EVE Online Industry Cost and Profitability Calculator

This project is to determine which Tech II items I produce have the best margin?

- I'll have to collect
  - Market data for sell prices from evemarketer API
  - Find input materials in EVE SDE Database
  - Calculate research costs + job cost + taxes

Explore data for calculating materials cost from the EVE SDE.

Here are a few examples of what the sqlite3 SDE database looks like:

Input materials (materialTypeID and quantity) for some blueprint (typeID) and activity.

```
 * sqlite:///C://Users//micha//PythonProjects//eveindysql.sqlite
Done.
```

Out[4]:

typeID	activityID	materialTypeID	quantity
32773	1	35	1327
32773	1	36	481
32773	1	37	113
32775	1	34	1327
32775	1	35	481

The length of time required to complete an activity:

```
 * sqlite:///C://Users//micha//PythonProjects//eveindysql.sqlite
Done.
```

Out[5]:

typeID	activityID	time
32773	4	315
32773	3	315
32773	1	900
32773	5	720
32775	4	315

Product materials (productTypeID):

```
 * sqlite:///C://Users//micha//PythonProjects//eveindysql.sqlite
Done.
```

Out[6]:

typeID	activityID	productTypeID	quantity
32773	1	32772	1
32775	1	32774	1
32781	1	32780	1
32783	1	32782	100
32789	1	32788	1

Import naming data

Import a list of the names of items, which is actually not found in the SDE Database and I will import separately.

Out[7]:

	typeID	typeName
0	2	Corporation
1	3	Region
2	4	Constellation
3	5	Solar System
4	6	Sun G5 (Yellow)

Extract Data for testing

Time to extract the data from sql into Pandas, and start combining data.

This first table is a list of the products of a blueprint run.

```
 * sqlite:///C://Users//micha//PythonProjects//eveindysql.sqlite
Done.
```

Out[8]:

	typeID	activityID	productTypeID	quantity	materialName	typeName
0	32773	1	32772	1	Medium Ancillary Shield Booster	Medium Ancillary Shield Booster Blueprint
1	32775	1	32774	1	Small Ancillary Shield Booster	Small Ancillary Shield Booster Blueprint
2	32781	1	32780	1	X-Large Ancillary Shield Booster	X-Large Ancillary Shield Booster Blueprint
3	32783	1	32782	100	Defender Missile I	Defender Missile I Blueprint
4	32789	1	32788	1	Cambion	Cambion Blueprint

Input materials

```
 * sqlite:///C://Users//micha//PythonProjects//eveindysql.sqlite
Done.
```

Out[9]:

	typeID	activityID	materialTypeID	quantity	materialName	typeName
19291	25716	4	11464	1	R.Db - Kaalakiota	Heavy Assault Missile Launcher II Blueprint
19292	25716	4	9836	2	Consumer Electronics	Heavy Assault Missile Launcher II Blueprint
19293	25716	4	3814	3	Reports	Heavy Assault Missile Launcher II Blueprint
19294	25716	3	11464	1	R.Db - Kaalakiota	Heavy Assault Missile Launcher II Blueprint
19295	25716	3	9836	2	Consumer Electronics	Heavy Assault Missile Launcher II Blueprint

Testing API marketdata acess from evemarketer.

The https://wiki.eveuniversity.org/API_access_to_market_data has an example of how data should be formatted:

https://api.evemarketer.com/ec/marketstat?typeid=215,216 returns the market data for Iron Charge S (typeid 215) and Tungsten Charge S (typeid 216).
https://api.evemarketer.com/ec/marketstat/json?typeid=215 returns the market data for Iron Charge S (typeid 215) in JSON format. Jita (the system where the majority of trading happens) usesystem=30000142

Basic call form: https://api.evemarketer.com/ec/marketstat?typeid=<®ionlimit=|&usesystem=>

Retrieve Market Data from Evemarketer

To estimate a fair value for an item, we need to look at the market transactions and estimate a sales price for the time. For the remainder of the project I will stick with the median prices.

- Buy prices
  - Cost when you put up a "buy order" and wait for someone to sell to you.
- Sell prices
  - Cost when someone else has put up a "sell order" and you can purchase it instantly.

Evemarketer allows a maxmium of 200 items to be queried at a time, so we will have to loop through our item list 200 at a time.

The data comes back as a JSON format and is converted to a DataFrame.

