



## Water Gain: As a Common Good Becomes a Financial Opportunity<sup>#</sup>

Cristiana Fiorelli<sup>1</sup>, Marco Mele<sup>2\*</sup>

<sup>1</sup>PhD Student, University of Teramo, Italy, <sup>2</sup>University of Teramo, Italy. \*Email: [marco.mele@unint.eu](mailto:marco.mele@unint.eu)

### ABSTRACT

The purpose of this paper is to analyze how the water has become, indirectly, an important element also in the financial markets. Nevertheless, its particular nature, vital and instrumental for human life, gives this item a peculiarity: It is difficult to generate a price but, equally, it attracts the agents that operate in the financial markets. But, like any other commodity, the water is starting to take hold in the equity markets. There is, however, a difficulty. No one can change the water as it does for other financial instruments present in the stock markets. For this reason, the investors began to bet on companies that have as reference the water sector, considered a booming business. The present work aims to analyze the performance of the assets related to the water sector in the financial markets, comparing performance against major indexes, such as Dow Jones, Nasdaq and SP 500. Next, we wanted to verify the existence of a causal link between the water and the SP 500 index in order to confirm the hypothesis that the water has become, in financial markets, a safe haven.

**Keywords:** Financial Markets, US DJ Water, Granger Test

**JEL Classifications:** C32, F36, G15

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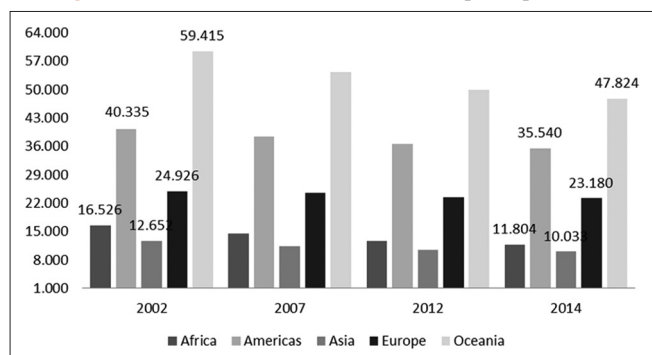
### 1. WATER MARKET GROWTH AND LITERATURE REVIEW

The United Nations established that the water right is an inalienable right with resolution n. 64/292 in 2010<sup>1</sup>. Despite its importance, water is a natural resource renewable and scarce, not sufficient for all future generations. The Falkenmark (1989) index is one of the most widespread measures of water stress. It attributes to each country the following categories (no stress, vulnerability, stress, scarcity, absolute scarcity), ranking these according to availability of renewable water resources per capita. Water is scarcer in developing countries. Therefore, it is necessary ensure the access to water for all population, including those that do not have own resources. Not surprisingly, the water security is part of the sustainable development goals of Agenda 2030 promoted

by the United Nations<sup>2</sup>. In order to achieve this objective, UN have proposed many actions, such as investments on site, public-private partnerships, development cooperation, capacity building, etc. How said, water is also essential for agricultural and industrial activities and is useful to allow the creation and maintenance of jobs (UN-WATER, 2016). Industrial activity related to the management of water supply networks and to the water distribution plays an important role in today's economies. Geman and Kanyinda (2007) estimated that the actual size of the global water sector is between 425 and 700 billion of dollars per year, and these numbers are expected to grow considerably in the next decades. In fact, the demand for water is directly proportional to the economic development degree of a country. The growth rate of the developing countries, together with the increase of their population, favors the increase in global water demand (Figure 1). The data of the African continent clearly show a declining trend in recent years compared to the previous decade, with a reduction of water resources by 20%. The possibility of core business enlargement,

1 Resolution n. 64/292, "The human right to water and sanitation," of General Assembly of 28 July 2010: "the right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights."

