GDP VS EVA® as Economic Indicator

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Abstract

This article discusses the limits and characteristics of GDP as economic indicator and suggests that an Economic Value Added (EVA®) approach would be more accurate and appropriate to measure macroeconomic performance. The main difference is that EVA® takes into consideration the invested capital cost of opportunity, while GDP is focused on quantity of production; an EVA® approach will be focused in the economic result of production activities. A final comment is done on the characteristics and limits of a GDP measured by EVA®.

> "The attempts to determine in money the wealth of a nation or of the whole of mankind are as childish as the mystic efforts to solve the riddles of the universe by worrying about the dimensions of the pyramid of Cheops."[1]
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> *Ludwig von Mises*

Introduction: The Role of Economic Indicators

The interest in economic indicators and measurement of the market gain relevance with the "Great Depression" of 1929, until then there were no such big crises and there were no imperative needs to estimate economic performance. The "Great Depression" shook the market to great extent and deepness becoming very difficult to know where the economy was standing. There were two reasons to start measuring the economy with more care. First, to know if the "new policies" were giving positive results and how much out of the crisis the economy was standing. Second, to follow and study economic performance with the purpose to avoid further crisis as economic indicators might become an evaluation of economic policies. The interest in economic measurement had practical objectives rather than theoretical.

There are many economic indicators, but surely the most important of all them is the Gross Domestic Product (GDP). As its denomination suggest, this indicator tries to measure how much an economy has produced. The reason of its importance rests in that GDP attempts to measure how much income a whole country has in a given period, generally a year. This indicator is also central as it is used to obtain other important parameters like GDP per capita, growth ratios, economic openness, and measurements like debt as percentage of GDP. The significance of this indicator is evident, and that is why it is so important to have a proper measurement of it.

However, three pitfalls affect economic indicators which are deeply important. First, they are taken as data much more accurate than they actually are; which creates an "aura" of

[1] von Mises, L. (1949). *Human Action. A Treatise on Economics* (1996 ed.). New York: The Foundation for Economic Education. p. 217.

"holy data" around them. This is what Oskar Morgenstern called "specious accuracy".[2] Although recently the "statistical error" of economic indicators is more widely accepted, their focus should be much more important.[3] Second, they started to be used also with a theoretical background without enough concern on the quality of the data. Third, and most important, regardless of the inaccuracies of economic indicators and use or misuse of them, they are actually concerned with accountancy or physical output rather than with economic value results. In other words, if the data were perfectly recollected and perfectly processed, without statistical error, GDP (as well as GDP real growth) will still not be a proper indicator of economic performance because it is observing at the wrong data. For example, Mark Skousen said that the: "Gross Domestic Product (GDP) is a Keynesian-inspired statistic that measures final output only. **The widespread use of GDP as the primary measure has led to much mischief, including the idea that an increase in government spending automatically increases economic growth, and the myth that consumer spending drives the economy, since personal consumption expenditures represents the largest part of GDP.**"[4]

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[2] Cf. Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). New Jersey: Princeton University Press. p. 62: "Roughly speaking, specious accuracy is often found in providing information down to several decimals points when no conceivable use can be made of such detail –even if the data, given to this degree, should be entirely free from error, which is usually impossible."

[3] However, this is not so widespread or equally accepted in all cases. The following quote from page 36 of the OECD's *Understanding National Accounts* express the magnitude of error and the loss on how to measure it: "In particular, while GDP for technical reasons is often expressed in millions of units of the national currency, **users should be aware that they are very, very far from being accurate at the level of millions.** National accounts' quality is highly dependent on the quality of the statistical system that exists in a given country. […] **National accounts data are therefore approximations. It is not even possible to give a summary figure of the accuracy of the GDP**". Bolds are ours.

On the other hand, the following quote from page 12 of the United Nations' 2003 *National Accounts: A Practical Introduction* seems to be quite confident: "However, even without the support of sophisticated economic tools**, indicators derived from aggregates in national accounts are already very useful for monitoring the overall performance of an economy**, its strength as well as weakness." Bolds are ours.

[4] Skousen, M. (2005). *Vienna & Chicago. Friends or Foes?* Washington: Capital Press. p. 287. Bolds are ours.

The Importance of Statistical Error

As statistical indicators, GDP and economic variables should be used as approximating values; their practical use can become important once this is taken into consideration. It is always better to know roughly than having no idea. The presence of statistical error does not mean that necessarily the data should be discarded on practical grounds, it means that it should be treated differently, with more care; the real problem is the absence of information on the statistical error rather than the error itself. However, the size of the statistical error is also a very important aspect, because knowing its weight helps to elucidate if we are looking at a real trend or just to an (statistical) error. This becomes critical, because economic and social policies are implemented based on economic indicators, and if we do not know the margin of error of these indicators, is likely that transcendental decisions will be taken based on "statistical error" instead of real economic performance.

The error is also data, and we may agree that it can neither be known in an exact and precise form, but nevertheless, as is argued with economic indicators, having an imprecise approximation of its size and weight is better than having no idea; especially because what seems to be "small" can actually result in very important deviations. Morgenstern gives many interest examples to illustrate this; we are going to borrow two of them. The first one consists of a pair of two equations system, where the parameters are statistically obtained, and a tiny error results in a very different result:[5]

(0.1)
$$\begin{cases} x - y = 1 \\ x - 1.00001y = 0 \end{cases}$$

(0.2)
$$\begin{cases} x - y = 1 \\ x - 0.999999y = 0 \end{cases}$$

[5] Cf. Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). New Jersey: Princeton University Press. p. 109-110.

The (0.1) equation's intersection is $(x;y)=(100001;100000)$ while the almost similar result of (0.2) equation is $(x;y)=(-99999;-100000)$. As can be seen, the smallest difference can result in important differences although a divergence of two digits in the fifth decimal will surely be considered as an "insignificant statistical error". This helps us to spot two important characteristic of "statistical errors", the structure of the problem where the statistical data is going to be used is as important as the size of the error. Statistical errors are not "small" or "big" *per se*; we need to know how the model behaves under small changes before knowing what can be considered an "insignificant statistical error". The error information becomes critical if econometric results are going to be used in a "mathematical model", because they become a very questionable tool to corroborate economic models for the ones viewing economics as an empirical science.[6]

It is important to note that this "statistical errors" do not appear in economic indicators only because it is in the nature of the statistical process to have data errors and deviations, but because many of the information to be measured does not exist and has to be assumed somehow. For example, when calculating the GDP there "**is no such direct source in the case of households, whose consumption represents 60% of GDP**. The national households' account is often calculated indirectly by using statistics from other sources".[7] It is then not surprising or suspicious that even the main economic indicator, the GDP, suffers from significant "statistical error" that may invalidate its use.