Out[13]:

	buy.forQuery.bid	buy.forQuery.types	buy.forQuery.regions	buy.forQuery.systems	buy.forQuery.hours	buy.forQuery.minq	buy.volume	buy.wavg	buy.avg	buy.variance
0	True	[35]	[10000002]	[30000142]	24	1	1470424110	8.47	8.51	3.25
1	True	[36]	[10000002]	[30000142]	24	1	335922207	59.51	57.85	27.70
2	True	[37]	[10000002]	[30000142]	24	1	95207708	381.25	399.53	2837.74
3	True	[34]	[10000002]	[30000142]	24	1	10948841419	3.96	3.73	0.37
4	True	[38]	[10000002]	[30000142]	24	1	10743158	685.19	826.29	24346.67

5 rows × 35 columns

The market data has a lot of information, which we will pare down to indentifiers and median buy/sell values.

Join material inputs required and market data to calculate costs

Out[16]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
13067	Ballistic Control System II Blueprint	Mechanical Parts	1	12640.0	9228.0	12640.0	9228.0
13068	Ballistic Control System II Blueprint	Morphite	5	45000.0	36710.0	225000.0	183550.0
13069	Ballistic Control System II Blueprint	Miniature Electronics	5	19450.0	11990.0	97250.0	59950.0
13070	Ballistic Control System II Blueprint	Ballistic Control System I	1	133950.0	81515.0	133950.0	81515.0
13071	Ballistic Control System II Blueprint	Quantum Microprocessor	9	47000.0	10680.0	423000.0	96120.0
13072	Ballistic Control System II Blueprint	R.A.M.- Electronics	1	1179.5	626.4	1179.5	626.4

Tax Costs

There are 3 "taxes" on sales:

1. Broker's Fee
2. Re-list Fee
3. Sales Tax

Broker's Fee = 0.015 * (Order Value) at broker relations V with no standing
Re-list Fee = 0.0188 * (New Order Value - Old Order Value)
Sales Tax = 0.036 * (Order Value)

Now we can add the Broker's Fee and Sales Tax costs to the table of our products.

Out[19]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty	Brokers Fee	Sales Tax
0	Medium Ancillary Shield Booster Blueprint	Medium Ancillary Shield Booster	1	1363000.0	203700.00	1363000.0	203700.0	20445.00	49068.00
1	Small Ancillary Shield Booster Blueprint	Small Ancillary Shield Booster	1	66770.0	23600.00	66770.0	23600.0	1001.55	2403.72
2	X-Large Ancillary Shield Booster Blueprint	X-Large Ancillary Shield Booster	1	6692500.0	4200000.00	6692500.0	4200000.0	100387.50	240930.00
3	Defender Missile I Blueprint	Defender Missile I	100	8.0	2.92	800.0	292.0	12.00	28.80
4	Cambion Blueprint	Cambion	1	0.0	0.00	0.0	0.0	0.00	0.00

Now transform the costs to make them a "material" called Taxes and Fees. This will make it into our standard table format for combining with other data later:

Out[20]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	Medium Ancillary Shield Booster Blueprint	Taxes and Fees	1	69513.00	69513.00	69513.00	69513.00
1	Small Ancillary Shield Booster Blueprint	Taxes and Fees	1	3405.27	3405.27	3405.27	3405.27
2	X-Large Ancillary Shield Booster Blueprint	Taxes and Fees	1	341317.50	341317.50	341317.50	341317.50
3	Defender Missile I Blueprint	Taxes and Fees	1	40.80	40.80	40.80	40.80
4	Cambion Blueprint	Taxes and Fees	1	0.00	0.00	0.00	0.00

Job Costs

Job costs are bit more complicated than the taxes and fees.
Job cost is based on the sum of the Estimated Item Value (EIV) of the inputs (at ME=0) - but the EIV is not the actual market value. I will have to query the EVE Online ESI (https://esi.evetech.net/ui/) for the info.
Job cost = ((EIV * Cost Index) - structure bonus) * facility tax

Import EIV Data

The EIV Data includes an adjusted_price and an average_price. In this case we are interested in the adjusted_price for EIV calculations.

```
Index(['adjusted_price', 'average_price', 'type_id'], dtype='object')
```

Out[22]:

	adjusted_price	average_price	type_id
0	0.000000e+00	2.830583e+07	43691
1	1.120829e+06	1.361189e+06	32772
2	4.148429e+04	3.947443e+04	32774
3	0.000000e+00	2.751500e+08	49153
4	5.902139e+06	6.815159e+06	32780

Combine the EIV data with materials data

EIV is the sum of quantity * adjusted_price.

