

# Testosterone levels predict city traders' profitability

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When City traders have high morning testosterone levels they make more than average profits for the rest of that day, researchers at the University of Cambridge have discovered.

The scientists hypothesize that this may be because testosterone has been found to increase confidence and appetite for risk – qualities that would augment the performance of any trader who had a positive expected return.

The influence of steroids naturally produced in the body (specifically testosterone and cortisol) may also provide insight into why people caught up in bubbles and crashes often find it difficult to make rational choices, unintentionally exacerbating financial crises.

Testosterone is a steroid hormone which controls competitive encounters as well as sexual behaviour. Testosterone in male athletes, for example, will rise prior to a competition and rise even further in a winning athlete (but decrease in a losing one). This increase of testosterone in the winner can increase confidence and risk taking and improve chances of winning yet again, leading to a positive-feedback loop termed the 'winner effect'. However, too much testosterone can have a detrimental affect on the ability to assess risk rationally.

In order to determine how hormone levels affect those working in the financial sector, the researchers followed 17 City of London male traders for eight consecutive business days. To measure the traders'

hormones, they took saliva samples twice per day at 11:00 a.m. and 4:00 p.m., times that fell before and after the bulk of the day's trading. At each sampling time, traders recorded their profit and loss (P&L).

Using the trader's previous trading history, the scientists determined a daily-average to which they could compare the test results. They found that daily testosterone levels were significantly higher on days when traders made more than their one-month daily average than on other days.

The researchers also speculated that if testosterone continued to rise or became chronically elevated, it could begin to have the opposite effect on a trader's profitability by increasing risk-taking to unprofitable levels. Previous studies have shown that administered testosterone can lead to irrational decision-making. They believe that this is because testosterone has also been found to lead to impulsivity and sensation seeking, to harmful risk taking, and in extreme cases (among users of anabolic steroids) to euphoria and mania.

Testosterone may therefore underlie a secondary consequence of the 'winner effect' in which a previous win in the markets leads to increased, and eventually irrational, risk taking in the next round of trading.

Professor Joe Herbert, Cambridge Centre for Brain Repair, said: "Market traders, like some other occupations (such as air traffic controllers), work under extreme pressure and the consequences of the rapid decisions they have to make can have profound consequences for them, and for the market as a whole. Our work suggests that these decisions may be biased by emotional and hormonal factors that have not so far been considered in any detail.

"Any theory of financial decision-making in the highly demanding environment of market trading now needs to take these hormonal

changes into account. Inappropriate risk-taking may be disastrous. Hormones may also be important for determining how well an individual trader performs in the highly stressful and competitive world of the market. We are now exploring this in much more detail.”

The researchers also examined the effects of increased levels of cortisol, a hormone which plays a role in our response to stress, on traders. They found that it rose when the variance of the market and traders P&L rose. The results suggested that cortisol responds to economic uncertainty.

During the study, traders experienced acutely raised cortisol in association with higher volatility in the markets and the increased chances of making money that higher volatility brings. The researchers suggest, however, that rising cortisol levels can reduce appetite for risk: that is, affect a trader’s risk taking in the opposite direction to testosterone. Cortisol is known to have powerful cognitive and emotional effects. Amongst these effects are heightened memory for adverse events, and alteration in mood.

Together, these effects would tend to decrease a trader’s risk taking. A situation of persistently elevated cortisol might occur if financial market volatility were to rise for an extended period, something that normally happens when the economy receives an unwelcome shock or enters a depression.

Cortisol is likely, therefore, to rise in a market crash and, by increasing risk aversion, to exaggerate the market’s downward movement. Testosterone, however, is likely to rise in a bubble and, by increasing risk taking, to exaggerate the market’s upward movement. These steroid feedback loops may help explain why people caught up in bubbles and crashes often find it difficult to make rational choices.

Dr. John Coates, lead author, said, "Rising levels of testosterone and

cortisol prepare traders for taking risk. However, if testosterone reaches physiological limits, as it might during a market bubble, it can turn risk-taking into a form of addiction, while extreme cortisol during a crash can make traders shun risk altogether."

Coates, himself a former trader, continued, "In the present credit crisis traders may feel the noxious effects of chronic cortisol exposure and end up in a psychological state known as 'learned helplessness'. If this happens central banks may lower interest rates only to find that traders still refuse to buy risky assets. At times like these economics has to consider the physiology of investors, not just their rationality."

The article 'Endogenous steroids and financial risk taking on a London trading floor' is in the 14 April 2008 edition of *Proceedings of the National Academy of Sciences*.

Source: University of Cambridge

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