The second illustration we are borrowing from Morgenstern is related to growth rates, which is usually considered as the performance of the policies taken by the government.[8] The important point here is that the growth rate is not calculated directly, but is a derived result from previous statistical data; which means that there is (or can be) "accumulation of errors". The following tables show two scenarios of growth between two years or periods. The first row shows the error of the data, where 0% means no error and the data is accurate and 100% correct, the following numbers show a 1%, 2%, 5%, and 10%

[6] The next step Morgenstern gives after showing the equation example is to translate small errors to an "economic mathematical model", showing the important effect a tiny error can produce.

[7] Blades, D., & Lequiller, F. (2006). *Understanding National Accounts.* OECD. p. 35. Bolds are ours.

[8] Cf. Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). Chapter XV. New Jersey: Princeton University Press.

standard deviations. In Table 1, we assume that the error of Period 0 affects in a negative trend resulting in a lower value than the free of error data, and in Period 1 the error affects in the opposite way. In Table 2 occur the other way around, the errors in Period 0 affect positive and the errors in Period 1 affects negative. The last row shows the growth rate for each "error scenario".

Table 1

Std. Dev.	0%	1%	2%	5%	10%
Period 0	100.00	99.00	98.00	95.00	90.00
Period 1	103.00	104.03	105.06	108.15	113.30
Growth	3.00%	5.08%	7.20%	13.84%	25.89%

Table 2

Std. Dev.	0%	1%	2%	5%	10%
Period 0	100.00	101.00	102.00	105.00	110.00
Period 1	103.00	101.97	100.94	97.85	92.70
Growth	3.00%	0.96%	-1.04%	-6.81%	-15.73%

As we can see, it is not extreme to find situations where a small error of 2% can move the growth rate from 7.20% to -1.04%, while the real growth rate is 3%. Note that the extremes, 7.20% and -1.04% are even wider than a 100% deviation of the real growth rate, 6% and 0%, and also imply a change of sign.[9] If a 2% error is considered acceptable in GDP calculations, what confidence can we have when looking at growth rates knowing the error is actually much higher? Especially if small and likely errors can result in a

[9] Also note that the 3% is not in the "middle" of the extreme values, there will be a "skew" depending if the growth rate is positive or negative; only when there is no growth its value will be in the middle. Of course, if we are looking at statistical data, and we do not know the real growth rate, we cannot know if there is skew or not and how it is affecting because we have only one observation.

difference of more than a 100% error! More realistic and higher standard deviation values results in completely useless growth rates.[10]

Another aspect that deserves to be considered is the "error" by rounding and truncating decimal numbers. When several operations are performed the accumulation of error can become quite important.[11] As processors cannot work with unlimited decimals, somewhere the information has to be truncated. This is a different process of rounding, where the last decimal is approximated to the nearest value trying to minimize de error. But in the process of truncating the information of the "next decimal" is missing, so that the decimal information is simply discarded. This might result in accumulation of error rather than cancelling each other; and if we want to be rigorous, cancellation of errors has to be proved, not assumed. It is true that the magnitude of the error by truncating will depend on how many decimals the processor can handle, how many and which mathematical operations are performed, and which specific numbers are being used among many other characteristics; but it is not less true that this error might become important (as we have seen with the above example of two digits change in the fifth decimal resulting in a 200.000 error value).[12]

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[10] It should be taken into account that all previous steps also suffer from statistical errors that are carried along, and the whole calculation process may be accumulating all this errors, the 2% error used in the example is quite optimistic.

Another adapted example of Morgenstern may help us to see the magnitude small errors may involve; a 2% error of world population can imply the omission of countries leaders in economic performance like Japan or two times the United Kingdom. As all countries are not equal, we do not know if this 2% omission represents poor or wealthy countries, the fact that the distribution is not uniform makes that the impact of the error could become considerable.

[11] For a similar treatment see Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). New Jersey: Princeton University Press. pp. 106-107.

This is a well known problem of processors, and therefore some conventions exists within "numerical methods" on how to handle and process numerical information like de IEEE 754.

[12] For example, the 0.10 number has limited decimal numbers, but in binary convention is an infinite repeating representation; then, if the processor has to convert to binary the 0.10 number, when "reconverting" back it will be affected by a rounding or truncating error despite the original number has only one decimal number in the first place.

But our problems do not stop here, the truncation of the data implies loss of information, meaning that we do not have the data needed to compare the results and see how much error we have accumulated. If our processor can handle, say 16 decimals, we cannot process the information with more than 16 decimals, having no benchmark to compare and see how much error we are dragging. To be more precise, we could only know the correct extent of the error when dealing with unlimited decimals or unlimited information; if not, what we would be really comparing having more decimals is more error with less error, which is the differential error, but not the whole accumulated error. We still would not know how much error the benchmark has itself. If this is so, how can we be certain that we are not two numbers deviated in the fifth decimal like in the two equations system example? If that is the case, what empirical use can this equation system have? Actually it becomes very difficult, if not impossible, to have some certainty of the error accumulated when truncating and rounding is present along the mathematical operations performed until reaching the final result. This important aspect deserves to be taken into consideration and represents a problem inherent to the calculation process; as it is unlikely that machines and processor will be able to handle unlimited information we will probably need to live with this statistical uncertainty, practical mathematics is not always as precise and pure as it seems at first sight.

Errors can be divided in two types, the *un-measurable* error on one side, and the measurable on the other. The problem with national accounts is not that the *un-measurable* error is not calculated, but that the measurable one is not. However, the measurement of this is not free from problems either, if we admit and recognize that statistical measures have a *natural* statistical error then we will also have statistical error when measuring the statistical error. This means that even the part of the error that we can measure or quantify somehow is affected by the same kind of error we are trying to measure. This implies that we cannot reach an error value free of error either. The situation becomes clearer, because we cannot know the magnitude of the real data if we cannot know the magnitude of the error; we can only have approximations to those values.

Despite of all the problems and dead ends statistical errors have, we are neither completely blind on them, some approximate values are obtainable. If we are conscious

on the problems of statistical error measurement and besides national account values we can see an estimated standard deviation, we are in a far better position than spotting a GDP number to the last number with no data on error at all. The statistical error is the information needed to know if we are uncertain on specific data or we really have no idea of its value; certainly it is not much to say that the GDP has grown between -1.04% and 7.20% (even with a very small error of 2%). Despite of all the mathematical and statistical methodology involved, GDP growth seems to be more a statistical opinion than certain economic data. As these examples show, the proverb that “numbers don’t lie” is pretty questionable, especially in social sciences statistics.

There is also another aspect of growth rates that we can mention. It is true that proportional values are important, but that does not mean that absolute values should be ignored, as they can provide very important information in the size and weight of the error. The next table represents the GDP of an economy divided in two sectors. Sector A growths at an accumulative rate of 3%, while Sector B growth at constant 3% but always relative to Period 0.

