

# QUARTERLY ECONOMIC NEWSLETTER



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## PUBLICATION INFORMATION

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## EDITORIAL

"Growth" is the word that defines the economic performance of EVE in Q4 2007. The period saw increases in total trade value and volume for all major categories on the EVE market. EVE's population surged upward after the release of Trinity, the massive graphics and world content expansion that included the release of blueprints for new types of starships. Numerous other technical issues were addressed to make the EVE experience better than ever before. Indeed, the fourth quarter of 2007 was a good quarter.

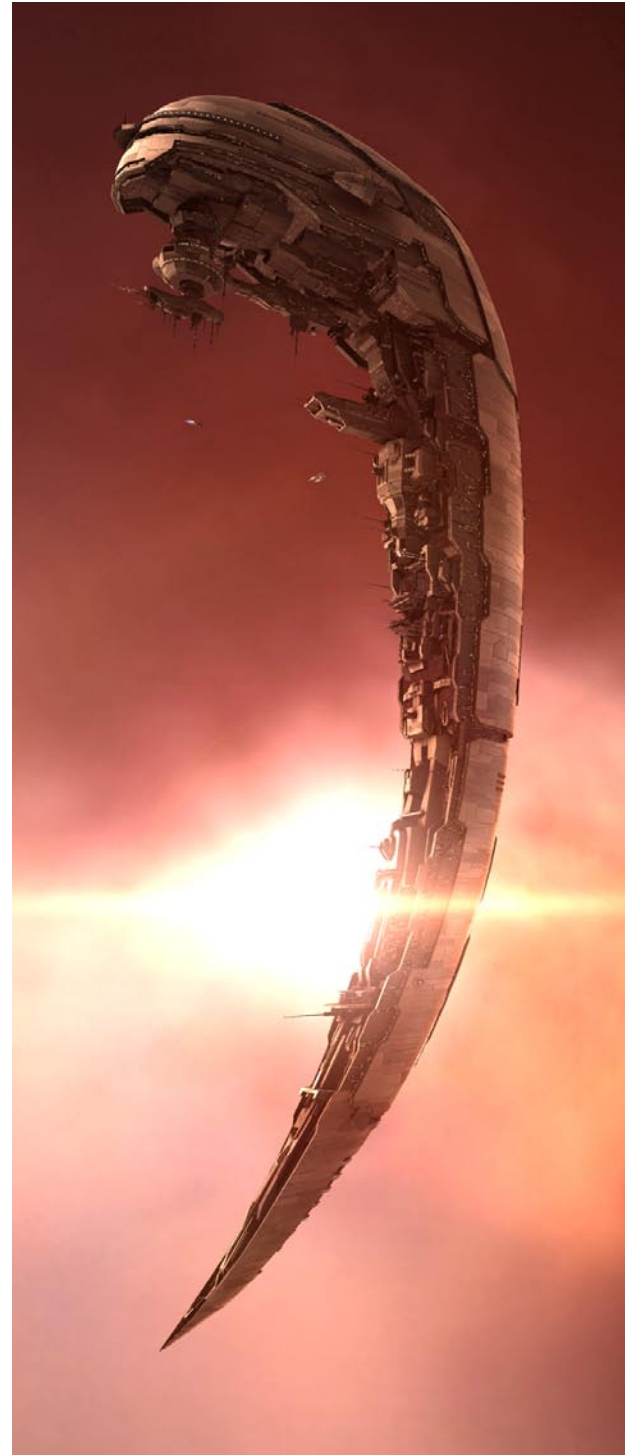
This strength stands in stark contrast to the economic situation faced by real life countries during the same period. With world financial markets reeling from credit troubles, economists are predicting a recession, and global central banks are scrambling to minimize the damage. Consumers are already impacted by the crisis and bracing for hard times. Because people from all over the world participate in EVE, the possibility exists that these real life economic events are affecting their behavior in the virtual universe as well. But to what extent will that happen? Will an economic recession cause decreased participation in the online world, or will the reduction in work hours (voluntarily or not) encourage people to spend more time producing virtual items in their online environment? In the case of fixed monthly subscriptions, the marginal cost of spending another minute in an online environment is zero when measured in monetary terms. Hence, people with more time on their hands might contribute more towards their online environment, stimulating growth in virtual economies. Thus production would shift from real life to another on-line universe. It will be very interesting to compare the growth of virtual economies with real world economies in the upcoming year. For EVE, economic growth will be observed by applying new methods to evaluate Gross User Product (GUP).

Without question, EVE will grow during 2008 as both an economy and as an emerging society. The environment will also be enhanced through expansions, and exciting new features such as factional warfare will be introduced. EVE will also reach the important milestone of having been online for five years on May 5th, 2008.

In fact, EVE will yet again move into uncharted territory by holding the first election of player representatives to the Council of Stellar Management (CSM). These representatives will be elected through a democratic process in which each player account has one vote to cast for a candidate of their choice. This will result in a new form of communication between EVE's residents and its "caretakers". We are very excited about the new CSM and have great expectations that it will be another step towards making EVE the most unique and intense virtual life experience available.

In this issue of the Quarterly Economic Newsletter, the focus will be the distribution of pilots, price levels, and how to measure economic activity in EVE. Step by step, our knowledge of the economic forces in EVE is increasing, guiding us closer towards the ability to make short-term economic forecasts for macroeconomic variables in EVE.

EVE will grow!



## DEMOGRAPHICS

The population of EVE grew sharply in Q4. This jump is attributed to the Trinity expansion and continued interest for EVE. By the end of 2007, there were 220,000 active subscribers representing 460,000 player characters—a 14% increase from the 192,000 subscribers on October 1st, 2007. The average number of characters per account fell from 2.2 at the end of Q3 to 2.04 at the end of Q4 2007. This is most likely due to the increased number of new subscribers that have not fully utilized their character options. Further growth is expected in subscriber numbers and thus characters as well. We therefore estimate that by the end of Q2 2008, we will have more than 250,000 subscribers representing 500,000+ characters in EVE.

EVE is a vast universe of more than 5000 solar systems distributed over 66 regions. Each region and each solar system is unique in terms of ore type combinations, quantities and distribution of agents. In such a vast environment where the risk and time cost of transportation between systems is significant, we decided to audit the movement of characters.

In our previous issue, we examined the location of pilots and found that 76% were located in high security areas (security status of 0.5 and above), 13% were in low security areas (security status between 0.1 and 0.4) and 9% were located in zero-zero space (security status of 0.0). During Q4, additional snapshots were taken to determine if previous findings could be verified. The number of systems visited was also examined to observe how pilots tend to move around within EVE.

