A-data: (BDTI TD3: 265,000mt, Middle East Gulf to Japan -- BDTI TD4: 260,000mt, West Africa to US Gulf)

B-data: (BDTI TD4: 260,000mt, West Africa to US Gulf -- BDTI TD5: 130,000mt, West Africa to USAC)

C-data: (BDTI TD3: 265,000mt, Middle East Gulf to Japan -- BDTI TD5: 130,000mt, West Africa to USAC)

Window size: 10—N/4, step 10

DCCA:

|  |  |  |  |
| --- | --- | --- | --- |
| Hurst Exponent | A-data | B-data | C-data |
| Period 1 | 0.629164172724 | 0.582080516556 | 0.584845054399 |
| Period 2 | 0.657615552802 | 0.625168149506 | 0.644580555957 |

DPXA:

|  |  |  |  |
| --- | --- | --- | --- |
| Hurst Exponent | A-data | B-data | C-data |
| Period 1 | 0.64642052322 | 0.605461409439 | 0.605239876561 |
| Period 2 | 0.719606428059 | 0.696333540565 | 0.6917151399 |

Hurst exponent:

1. DCCA, DPXA: 第二段hurst exponent都大于第一段。DPXA的增幅更大一些。说明油价是影响因素，但金融危机前后的核心因素可能综合/复杂无法分析定论。
2. DCCA: A>C>B; DPXA: A>B>C

从经验上来说，A-data有相同船型，B-data航线有相同的起点，C-data表面上没很大关系 -> hurst exponent A>B>C. DCCA得到了一个违背经验的结果。

1. DCCA, DPXA中从Period 1到Period 2，B-data和C-data之间hurst exponent的差异变大，可能是金融危机过后失去了一种共因，有待检验。
2. DCCA, DPXA的general hurst exponent 在同一时段都是极为相似的，说明DPXA是在DCCA基础上一个有效的改进。
3. DCCA, DPXA的图都是非线性的，证明是多分形的。第二段比第一段H\_q跨度更大，分形维度增加。原因是金融危机增强的价格波动。

左：DPXA第一段；右：DCCA第一段

左：DPXA第二段；右：DCCA第二段

τ直接反映分形维度，与上述结论契合。

左：DPXA第一段；右：DCCA第一段

左：DPXA第二段；右：DCCA第二段

DCCA:

|  |  |  |  |
| --- | --- | --- | --- |
| A-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.543721493526 | 0.131997360108 | 0.346151257186 |
| Period 2 | 0.937699541274 | 0.225516863086 | 0.374986838157 |

|  |  |  |  |
| --- | --- | --- | --- |
| B-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.445937498755 | 0.122667919129 | 0.367783967666 |
| Period 2 | 0.986317513834 | 0.242049886513 | 0.287474198852 |

|  |  |  |  |
| --- | --- | --- | --- |
| C-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.444380596776 | 0.127045583377 | 0.233746685628 |
| Period 2 | 0.808428650936 | 0.252472368934 | 0.27752723131 |

DPXA:

|  |  |  |  |
| --- | --- | --- | --- |
| A-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.540565040202 | 0.186711659211 | 0.25363934751 |
| Period 2 | 0.787511332712 | 0.235656256922 | 0.394384508475 |

|  |  |  |  |
| --- | --- | --- | --- |
| B-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.437005349856 | 0.172737397768 | 0.377896233765 |
| Period 2 | 0.805512696612 | 0.370777606646 | 0.286078788058 |

|  |  |  |  |
| --- | --- | --- | --- |
| C-data delta\_alfa | origin | random | surrogated |
| Period 1 | 0.472064905085 | 0.193455245563 | 0.256437374427 |
| Period 2 | 0.637337828689 | 0.260836346241 | 0.371092772816 |