Table 3

Period	Sector A	Sector B	Output	Abs. Growth	Growth Rate
0	50.00	50.00	100.00		
1	51.50	51.50	103.00	3.00	3.00%
2	53.05	53.00	106.05	3.05	2.96%
3	54.64	54.50	109.14	3.09	2.92%
4	56.28	56.00	112.28	3.14	2.88%
5	57.96	57.50	115.46	3.19	2.85%
6	59.70	59.00	118.70	3.24	2.81%

Note that the absolute growth of each period (or year) increases but the growth rate decreases. It is clear that the growth rate decreases because the base value from which is calculated increases from period to period; but how accurate is to say that the growth performance of Period 6 (2.81%) is worse than that of Period 1 (3.00%)? Actually, if this were GDP per capita the 2.81% of Period 6 means more in absolute terms per individual

than Period 1.[13] Actually, the absolute growth increases from period to period. It is common to pay much attention to growth rates, and that is okay, but growth rates are only half of the story; absolute values are equally important.

Rothbard also gives us a more conceptual consideration, asking himself what a monetary aggregate means, if it means anything.[14] Rothbard recalls that monetary prices are ratios of two things, not just a quantity of money. To follow Rothbard's example, assume two transactions have been performed, an individual has bought one pound of sugar at 7 cents and a hat at 1.000 cents. How can we aggregate this two data without discarding the "pound of sugar" and the "hat"? The information we have is not just "7 cents" on one hand and "1.000 cents" on the other, is "7 cents for one pound of sugar" and "1.000 cents for one hat"; by definition monetary prices are rations between two things, not only a currency expression.

$$\text{(0.3)} \qquad \frac{7 \text{ cents}}{1 \text{ pound of sugar}} + \frac{1.000 \text{ cents}}{1 \text{ hat}} = \frac{\left(7 \times 1 \text{ hat} + 1.000 \times 1 \text{ pound of sugar}\right) \text{ cents}}{1 \text{ pound of sugar} \times 1 \text{ hat}}$$

It should be clear that the above relation is economically meaningless. Rothbard's example has only two goods to illustrate the idea, but it becomes evident that aggregates of national scope represent much more complicated problems. The only way to avoid this situation is by ignoring or mathematically avoiding part of the data, in our example the "hats" and "pounds of sugar", but that only leaves us with the quantity of money exchanged, which is not of much use, especially if our interest is economic performance and productivity. This represents a clear problem in cases like level of prices, and even if GDP calculation is free of this issue, it will be affected when deflacting the GDP to real values.

[13] For matters of simplicity, we are assuming that the population is constant. The incorporation of a growing (or decreasing) population would make the example more complex but would not alter the results and conclusions of it.

[14] Cf. Rothbard, M. N. (1962). *Man, Economy, and State* (1970 ed.). Chapter 11.13. Los Angeles: Nash Publishing.

It is not enough to say that measuring the statistical error of economic indicators is very difficult to calculate and then dismiss the presence of error, or disregard the conceptual problems of aggregates; this important information is not given the consideration it deserves. Statistical information is not about "values", but about "values, errors, and economic meaning" all together, we cannot look only the "value". The above examples and considerations show that this "statistical values" are useless until we know what size and kind of error we are dealing with. Once we know the size of the "statistical error", we then can move to the following step of studying the model structure to see how sensitive is to small changes in its parameters and pay special attention to "where" the error is located.

This absence of interest in error of measurement can be found in how data is presented and treated. What is the point of showing more information that we can really calculate? Why not present GDP values as a range of possible values instead as only one value? That sends the wrong message to the statistical data user. If the professional economic statisticians fall in this vice, how can we expect better from the statistical user?[15] What is the point of calculating GDP to its last number? Why so much focus in a very questionable data as growth rates? It is much more rich to provide the border values where GDP or other national account is expected to be within a given confidence and standard deviation than setting a unique value of doubtful significance. It seems that the questions and remarks Morgenstern asked him in 1963 are still valid:

> "However, as yet, no one has arrived at a measure of the margins of errors which are inherent in the estimates of national income. These margins could only be stated by the agencies that collect the basic data or the compilers of the aggregates. Since most of these groups either seem to have ignored the problem, or simply refuse to deal with it systematically, it becomes impossible for the user to determine with what confidence he may employ the data. The fact that little or nothing is said about accuracy is more dangerous than if the margins of error were frankly stated to be very high. This is particularly important in view of the great and increasing importance attached to national income figures in policy making.

[15] Even today, the United Nations Statistical Division presents population information to its last number; even in projections for future years.

> To throw the burden of estimating the errors and the reliability upon the user, though exceedingly convenient for the maker, is a totally inadmissible procedure. How can the individual user be expected to accomplish something where the government with its vast resources fails? This kind of evasion is also frequently encountered, as we have seen, in other fields of government statistics. It either shows that one is lacking in clear ideas and procedures or does not dare to use them since they would show up tremendous limitations of the figures which the government itself uses freely in the pursuit of its business. It certainly demonstrates that those who attempt to place the burden of proof on the reader or user have only an inadequate idea of proper scientific procedure".[16]

Some Limitations of the GDP

The previous section shows some difficulties that arouse on economic indicators because of "statistical error". However, there are also others limitations, especially in the GDP, that makes this value economically meaningless regardless of how accurate and free of "statistical error" it might be. It will not matter if the GDP is perfectly calculated, it still has biases because it is not interpreted as it should be or is not properly focusing on what is intended to represent.

GDP is usually defined as the indicator that "combines in a single figure, and with no double counting, all the *output* (or *production*) carried out *by all the firms, non-profit institutions, government bodies and households* in a given country during a given period, regardless of the type of goods and services produced, provided that the production takes place within the country's economic territory."[17] In other words, how much has been produced in a country (or region) in a given period of time. The following quote shows the importance national accounts manuals give to GDP:

> "GDP is the most important aggregate derived from the production account. GDP reflects the aggregate production of an economy. The growth rate in the volume of GDP summarizes the growth rate of the economy. **Growth in GDP would**

[16] Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). New Jersey: Princeton University Press. p. 253.

[17] Blades, D., & Lequiller, F. (2006). *Understanding National Accounts.* OECD. p. 15.

> **allow for increases in either final consumption of the population and the government or investment in capital goods. The latter is expected to accelerate the growth rate of the economy.**"[18]

There are many known criticisms to GDP with special focus in that is not properly measuring the whole market. For example, GDP calculation does not distinguish between production of capital goods and final consumption goods (quality and quantity of growth). "Black market" cannot be properly measured either, it has to be estimated.[19] The same happens with voluntary work and inputted rents (people and firms living and working in their own houses and buildings); they have to be estimated somehow. These effects might not be a minor detail, free developments like Linux with high impact in the market cannot be properly measured; if these kinds of developments have no market prices because they are free, it becomes very difficult and imprecise to measure its contributions to GDP. Another mentioned case is that government services are computed at cost of production instead of market prices.[20] And of course, GDP does not consider many important aspects like health, cultural richness, quality of life, etc. In a more general and drastic view, Rothbard says that GDP is wrongly built as it is concentrated in consumption rather than production, and this may result in considering government consumptions as an output while it would be more proper to see it as a full cost:

> "The critical assumption is the challenge to the orthodox postulate that government spending, *ipso facto*, represents a net addition to the national product. This is a clearly distorted view. Spending only measures value of output in the private economy because that spending is voluntary for services rendered.