2 Goal 6: Ensure access to water and sanitation for all.

**Figure 1:** Total renewable water resources per capita in m<sup>3</sup>

Source: Own calculation; FAO - Aquastat

through investments in water infrastructure and in management efficiency in developing countries, the scarcity of good, connected to climatic and demographic problems and the constant increase in global water demand, made companies that operate in the water sector, more attractive than others in terms of performance.

Financial operators have developed an interest of water investment in financial markets, because of the great necessity of new financing, as well as the good prospects of growth (Jin et al., 2016). Investing in water industry has been the approach most commonly adopted as alternatives to direct investments in water commodity, and, as showing the study of Gilroy et al. (2013), appears to be an excellent component for portfolio diversification (Gorton, et al., 2006).

## 2. ANALYSIS OF THE MAIN WATER INDICES

As a growing interest in capital-intensive companies, linked to the water sector, financial indices have been created to capture the major movements in financial markets of these. In fact, the indices are designed to help investors motoring the overall trend of asset prices. Generally, they consist of listed companies, operating in the water sector, which record a high percentage of revenues due to their core business, the water (Upper et al., 2000). Each index is characterized by a balanced representation of different segments of the water industry, like a water distribution, an infrastructure management and a waste water treatment, making it a good proxy of the whole water financial market. There are different types of indices and most of these contains U.S. companies. Around the 2000s, the first indices appeared just in the United States on NYSE. For instance, the Palisades Water Index, the NASDAQ OMX Water, the SP Global Water Index, the Dow Jones US Water Index (DJUSWU) and the World Water Index (WOWAX).

The following analysis considers the DJUSWU and the WOWAX like the most representative indices of US and world water sector. The sample covers a period from January 2010 to March 2016. The first index is composed of 18 companies<sup>3</sup> weighted by its market

3 American States Water Co., American Water Works Co. Inc. (AWK), Aqua America Inc. (WTR), Artesian Resources Corp., BioShaft Water Technology Inc., Cadiz Inc., California Water Services Group, China

capitalization (market cap weighted); while the WOWAX, which includes 20 companies<sup>4</sup>, is built according to a weighting model in which the same weight is assigned to each component (equally weighted). Moreover, they share three companies that appear in both compositions. Figure 2 shows the trend of the price indices with a weekly data (on the left). Since 2010, it has revealed a high performance growth associated to the substantial sector, with a semi-exponential trend in the last trait, corresponding to the end of 2015. The right side of the chart, that shows the price performance relative to three major companies (MSEX, WTR and AWK) represented by DJ US Water Index, points out the same situation. It reproduces exactly the growing tendency of the overall index, with the highest points at the end of 2015. During the crisis period, the agents began to invest in a new asset, completely different from standard assets for the nature of substantial. Considering the turmoil on the stock and bond (sovereign debt crisis) market, the agents preferred liquidate investments toward a “niche” sector, such as the water industry. The graphical analysis confirms what we said. However, we have to focus on factors that have led the agents to invest in this market. They may have been attracted by a new revenue opportunities due to the expansion of reference market, on the other hand could be other reasons, not linked exactly to the intrinsic value of water, that have facilitated the rapid growth of financial assets.

## 3. COMPARISON OF INDICES PERFORMANCE

We consider the semi-exponential growth of price indices as a factor attributable to the normal behavior of operators that help the rise of a speculative “bubble.” The continuous growth of trend leads to an overvaluation of index market value misaligned with the values of substantial fundamentals. Figure 3 compares the DJ US Water Index’s price changes with price changes of the three most important indices, Dow Jones, Nasdaq and SP 500<sup>5</sup>.

We project the changes on a single chart to compare indices returns. The standard stock market registered a homogeneous growth throughout the year, around zero, even if negative in some cases, showing a very similar behavior to DJ US Water Index in the first trait.