During the last two weeks of Q4, a total of 6.85 million visits were made to solar systems by 252,000 characters. This means that about 210,000 characters stayed within the same system or were not accessed during this time. The characters that are not accessed or do not move between systems are most likely alternate characters for subscribers. We therefore assume that these jumps show us the movement of main characters on each subscription account and are therefore representative for the movement of the main population in EVE. The table to the right shows the number of visits within each space (zero-zero space, low-sec and high-sec). A total of 1.35 million visits were made to zero-zero space systems (19.6%), 743,000 visits were made to low-sec space (10.8%), and 4.76 million visits were made to high-sec solar systems (69.5%).

The first lesson from these findings is that zero-zero pilots tend to move around more than other pilots. This means that each character in zero-zero space visited more systems than did pilots in high-sec or low-sec. The explanation for this could simply be that zero-zero pilots have to travel much longer distances to reach main market hubs. The sheer vastness of zero-zero space alone probably forces pilots to make many jumps to access strategically important positions during fleet battles or zero-zero skirmishes.



Type of space	Visits	% share
0.0	1,345,519	19.6%
Low-sec	743,017	10.8%
High-sec	4,761,416	69.5%
<b>Total Visits</b>	<b>6,849,952</b>	<b>100.0%</b>

Table 1: Number of visits in each type of security space. The majority of visits are in high-sec regions, as expected. The relatively small number of pilots in zero-zero space actually make 20% of all system visits.



Pilots in higher security areas tend to be more localized, focusing on regular tasks such as running agent missions from a specific location. In the last two weeks of Q4, 49% of all pilots moved only within high security areas (high-sec), another 32% flew into low-sec and high-sec, and 19% of pilots travelled into all three security zones. Overall, 81% of pilots travelled to high-sec and/or low-sec only, and 19% travelled to zero-zero space.

Delving deeper into the jump logs reveals some more interesting information. Examining a list of the ten most visited solar systems (basically jumps between systems), we can see that it was Urlen, not Jita, that holds the top spot on the list. This is because Urlen is a crossroad that traffic from the southern and eastern regions must travel through on their way to Jita, in addition to being the crossroad for those travelling between the northern and southern high security regions.

Other systems on the top ten list within the Essence, Citadel, and Domain Regions are all on the trade route towards Jita.

In terms of regions, the highest number of solar system visits within a region is the Citadel. This is because there are several popular mission running solar systems, including Sivala and Kaaputenen, in addition to accommodating through-traffic from the southern regions. The Forge is the second most traveled region, with Lonetrek and Domain following close behind.

Additional snapshots taken over the period revealed a similar distribution of pilot location. At both peak hours and close to downtime, about 8% of pilots were located in zero-zero space, and 82% in low-sec and high-sec. They also showed that pilots today are mostly flying the same vessels that they were in October. However, the Kestrel frigate jumped up from third place to replace the Raven battleship as the most flown ship by the end of Q4, dropping the Raven to second place overall. The Caracal cruiser moves up the list as well, from ninth place to sixth. There are five industrial/mining ships on the top ten list, further supporting evidence from the last QEN that at any given time, a substantial portion of characters are involved in mining/trading and manufacturing rather than mission running or PvP operations. As expected, there are no Tech II ships on the top ten list. But with more than 25% of all pilots (125,000 characters) now qualified to fly Tech II ships, 2008 might be the year when some Tech II vessels finally make the list.

To summarize, the demographic overview for Q4 2007 shows the effect of new players arriving after the launch of Trinity. This change is expected to impact EVE during Q1 and Q2 of 2008, beginning with increased demand for Tech I products, and then an increased demand for Tech II ships as these new pilots train the skills necessary to fly and use Tech II equipment. Most pilots are located in high security areas, or about 70% - 80% at any given time. This number seems to be rather constant between Q3 and Q4 of 2007, and it will be interesting to see if that changes in 2008.

Category	Pilots	% share
Stayed in high-sec.	123,963	49%
Ventured into high-sec and low-sec	80,756	32%
Ventured into 0.0	48,459	19%
<b>Total</b>	<b>253,178</b>	<b>100%</b>

Category	Pilots	% share
Stayed out of 0.0	204,719	81%
Ventured into 0.0	48,459	19%
<b>Total</b>	<b>253,178</b>	<b>100%</b>

Table 2: Number of security space visits segmented by security level during the last two weeks of December 2007. Almost 50% of pilots never left high security areas (security status of 0.5 and above), and only 19% ventured into zero-zero space. In between, about 32% of pilots travelled between high-sec and low-sec areas. These numbers refer to characters that moved between at least two systems.

Solar System	Region	No. of visits
Urlen	The Forge	49,033
Jita	The Forge	48,463
Perimeter	The Forge	46,070
Renyn	Essence	37,981
Uedama	The Citadel	37,167
Kamio	The Citadel	36,134
Kaaputenen	The Citadel	35,896
Sivala	The Citadel	35,455
Madirmilire	Domain	34,708
Niarja	Domain	34,049

Table 3: Number of jumps per solar system. The three top systems are in the Forge due to the popularity of Jita as the premier trade hub for all of EVE. The top five systems are all on the route to Jita from various regions in EVE.



## INFLATION OR DEFLATION?

Price levels are measured by using four chained price indices: the mineral price index, primary producer price index, secondary producer price index, and consumer price index (for detailed clarification see QEN 3Q, 2007).

The monthly change in price indices is shown in figure 1. The data shows the monthly change from November 2006 through December 2007. During the first three quarters of 2007, there is a general price decline, or deflation, in EVE. This phenomenon was explained in detail in the last QEN, where it was shown that declines in production costs due to invention lead to a drastic cut in Tech II modules which again resulted in deflation.

But Q4 numbers for all price indices indicate that the period of deflation is over, with some inflation at all production and consumption levels. If there are price increases in minerals, it will lead to increased production costs for primary and secondary producers, who will pass these costs on to the final consumer. Hence, if there is inflation at the raw material level, it will eventually lead to increases in consumer prices. The short term changes depend on the current status of inventories, market efficiency, and effectiveness of the market systems. Thus it is possible to have different price developments at different production and consumption stages in the short run. Individual indices will be reviewed in the following sections, and as is evident from figure 1, there are some real differences in the development of prices in EVE.

### MINERAL PRICE INDEX

The mineral price index contains the eight basic minerals: isogen, megacyte, mexallon, morphite, nocxium, pyerite, tritanium, and zydrine. The weight depends on the relative trade value from the previous month and thus accounts for changes in trade patterns. This is important, since changes in trade patterns can happen quickly. For example, the share of megacyte decreased from 12.8% in October to 9.8% in December, while the share of tritanium increased from 22.4% to 29.8%.