[18] United Nations. (2003). *National Accounts: A Practical Introduction.* New York. p. 4. Bolds are ours.

[19] The OECD 2006 Understanding of National Accounts says that the black market is "estimated to be anywhere from 2% to 15% of GDP in OECD countries" (page 101) and that in "the case of France, for example, these adjustments increase GDP by around 4%" (page 37). This and other estimations confirm that the 2% standard deviation we used as example in the Tables 1 and 2 of the growth rate scenarios quite optimistic.

[20] This is specially the case of those goods and services provided only by the government, as there is no private production of them there cannot be market prices and the costs of production are the only measurable reference available.

> In government, the situation is entirely different: government acquires its money by coercion, and its spending has no necessary relation to the services that it might be providing to the private sector. There is no way, in fact, to gauge these services. Furthermore, every government-conscripted dollar deprives the citizen of expenditures he would rather have made. It is therefore far more realistic to make the *opposite* assumption, as we do here, that all government spending is a clear depredation upon, rather than an addition to, private product and private output. **Any person who believes that there *is more than 50 percent* waste in government will have to grant that our assumption is more realistic than the standard one.**"[21]

This structure of the GDP calculation also results in some paradoxical situations. For example, if an earthquake destroys many buildings, their reconstruction increases the GDP value. If an infection affects many individuals, GDP growths due to the hospital activities regardless this is not a better situation; similar effects happens with other activities like military production.

It might be argued that the resources used in reconstructing the buildings (or healing the diseased) would be used in other goods and services if they were not previously destroyed and GDP would have increased anyway, but is a very different situation to have an increase in GDP because of reconstruction than because of new goods and services are being produced.[22] How do we know, from GDP, if we are growing or reconstructing? GDP is a measure of production flow, not of accumulated welfare. This is important because we cannot know, just looking at GDP, if its value represents new goods and services or just reconstruction and depreciation coverage. GDP is about production, not about accumulation and economic growth; and the examples above show

[21] Rothbard, M. N. (1963). *America's Great Depression* (1975 ed.). Kansas City: Sheed and Ward, Inc. p. 296 Bolds are ours. Whether we consider that Rothbard has exaggerated or not by saying that "all government spending is a clear depredation", he actually points out a true problem of GDP, it does not take into account productivity in proper economic terms.

[22] A still excellent discussion of this can be found in Bastiat's *What is Seen and What is not Seen* (1850); this essay can be found in Bastiat, F. *Selected Essays on Political Economy* (1975 ed.). New York: The Foundation for Economic Education; and also in Hazzlit's *Economics in One Lesson* (1946).

us that even as a production measure cannot be too reliable either. If we know and are conscious that GDP is a production flow and not an accumulated welfare indicator, why so much focus is given to GDP as a growth indicator? If we do not grasp this difference, then economics does not completely understand the nature of its process and indicators.

From this we can conclude that economic growth leads to positive GDP growth rates, but positive GDP growth rate does not necessarily mean economic growth. If in Period 0 a country produces 100 buildings, while an earthquake has destroyed 500 buildings, and in Period 1 this same country produces another 100 buildings, GDP shows a growth respect to Period 0 but the absolute and relative situation of Period 1 is worst.

However, there is another important problem with GDP, and is that it might also show positive growth rates while accumulated capital is being consumed. GDP cannot distinguish when a rise in production is due to capital consumption rather than to new investments projects. Take for example a bus company that has 10 buses performing one round per day each. The bus company decides to increase his production by offering 11 rounds per day, but not by investing in a new bus but making one of them to perform two rounds instead of one. This results in an increase of GDP (one more round bus service) while capital is being consumed (a bus being wearied out at double speed); note that this increase in production is not to replace depreciated or "destroyed" assets, this is a different situation affecting GDP than the one we saw in the previous paragraph. To conclude that the country is growing will be to misinterpret the information; the country is actually shrinking because it is consuming its capital; only if the income from the extra round is invested at a higher rate than the bus depreciation then the economy actually growths.[23] GDP can increase for many reasons other than economic growth. If an individual decides to consume all his food saved in his refrigerator, it does not mean that his income is growing because his consumption has increased; it means that he is consuming his capital. This is not economic growth, this is economic shrinking. GDP cannot distinguish between these two different situations.

[23] This is not a minor detail, if we look at the growth rates of Argentine in the years following its last crisis; how can we know how much of the GDP growth is real growth and how much is due to capital consumption? How certain can we stand that Argentina is really growing instead of seeming to grow because it is consuming the savings of previous years?

Now, this is not just another GDP pitfall that we might disregard as insignificant (and we already saw that these alleged small errors might actually have very significant consequences), this implies a conceptual problem with GDP, as we cannot trust in the sign of the growth rate either. To be more precise, neither GDP nor GNI (Gross National Income) are equal to economic income even after discounting depreciation, capital transfers, and/or holding gains and losses (because of price movements). All the pitfalls and deviations of GDP are translated to any other indicator based on it. As we can see, in difference with the United Nations' above quote from the "National Accounts: A Practical Introduction", GDP is an unreliable indicator of economic performance; only in some cases GDP is aligned with the real economic situation. GDP and its derivatives (GNI and others) are *useless* as indicators of economic performance, not only because of the impact the statistical errors do have, but because they are unable to measure properly in economic terms.

Accountancy Value Added versus Economic Value Added

There is special attention in national accounts, especially in GDP, to measure the "value added" of each production process stage to avoid double counting. From each firm is computed only the "value added" it provides in the production process. For example, a product X is produced by two firms; A in the initial phase and B in the final one. If A sells its product to B at 75$ and B sells X at 100$; the value added of B is 25$. The total product is A's 75$ A and B's 25$; if this "value added" principle were not taken into consideration the whole product will be of 175$ because A's participation is being counted twice. If then A and B merge becoming a new firm called C, then the product would still be sold at 100$, but the "GDP of C" will drop to 100$; the other way around, a firm splitting into two or more firms will make GDP growth despite there is no increase in production. Note that GDP measures how much has been produced, regardless of the efficiency of the productive structure. It might be more efficient to produce X with two firms, A and B, instead of with only one C; but the problem is that neither GDP nor accountancy can measure economic performance accurately. GDP is not about efficiency either.

Although the spirit or intention of the "value added" is correct, the problem with GDP is that drags with it all the problems and inaccuracies of conventional accounting. As can be found in a United Nations report, GDP and national accounts are based on the same principles than accountancy:

> "National accounts is the macroeconomic depiction of the national income cycle using the doubleentry bookkeeping principle of business accounting and a sequence of accounts to show the relationship between the various economic variables."[24]

Accountancy reports, like the balance sheet and the income statement, are intended to inform on the situation and performance of firms and organizations. However, these results are very different from financial ones; accountancy is more focused on the "legal situation" of the firm than in the "economic situation".[25] This is very important because national accounts and GDP are calculated based on accountant principles and not on economic results.