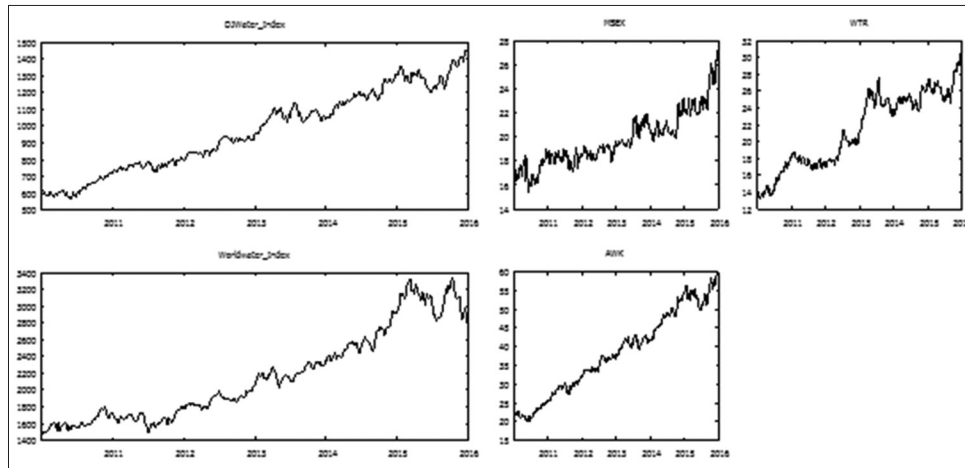
The latter, since the second half of 2015, has begun its escalation ending with an increase of stock value of about 30% in 1 year. The

Water Group Inc., Companhia de Saneamento, Connecticut Water Service, Inc., Consolidated Water Co. Ltd., HYFLUX Ltd., Middlesex Water Co. (MSEX), Purecycle Corp., SJW Corp., STW Resources Holding Corp., Veolia Environment SA, York Water Co.

4 American Water Works Co. Inc., Aqua America Inc., Beijing Enterprises Water Gr, Calgon Carbon Corp., Coway Co. Ltd., Flowserve Corp., Geberit Ag-Reg, Guangdong Investment Ltd., Kurita Water Industries Ltd., Masco Corp., Miura Co. Ltd, Pentair Plc, Severn Trent Plc, Smith (A.O.) Corp., Spirax-Sarco Engineering Plc, Tianjin Capital Environ-H, Toto Ltd., United Utilities Group Plc, Veolia Environment, Xylem Inc.

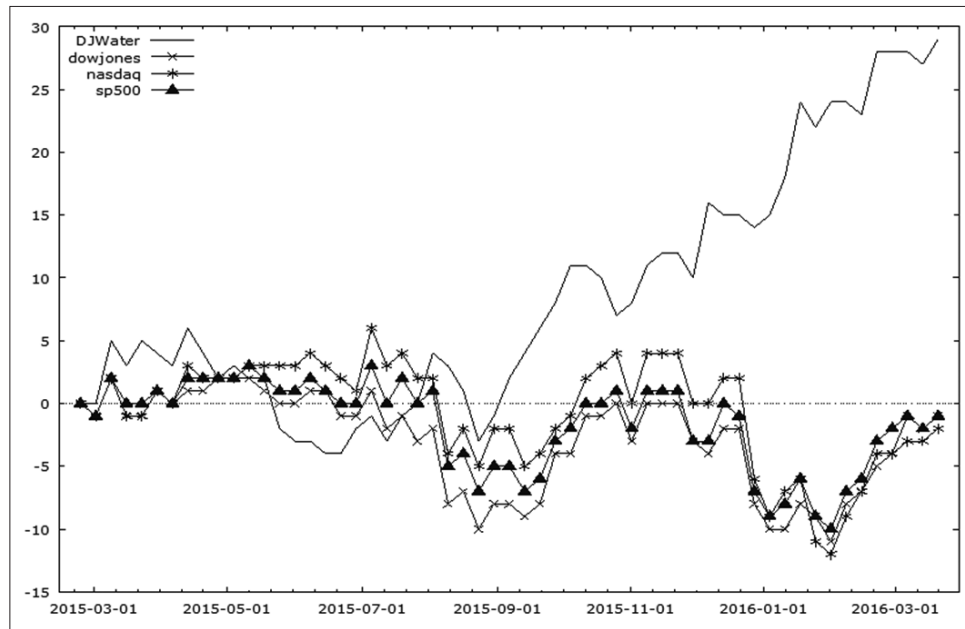
5 To calculate this changes we use differences on fixed based indices (start from the 1<sup>st</sup> week on March 2015) with weekly data referred to the last 12 months of the sample that correspond to high growth period observed before (Figure 2). In this way, it is possible evaluate the annual performance trend and calculate the trend rate of growth.