During Q4 the price index for minerals declined in the first two months but then increased slightly in December. This change is shown in figure 2. In October, the price index declined by 2.1% despite an average 3.3% increase in the price of tritanium in the same month. The index decline for October and November was due to a price decrease in pyerite, megacyte, nocxium, and isogen. The mineral price index increased in December for the first time since June 2007. A general drop in supply (with the exception of tritanium) coupled with an increased demand for all minerals appears to be the main reason for the price increase in December. It is also apparent that the highest fluctuations occur during releases of new expansions for EVE, i.e. November/December 2006 (Revelations), June 2007 (Revelations II) and now in December of 2007 (Trinity). This indicates that the expectations surrounding the release of

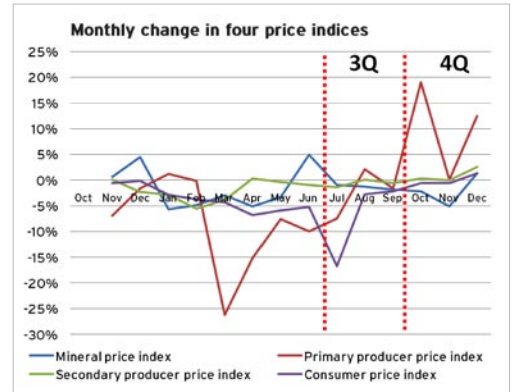


Figure 1: Monthly change in price levels for minerals, items for primary and secondary production, and final consumption goods. From November 2006 through June 2007, there is a general price deflation in EVE that stabilizes somewhat during Q3. This turns to price increases, i.e. inflation, in Q4.

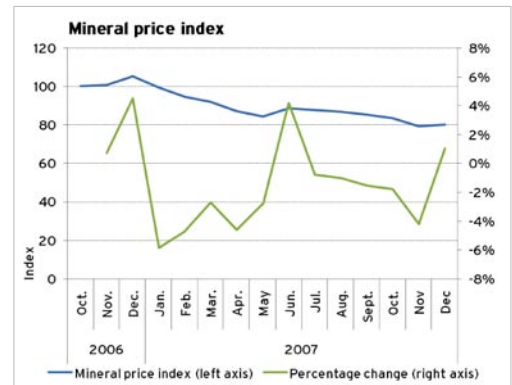


Figure 2: Mineral Price Index for all basic minerals. There has been a general decline in mineral prices during the past year, though with some relatively high fluctuation as well. It is interesting to note that the highest fluctuations are around releases of new expansions for EVE, i.e. November/December 2006 (Revelations), June 2007 (Revelations II) and now in December of 2007 (Trinity).

new content generally sends pilots into overtime preparing their businesses to handle the change.

Trade volume in isogen has been relatively stable throughout Q4, rising from 9.5 billion units in October to 10.7 billion units in November, and then returning to 9.5 billion units for December. After falling close to 30% by the end of Q3, unit prices hovered around the 65 ISK mark for most of Q4, with current prices dropping towards the 60 ISK level.

A total of 46.7 billion units of mexallon traded hands in October, a 1.3% decline in volume from September. Trade quantities for mexallon increased to almost 50 billion units in November before dropping to 43.6 billion units in December. Unit prices peaked early in Q4 at about 38 ISK, but fell to 35 ISK per unit by mid-November, remaining steady through December until recently dropping below 34 ISK per unit.

Pyerite is second only to tritanium in terms of manufacturing consumption and is an essential ingredient for the production of most modules and starships. Trade volume in pyrite decreased from 166.5 billion units in September to 162.5 billion units in October. A 12.5% jump in November to 183 billion units was followed by a modest decline to 164.5 billion units in December. Unit prices began Q4 at the 5.5 ISK level but declined steadily to a period low of 4.5 ISK per unit, rebounding somewhat in December. Pyerite is currently trading at just under 5.0 ISK per unit.

Trade in megacyte increased by 5.2% from September to October, and then jumped another 9.9% in November. But in December, trade fell by 15.6% to 345 million units, well beneath the 372 million units that exchanged hands in October.

Trade volume in morphite, the essential mineral for Tech II production, spiked 21% from September to October, and then an additional 6.3% in November for a total of 35.6 million units. But in December, trade volume dropped by 7.8%, close to October levels but staying above September figures. Total quantity traded in December amounted to 32.9 million units. But despite this significant increase in demand, prices remained relatively stable, fluctuating between 9,000 ISK and 10,000 ISK per unit. Prices had increased earlier in the year; in June, the price per unit rose from 4,000 ISK to a peak of around 11,000 ISK before retreating to the 9K - 10K range.

Nocxium trade increased slightly in October to 3.5 billion units, up from 3.4 billion units in September. But in November, trade leaped upwards by 19.5% to 4.2 billion units, and then receded 3.8 billion units in December. Price per unit continued to decline throughout Q4, starting at 150 ISK and falling to 110 ISK per unit. Prices are currently hovering at the 100 ISK level. Zydrine is the most traded high end mineral. In October, total trade volume reached 678 million units, up 3.8% from September. Trade increased to 730 million units in November before falling to 680 million units

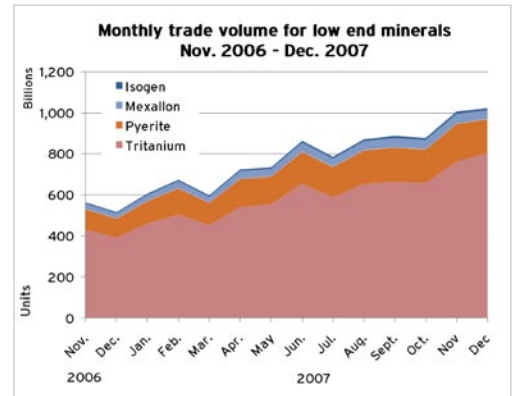


Figure 3: Monthly trade volume for low end minerals. Tritanium is the backbone of all mineral trade in EVE. Traded volume nearly doubled from about 430 billion units in November 2006 to more than 800 billion units in December. Other low-end mineral trade increased between 50% and 75% during this same time period, though the trade volume in those minerals is dwarfed compared to the tritanium trade.

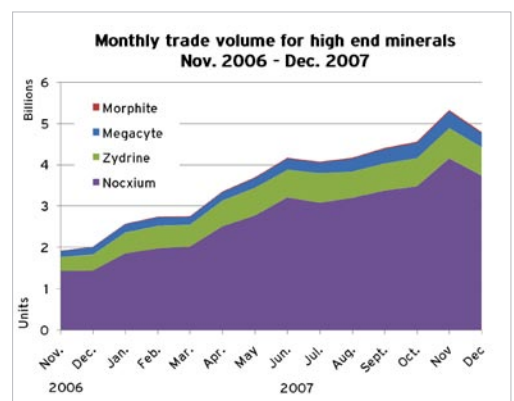


Figure 4: Monthly trade volume for high-end minerals. Nocxium trades the most quantity overall, with total volume increasing 260% since November 2006. However, morphite had the largest gain in trade volume for the same period, increasing some 340%. After a sharp increase in November 2007, trade volumes in all high-end minerals decreased for the first time in six months.

in December. Price per unit during the quarter rose from around 1,800 ISK to 2,200 ISK in December. Zydrine is currently trading between 2,400 and 2,500 ISK per unit.