Out[24]:

	typeID	activityID	materialTypeID	quantity	materialName	typeName	adjusted_price	average_price	eiv_price
0	32773	1	35	1327	Pyerite	Medium Ancillary Shield Booster Blueprint	7.704728	10.69	10225.0
1	32773	1	36	481	Mexallon	Medium Ancillary Shield Booster Blueprint	38.143700	65.51	18348.0
2	32773	1	37	113	Isogen	Medium Ancillary Shield Booster Blueprint	90.317323	479.58	10206.0
3	32775	1	34	1327	Tritanium	Small Ancillary Shield Booster Blueprint	3.288613	4.26	4364.0
4	32775	1	35	481	Pyerite	Small Ancillary Shield Booster Blueprint	7.704728	10.69	3706.0

Now to make a "Job Cost" table

Similar to the Taxes and Fees table we will also make our new Job Cost table where we have a new entry with the materialName = "Job Cost" for adding our tables together later.
The job cost is the same regardless or buy or sell values, so every column will have the same entry.

Out[25]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	'Abatis' 100mm Steel Plates I Blueprint	Job Cost	1	20001.286272	20001.286272	20001.286272	20001.286272
1	'Alpha' Data Analyzer I Blueprint	Job Cost	1	636.438432	636.438432	636.438432	636.438432
2	'Arquebus' Heavy Beam Laser I Blueprint	Job Cost	1	117752.464056	117752.464056	117752.464056	117752.464056
3	'Augmented' Acolyte Blueprint	Job Cost	1	4064.879864	4064.879864	4064.879864	4064.879864
4	'Augmented' Berserker Blueprint	Job Cost	1	14264.830664	14264.830664	14264.830664	14264.830664

Invention Costs

"Invention" is chance based, so cost will have to be assumed on an averaged basis.
For example most T2 module BPCs have around a 47.3% chance to succeed with moderate skills.

Invention costs come from using datacores with a tech I version of the blueprint you would like to have a tech II blueprint of.

I think the best approach here is to make a list of all Tech II blueprints, then search for tech I blueprints by manipulating the name to combine them.

The below table is the cost for invention on the T1 blueprint, which can be added as a cost for datacores to the list of costs.
To account for the success chance of researching blueprints, the quantity will be adjusted to the average needed to make 1 item.

Out[29]:

	typeID	techIName	activityID	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
139	32982	Salvage Drone I Blueprint	8	Datacore - Electronic Engineering	0.211416	128200.0	74200.0	27103.594080	15687.103594
140	32982	Salvage Drone I Blueprint	8	Datacore - Graviton Physics	0.211416	156650.0	71385.0	33118.393235	15091.966173
253	33177	Scan Acquisition Array I Blueprint	8	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188
254	33177	Scan Acquisition Array I Blueprint	8	Datacore - Electronic Engineering	0.422833	128200.0	74200.0	54207.188161	31374.207188
261	33179	Scan Pinpointing Array I Blueprint	8	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188

Match tech I and II blueprints together.

Now that we have the costs for the invention jobs, match the tech I blueprint to the Tech II bluprint

Out[30]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
139	Salvage Drone II Blueprint	Datacore - Electronic Engineering	0.211416	128200.0	74200.0	27103.594080	15687.103594
140	Salvage Drone II Blueprint	Datacore - Graviton Physics	0.211416	156650.0	71385.0	33118.393235	15091.966173
253	Scan Acquisition Array II Blueprint	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188
254	Scan Acquisition Array II Blueprint	Datacore - Electronic Engineering	0.422833	128200.0	74200.0	54207.188161	31374.207188
261	Scan Pinpointing Array II Blueprint	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188

Data Review and Combining Cost Sources

To calculate the cost required:

- Collecting data from 1 SQL Server and 2 different APIs.