**Figure 2:** Trend of the two indices and the major companies of DJ US Water



Source: Datastream

**Figure 3:** Annualized performance DJ US Water, Dow Jones, Nasdaq e SP 500



Source: Datastream

**Table 1: Calculation of returns volatility**

Types of volatility	DJ US Water	Dow Jones	Nasdaq	SP 500
Volatility 1	11.222	3.777	5.052	3.809
Volatility 2 <sup>6</sup>	1.536	5.118	5.945	4.553

gap between the senior indices group and the DJ US Water Index seems to represent the pattern of speculative bubble. Despite the higher returns volatility (Table 1), the investors preferred to focus on a title perhaps riskier, as it is subject to a possible bubble, but more profitable. However, the volatility is insignificant if we consider only the volatility relative to returns lower than average of returns, as influenced by bullish expectations. In fact, investors are not averse to total volatility, but only to volatility that generates losses, i.e., returns lower than expected average returns. This situation refers to the last 6 months of sample, in which the DJ US Water Index volatility is considerably lower than the values of other indices and amounted to 1536. A strong market turbulence has characterized the period from

September to March 2015, mainly due to the volatility on Chinese stock market and the problems of European banks, causing periods of inaction on international stock exchanges.

In same situations, agents usually shift their liquidity towards market considered more resilient, as traded assets preserve intrinsic value, even in cases of high volatility. For instance, the market of safe havens such as gold and other precious metals.

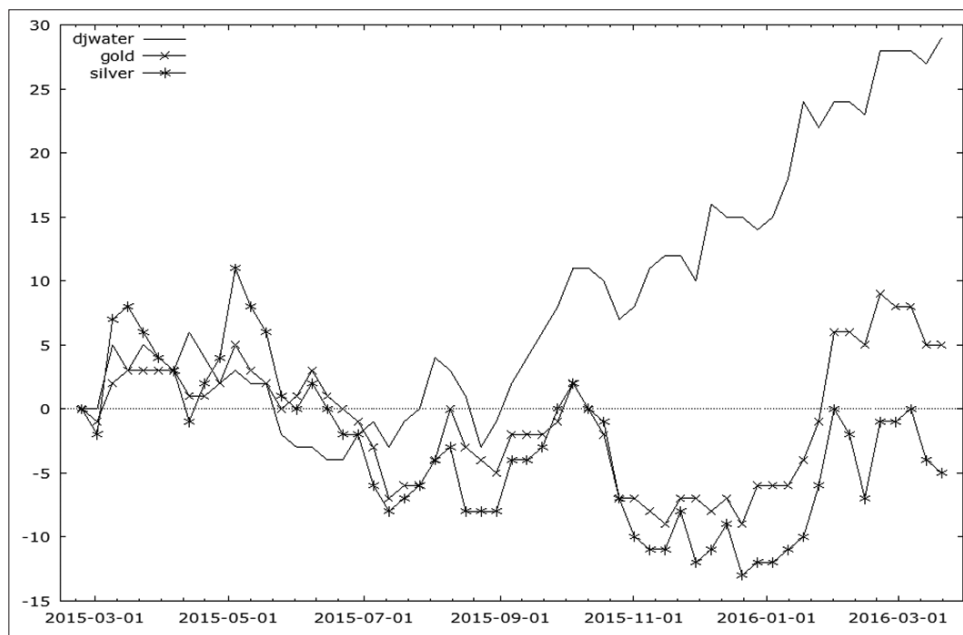
#### 4. IS THE WATER A SAFE HAVEN?