For example, accountancy reports show how much has been sold, but not how much of the sales has been really collected; accountancy shows how much costs are involved in the production process, but not how much of that costs had already been paid. Different conventions makes that there can be as many different accountancy reports as possible combinations within accountancy practice are possible. For example, accumulated stocks can be computed following different methodologies (LIFO, FIFO, PPP), or computing research and development as a cost or an investment; many other conventions can be found in accountancy practice. This has an important significance, because the economic results and market value of a firm is only one, not many as accountancy has to offer. Even more, we cannot even be sure that one of all the possible accountancy results is the correct one; it is more likely that all of them be wrong. Morgenstern already mentioned

[24] United Nations. (2003). *National Accounts: A Practical Introduction.* New York. p. 4.

[25] For a more complete treatment of these topics see Rappaport, A. (1986). *Creating Shareholder Value. A Guide for Managers and Investors* (1998 ed.). New York: The Free Press; Koller, T., Goedhart, M., & Wessels, D. (1990). *Valuation. Measuring and Managing the Value of Companies* (2005 ed.). Wiley; and Young, D., & O'Byrne, S. (2001). *EVA® and Valur-Based Management.* McGraw-Hill.

this in 1963 when saying that in "profit and loss statements some receipts and transfers of money such as interest received and monies transferred to surplus are again of highest accuracy, **but what a 'profit' or 'loss' is, as already mentioned, depends on some theory which can never claim to be as convincing as a statement of the hard facts that certain sums of money were received others were paid out**".[26] More recently, Rappaport mentioned the same idea with the following words: "Once again, a change in accounting affects neither a company's cash-flows nor its economic value. **Remember, cash is a fact, profit is an opinion**".[27]

This disassociation is what makes financial reports so important to reach more accurate economic results. The value and economic performance of the firms depends on its cash flow, accountancy lacks of a relation strong enough with it.

It might be argued that the income statement can be corrected to have a "cash-flow statement", but the main problem is that accountancy and alike methodologies do not take into account the cost of (invested) capital.[28] This "cash-flow statement" will show if the activity is having profits in the sense that income can cover the cost of being operative; but not in the sense that covers the cost of opportunity of the invested capital. An investor will become a partner of a firm and contribute with capital only if the profits are big enough to cover his cost of opportunity.

Two firms reporting the exact same income statement and exact same cash-flow are in a very different situation if one of them has an invested capital of 100.000 and the other of 1.000.000. The second one is in a worst situation, because it needs an investment ten times bigger than the first one to obtain the same cash-flow. A more accurate comparison

[26] Morgenstern, O. (1950). *On the Accuracy of Economic Observations* (1963 ed.). New Jersey: Princeton University Press. p. 78-79. Bolds are ours.

[27] Rappaport, A. (1986). *Creating Shareholder Value. A Guide for Managers and Investors* (1998 ed.). New York: The Free Press. p. 15. Bolds are ours.

[28] To be more precise, accountancy only considers the cost capital that corresponds to liabilities. The total capital invested in any firm is equal to the equity plus the liabilities taken from lenders. The difference resides in where the capital comes from (inside or outside), but both are part of the firm's capital. If income statement computed the cost of capital as does with liabilities interest the result will be much more accurate.

would be to add 900.000 to the first firm's capital with an opportunity yield and then compare both cash-flows.[29]

As we can see, this is very important, because the "value added" we mentioned above, and how it is computed in accountant reports, do not correspond to the economic concept of it. "Accountancy value added" is a different concept of "economic value added" (EVA®). Roughly defined, the cost of opportunity of the invested capital should be deducted from the accountancy profit to reach real economic profit.

Economic Profit = Accountancy Profit – Cost of (Invested) Capital

The absence of the cost of capital means that values added in the conventional sense and accountancy reports are overrated. The following quote from Bennet Stewart III shows that the importance of capital's cost of opportunity is far from insignificant:

> "How substantial is the accountant's neglect of the cost of equity? Massive. The 1,000 largest U.S. firms ended 2001 with book equity of about $2.9 trillion. At a 10% rate, the cost of equity is on the order of $290 billion. **To put that in perspective, the equity capital charge is more than three times as large as the $96 billion in aggregate net income those firms reported that year.** True, 2001 results were depressed for many reasons, but the impact of ignoring the equity capital charge is simply stupendous. It is the greatest fraud ever perpetuated upon the investing public. It is the single most significant governance issue in the accounting system. It needs to be at the top of every one's list for reform."[30]

[29] Note that this is not present in conventional microeconomics either when analyzing and crossing different costs curves; the capital cost of opportunity is absent. It might be argued that is not a role of accountancy to consider the capital cost of opportunity and only the project performance, that the cost of opportunity would be then analyzed by the investor; but certainly that is not the case of economics, *mainstream* microeconomics has a very important flaw in the conventional cost analysis of the firm.

[30] Stewart III, B. (2002, September). Accounting is Broken. Here's How to Fix It. A Radical Manifesto. *EVAluation*. p. 5. Bolds are ours.

Without considering the capital's cost of opportunity, the concept of "value added" becomes limited. As accountancy value added does not consider the cost of capital, it has bias to be higher than the "economic value added". How can we know, in economic terms, if a firm is having economic profits if we do not consider the cost (of opportunity) of the capital? To know if there is economic profit, the return of invested capital (ROIC) and the weighted average cost of (invested) capital (WACC) has to be compared. And to know the "size" of the economic profit or loss the amount of capital invested has to be considered. The following equation shows the relation.

(0.4) $$EVA = \left(ROIC - WACC\right) Capital$$

We can relate the ROIC with the "cash-flow statement" we mentioned a few lines before, the relationship between real operative cash-flow and the capital gives us the capital rate of return. This operative result is known as NOPAT (Net Operative Profit After Taxes):

(0.5) $$ROIC = \frac{NOPAT}{Capital}$$

This relation is very important, because without the capital we cannot know the weight of the NOPAT in relation to the investment performed, the "cash-flow" statement is only part of the information needed.

Note that when ROIC equals WACC there still are *profits*, but not "economic added profits". When ROIC equals WACC, profits are precisely in the amount where it covers the cost of opportunity and there is no reason for investors to leave the project. A positive EVA® is what classical economist called "extraordinary profits", and an EVA® equal to zero represents what they called "ordinary profits". The absolute amount of these "ordinary profits", the ones received in the state of equilibrium, will be the NOPATs of each firm. A positive EVA® is what the entrepreneurial activity tries to achieve. If instead of that ROIC is smaller than WACC, then capital is being consumed. Economic

growth means discovering market opportunities with positive values of EVA®.[31] In Kirzner's words: "Entrepreneurship does not consist of grasping a free ten-dollar bill which one has already discovered to be resting in one's hand; it consists in realizing that it is one's hand and that it is available for the grasping."[32]

As long as GDP and national accounts are built in accountancy similarly methodologies without considering the cost of capital, their results will remain economically meaningless.

