171.40	116963.10	100280.10
YFPT	197372.05	186629.48	178355.90	181968.00	168013.80	173804.40	159323.60	141837.42	122133.31	110300.00	101415.00	88839.85	80258.00	69444.90	53859.00	50686.00	47710.00	44521.00
RF	62379.00	58474.00	52414.02	48128.18	42336.48	39316.56	32857.04	32460.97	28077.04	20354.84	22718.84	20804.84	19239.08	17313.05	14442.20	13782.38	12975.40	10669.87
FE	172952.77	159904.97	152269.23	144070.03	129299.64	117253.52	108974.43	83101.51	68518.30	61330.95	51521.78	38760.20	31645.29	26396.47	21715.25	18963.64	16386.94	13395.23
n1	543790.15	489567.24	402955.44	348956.41	337291.05	308964.23	289847.70	266211.54	221446.80	162111.13	152960.10	126028.10	107278.80	95969.70	84118.60	70881.80	59871.00	53147.20
n2=n1	149025.31	155006.87	139278.11	122074.81	1116524.59	97448.80	851590.90	729561.80	610224.50	470164.50	403462.20	345577.90	299755.70	254107.00	221222.80	185607.00	153301.90	124610.30
n2	1146445.16	1063509.43	991324.67	880818.40	769233.93	665484.57	561743.20	459230.26	388778.70	309945.47	252892.10	215495.80	191476.90	156137.30	137104.20	114125.20	98430.30	81463.10
n1/n2	0.47	0.46	0.40	0.40	0.44	0.46	0.52	0.58	0.57	0.54	0.61	0.57	0.56	0.61	0.61	0.62	0.61	0.65
LA	1201320.99	1006040.00	939546.16	816770.01	718961.46	629909.64	547946.69	479195.85	399684.82	303394.64	261690.88	225347.20	194690.39	178197.78	158996.23	131293.93	112314.70	99371.07
ED	2657768.00	2387096.00	1309219.00	935297.00	678405.00	403426.00	216417.00	152285.20	118039.13	95885.15	628787.97	382839.23	228456.96	127849.02	151568.51	106321.69	41030.69	16363.02
LE	2.77	2.18	2.29	3.00	3.81	3.92	3.34	1.74	1.07	2.53	2.38	2.13	1.67	2.29	2.15	2.15	2.47	2.42
FE	16.30	16.90	18.90	16.90	11.00	12.30	13.40	11.60	28.70	14.90	59.20	33.30	16.30	24.20	36.50	34.40	37.70	58.20
TE	180.50	158.40	489.60	242.00	123.60	101.60	124.80	196.00	499.40	392.50	927.20	541.10	274.40	288.70	250.80	214.00	209.30	492.90
VT	1134625.00	1277860.00	255941.00	742395.00	460771.34	314935.27	421944.99	549035.35	539687.00	267112.66	460596.23	90468.89	31664.78	45333.95	32115.27	2796.46	38305.18	60824.65
SBEI	3307.20	3103.60	3938.20	3234.70	2116.00	2269.10	2195.40	2808.10	3277.10	1820.80	5261.60	2675.50	1161.10	1266.50	1497.00	1357.70	1646.00	2073.50

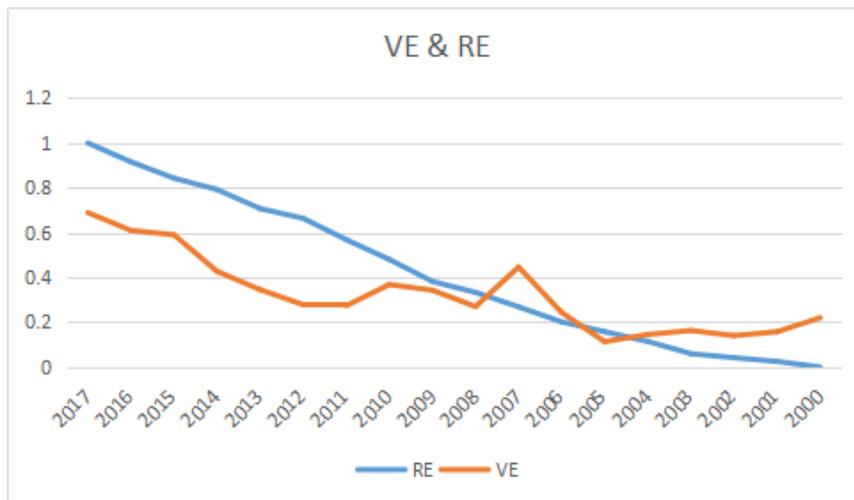
(Table 1. Essential data of virtual economy and real economy)