Finally we have the almighty tritanium, the core ingredient of almost every manufactured item in EVE. By far the most traded low-end mineral, total volume rose from 659 trillion units in September to 805 trillion in December. It is the only mineral to increase in total volume for Q4. Price per unit rose sharply in September from 2.5 ISK to 3.6 ISK before declining steadily over the quarter, trading at 2.8 ISK per unit towards the end of December.

Mineral trade in Q4 was impacted by the expected release of the Trinity expansion. In general, trade volume increased from October through November, then declined in December. The total volume of low-end minerals has increased by 180% in the past year, while total volume for high-end minerals has increased by 250%. This shows the increased demand for high-end minerals due to Tech II production. With more possibilities to produce Tech II items, the relative demand for high-end minerals will probably increase in the near future, while demand for low-end minerals will grow in-line with economic growth in EVE.

#### PRIMARY PRODUCER PRICE INDEX

The primary producer price index rose steadily during Q4. This overall increase in primary producer price was fueled by increases in the price for prototypes, datafiles, and datacores. All of these items are required to obtain efficient blueprints through invention. Hence, as the types of Tech II ships available for production increases, and as producers learn the most efficient methods to produce these ships, the advanced components become highly sought after. In addition, game play changes were introduced in mid-2007. This change resulted in reduced supply and thus increased prices over the time period. With yet another increase in demand around the release of Trinity, prices for datafiles and datacores rose again, increasing the production cost for Tech II primary producers.

In November, prices of datacores and other invention material started to decrease, but an increase in the price of moon materials offset the price decreases in invention materials. In fact, the price increase in moon material was the single largest contributor to the increase in the PPPI for November.

In December, the PPPI jumped 14%. This increase was caused in large part by rises in the price of moon materials, which offset price decreases for invention modules. Other items generally rose in price between 5% and 50%, but with low trade volumes these items had a minor impact on the PPPI. The increase in prices of moon materials is due to increased demand for these raw materials after the launch of Trinity.

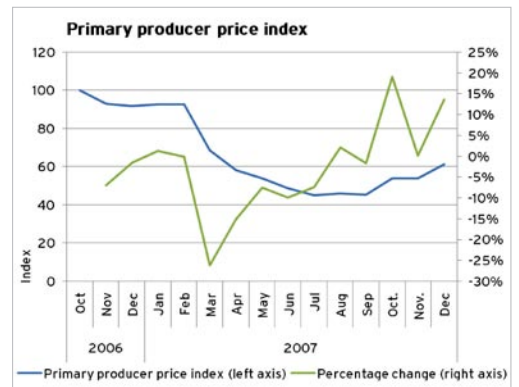


Figure 5: Primary Producer Price Index. The Primary Producer Price Index rose steadily during Q4, beginning with a nearly 20% price increase between September and October. This spike was initially fueled by a rise in datacore prices and other invention materials in October but then followed by increases in prices for moon material.



## SECONDARY PRODUCER PRICE INDEX

The Secondary Producer Price Index (SPPI) increased gradually throughout Q4. The index increased 0.3% in October, followed by a miniscule rise of just 0.01% in November, but then made a significant jump of 2.6% in December. The driver for the December price increase was materials required for Tech II production, such as starship construction components and salvaged materials, although a few items within this category have actually decreased in price.

Between November and December, the biggest contributors to the increase in the SPPI were salvaged Armor Plates (34% increase) and Alloyed Tritanium Bars (8% increase). Both are traded in large quantities, thus their share in the index is relatively significant. Other units on the top ten list of contributors to the SPPI increase were reactor units for Tech II starship production, i.e. Fusion, Nuclear, and Graviton Reactors.

Items that counterweighed the price increases in December include salvaged Fried Interface Circuits, Contaminated Nanite Compound, and Melted Capacitor Consoles. Some popular trade good commodities such as Gallente Alpha Nexus Chips and Amarr TIL-1 Nexus Chips decreased as well. Salvage material for rigs has been declining in price over the quarter, but seems to have rebounded during the first weeks of 2008.

After a period of relative stability beginning in July, the SPPI rose throughout Q4. Increases in both demand and price for raw materials is the most likely cause of the turnaround, as is the probability that most of the efficiency gains from inventions have been realized by now. This means that production is expected to run at current capacity given present pilot knowledge and skill efficiency. All indications point to an increase in producer prices during Q1 and Q2 of 2008, thus leading to an increase in consumer prices for EVE throughout the entire year of 2008.

## CONSUMER PRICE INDEX

After a decline from October to November, the Consumer Price Index (CPI) increased in December.

In late August, the Astronautic Engineering skill was mistakenly added to the market and promptly withdrawn from NPC supply. But the introduction produced an interesting effect for October. Although the skill is useless, it remains on the character sheet and appears to have become a collector's item. The original NPC asking price for the skill in September was 10 million ISK. By October, the skill was changing hands at a price of over 72 million ISK each, with total trade transactions reaching 128 billion ISK. The current offer price for the skill is in the 200 - 220 million ISK range.

Other notable items contributing to the increase in CPI for October is the Hulk mining ship, starship rigs, POS fuel, and the Sleipnir command ship. The combined trade value of these items was high,

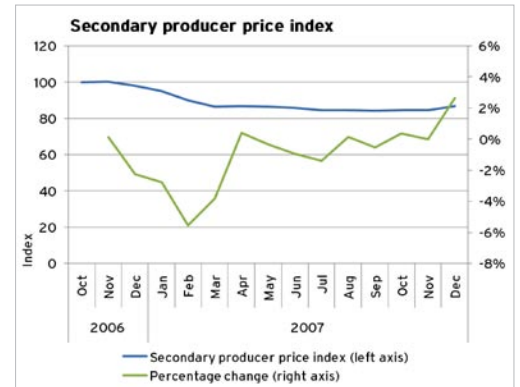


Figure 6: Secondary producer price index. After increasing slightly in October and November, the index takes a jump in December due to increases in the price of Tech II materials.

