CORPORATE FINANCE FOR SUSTAINABILITY: CHINA OIL AND GAS INDUSTRY OPTIMUM FINANCIAL GROWTH AND SYSTEM BALANCE INDICES APPLICATION RESULTS

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Abstract. Financial decisions considering long-term social and environmental impacts must occupy a central place in the China oil and gas companies' sustainable growth concept. But nowadays China energy industry sustainability as we can observe is not ideal. It is interdisciplinary research related to how financial sustainable growth index interacts within the energy, environmental and social factors. On the base of System Economics Theory, pattern recognition with use such methods as grey correlation analysis, Sheremet' methodology, Kleiner' "tetrade system" model, was constructed financial sustainable report according to financial sustainable growth recognition model application results. It was created new financial sustainable index $FSI_{Wang\ zhen}$ with nonfinancial factors as a part of a whole. It was found the way from "just now" China energy industry sustainability to "ideal" one with help of Authors' financial sustainable strategy matrix methodology (FSG-matrix). Proportionality of the new Financial Sustainable Growth Index' elements interconnections was tested by System Balance Index $SBI_{Kleiner} SBI_{Kleiner}$. Implications for this century for the China oil and gas companies are as follows: (a) the design of financial policy system as sustainable growth and system balance (b) the provision of affordable level of environmental protection, social responsibility and energy efficiency financing activities are a pre-condition of financial sustainable growth (c) follow the Law of the stable long-term energy efficiency impact to financial sustainable growth index as tool of financial growth sustainability suggestions.

Keywords: System Economics Theory, Kleiner' "tetrade system" methodology, financial sustainable growth pattern recognition model, Financial Sustainable Growth Index, System Balance Index, financial sustainable growth strategy matrix.

INTRODUCTION

China, the world's largest developing country, is expected to cross the sustainable development threshold in 64 years (in 2079) [1]. The group, led by Prof. NIU Wenyuan from the CAS Institute of Policy and Management, creatively proposed the concept of "Lagrange Point of Sustainability" to balance three crucial elements in their research, borrowing from physics the idea of equilibrium point between gravitation fields from major planets. [1], [2], [3]. That China's energy structure and its economic model are mutually reinforcing should be obvious [4]. That is because China's development model determines its energy profile [5]. Oil and gas companies also can be seen as the driver of society progress [5].

The contribution of this research is valuable. First, because the process of building financial reports with a focus on sustainable factors (energy efficiency, environmental protection and social responsibility) can be of more important value than the financial reports themselves [6]. Second, implement new created Financial Sustainable Growth Index as KPI to oil and gas companies contribute to country and planet at a whole sustainable future. Third, new financial sustainable pattern recognition model can be used by follower researches as the base for created their own companies' sustainable indices with the accent on company financial sustainable growth. Also, at last, but not least, we suggest the instrument of checking

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sustainable growth financial models by System Balance Index, an approved intensity of links between index factors.

METHODS

Take into consideration China oil and gas industry financial data from oil and gas companies' official reporting, environmental data from China government statistical database, and energy data from China University of Petrolem (Beijing) research center. The study carries out 11 years period between the years 2005 and 2017. The set of indices for the Research has chosen according to financial sustainable growth functions assessment. List of indicators used in the study see *at the Appendix A.* Data was classified according to the sustainable areas regarding finance, environmental, energy and social criteria factors. Calculations was done with help of R language programme, developed by Russian Academy of Science Central Economic Mathematician Institute as part of the Russian Science Foundation project № 14-18-02294. Forecast was done with help of NOVA Forecast PRO, interaction flows map was done with the help of triangulated modelling at the tubiaoxiu.com, figures was done in Origin Pro and Magic plot. Pattern recognition considers objects at a fixed moment in time without considering their temporal development as well as also to analyze properties characterizing their temporal development [7]. According to pattern recognition steps, set of objects was classified, dataset was represented by "subsets" called classes with information about classes, dataset description was done as well as it was done "similarity" concept steps between images: financial and nonfinancial factors influencing on Chinese oil and gas companies' financial sustainable growth. Positive correlation and the same dynamics determine the degree of "participation" of each indicator in the impact on the factors of sustainable growth.

Pattern recognition model steps (see **Fig.1**), it can be tested other variants of financial and nonfinancial factors on financial sustainable growth. It was described passport for the financial sustainable pattern recognition model and described all steps for gain China oil and gas industry financial sustainability in the case of "environmental finance."

Financial sustainable pattern recognition model research methodology is based on polymethodological approaches including the theory of system, synergy process, institutional approach, system analysis in the context of justification of research indicators' structure, system economic theory, Kornai' paradigm, pattern recognition, Higgins sustainable growth index, multidimensional multipolar statistical analysis.