Economic Value Added and Economic Growth

The EVA® approach gives a new focus on how to measure GDP and economic growth in a more coherent manner. If GDP is the aggregation of production, the "Economic Value Added GDP", which for the moment we shall call GDP(EVA®), should be the aggregation of the firms and agents' EVA®.[33]

This approach will result in a GDP(EVA®) growth if the production of the firms and agents cover and excel the cost of opportunity of the capital (liabilities and equity as well).

Economic growth and performance requires high productivity, there is no way to consume what has not been produced; however, economic growth and performance is not about producing anything, but producing what should be produced in the way it should be done.[34] As EVA® is more accurate than accountancy and conventional GDP its result

[31] For a discussion of equilibrium and discovery process see Kirzner, I. M. (1973). *Competition & Entrepreneurship*. Chicago: The University of Chicago Press.

[32] Kirzner, I. M. (1973). *Competition & Entrepreneurship*. Chicago: The University of Chicago Press. p. 47

[33] Murray Rothbard proposes an approach for a modified GDP by deducting the government participation. However, although the principle might be considered right, Rothbard's proposal still drags the GDP pitfalls we have seen before by not considering the cost of opportunity of invested capital. His suggestion can be found in Rothbard, Murray. (1962). *Man, Economy, and State (with Power and Market)*. (2004 ed.). Auburn: Ludwig von Mises Institute. p. 1292-1295; and Rothbard, M. N. (1963). *America's Great Depression* (1975 ed.). Kansas City: Sheed and Ward, Inc. pp. 296-304.

[34] For an interest discussion on this see von Mises, Ludwig. 1952. *Planning for Freedom*. 1974 ed. Chapter "Lord Keynes and Say's Law". South Holland: Libertarian Press.

will be more focused on economic value and the result will have more economic meaning.

Again, entrepreneurs seek to gain "extraordinary earnings", which is a positive EVA®; entrepreneurs are in an *alertness* situation trying to find projects where ROIC is bigger than the WACC. The correlation with economic growth is now more direct than with conventional GDP; if well measured there will be no more cases of "economic growth" when an "individual increases his consumption by depleting his refrigerator"; that is why it seems that GDC, Gross Domestic Consumption, should have been a more accurate expression for the indicator. The reason why certain projects achieve to have a positive EVA® is because the prices consumers are willing to pay for the project's final good or service is higher than the cost of production and resources required; this means entrepreneurs can put a higher bid to acquire the resources needed. When an opportunity like this is spotted, the entrepreneurs reassign resources to this new project because its EVA® is bigger. Note the following quote from the first page of the Bennet Stewart III's "The Quest of Value": "A quest for value directs scarce resources to their most promising uses and most productive users. The more effectively resources are deployed and managed, the more robust economic growth and the rate of improvement on our standard of living will be. Adam Smith's invisible hand is at work when the investor's private gain turns into public".[35]

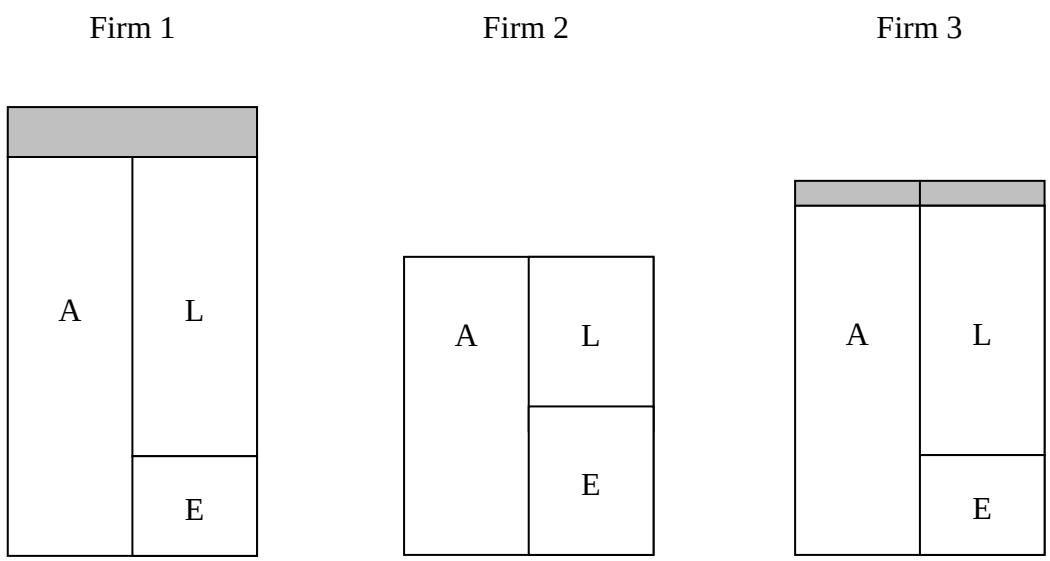
This reassignment means a shift to a better production structure, resulting in economic growth. If the reassignment of resources was well evaluated, then the EVA® of the new project is higher than the EVA® resigned of the previous project; the EVA® differential is the economic growth. Kirzner referred to this process with the following words:

> "Entrepreneurship for me is not so much the introduction of new products or of new techniques of production as the ability to *see* where new products have become unsuspectedly valuable to consumers and where new methods of production have, unknown to others, become feasible. **For me, the function of**

[35] Stewart III, B. (1990). *The Quest for Value.* Harper Business. p. 1. Bolds are ours. The idea of value maximization is more accurate than the conventional profit maximization; as a quest for value will result in profit maximization, but the other way around does not necessarily follow.

> **the entrepreneur consists not of *shifting* the curves of cost or of revenues which face him, but *of noticing that they have in fact shifted.*"**[36]

The following diagram shows three firms with its assets (A), liabilities (L), and equity (E). The size of the firms is given by total capital invested, which is the sum of liabilities and equity. Firm 1 spots an EVA® opportunity and takes resources originally used by Firm 3, which is marked by the grey area. The grey area in Firm 3 is the firm's value shrinking because it has to resign the resources now used by Firm 1.