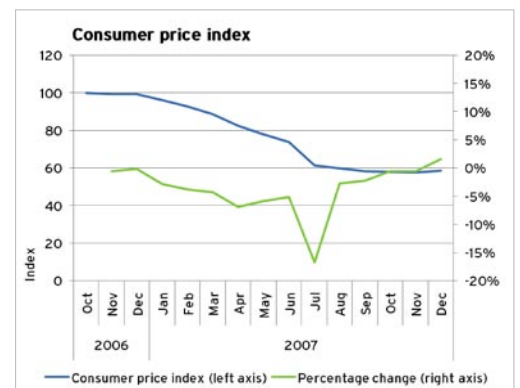
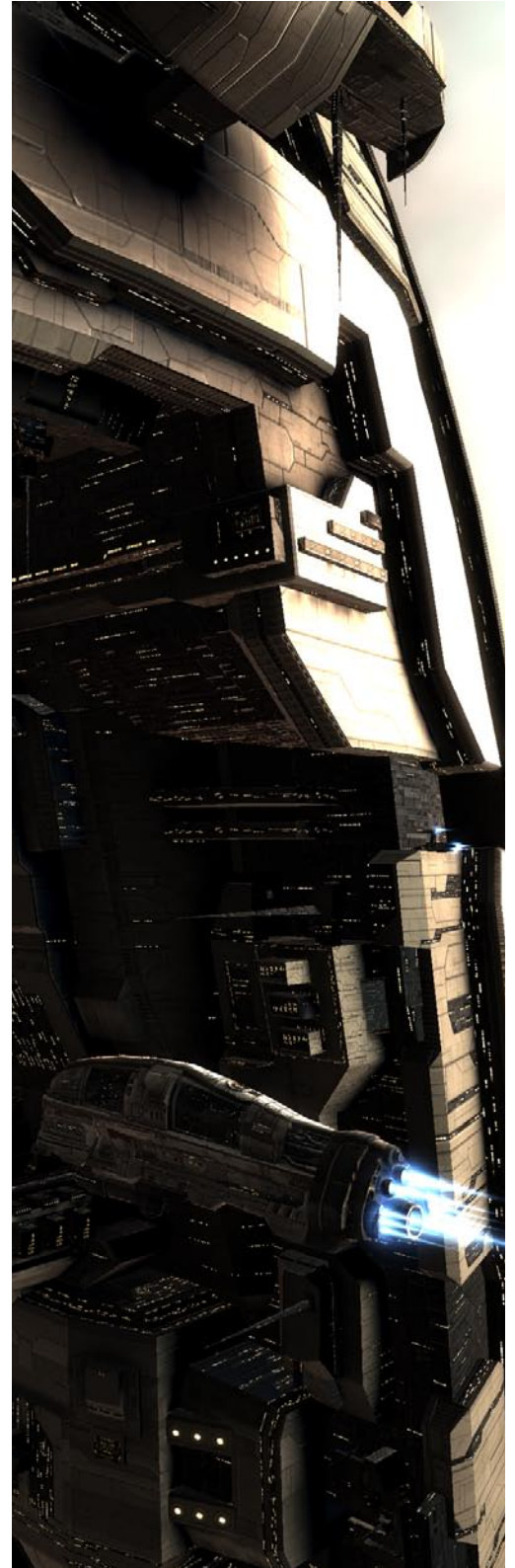


Figure 7: Consumer Price Index. The consumer price index was steady in the last half of 2007, with a slight increase in December.

as each of them rose in price between 7% and 45%. POS and jump drive fuel prices rose by 23.9%, causing a 1.1% increase in the CPI. Hardcore PvP corps are said to be organizing their own ice mining operations in response to these price increases.

The CPI continued to fall in November. The leading price decline items were the Hulk mining ship, Raven battleship, Tech I weapons, and other items used for mission running or PvP operations. POS fuel offset these price declines somewhat as isotope prices rose sharply. Price increases for the Sleipnir and Nighthawk command ships, plus a 24% rise in price for the Falcon force recon ship all helped to level the CPI for November. Overall, the CPI decreased by 0.61% between October and November, but then increased in December by 1.59%, or from the absolute value of 57.7 to 58.6. The average price of "Arbalest" Cruise Launchers jumped 86% from November to December, while at the same time the average for "Arbalest" Seige Launchers fell by 48% as players switched from torpedoes to cruise missiles. Encryption skill prices fell by 60.9% (a -0.6% effect on the CPI) since they can now be found in exploration sites instead of COSMOS sites. This significantly lowered the entry barrier to invention, which may result in downward pressure on Tech II prices. The increase in rig prices is attributed to the introduction of many advanced ships with Trinity. All of this upward pressure was offset with price reductions to Tech II modules that included the Damage Control II, Expanded Cargohold II, Cap Recharger II, and Warp Disruptor II. The Tech II Deimos heavy assault cruiser also dropped in price between September and October, further contributing to the CPI decrease for the period. It was also the first time in thirteen months when the CPI actually increased, or in other words, the first month in which deflation ceased and inflation began, as evidenced by increases in the price of POS fuel and Tech II items. Another notable observation for the period was the sharp price decline in torpedo armaments, versus the simultaneous price increase for cruise missile weaponry. This was the net effect of an attribute change that reduced torpedo range but increased the rate of fire (ROF), suggesting that the majority of pilots prefer range over ROF in combat.

This marks the beginning of a new period in EVE. The effects of invention have now been fully materialized through lower production costs for Tech II items. The supply of Tech II items has thus increased considerably over the past 12 months. With the introduction of Trinity, new Tech II ships increased the demand for Tech II components and modules. The population of EVE is also growing at a significant rate, and thus increased demand is expected during Q1 of 2008. We therefore anticipate low to medium level inflation to become evident over the next two quarters.



## GROSS USER PRODUCT<sup>1</sup>

### MEASURING PRODUCTION VALUE IN EVE - THE GROSS USER PRODUCT (GUP)

In a real-world economy, there is a need for a system that measures the level of production, economic growth, and changes in consumption, investment, and saving patterns. The measurement system of these and other macroeconomic variables is called The System of National Accounts (SNA), which is a guideline published by the United Nations Statistics Division. The aim of the SNA is to establish internationally consistent macroeconomic accounts, allowing for meaningful comparisons between different economies.

A similar system is needed for EVE and other online environments for measuring the total value of goods and services produced during a period of time within the boundaries of the virtual economy. In a real-world economy, this figure is called the Gross Domestic Product, or GDP. The GDP is the value of all goods and services produced in a period of time, minus the goods and services consumed in the production process during this period.

A measure of online production that serves the role of GDP should include the value of all services and virtual goods produced in the economy, minus the value of all services and virtual goods consumed in the production process. Developing such a measure provides a means of testing how the macroeconomic concepts of national accounting can be transferred to a virtual economy. The results give a quantifiable measure of the economic activity of participants in the economy, allowing for comparisons over time, and even between universes. Understanding the differences and similarities of virtual and real-world economies in the national accounting context also enhances the understanding of the economic system in both worlds.

### MEASURING AGGREGATE PRODUCTION

Flow diagrams, such as the one in the last [QEN](#) show how expenditures flow to producers and income flows to pilots. The diagram shows that for any economy, the total supply of goods and services must equal the total use of these goods and services.

It is possible to have three different definitions of GDP. First, there is the production approach to GDP, which specifies that GDP is the sum of value added to the economy. Second is the expenditure approach, which can be derived using the sum of total expenditures. Third, there is the income approach, which sums income for factor use at all levels. All three methods should - in theory - give the same outcome. In a report produced by the Helsinki Institute of Information Technology, these three different approaches to measuring the equivalent of GDP in the EVE economy are examined. But the first thing to decide is what to call the measure of GDP in

<sup>1</sup> This section is contributed by Tuukka Lehtiniemi, researcher at Helsinki Institute of Information Technology. The text is based on continuing research on macroeconomic indicators in virtual worlds.