RESULTS

Author's supposed financial pattern recognition optimal sustainable growth system as a self-growing system, with high intensity of links between internal four sustainable parameters. For Authors' idea logic, the constraints require the optimal solution, so, it is optimal sustainable growth system according optimal solutions modelling.

We normalized data on average according to the method of distances formula. Our intention here is to highlight factors ranking (k) calculated by use of the Fibonacci method with next distribution results SGI_{wacc} - 45%, LEI - 27%, ROE_{env} — 17%, ROE_{sr} - 11%. And as a result, we have Rating Assessment, which was done according to Sheremet' analysis method with SGI results first by the ranking system, ROE_{sr} results second, ROE_{env} results third, LEI results as the fourth factor of our financial sustainable system model.

Authors' formula 1:

$$FSI_{Wang\ Zhen} = \left[\sum \frac{\sqrt{k_i \left(1 + \frac{x_i}{x_{max}}\right)^2}}{\sqrt{k_j \left(1 + \frac{x_i}{x_{max}}\right)^2}} - (A_n^2 - 1) \right]^{-1}$$

Where,
$FSI_{Wang\ Zhen}$ - Financial Sustainable Growth Index (Wang Zhen)
k_i, - Fibonacci method 'calculation ratio;
x_i, - Correlation factor value;
x_{max} - Initial factors' maximum value;
A_n^2 - The rank number of every two from all the factors (permutation value of impact factors).

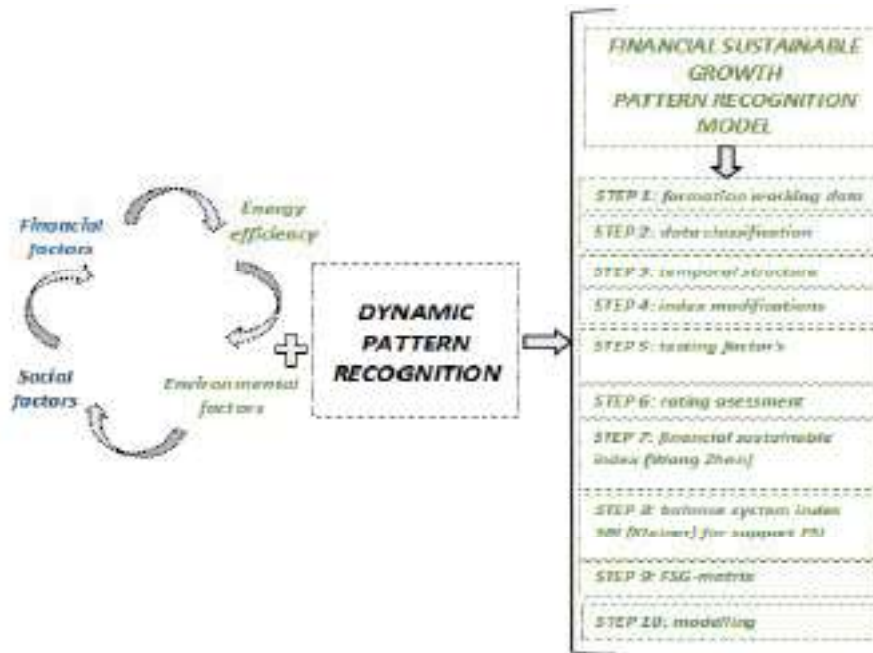STEBLYANSKAYA ALINA, WANG ZHEN, BRAGINA ZINAIDA

Fig. 1 Dynamic Pattern Recognition model
Source: Author's Methodology

The value of the Financial Sustainable Growth index can be interpreted as follows: $0 \leq FSI_{Wang\ Zhen} \leq 0,2$ - very weak system sustainability, the $0,2 \leq FSI_{Wang\ Zhen} \leq 0,5$th weak sustainability, $0,5 \leq FSI_{Wang\ Zhen} \leq 0,7$ – average sustainability, the $0,7 \leq SFI_{Wang\ Zhen} \leq 1$ strong sustainability.

Financial sustainable system model results formula:

$$FSI_{Wang\ Zhen} = 1,43 SGI_{ce} + 0,99 ROE_{sr} + 0,82 ROE_{env} + 0,76\ LEI \qquad (4)$$

Where

$FSI_{Wang\ Zhen}$ - Financial Sustainable Growth index;

SGI_{wacc} - Sustainable Growth index (capital expenditure);

LEI - Lambert Energy Index;

ROE_{sr} - Return on Social Investments;

ROE_{env} - Return on Energy Environmental expenses.