In our example, economic growth would be Firm 1's EVA® minus Firm 3's EVA®. The total aggregate will then by the sum of all *n* firms' EVA®:

(0.6) $$GDP\,(EVA®) = \sum_{i=1}^{n} \left(ROIC_i - WACC_i \right) Capital_i = \sum_{i=i}^{n} EVA_i$$

Note once more that ROIC equal to WACC does not mean zero production; it means that the market is not beating the capital cost of opportunity, it is just covering it. But the

[36] Kirzner, I. M. (1973). *Competition & Entrepreneurship.* Chicago: The University of Chicago Press. p. 81. Bolds are ours.

main point is that there will not be positive values when the cost of opportunity of the capital is not being covered, profits are not big enough, like in the example of the bus company performing one more round without investing in new vehicles. Economic growth will depend on ROIC rates, WACC rates, and capital assigned to each project, firm, or agent. The following table summarizes some possible scenarios with three firms, from higher aggregate growth in the first line to depression in the last line.[37]

	Firm 1	Firm 2	Firm 3
1	(ROIC > WACC) Capital	(ROIC > WACC) Capital	(ROIC > WACC) Capital
2	(ROIC > WACC) Capital	(ROIC > WACC) Capital	(ROIC = WACC) Capital
3	(ROIC > WACC) Capital	(ROIC = WACC) Capital	(ROIC < WACC) Capital
4	(ROIC = WACC) Capital	(ROIC < WACC) Capital	(ROIC < WACC) Capital
5	(ROIC < WACC) Capital	(ROIC < WACC) Capital	(ROIC < WACC) Capital

This approach divides growth in two parts, return and cost rates on one side, and capital invested in the country on the other. This means that the ROIC and WACC spread is part of the growth data, the amount of capital invested is also needed to know how much a country is actually growing. If the aggregate shows an increase in GDP(EVA®), then there is “market value added” or an increase in the “market value”. Note that the “ROIC-WACC spread” is a more accurate approach to measure productivity, without market prices we can only have physical productivity, which is a different concept of “economic productivity”.[38] A given country A with 1.000.000 capital investment and a 1% ROIC-WACC spread growth accumulates more capital than a given country B with a 2% ROIC-WACC spread but 100.000 capital invested.

[37] This should be taken just as an example to help the idea be more clear, in reality much more firms and agents exists and much more combinations can happen; like different firms having different amounts of invested capital or risk premium in their WACC. Also, different sectors might be correlated, and a bad management in one of them may result in a negative EVA® affecting other sectors with positive EVA®, etc.

[38] Also note that the ROIC-WACC spread as economic productivity can also be used to explain how international commerce and markets interact with each other. Here conventional economics does not fully consider this kind of analysis, but different models of physical output and inland availability of resources.

Country A	Country B
(ROIC – WACC) Capital = EVA	(ROIC – WACC) Capital = EVA
1% 1.000.000$ = 10.000$	2% 100.000$ = 2.000$

Another important analytical advantage of EVA®, is that in difference with other methodologies, like the "free cash-flow" (FCF) approach, it separates economic result from investment decisions. It might happen that a project is having a positive EVA®, but investors are investing amounts higher than the EVA® which result in a negative FCF. This might lead to think that the firm is having economic looses, while the correct reading should be that investors are investing at higher pace than the project earnings. The following table is an example of that situation.

Table 4

NOPAT:	150.000$
Invested Capital:	1.000.000$
ROIC:	15.00%
WACC:	10.00%
Investment:	175.000$
Free Cash-Flow (FCF):	-25.000$
Economic Value Added (EVA®):	50.000$

It is true that when performing a company valuation the FCF and EVA® methodology gives us the same result, but EVA® provides clearer information. But the main point is that we are not valuing companies, we are trying to calculate how much economic value was added in a given period, which means that no scenario projections are needed of the expected performance of future years. At the end of a period, the NOPAT ceases to be an estimation to become a known fact. As we are only looking at the present period, the FCF

approach may mislead our results by mixing up capital return with investment decisions, there can be positive EVA® results with negative FCF.[39]

We could still calculate the GDP(EVA®) growth following the traditional way by dividing their values, for a given period *t* the growth rate will be:

$$GDP(EVA®)\,\text{Growth Rate}_t = \frac{GDP(EVA®)_t}{GDP(EVA®)_{t-1}} - 1 \tag{0.7}$$

GDP(EVA®) does not show us the total economic value of each period, it gives us the new economic value that has been added. So, this proportional relationship does not compare the total value of the market in two periods but how much economic value was added in each period. If in period *t* the GDP(EVA®) is of 10, and in period *t+1* is of 5, then the result will give us a -50%. This represents the proportional variation of the aggregation of economic value, not the economic value added in each period. That is, the absolute growth has decreased by 50%, but there the economy is still growing.

If there is a variation in the total capital for other reason than the EVA® accumulation, the then result will be biased. For example, this equation would still show a positive growth rate in cases like the buildings reconstructions after an earthquake as in the example we used before, GDP(EVA®) is still a "flux" indicator. It is true that maybe more economic value added was generated, but the problem with this approach is that it assumes the value of reference (number of buildings) is constant. Another possibility that allows us to spot more information can be:

$$GDP(EVA®)\ \text{Growth Rate}_t = \frac{GDP(EVA®)_t}{Capital_t} \tag{0.8}$$

This equation has the advantage over equation (0.7) that allows us to see the "Capital" value of the period we are measuring, which has the advantage of being more transparent

[39] Note that this can happen if a project promises good EVA® returns and high and fast investments are performed. This will result in a negative FCF not because a firm or project is being tried to be saved, but because high returns are expected in future periods.

by providing more information and does not assume that the base value, in this case the capital, is constant in each year. If there is no change in the reference value (number of buildings) for other reason than GDP(EVA®) both calculations gives us the same results. If in period *t* there is 1.000.000$ in capital and the EVA® rate is of 10% percent of the capital value; the capital of period *t+1* will be the previous capital plus the EVA® obtained in period *t*. If in the next period the EVA® rate is still of 10%, it is indifferent if we compare the GDP(EVA®) growth rates or the EVA® over capital as growth rates.

Table 5

$Capital_t$:	1.000.000$
GDP $(EVA®)_t$:	100.000$
$Capital_{t+1}$:	1.100.000$
GDP $(EVA®)_{t+1}$:	110.000$

Note that if we measure the growth rate as the ratio between the GDP(EVA®) of each period or be the ratio of GDP(EVA®) over capital the final value is the same. In both cases the result is 10%. But if in the meantime, between period *t* and *t+1*, capital is lost, due to a natural disaster, confiscatory policies, devaluations, or any other reason, then the difference between the two ways to calculate the growth rate becomes important. Assume that 200.000$ of capital has been lost due to any of these reasons. Now, the values of the previous table become:

Table 6

$Capital_t$:	1.000.000$
GDP $(EVA®)_t$:	100.000$
$Capital_{t+1}$:	900.000$
GDP $(EVA®)_{t+1}$:	110.000$

If this is the case, the conventional growth rate used in national accounts will show us a growth of 10%; but if we use equation (0.8) the results is 12.22%:

(0.9) $$GDP(EVA®)\text{ Growth Rate}_t = \frac{GDP(EVA®)_t}{Capital_t} = \frac{110.000\$}{900.000\$} = 12.22\%$$

If the size of the economy is given by the invested capital, this equation is more transparent and accurate when capital is lost *in the meantime* for any given reason (government policies, devaluations, confiscations, etc).