EVE. "Gross Domestic Product" will not do, as "domestic" bears no significance in this context. The point of interest is the total product, in gross terms, of the user-controlled characters in the economy. This measure will be referred to as GUP, or Gross User Product.

#### VALUATION OF GOODS - VALUATION PRINCIPLES

The underlying principle of valuation of goods and services in SNA is the use of market or equivalent market prices, where they are available. When market prices are available, the task is relatively simple. Market prices of output are the economically significant prices agreed upon by those who are trading. The transaction parties, however, may have different perceptions of the market price due to net taxes on the goods. In short, basic prices measure the amount receivable by the producer for the purchase of a unit of output; producers' prices are basic prices plus net taxes on producers; and purchasers' prices are producers' prices plus net taxes on consumers, transport, and trade margins.

Goods in the markets of the EVE virtual economy are exchanged in many ways, such as using the market feature, auctioning in the contract system, forming verbal contracts, and bartering. The price agreed upon using the market feature is the best option for measuring general market prices. The prices of goods transacted through the market feature are unambiguous, as opposed to any other method of exchange, where multiple goods may be bundled together. Other prices are also more likely to be economically insignificant; that is, the production and purchase decisions are based on something other than the prices. The prices occurring in the markets are the minimum and maximum prices for a good that the producer and consumer, respectively, can find. Any transaction executed using the market feature is subject to the market tax mentioned above. The market tax is a proportional tax on the value of the transaction payable by the party that listed the buy or sell order. Therefore, the market prices inclusive of transaction taxes have properties of both producers' and purchasers' prices. Moreover, the size of the market tax varies according to certain skills of the listing party. For these reasons, despite the discrepancy between what the purchaser pays and the seller gets, the market prices shall be, as the first approximation, defined as the prices observed on the market, inclusive of taxes.

Market prices are used for products that have an observed market price, regardless of whether or not they are sold. That is, factor incomes paid in kind or self-account production are to be valued at market prices. For some goods, there are no market prices available. In EVE, such goods include any rare goods that are seldom exchanged. The largest, most complex goods are not sold using the market feature at all. Some goods are exchanged in the market, but not during each period. The SNA approach to valuing any production for which there are no reliable market prices





available is to use production costs as the second best alternative. The new final goods for which there are no market prices shall be, accordingly, included in GUP using production costs.

#### VALUATION IN PRACTICE

Production costs are defined in SNA as the sum of intermediate consumption, compensation of employees, consumption of fixed capital, and net taxes on production. The valuation scheme using production costs includes measuring only the costs of intermediate goods using market prices, ignoring user-dependent inefficiencies in material use. The value of partially used intermediate goods is included using the corresponding part of the total value – this most closely corresponds to consumption of fixed capital. Compensation to other factors of production is not considered. An estimate of compensation to other factors of production could be formed by first determining goods that are similar (production-wise) to the good in question, and then comparing the market prices of these goods to their material costs. This more complex valuation scheme is not attempted here. Some items that are produced by the alternative means of production described above cannot be manufactured at all. In the absence of market prices, these goods are valued, if possible, using the value of goods that can be produced by recycling the original good.

#### MEASURING GUP

In a more structured form, the GUP can be represented as:

$$GUP = C + I + E_x + E_{xs} - E_m - E_p$$

Where C is consumption of final goods, I stands for investments, and E stands for goods and services purchased by the environment (NPC purchases).  $E_x$  stands for NPC purchased goods,  $E_{xs}$  stands for services purchased by NPCs, and  $E_p$  stands for tax-like payments paid by corporations and pilots to NPCs, and  $E_m$  stands for intermediate goods bought from NPCs and used in the production of final goods.

Note that this formula does not produce GUP at basic prices, as final goods are still valued with observed market prices and only the paid taxes are excluded. There is, however, a practical difficulty of not being able to reliably discern between a newly produced good sold on the market, and an old good re-sold on the market. This overestimates GUP to some extent. However, the size of the market tax is rather small. As only a portion of the products are exchanged on the market, the effect of this decision is insignificant.

Next, there is the question of how to actually measure GUP in the EVE economy. Investment and consumption expenditures are difficult or impossible to separate, and not nearly all of the goods produced are sold using the market feature, or even sold at all. Thus, although all transactions with the environment can be measured, attempting to measure the different parts of GUP directly turns





out to be impractical. However, measuring the production of new final goods is possible. Adding up all values of final goods produced will end up measuring production of final consumption goods and production of fixed investments. Manufactured goods are measured directly by observing the completed manufacturing jobs. The types of destroyed NPC units have been logged, and probabilities of dropping different good types are available. The types of goods considered as final goods in this context are listed in table 4.

In terms of the equation above, the value of produced goods will include consumption of final goods (excluding services), fixed investments, and net exports of final consumption and investment goods (excluding intermediate goods and services).

These items should be included in the measure of GUP. However, two corrections have to be made. First, some final goods are produced from other final goods. The final goods used up in the production process should also be, and are, subtracted from the total value of produced final goods. Second, the value of investment goods purchased from the environment is, by assumption, included in the prices of final goods. Fixed investments and intermediate goods that the environment sells represent flows out of circulation, and should be subtracted from the value of produced final goods. The classes of goods that are considered fixed investments and intermediate goods that are purchased from the environment are blueprints, skills, and starbase-related purchases from the environment as investments, i.e. as adding to future production capacity. The latter two are not only investments, but have also consumption-like parts. The broad categorization of these two classes as investments obviously introduces some error in the GUP measure.

In addition to the items mentioned above, there are remaining items for the GUP equation. First, the value of intermediate goods sold to the environment should be included since they are produced by the users, but excluded from the value of final goods. Second, the total value of services sold to the environment should be included. Among these services are NPC bounty payouts and agent mission payouts, subtracted by the amount of collateral that the agents do not pay back because the mission is not achieved. Third, the net value of goods that can be bought from the environment and sold again with a higher price should be included in GUP. These goods are defined as those goods in the "Trade Goods" market category that are not listed as a material requirement for any other good. This definition also includes goods that are dropped by NPCs and sold to the environment, but are not final goods or listed in material requirements of other goods. Finally, the paid market taxes are subtracted from the sum of the above items to finally arrive at GUP. There are two categories of production that are not included in the above list of items, but should be included in a full computation of the GUP. These production types are increases in stocks of intermediate goods and services sold to other users. Both are left out due to difficulties in measuring them. These difficulties

Final goods in production
Ammo & Charges
Drones
Ship Equipments
Ships
Implants & Boosters
Ship Modifications

Table 4: Final good production by market category.



are mostly practical, though determining the value of services that users perform to each other is also partially difficult in principle.