China oil and gas companies' SGI dynamics last years was sharped decrease, and only at 2016 we see increasing in SGI level, but observed strong direction to settle. But the SGI level last years is less than previous that shows us on the discrepancy between the stated strategies to the actual situation **(see Fig. 2). Fig. 2. (**a) SGI formula modifications results and $FSI_{wang\ zhen}$; (b) $FSI_{wang\ zhen}$ and

Strategic spread; (c) SGI indices and main financial indices (d) $FSI_{wang\ zhen}$ and main sustainable indices.

The received schedule of $FSI_{Wang\ Zhen}$ is submitted reliable. Reasons: development of economy (as the body temperature of the person) can't «jump» from a whiff of a breeze, and with finance so can be (the exchanges, the prices). As opposed to «mobility, instabilities» finance act fundamental factors: social sphere and bionomics. These factors have the heredity (the genetics, the cycles of life, the rate of changes). They the potential stabilize fastness of a state and development of economy and society in general and our factor of financial steady body height in general. Of course, finance influences them because finance is a mobile resource of adjustment and the social sphere and bionomics (qualities of human life and intensity of destruction of nature using harmful emissions). And here they are what character «compatibility, coherence or discrepancy» and what trend of their relations» - we also show our formula and the schedule. The $FSI_{Wang\ Zhen}$ schedule shows smoother results than financial fastness in connection with «steady components» as a part of it. Authors' Financial Sustainable Index trend repeat the dynamics of Sustainable

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growth indices, but fixed changes earlier show us the same tendentious but with the impact of energy, social and environmental sustainability factors. Financial and sustainable indices were tested on correlation with our new financial sustainability index for China energy companies. We compared $FSI_{Wang\ Zhen}$ and many existing indices: GDP, Energy Intensity Index, Dow Jones Industry, NASDAQ Industry, Human Development index (United Nations), Global Peace Index, GINI, Genuine progress indicator (GPI). SGI Higgins, SGI Ivashkovskaya and our modification indices is in trend of GDP, but $FSI_{Wang\ Zhen}$ is absolutely in trend with Human Development index (United Nations), Global Peace Index, World Energy Council's Energy Trilemma Index, Genuine progress indicator (GPI), Energy Intensity Index.
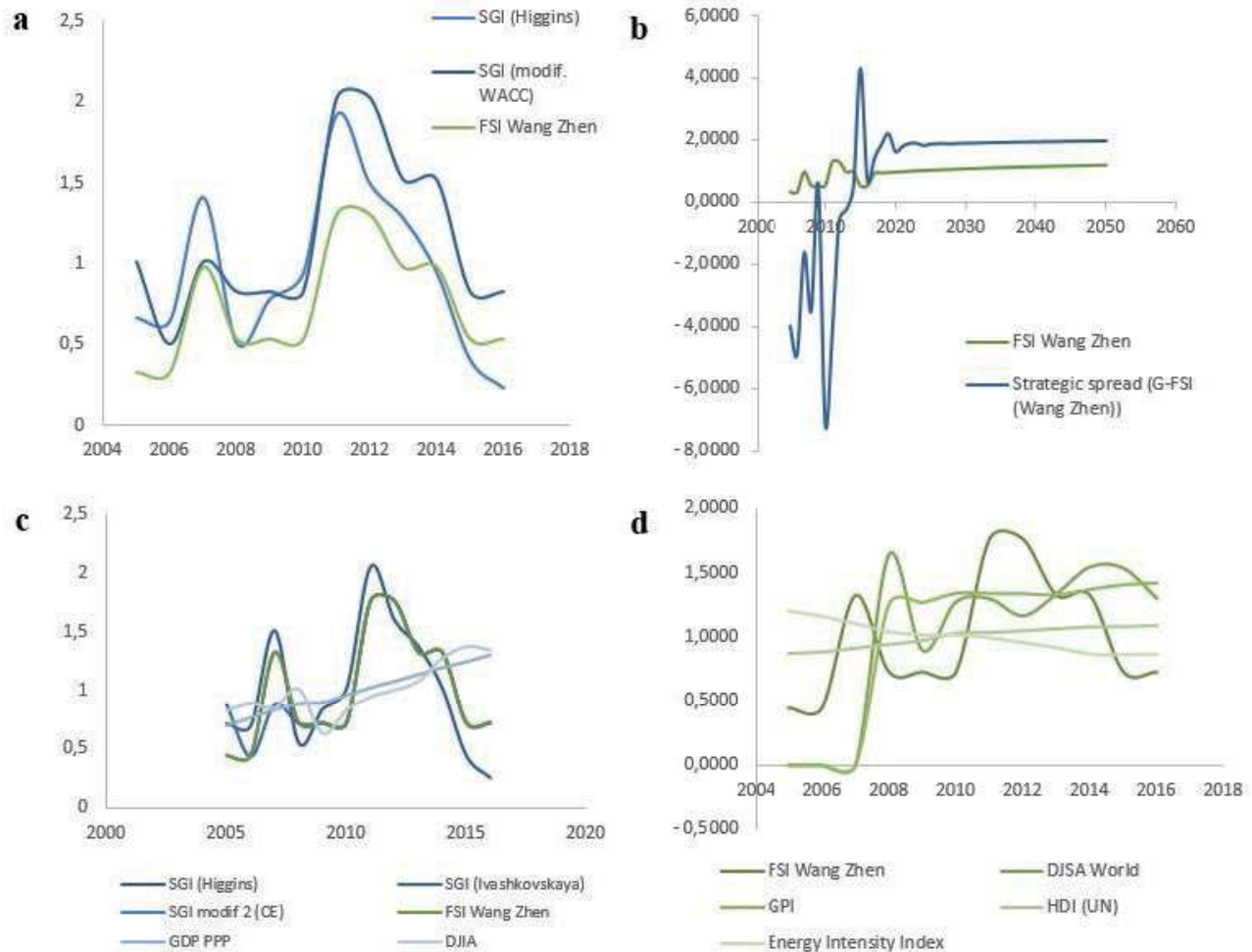

