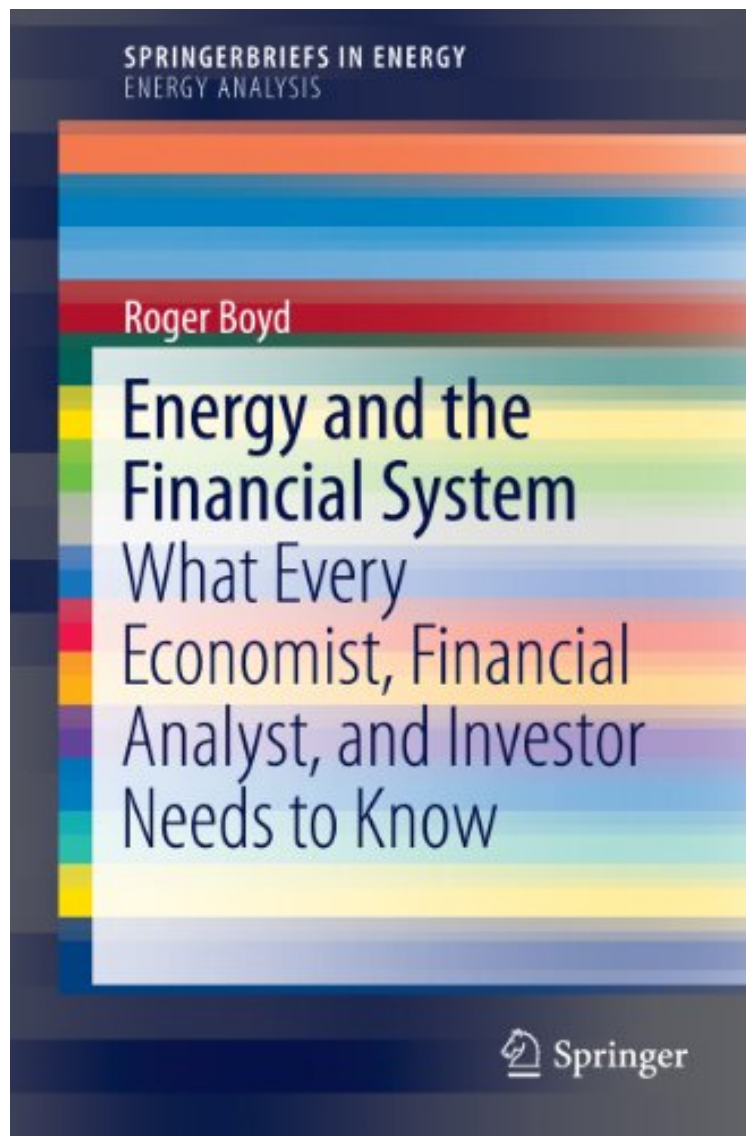


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Energy and the Financial System: What Every Economist, Financial Analyst, and Investor Needs to Know (SpringerBriefs in Energy)

Roger Boyd

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Roger Boyd : Energy and the Financial System: What Every Economist, Financial Analyst, and Investor Needs to Know (SpringerBriefs in Energy) before purchasing it in order to gage whether or not it would be worth my time, and all praised Energy and the Financial System: What Every Economist, Financial Analyst, and Investor Needs to Know (SpringerBriefs in Energy):