- Aggregating data into a usable format for 5 different sources of cost.
-

The value of the products

Out[31]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	Medium Ancillary Shield Booster Blueprint	Medium Ancillary Shield Booster	1	1363000.0	203700.00	1363000.0	203700.0
1	Small Ancillary Shield Booster Blueprint	Small Ancillary Shield Booster	1	66770.0	23600.00	66770.0	23600.0
2	X-Large Ancillary Shield Booster Blueprint	X-Large Ancillary Shield Booster	1	6692500.0	4200000.00	6692500.0	4200000.0
3	Defender Missile I Blueprint	Defender Missile I	100	8.0	2.92	800.0	292.0
4	Cambion Blueprint	Cambion	1	0.0	0.00	0.0	0.0

The cost of input materials

Out[32]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	Medium Ancillary Shield Booster Blueprint	Pyerite	1327	11.40	9.18	14683.20	11823.84
1	Medium Ancillary Shield Booster Blueprint	Mexallon	481	67.73	60.64	31629.91	28318.88
2	Medium Ancillary Shield Booster Blueprint	Isogen	113	675.00	366.10	74250.00	40271.00
3	Small Ancillary Shield Booster Blueprint	Tritanium	1327	4.75	4.00	6118.00	5152.00
4	Small Ancillary Shield Booster Blueprint	Pyerite	481	11.40	9.18	5323.80	4287.06

The cost of invention

Out[33]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
139	Salvage Drone II Blueprint	Datacore - Electronic Engineering	0.211416	128200.0	74200.0	27103.594080	15687.103594
140	Salvage Drone II Blueprint	Datacore - Graviton Physics	0.211416	156650.0	71385.0	33118.393235	15091.966173
253	Scan Acquisition Array II Blueprint	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188
254	Scan Acquisition Array II Blueprint	Datacore - Electronic Engineering	0.422833	128200.0	74200.0	54207.188161	31374.207188
261	Scan Pinpointing Array II Blueprint	Datacore - Electromagnetic Physics	0.422833	195800.0	74200.0	82790.697674	31374.207188

The cost of installing the job

Out[34]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	'Abatis' 100mm Steel Plates I Blueprint	Job Cost	1	20001.286272	20001.286272	20001.286272	20001.286272
1	'Alpha' Data Analyzer I Blueprint	Job Cost	1	636.438432	636.438432	636.438432	636.438432
2	'Arquebus' Heavy Beam Laser I Blueprint	Job Cost	1	117752.464056	117752.464056	117752.464056	117752.464056
3	'Augmented' Acolyte Blueprint	Job Cost	1	4064.879864	4064.879864	4064.879864	4064.879864
4	'Augmented' Berserker Blueprint	Job Cost	1	14264.830664	14264.830664	14264.830664	14264.830664

The cost of taxes

Out[35]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
0	Medium Ancillary Shield Booster Blueprint	Taxes and Fees	1	69513.00	69513.00	69513.00	69513.00
1	Small Ancillary Shield Booster Blueprint	Taxes and Fees	1	3405.27	3405.27	3405.27	3405.27
2	X-Large Ancillary Shield Booster Blueprint	Taxes and Fees	1	341317.50	341317.50	341317.50	341317.50
3	Defender Missile I Blueprint	Taxes and Fees	1	40.80	40.80	40.80	40.80
4	Cambion Blueprint	Taxes and Fees	1	0.00	0.00	0.00	0.00

Total Cost Table

As an example of the total cost table, here is a table with all of the costs related to "Heavy Assault Missile Launcher II" production:

Out[36]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
19297	Heavy Assault Missile Launcher II Blueprint	Heavy Assault Missile Launcher I	1.000000	116200.000000	26680.000000	116200.000000	26680.000000
19298	Heavy Assault Missile Launcher II Blueprint	Morphite	6.000000	45000.000000	36710.000000	270000.000000	220260.000000
19299	Heavy Assault Missile Launcher II Blueprint	Quantum Microprocessor	3.000000	47000.000000	10680.000000	141000.000000	32040.000000
19300	Heavy Assault Missile Launcher II Blueprint	Robotics	6.000000	94930.000000	87110.000000	569580.000000	522660.000000
19301	Heavy Assault Missile Launcher II Blueprint	R.A.M.- Weapon Tech	1.000000	999.900000	601.950000	999.900000	601.950000
20919	Heavy Assault Missile Launcher II Blueprint	Datacore - Nuclear Physics	0.422833	270750.000000	74190.000000	114482.029598	31369.978858
20920	Heavy Assault Missile Launcher II Blueprint	Datacore - Rocket Science	0.422833	128400.000000	80280.000000	54291.754757	33945.031712
2509	Heavy Assault Missile Launcher II Blueprint	Job Cost	1.000000	9615.980536	9615.980536	9615.980536	9615.980536
3025	Heavy Assault Missile Launcher II Blueprint	Taxes and Fees	1.000000	71400.000000	71400.000000	71400.000000	71400.000000