Fig. 2 FSI and SGI indices
Source: [4]. Authors' calculations

DISCUSSION

In perspective view, financial sustainability in the context of sustainable growth in the field of future investigations and gains. But the central controversial question of this Research is that sustainable growth must be optimal harmonic or balanced? $FSI_{Wang\ Zhen}$ based on harmonic weight as financial sustainable system as a whole, as perfect system, nature in our daily activity. $FSI_{Wang\ Zhen}$ always under the reform and development state, but not still in balancing. Authors' another index $SBI_{Kleiner}$ expressed the intensity of links between model' factors components, equilibrium of the tendention. This equilibrium index, which also can be

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used by testing financial sustainability on the balancing between factors.

Nowadays for Authors is "hot" discussion whether it is better financial sustainable growth must be balanced, so, all parts of the model must be equal at the end, or this model is not useful in our society, because of expressed only "ideal" world. Today our common conclusion that financial sustainable index must be built as "optimum value" index. But we are firmly intended to research all-level-equilibrium financial sustainable growth model. Researchers need to deepen the classification of economic systems according to parameters of localization within the space-time continuum, combined with a behavioral classification of economic systems. Besides, of significant interest are the theoretical and methodological studies of measuring and correlating systemic properties, scales and structural characteristics of systems.

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Appendix A.

Tab. 1, App. A: **Full list of indicators used in Research**

Sustainability Indicators Status	Index	Proxy	Pattern	Calculation method
Sustainable Growth Indices (financial)	Sustainable Growth Indices	SGR(H)	○	RM*AT*FL*R
		SGI (Iv)	○	$SGI_{ROE-r_s} = G_{sales}^{aver} \times \frac{l}{k} \times \sum max[0,(ROE-r_s)]$
		SGI_{ROE-r_s}	○	$SGIiv = (1+g_s) \times \frac{l}{k} \times \sum_{i=1}^{k} max[(0,(ROCE_i - WACC_i)]$
		SGIce	○	$SGI_{CE} = G_{sales}^{aver} \times \sum max[0,(ROCE_i - WACC_i)] \times \sum max[0,(g_{ce} - g_{aver})]$
Financial factors	Earnings before interest and taxing	EBIT	▢	Earnings before interest and taxing
	Return On Capital Employed	ROCE	▢	EBIT/(Total Assets-Current Liabilities)
	Return on Fixed Assets	ROFA	▢	EBIT/Fixed Assets
	Net working capital	NWC	▢	Current assets-current liabilities
	Current Ratio	CR	▢	Current assets/current liabilities
	Revenue growth	RG	▢	An increase of a company s sales when compared to a previous quarter s revenue performance
	Net profit growth	NPG	▢	An increase of a company s net profit when compared to a previous quarter s net profit performance
	Net assets growth	NAG	▢	An increase of a company s net assets when compared to a previous quarter s net assets performance. Net assets=Total assets-Total Current liabilities
	Financial leverage	FL	▢	Total Assets/Equity
	Operation leverage degree	DOL	▢	% change in EBIT/% change in Revenue
	Combine leverage	CL	▢	Financial leverage*operation leverage
	Weighted Average Cost Of Capital	WACC	▢	WACC = rE × kE + rD × kD × (1 – T)
Energy factors	Energy Indicators	LEI	△	Lambert Energy Index
		ES	△	Energy Savings
Environmental factors	Envoronmental indicators	ROEenv	✩	ROEnv = costs concerning environmental protection and decision of pollution question/production
Social factors	Revenue per employee ratio	RER	▭	Total Revenue/Total Number of Employees.
	Return on social expences	ROEsr	▭	Costs concerning employee benefits/net profit