There is another advantage on using the GDP(EVA®) approach, and is that it can be discomposed in "GDP(EVA®) drivers". In financial analysis, this is commonly done in relation with sales; in this case it might be a bit differently. For example, the GDP(EVA®) value can be split in the EVA® contribution of each sector *s*:

(0.10) $$GDP(EVA®) = \sum_{s=1}^{n} \frac{GDP(EVA®)_s}{Capital}$$

This relation can show us which sectors are adding more economic value to the economy as a whole. On the other hand, if we compare each sector's GDP(EVA®) with its own invested capital we can see which sectors are growing at higher pace. For example, if Sector 1 is having higher EVA® than the other sectors, it might be expected higher investments in that branch of activities.

(0.11) $$GDP(EVA®) = \sum_{s=1}^{n} \frac{GDP(EVA®)_s}{Capital_s}$$

As the EVA® approach gives a more accurate and precise focus and calculation, more confident and clear analysis can be performed on countries' economic performance. Equations (0.10) and (0.11) can be used regardless what type of analysis is being done; but the information they provide is more clear than the conventional GDP minus depreciations and other similar indicators. As we have seen above, as conventional GDP confuses accountancy value added and depreciation with capital cost of opportunity its result is lacking of economic meaning. The adoption of a more financial or economic approach is much more useful and powerful than traditional national accounts

Conclusion: Limits and Uses of "GDP(EVA®)"

Our analysis would not be complete without a mention of the problems and limits a GDP(EVA®) may have. National accounts, and developments like a GDP(EVA®), can only be properly used if we know what their limits are. Some of these problems were analyzed in the first two parts of the article.

We know that GDP(EVA®) focuses on more accurate and proper economic concepts, but that does not mean those "concepts" are easily measurable. However, economic as a science should be guided by concepts and theory, not by what happens to be easily measurable; that is not to resolve the science problems, but avoid them. Hayek referred to this attitude as the "pretence of knowledge": "And while in the physical sciences the investigator will be able to measure what, in the basis of a *prima facie* theory, he thinks important, **in the social sciences often that is treated as important which happens to be accessible to measurement. This is sometimes carried to the point where it is demanded that our theories must be formulated in such terms that they refer only to measurement magnitudes**".[40] Once the wrong measurement is a common practice, its relation to the concept it is supposed to represents starts to be accepted without any questioning; but economics is not a *quantitative* as is a *qualitative* science.

One of the main problems of empirical economics is its concern with contrasting their theories and models. But even if the values required could be perfectly calculated, without any statistical error, this would still not be possible. Assume we have a GDP value without statistical error showing a steady growth rate for any given period and we decide to "correlate" this growth with the "X" phenomenon. How do we know, "empirically speaking", if the growth is due to "X" presence or in spite of its presence? If we see A and B in a social phenomena, how do we know, only looking, if B happens because of A or even with the presence of A? How can we be certain, just by looking, there would not be two Bs (or none) if A were not present? Empirical economics cannot help to choose between two or more theories with opposing conclusions because empirical economics cannot prove nor disprove any theory. In an empirical test, if we see that the model predictions occur, we cannot say if this is because of "the model" or

[40] Hayek, F. A. (1974). The Pretence of Knowledge. *Nobel Memorial Lecture.* Stockholm. Bolds are ours.

"despite of it". Empirical economics can prepare statistical research supporting the Keynesian, Monetarist, or Austrian approach, to explain a trade cycle;[41] "empirics" is useful to economic history, but is infertile as a scientific approach to support or discard theories. Even if national accounts were statistical error free, they would still be useless for empirical reasons. The limitations of empirical economics become even more important when we start to be aware of the important effects "small" error can have, because mathematical models become virtually useless. This can easily become discouraging for empirical economics when we notice that some kind of error cannot be measured and the statistical error that is measurable is not free from statistical error itself either.

All these limitations and problems do not mean that economic is cursed as a science; it means that economics should be treated as an *a priori* science, not as an empirical one.[42] When these aspects are taken into consideration, the role of economic indicators and national accounts becomes clearer; they can have a practical end rather than a theoretical one.

For example, economic indicators may have a very important role in economic history, helping to understand and describe what historically happened.

GDP(EVA®) indicators can be much more accurate indicators of how the economy is performing. These indicators cannot prove nor disprove any economic theory on empirical grounds, but they can surely provide more accurate information than conventional GDP. The difference between conventional GDP and GDP(EVA®) is not on the presence of statistical error, but on being focused on the proper information. Having a focused indicator means we need to concern *only* on the statistical error and not on the indicator's internal problems.

[41] It seems worth to mention that Popper's epistemology is about the refutation of theories, not about confirming them. Empirical economics should seek to debunk its models, not to confirm them, if it wants to behave according to its paradigm.

[42] For a discussion on economics as a science see von Mises, L. (1949). *Human Action. A Treatise on Economics* (1996 ed.). New York: The Foundation for Economic Education; and von Mises, L. (1962). *The Ultimate Foundation of Economic Science. An Essay on Method* (1976 ed.). Kansas City, United States: Sheed Andrews and McMeel, Inc.

Of course, it might be very difficult to purely and perfectly measure GDP(EVA®), because it suffers from some similar problems than the conventional GDP. For example, the WACC might be difficult to obtain as all its components are not always open to public knowledge, "black market" would still be difficult to measure. The government WACC represents another problem (maybe, an interest proposition would be to use the "market ROIC" as the government WACC, to really see if the state is adding value to the market, if not, then the "government's EVA®" will show an economic deficit). But it also has some advantages, because it is concerned with cash-flow rather than accountancy type of reports, any activity can be traced back to its cash movement. For example, a government provided service can be discomposed in its incomes and outcomes of cash; if these activities are financed by taxes, then the EVA® of the contributors will diminish; EVA® has a better aggregate coverage.

GDP(EVA®) is not free from statistical error either, but also having a faulty indicator like GDP does not help. As Bennet Sewart said, the "cost of equity cannot be measured precisely, **but as the accounting framework assumes it is zero, any systematic measurement technique that conforms to modern finance theory will significantly improve upon that estimate and render profit figures that are generally more relevant and more accurate.** Even using a 10% charge across the board would be better than continuing with the current assumption that equity is costless, but it is certainly possible to be even more accurate than that because most managers are already making an assumption about the cost of equity."[43]

GDP(EVA®) is a better indicator than conventional GDP not because it is better on statistical terms but because is better on economic terms. The economist should be aware of the statistical error presence and the effects it might have if he wants to perform a proper reading of that information. The economist and politician should know that economic indicators should be carefully used with practical or historical studies, not as empirical theory. But having the proper indicator is only half of the way. This information must be provided with an estimated error associated to it as any other sciences do with their own indicators. Statistical information is meaningless without the

[43] Stewart III, B. (2002, September). Accounting is Broken. Here's How to Fix It. A Radical Manifesto. *EVAluation*. p. 5.

error approximation, even worst if not even focus on economic results. Economics should be more focused on finance as “economic calculation” and much less on accountancy, as the former one corresponds to economic calculation while the latter one does not.

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