# Exploiting of fundamental interest rates inefficiency

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20 March 2014

# Exploiting of fundamental interest rates inefficiency

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**Abstract**

This article is a supplement to previously published paper [1]. It represents a theoretical example that demonstrates a strategy based on exploiting of found market inefficiency. It is fundamental. Thus, what markets without this inefficiency should be is an open question. It is connected to fluctuating interest rates. In original paper it was shown that in some cases they allow creation arbitrage strategies. However, it is possible to create such cases artificially.

**Introduction**

Example is rather simple. However, it contains complex processes. If we buy futures we buy some asset delivered at some moment in the future. By exchanging futures with different delivery times we can move asset farther or closer. This operation has a price, which reflects interest rate. The example shows that if price for moving asset from moment T1 to T2 is equal to price for moving asset from T2 to T3 then arbitrage is possible. This arbitrage could be very profitable. It was shown that such situation could be created any time.

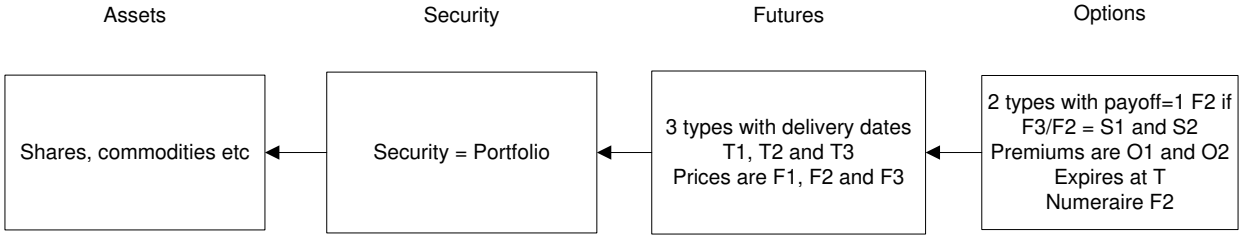
**Example**

Assume that we have a portfolio consisting of some amount of shares or other securities. We also have a security which price is equal to portfolio price or is part of it. This can be done through issuing asset-backed securities, mutual funds, issuing shares of public company and other mechanisms. Let there be futures on this security with delivery dates T1, T2 and T3. Their prices are F1, F2 and F3 correspondingly.

We can sell some shares in portfolio and pay their price to holders of our securities. If we a going to do this in the future and this information is open then this is reflected in today's price of futures on these securities. Price will fall. However, we will expect big dividends. We manage in such a way that

1. $\frac{F2}{F1}$ could take one of two possible values, S1 or S2, depending on shares price. $\frac{F2}{F1}$ is the exchange rate between F2 and F1, i.e. it is price for moving of delivery date. Initial ratio at T0 is S1.
2. $\frac{F3}{F2} = \frac{F2}{F1}$. This condition is like a case with constant interest rates.

Also there are two options with payoff equal to 1 F2 if $\frac{F3}{F2}$ is equal to S1 and S2. Expiration time is T. Premium is paid in F2. Premiums are O1 and O2 correspondingly.




Examine the case when we want to create a strategy that grants us constant payoff equal to 1 F3. Premium we also want to pay using F3. In this case we shall use both options and exchange premium and payoff, i.e. to pay premium we sell some amount of F3 to F2 (at price S1), and after exercising we sell payoff in F2 to F3 (at price S1 or S2). We need S1 options O1 and S2 options O2. They correspond to equal to 1 F3 payoff. Premium $S1 \cdot O1 + S2 \cdot O2$ we need to transform from F2 to F3. Premium in F3 of such strategy will be

$$\frac{S1 \cdot O1 + S2 \cdot O2}{S1} = O1 + \frac{S2}{S1} \cdot O2 = 1 \tag{1}$$

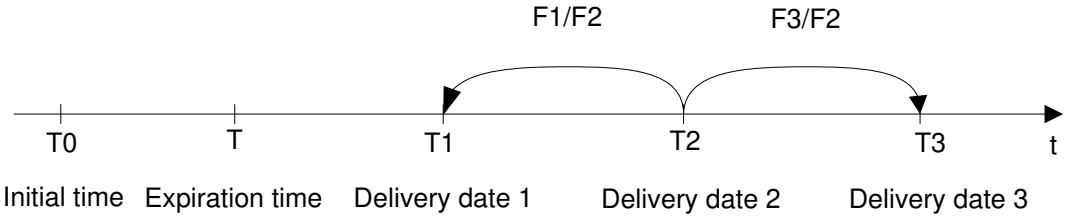
This premium has to be equal to 1 F3, because we cannot lend futures under some interest rate. 1F3 tomorrow cost 1 F3 today. Otherwise, we could create huge amount of futures on assets we own and lend them.

Analogously, for F2:

$$O1 + O2 = 1 \tag{2}$$

And for F1:

$$(\frac{1}{S1} \cdot O1 + \frac{1}{S2} \cdot O2) \cdot S1 = O1 + \frac{S1}{S2} \cdot O2 = 1 \tag{3}$$




We have three equations. After solving we get:

$$\frac{S2}{S1} = 1 \text{ or } O2 = 0. \tag{4}$$

Both conditions are not real. Consequently, we can buy, for example, 1 F3 for 0,5 F3. In this case arbitrage is possible. Only solution of this problem is our inability to manage our security in described above way. However, this means that shares became illiquid.

**Conclusion**

As we can see consequences to markets might be very significant because very profitable strategies are possible. This means that inefficiency that lies behind this example is very fundamental.

Described example is theoretical. It is too complex for practical use, but it demonstrates market opportunities very well.

**References**

1. Ivanov, Sergei A. (2014) Implied-in-prices expectations: Their role in arbitrage. AAPP | Physical, Mathematical, and Natural Sciences, vol. 92, Sl, B1. doi:10.1478/AAPP.92S1B1.