Analysis

I'll start by only plotting the Tech II blueprints I own, because they are the items I am interested in producing

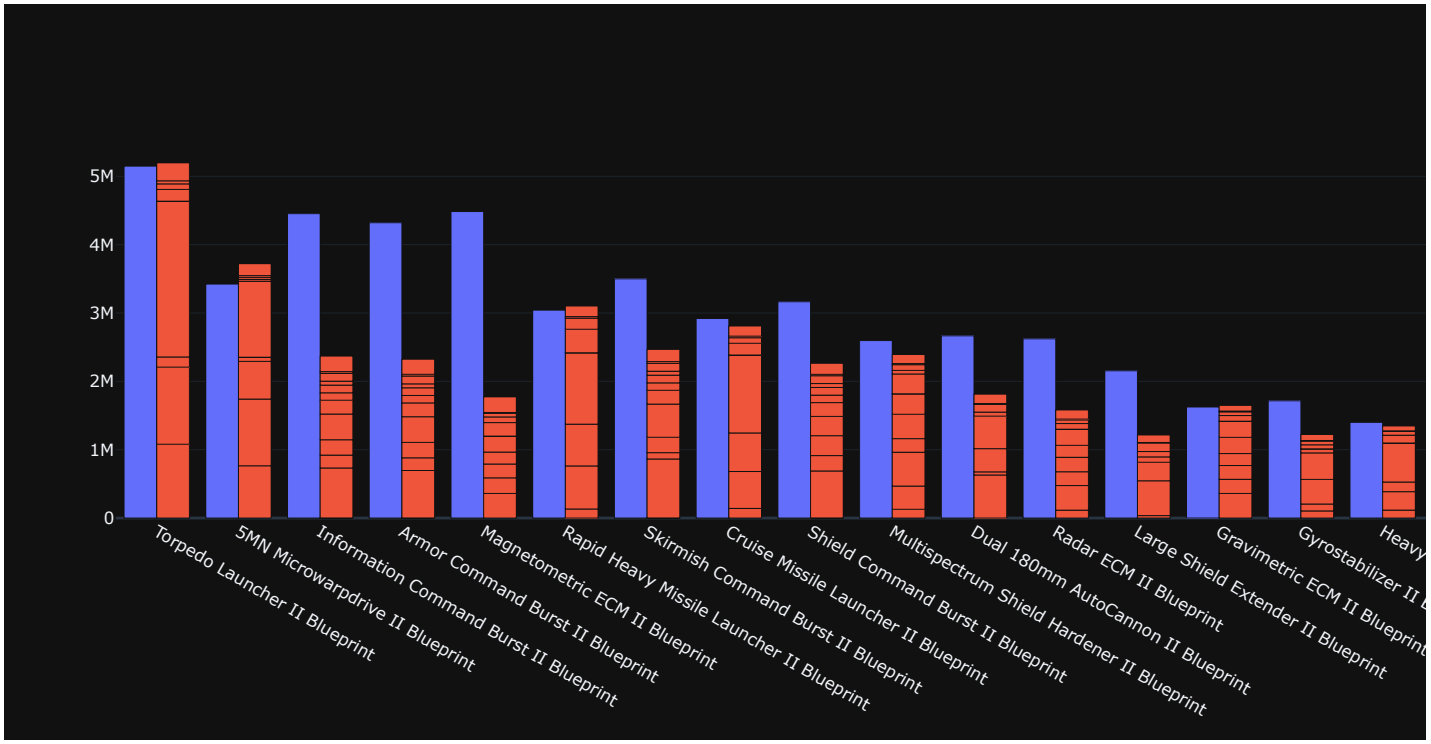
Plus, there are a TON of blueprints and that lowers the size greatly.

Out[38]:

	typeName	materialName	quantity	sell.median	buy.median	s.median.qty	b.median.qty
477	5MN Microwarpdrive II Blueprint	5MN Microwarpdrive II	1	3423500.0	2173500.0	3423500.0	2173500.0
892	Rapid Light Missile Launcher II Blueprint	Rapid Light Missile Launcher II	1	910000.0	708300.0	910000.0	708300.0
921	Damage Control II Blueprint	Damage Control II	1	413400.0	345400.0	413400.0	345400.0
1005	Multispectrum Shield Hardener II Blueprint	Multispectrum Shield Hardener II	1	2597000.0	1570000.0	2597000.0	1570000.0
1043	Torpedo Launcher II Blueprint	Torpedo Launcher II	1	5149000.0	4385000.0	5149000.0	4385000.0