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Rather, according to Roger Boyd's Energy and the Financial System: What Every Economist, Financial Analyst, and Investor Needs to Know, a rather large pack of wolves have been with us for quite some time now and our failure to deal with them has meant that they have grown in strength such that jointly they could derail the global economy.To call Boyd a peak oil theorist, however, would be to reduce the complexity of his view for according to Boyd it is not only the availability of cheap oil that is in decline but rather what is in decline is the general availability of energy sources which provide a high amount of energy in return for energy invested. Indeed, Boyd's view revolves around a measure economists refer to as EROI, which measures the ratio between the amount of energy returned relative to energy invested. Thus we might better label Boyd a peak EROI Theorist for he believes that increasingly we will need to invest more energy in order to get energy back, as we have used up the vast majority of easily accessible high energy sources of oil, natural gas and to a lesser extent coal.The importance of EROI is that to a large extent it determines the prosperity of society. The higher the EROI, the higher the prosperity levels, as we are able to direct more energy back into society rather than into producing more energy. According to Boyd, "our modern societies have become so hooked on nearly-free energyhellip; with an EROI of at least 8 : 1 being required to maintain the high living standards and complex society to which we have become accustomedrdquo;. Higher up the sophistication level Boyd cites that a societal EROI of up to 14:1 is required to support such things as good education, health care, and the arts. As the EROI continues to drop, however, it is not only the arts that we have to worry about, rather as Boyd's book illustrates the implications are potentially far reaching and devastating with the potential to reverse global prosperity and to do so rather unequally.The logic behind Boyd's concise and telling book is rather simple. Our economic and financial system is based on assumptions of continued growth. Currently growth is highly dependent on energy and a surplus thereof as provided by high EROI energy sources. Our available energy sources, however, are providing less and less energy returns on the amount of energy we put into them. Therefore the amount of surplus energy available is declining. Thus, given the dependence of growth on energy, growth will decline too. The little remaining health of our financial systems, however, relies heavily on assumptions of continued growth and rather high ones at that, but those assumptions will increasingly turn out to be false if Boyd's prediction of declining EROI is true. Thus Boyd concludes that:"What all of this means for investors is that, at best, growth may cease at the global level in the relatively near future. Once you accept that growth will cease, all of the current "common sensersquo; assumptions about investing, such as the assumption of making money from money, cease to be true. Completely different assumptions will be required, including an understanding that the future will be a less wealthy place than the present. [This realization] could destabilize and crash the financial system. "A sobering conclusion if there ever was one. Economists, however, will generally give a spattering of reasons why we should resist this rather unpalatable conclusion. So what are they, and should we buy them, or is it time we sobered up and swallowed Boyd's bitter pill?A rather optimistic note that is often sounded in response to a Boyd-like picture is that we have already and can increasingly decouple growth from energy. Thus, such optimists may claim that while our energy use will go down, growth may not necessarily suffer as a result. In response, Boyd asks us to look at the historical relationship between energy and growth, and to consider that while "the energy intensity of what some countries produce may have gone down [while their growth has gone up], the energy intensity of their consumption which includes imported goods, has notrdquo;. Indeed Boyd argues rather convincingly that if historical trends are an adequate measure to go by, it seems unlikely that we can sufficiently decouple energy from GDP to rebuff his conclusion.Another prominent response is that Boyd is just plain wrong about our energy reserves and we do in fact have sufficient supplies of high EROI fossil fuels. However, as Boyd points out, evidence to the contrary is provided by, among many other things, the current rush for unconventional fossil fuels, such as Arctic, deep sea, tar sand and shale oil, which on average have an EROI of 5:1, far below the required EROI of 8:1 required to maintain (never mind increase) current living standards. According to Boyd, that companies are investing heavily in these low EROI projects reflects "acts of increasing desperation to keep replacing the depleting older fields. If there were easier ways to get the oil, energy companies would not be bothering with these difficult operationsrdquo;. The market logic here is hard to resist, and it seems we're stuck with Boyd's conclusion unless other stronger objections exist.But what of the explosion of fracking and natural gas? Will that not shore up the declining EROI? According to many, especially those within the natural gas industry, the answer is an assured yes. The US Energy Information Administration, for instance, estimates that there is enough recoverable gas to meet nearly a century's worth of growth. But Boyd argues that such estimates are both wildly optimistic and do not take into account the potential for rapidly declining EROI of natural gas. As Boyd points out, the easy to access sweet spots of high EROI natural gas are

