

BLOCKCHAIN TECHNOLOGIES (COMP5125M)
COURSEWORK 1 by MARK STEPHEN
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1. Incentive Mechanism

The incentive mechanism used in my smart contract is variable pricing determined by the laws of demand and supply.

The laws of demand and supply respectively state that, *ceteris paribus* (other factors holding constant), the price of a product increases as its demand increases whereas the price of a product will decrease as its supply increases (Kinyanjui and Mwawaza, 2014).

Using this law, I have set up my variable pricing such that if total demand for energy in the market exceeds the total supply, the unit price for a unit of energy will go up from 1 Ethereum (ETH) to 1.25 ETH. Conversely, if total supply for energy in the market exceeds the total demand, the unit price for a unit of energy will go down from 1 Ethereum (ETH) to 0.75 ETH. Total energy demand in the market is gotten by totalling the units of energy demanded by the buyers. Total energy supply in the market is gotten by totalling the units of energy being offered by the sellers.

This law encourages free market economics - where there can never be a monopoly as the market is purely determined by the forces of demand and supply. This encourages many new sellers to enter the market to sell energy, thus increasing supply. This will consequently drive the price down. Lower prices will encourage buyers to purchase units of energy. This will incentivise stakeholders in the energy market to take part in energy trading.

2. Improvements

I have implemented two arrays, one for buyers and one for sellers. They act as queues such that my trade function loops through the buyer queue and seller queue matching buyers to sellers on a first-come-first serve basis.

This way, as soon as a unit of energy becomes available, it is automatically allocated to the next available buyer. In a way, this also incentivises stakeholders as the earlier they send a request, the sooner they trade.

3. Table of System's Behaviour in Implemented Scenario

To implement the test scenario, I created 20 QuickStart accounts on Ganache and preloaded each of them with 100 ETH. I then linked the Ganache Server to Remix IDE Desktop using the 'Dev – Ganache Provider' Environment plugin connected via the RPC Server URL.

I then compiled and deployed my script's Main smart contract and then registered each user onto the blockchain, deposited 10 ETH in each account and made varying buying and selling requests as per the coursework specification on the test scenario. Once completed, I executed the 'trade()' function. The process and results are shown in the table on the next page. In the test scenario supply exceeded demand so my incentive mechanism kicked in and the price for a unit of energy decreased from 1 ETH to 0.75 ETH.

PROSUMER ADDRESS	ENERGY STATUS BEFORE TRADING	SMART WALLET BALANCE BEFORE TRADING (ETH)	ENERGY STATUS AFTER TRADING	SMART WALLET BALANCE AFTER TRADING (ETH)
0xd5d3A33A7D293C1F63F48eE7F49DD18989e53dB6	-1	10	0	9.25
0x6c99b3065cBdEAb0208A160C03dfd5C3d9731b30	-2	10	0	8.5
0x4E053ba9F7f1b71233E165490826FAB8253F2D7D	-3	10	0	7.75
0xD1f843da7148E047627588c75445E0562ec6c312	-4	10	0	7
0xc1A0fe1C6940273DbD92C8413aa17A1b1AF5A46d	-5	10	0	6.25
0x05aB005F7cec6063fac693Ce665139A4E06eADe5	-6	10	0	5.5
0x5eAE0e6A31897A2059D36A5021f9f178817775FE	-5	10	0	6.25
0xE067949B1039c0E39eF3626A91d1D5eEc4967842	-4	10	0	7
0x5045df31f024045472b058E1CA75796746fc9844	-3	10	0	7.75
0x16A37a8a3300fD95818fF1c526C132BFD0154E29	-2	10	0	8.5
0x90a8cCc0988c1DB36ffE8E986c8f88381eB53BC7	1	10	0	10.75
0x767cd7aEC22CeCC8e09D5Ca51050dFf133c80382	2	10	0	11.5
0x00300fA69a5a2587BD0A9cc8D03e651A332a2593	3	10	0	12.25
0x9feAcf533473144c4aBbFBf33B2d4f3788b86dc1	4	10	0	13
0xbc381A82b0aABb37778e2cd816aae8d96403c632	5	10	0	13.75
0x7A1Ba56fe11bCf739D36561266fAa45ae5306BB1	6	10	0	14.5
0x947E7786bF7f3d594178CDC16dda9f8ECB6096Ef	7	10	0	15.25
0x3dBEABa246c6a1cb24821d9aCCc38F40c5f81907	8	10	1	15.25
0xDd08ff4B5255Eba4C693C9a9Aec98EdFe1f3793D	7	10	7	10
0x3f4251fED46Cc37bBf640Ee184EADA940Ca03Ca1	6	10	6	10

4. References

1. Kinyanjui, J. and Mwawaza, D. (2014) *A+ Revision Business Studies for KCSE*. Nairobi: Longhorn Publishers.