## RESULTS

GUP measured at current prices does not, however, tell the whole story of the increase or decrease of user activity in the economy. The value of GUP seems to be dropping when the last two periods are compared. Prices have also been changing, declining steadily during the first half of 2007, and in fact are dropping rather fast at the end of the period presented. Chained multiplication of the links of the Fischer index yields a deflator that can be used to produce GUP values discounted to period 1. These GUP values, called real GUP values, are shown in figure 8 along with relative change in the GUP.

The figure shows a steady increase of real GUP from February through June of 2007. During the period the real value of production increases by almost 65%. This growth rate is clearly fluctuating, as can be seen from the rate of change in the figure but more observations would be needed to make statistical analysis relating growth rate to other variables. Note that the GUP figures are not averaged per capita or using any other method that takes the varying participation of users into account. The reasons for this growth are twofold. First, there has been a general increase in the population which leads to an overall growth in production. Hence, in the future, a measurement of GUP per character needs to be included. Second, prices of all major Tech II items and components for manufacturing of these items declined sharply during this same period. The decline in prices actually increases the relative value of production in June compared to January.

Examining the composition of the GUP reveals that the greatest single part of GUP is the manufacturing of final goods. But the contribution of other parts has been growing throughout the investigated time period as well. The share of services purchased by the environment has been growing most rapidly compared to the share of manufactures. Fixed investments to future production capacity, to the extent they are measured in this study, have also been growing. This, along with more details, will become available later this year with the formal publication of the HIIT report on macroeconomic indicators in virtual economies.

This is the first step towards creating an index for the value of production in EVE that can be used to measure economic growth. The aim is to be able to calculate an up-to-date value in our next issue of the Quarterly Economic Newsletter.

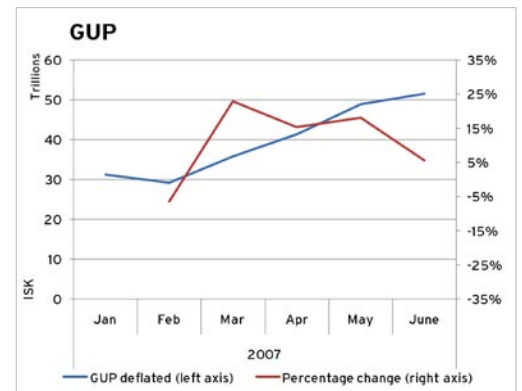


Figure 8: Gross User Product (GUP). This graph shows the equivalent of the GDP in real life. The blue line shows the GUP from January 2007 through June 2007. The red line shows the percentage change in GUP, or the monthly growth of the economy of EVE. The economy has been growing at the rate of 5% to 25% per month. The main reason for this growth is that production has been increasing and prices have been decreasing (due to invention), resulting in additional growth in the real Gross User Product.



## ECONOMIC AND MARKET SNAPSHOTS

The following figures reveal interesting changes in different markets. All quantities are for EVE as a whole, and all prices are weighted average prices across the entire universe.

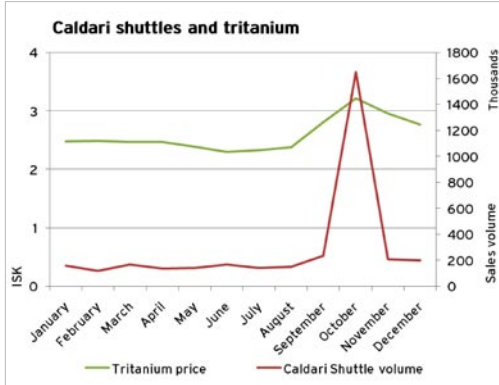


Figure 9: Price of tritanium (left axis) and sales volume of Caldari Shuttles. In October, when prices of Tritanium increased, the volume of shuttles traded also increased. Since prices of NPC-supplied Caldari shuttles are fixed, it is profitable for pilots to buy shuttles and reprocess them in order to use, or sell, the minerals. This results in a price cap at around 3.6 ISK per unit for Tritanium.

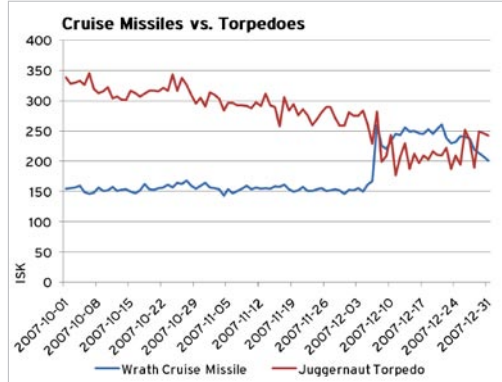
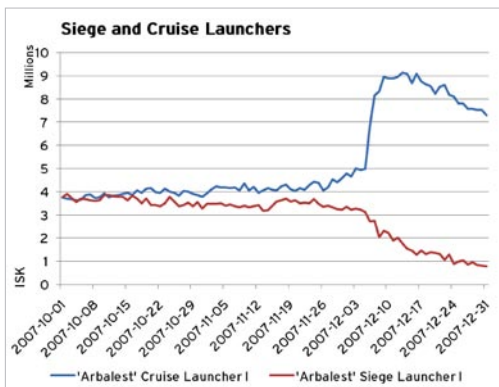


Figure 10: Trinity introduced a change to the attributes of torpedoes; they now have shorter range but a higher rate of fire. However, it seems that most pilots had valued the range since prices of torpedo launchers and torpedoes dropped by 60% to 70%, while price of cruise launchers skyrocketed. These figures clearly show changes in price for Siege Launchers and Cruise Launchers.

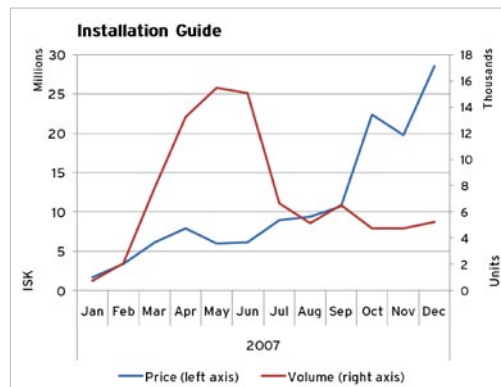


Figure 11: Installation guides are used to improve the likelihood of a successful invention job for Caldari Blueprints. With Revelations II, the supply of installation guides was reduced when they were no longer available through complexes. Initially, the effect on market prices was moderate. But during Q4, demand increased sharply, resulting in a doubling of the market price for installation guides. Similar items are available for other races, and the development of those markets have been similar to the development of the market for installation guides.