In this section we want to estimate the possibility that water, as a financial instrument, has played the role of safe haven. As the

6 We calculate the returns ( $r_i$ ) volatility using semi standard deviation:

$$\sqrt{\frac{\sum_{r_i < \bar{r}} (r_i - \bar{r})^2}{n}}$$

**Figure 4:** Price comparison between the water index and two commodities (gold and silver)



Source: Datastream

**Table 2: Correlation between DJ US water, gold and silver**

Variables	Time	Spearman R	P value
DJ US Water – Gold	1 years	0.3312	0.0000
DJ US Water – Silver	1 years	-0.0126	0.8238
DJ US Water – Gold	6 months	0.6034	0.0000
DJ US Water – Silver	6 months	0.4135	0.0000
DJ US Water – Gold	3 months	0.6277	0.0000
DJ US Water – Silver	3 months	0.5559	0.0000

**Table 3: Summary statistics**

Variables	Mean±SD	Minimum	Maximum	IQR	10-Trim	Pseudo SD
d.I_W	0.665±1.203	1.05	4.29	1.08	0.74	1.198
d.I_SP	1.756±1.215	2.08	7.52	1.96	1.72	1.208

SD: Standard deviation, IQR: Inter-quartile range

Figure 4 shows that it is a price comparison between the water index and two commodities (gold and silver) there is a similar trend in the water index and the safe havens especially during the time of financial instability (Angelo et al., 2010) and (Baur et al., 2010). The correlation analysis between the indices confirms our hypothesis, especially if the study is reduced to the last 6 months of our dataset. In this case, we can observe a significant correlation between all variables, with a value around 0.6 in recent months there is a greater volatility and market instability (Table 2). An explanation of this result could be the following: The instability generated a fear effect among investors who have started investing in the water title, with the effect of increasing the price. In addition, the relationship between the assets, suggests the possibility that in the future the water could be exchanged freely in the market. In that case we could be facing a new safe haven.

In order to verify, finally, the existence of a causal link between the period of instability and the growth of the water price index, we conducted a Granger causality test on SP 500 and DJ US Water.

**Table 4: Toda-Yamamoto test**

Dependent/independent	d.I_W	d.I_SP
d.I_W	1	2.903***
d.I_SP	1.085	1

\*\*\*P<0.01

Table 3 reports the summary statistics for the overall sample and we can see the Mean value of all variables is positive.

We can also observe that for each variable the 10-Trim values are near to the mean, as well as the standard deviation to the pseudo standard deviation, the inter-quartile range shows the absence of outliers in the observed sample.

Now, we want to verify the causal link between the variables considered through Toda-Yamamoto test (Table 4).

The test shows the existence of a large causal effect (measured in P value) between the performance of the SP 500 and the water

index in our time dataset. However, there isn't a reverse causality. This result leads us to conclude that the instability performance recorded in the financial markets (in our analysis we chose the SP 500) caused performance in the water price index confirming, quite possibly, our initial hypothesis: DJ US Water has played the role of safe haven for many investors.

## 5. CONCLUSIONS

Over the last few years, financial markets have recognized the important role played by the water. For this purpose, with this work we tried to show the causes underlying the development of that market by referring to the DJ US Water Index. Our analysis, initially, showed the likelihood that the choice continues to invest in the water index will generate, over time, a case of a speculative bubble. In addition, we have been able to verify, such as high index correlation between the values associated with the commodity during inactivity periods in the financial markets, it allows us to compare the growth in water stock market to that of the safe haven assets. This result was also confirmed in the Toda-Yamamoto test. In fact, our analysis it showed a unidirectional causality: SP 500 index cause in Granger sense the water index especially during a instability time in financial markets.

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