	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	MIN	MAX
GDP	1.08799499	0.812954079	0.75089506	0.683831704	0.638549196	0.538952432	0.432924937	0.344547822	0.302917198	0.239599046	0.185388881	0.128076587	0.105443995	0.091923019	0.029754431	0.014989827	0.0102801	0.0120754	0.0120754	0.0120754
YFPT	1.032696999	0.87749491	0.80739868	0.808170847	0.86011529	0.781397322	0.67149132	0.56869591	0.43189796	0.37302603	0.26874682	0.224802088	0.14515474	0.06218832	0.04187268	0.02132852	0.014821	0.013732	0.013732	0.013732
RF	0.02481421	0.02378384	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781	0.02396781
FE	1.018417861	0.8732376	0.79793277	0.72748991	0.62328674	0.56549469	0.47866284	0.3462579	0.30110463	0.23823779	0.19252043	0.11466293	0.08169742	0.05232624	0.046611	0.01878978	0.01399532	0.01399532	0.01399532	0.01399532
n1	0.91000074	0.84119891	0.76220135	0.707400325	0.68372083	0.59863132	0.48038829	0.382188097	0.33384975	0.288734507	0.201781431	0.158114946	0.114443799	0.098773216	0.041881878	0.02534446	0.0102801	0.0120754	0.0120754	0.0120754
n1/n2	0.307165734	0.24174609	0.05535276	0.016788974	0.286281979	0.49214337	0.72051961	0.67780496	0.55491738	0.62795966	0.69506392	0.84151469	0.82285374	0.848772006	0.878147009	0.82825938	1.0	1.0	1.0	1.0
LA	0.877234959	0.762438542	0.65102809	0.562207285	0.481454339	0.407074419	0.344682976	0.2732924	0.18514777	0.147302347	0.114321103	0.08950992	0.071533841	0.054108775	0.02899429	0.01746415	0.0102801	0.0120754	0.0120754	0.0120754
ED	1.039732362	0.48948769	0.34748823	0.25049089	0.14855978	0.07577716	0.57025231	0.4407682	0.35687629	0.23185767	0.13874209	0.08026981	0.04220783	0.01111242	0.034857129	0.00230844	0.00230844	0.00230844	0.00230844	0.00230844
LE	0.69423259	0.45728432	0.48118782	0.79372329	1.0	0.76128249	0.91939124	0.277017784	0.59849521	0.53985481	0.43394528	0.24521208	0.487004104	0.48553295	0.44990929	0.57624197	0.554023081	0.69166667	0.69166667	0.69166667
FE	0.10995899	0.10169781	0.16390415	0.12486639	0.029970954	0.04979251	0.119617012	0.38721991	0.08012863	1.0	0.46265502	0.10968906	0.27389921	0.52948543	0.485477178	0.59341809	0.47923112	0.11	58.2	58.2
TE	0.0929669	0.0679845	0.4696124	0.1700814	0.02647487	0.02810778	0.11676566	0.48181399	0.32348908	1.0	0.3234891	0.20932306	0.22662392	0.18017054	0.13944841	0.2032129	0.47923112	101.6	927.2	927.2
VT	0.43472439	0.495497137	1.0	0.38203281	0.17489897	0.11361231	0.15605411	0.20326231	0.20326231	0.09478819	0.17147828	0.02476796	0.001458589	0.00568106	0.001433174	0.0	0.004909004	0.13017059	27996.46	2350541
SBEI	0.023370198	0.47322717	0.57993964	0.00994428	0.23237494	0.27021499	0.25232323	0.40105824	0.01049451	0.16088219	1.0	0.393528915	0.02701482	0.08118489	0.04746373	0.18230971	0.2225946	1181.1	3281.6	3281.6
n1/n2	0.689429762	0.60994333	0.59045887	0.42725665	0.34552873	0.278377779	0.273930613	0.36839448	0.43842016	0.27085277	0.446544334	0.248805647	0.113297148	0.145307246	0.163346531	0.140163174	0.157594477	0.22029825	0.22029825	0.22029825
LA	0.81000874	0.84119891	0.76220135	0.707400325	0.68372083	0.59863132	0.48038829	0.382188097	0.33384975	0.288734507	0.201781431	0.158114946	0.114443799	0.098773216	0.041881878	0.02534446	0.0102801	0.0120754	0.0120754	0.0120754
FE	0.689429762	0.60994333	0.59045887	0.42725665	0.34552873	0.278377779	0.273930613	0.36839448	0.43842016	0.27085277	0.446544334	0.248805647	0.113297148	0.145307246	0.163346531	0.140163174	0.157594477	0.22029825	0.22029825	0.22029825

(Table 2. Data after nondimensionalization)

	AVG均值	STDEV 标准差	Variable Coefficient 变异系数	Weight 权重
GDP	0.39	0.26	0.67	0.22
货物周转量 turnover volume of freight transport (TVFT)	0.40	0.29	0.73	0.24
发电量 electric energy production (EEP)	0.41	0.32	0.78	0.26
财政收入 fiscal revenue (FR)	0.32	0.27	0.84	0.28
RE=0.22GDP+0.24TVFT+0.26EEP+0.28FR				
m1/m2	0.60	0.26	0.43	0.04
贷款额 loan amounts (LA)	(0.03)	0.08	2.80	0.25
债券 bond (BD)	(0.07)	0.18	2.74	0.24
拆借率 Lending rate (LR)	(0.14)	0.14	0.99	0.09
市盈率 PE ratio (PE)	0.45	0.29	0.65	0.07
换手率 Turnover Ratio (TR)	0.23	0.20	0.85	0.08
交易量 Value of trade (VT)	0.18	0.25	1.44	0.13
上证股指 The Shanghai stock index (SHSI)	0.21	0.23	1.11	0.10
VE=0.04m1/m2+0.25LA+0.24BD+0.09LR+0.07PE+0.08TR+0.13VT+0.10SHSI				

(Table 3. Establishment of comprehensive index)



(Figure. Relationship between virtual economy and real economy)