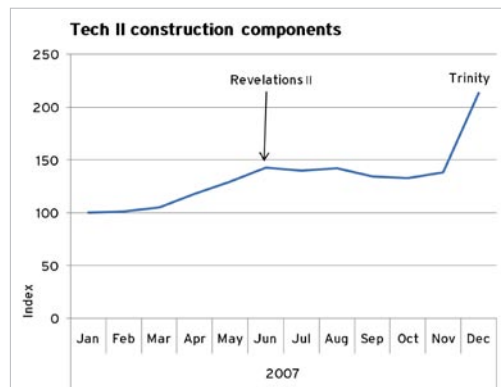


Figure 12: Tech II construction components doubled in price during 2007. Prices increased by almost 50% from January through June. Prices were stable throughout Q3 2007 and at the start of Q4. But in December prices jumped again by 50% because of increased demand for Tech II components, which in turn was consequent to the introduction of new starship types with the Trinity expansion.

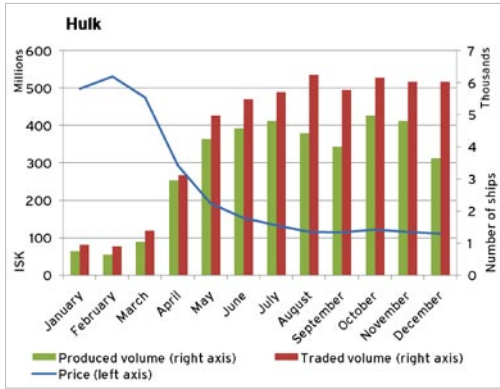


Figure 13: The price of the Hulk mining barge has dropped from 500 million ISK at the beginning of the year down to about 100 million ISK. At the same time, production has increased to a range of four to five thousand per month, dropping below 4000 units in December. Traded volume has been stable throughout the period.

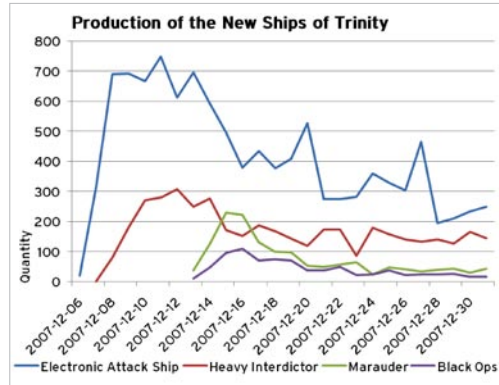


Figure 15: This figure shows daily production of ships introduced with the Trinity expansion. Electronic Attack Ships were the most popular, with daily production reaching more than 100 units just a week after the introduction of Trinity. All categories follow the same trend in which initial production is high for the first two weeks, and then recedes to relatively stable levels.

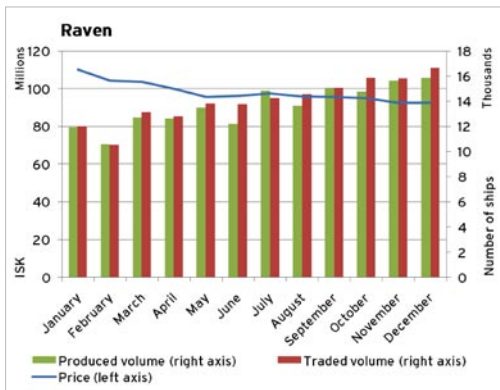


Figure 14: The Raven is still one of the most flown vessels in EVE. Production has been gradually increasing throughout the year, beginning at 12 thousand units per month and increasing to almost 16 thousand units in December. Price has also declined somewhat, or from 110 million ISK down to about 90 million ISK per ship. The Raven will probably continue to be popular throughout 2008.

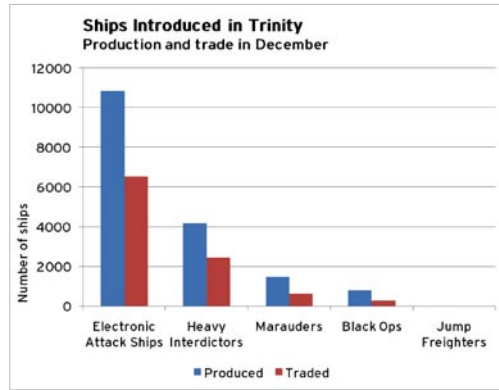


Figure 16: The Trinity expansion introduced several new vessels to EVE. This graph shows the total production of these ships during the first month of production (December 2007). Electronic Attack Ships were the most produced and traded with more than 10,000 units produced in December. Marauders and Black Ops are both based on Tech I battleships, but the Marauders have been produced and sold in higher quantities. The word is that the popularity of Marauders is due to the fact they are very good mission running ships.





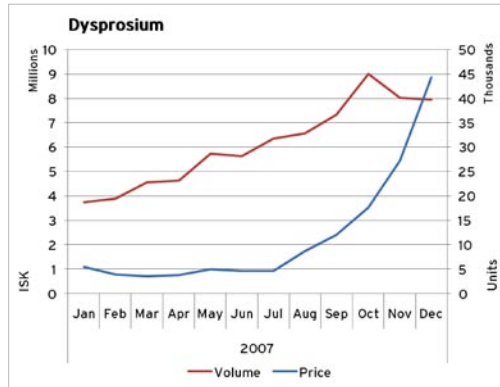


Figure 17: Dysprosium is one of the moon materials. The price of moon material has been increasing exponentially over the last two quarters despite the increased supply. Since moon material is a finite resource, it is expected that the price of these materials will increase further in the next quarter.

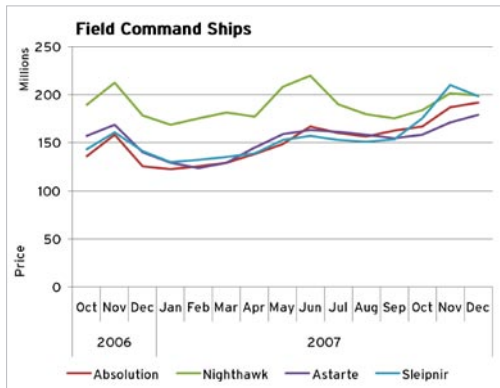


Figure 18: The price of field command ships increased during 2007, but at a varying rate. The Sleipnir has increased the most, or from around 150 million ISK to more than 200 million ISK per ship, while the Nighthawk has fluctuated around the 200 million ISK mark. Both the Absolution and Astarte have followed the price development of the Sleipnir. The interesting observation is that the price difference between these four vessels is less at the end of the year than in the beginning.



Figure 19: This figure shows the total value of all trades on the official EVE exchange market. This excludes direct trade between pilots as well as all contracts. From mid-November through December trade increased from just under 2 trillion ISK daily to more than 2.2 trillion ISK per day. Note how much this value can fluctuate on a daily basis. The effect of the Trinity launch is obvious on December 6th, and the huge spike in trade just four days later when total trade value reached 2.6 trillion ISK. This is yet another indicator which demonstrates that the economy of EVE is growing.







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