quickly diminishing, such that we are quickly moving towards much lower EROI natural gas. To this many have responded that increased efficiency in fracking and other fossil fuel recovery methods and technologies will lead to higher EROI. However, Boyd responds that while "societies may be able to mitigate these impacts through increased energy efficiency and other measures, these will only slow down the impacts rather than being a cure for the underlying scarcity of cheap energy." To an optimistic climate activist much of the news about declining fossil fuels may sound like music to their ears. For if fossil fuels can't cut it, surely renewables will save the day... But on this point Boyd does not provide the climate activist with much hope. Rather, according to Boyd, "currently, only hydro-power and wind provide net energy levels equal to conventional oil and gas. Hydropower is severely constrained by availability of usable sites, and wind power currently provides only 1 % of global energy supplies so even with very rapid growth it will remain a small contributor for a decade or more. That leaves the oldest and dirtiest of the fossil fuels, coal, which still has a high EROI." Similarly, other renewables simply cannot provide us with high enough EROI in sufficient quantity to shore up the declining EROI levels, according to Boyd's analysis. Thus Boyd claims that "The world may be faced with the difficult choice of either burning more coal to keep something like the current civilization going or burn less coal to limit global warming and accept some level of societal simplification, and possibly, collapse." Such a conclusion is rather harrowing. On this point many might argue that Boyd has underestimated the potential of renewable energy and point to studies such as one provided Stanford University arguing that we can attain 100% renewable energy by 2050. In response, Boyd would respond that in the interim transition EROI levels will decline significantly, especially as we divert more energy into developing renewable energy sources which require high initial energy investments which only pay out over time. Thus a drop in GDP growth would be entailed for quite some time even on the 100% renewable energy path, and, given the fragility of modern economies and the global financial system, a point which Boyd eloquently and concisely expands on in his book, "it's unlikely we could easily absorb the reduced growth. Yet there may still be hope. As Jessica Trancik, for instance, points out "the speed of energy-technology innovation is only just coming to light as long-term data sets become available". Trancik believes that rapid innovation in renewable energy development may be enough to largely decarbonize the world's energy system by 2050 with the remainder produced by natural gas and "clean" coal in the meantime. Boyd, however, believes that rather than being able to innovate our way out of this, "instead a long and complex [and possibly tumultuous] journey to a simpler way of living may be what stands before Earth's population, especially in rich, industrialized countries". Perhaps Boyd is right here. Perhaps the level of growth and energy that we have recently been experiencing was merely an anomaly based on the exploitation of millions of years of stored up fossil energy; an anomaly which won't be repeated again. Perhaps it's time we came to grips with the idea that we live on a finite planet with finite amounts of energy. Indeed, Boyd's book might consist of illustrating in a rather convincing manner that an economic system based on perpetual growth could never continue indefinitely on a finite planet. Unfortunately given how dependent we have become on our high growth economic system, such that even our food production is hooked on high EROI, the effects of limits to growth are likely devastating. Thus Boyd's book is a rather shocking wake-up call, which if rationally responded to should spurn on rapid transformation. As Boyd points out, "the longer humanity waits to make such changes, the harder those changes will become, as net energy, climate change, and other challenges wield greater and greater impacts upon society." Boyd, however, unlike authors such as Leggett, does not seem optimistic that we are rational enough to make the necessary transition in time... In conclusion, while it would be comforting to believe that Boyd is merely another peak oil theorist crying wolf, the uncomfortable predicament comprehensively outlined in his book is hard to resist. Boyd, furthermore, is not simply a lone fringe voice in this matter as the predicted arrival of peak oil as soon as 2015 is corroborated by the forecast of many others including the US and German militaries. What Boyd's book brings to the table with a clarity and force is the linkage between energy, growth and the financial system in a way that is not only relevant for economists, investors and financial analysts but for all of us. So, because I hope that Boyd is wrong and that humanity jointly will prove him to be so, I would like end by suggesting a new title for his book: Energy and the Financial System: What Everyone Needs to Know and Work Darn Hard to Avoid

The modern financial system was developed to support the rapid economic growth that took off about 200 years ago with the phenomenal amounts of cheap energy made available through the exploitation of fossil fuels. As a result, its viability is completely dependent upon the continuation of that growth. Unfortunately, the more recent fossil fuel discoveries, especially for oil, have tended to have lower production levels than earlier ones. In addition, greater amounts of energy are required to extract the fossil fuels leading to less net energy available for society. The Energy Return On Investment (EROI) for oil has fallen from 30:1 in the 1970's to 10:1 today. Thus, newer energy finds produce lower extraction rates and more of the energy provided is offset by the energy used in the extraction processes. The result has been economic stagnation or even contraction, with growth in China and India etc. only possible due to the extensive use of local coal reserves, and recession-induced drops in OECD country energy use. Renewable sources of energy will not be able to expand fast enough to replace the 87% of energy supplies provided by

fossil fuels, and apart from hydro and wind, tend to have very low EROI rates. They are also critically dependent upon the cheap energy infrastructure provided by fossil fuels. The phenomenal amounts of path-dependent energy infrastructure will also greatly inhibit any move away from fossil fuels. Without continued economic growth there will not be the extra output to fund loan interest payments, nor the revenue and profit growth to support share price/earnings multiples. The financial system acts as a time machine, creating asset prices based upon perceptions of the future. As an increasing percentage of investors come to accept the future reality of at best, financial asset prices will fall to reflect a realistic future. The resulting crash will remove the underpinnings of the banking, brokerage, mutual fund, pension fund, and insurance industries. The comfortable futures of many will be shown to have been based upon a mirage of future growth that will not take place. With the financial system acting as the critical coordination system of the global economy, its crash will also intensify economic problems. Written by a retired financial industry executive with over 25 years of experience, this book describes how the crisis will affect different regions and industries to help identify the career and investment choices which may provide a relative safe harbour.

About the Author Roger Boyd is a retired financial industry executive, where he worked for 25 years. He received a BSc in Information Systems from Kingston University in England, an MBA in Finance from Stern School of Business, New York University in the United States, and an MA in Integrated Studies from Athabasca University in Canada. Over the past decade he has taken a deepening interest in the way in which modern societies, especially their financial systems, will deal with global threats such as energy constraints and climate change. He also maintains a blog covering such issues, www.humanitystest.com.