Costs and Product Value Chart

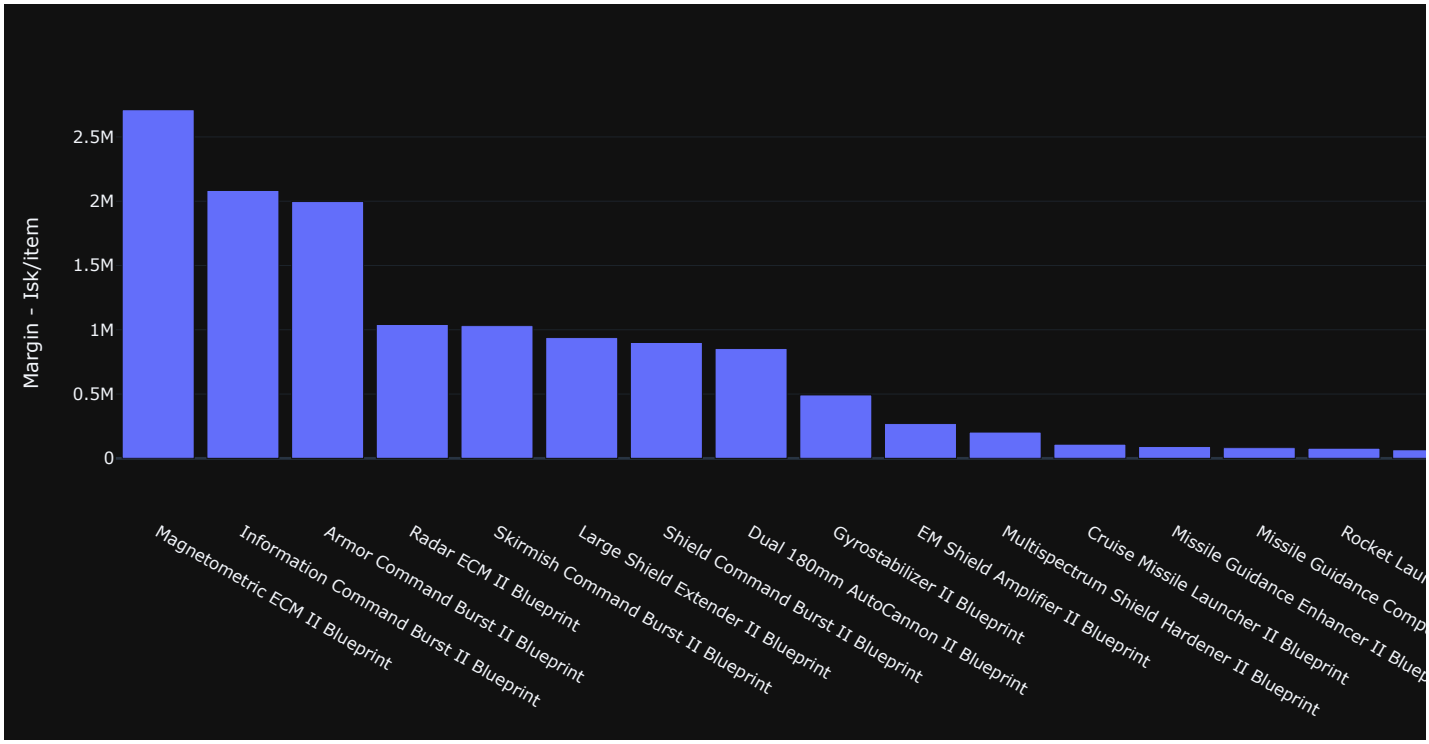
Side-by-side comparison of product sales value and costs to produce. Prices are in ISK at Jita Sell Value (JSV).



Margin Table

Blueprint	Margin (per item)
Magnetometric ECM II Blueprint	2711552
Information Command Burst II Blueprint	2083497
Armor Command Burst II Blueprint	1997308
Radar ECM II Blueprint	1040912
Skirmish Command Burst II Blueprint	1032422
Large Shield Extender II Blueprint	939361
Shield Command Burst II Blueprint	900996
Dual 180mm AutoCannon II Blueprint	854011
Gyrostabilizer II Blueprint	493185
EM Shield Amplifier II Blueprint	270571
Multispectrum Shield Hardener II Blueprint	204151
Cruise Missile Launcher II Blueprint	109812
Missile Guidance Enhancer II Blueprint	91837
Missile Guidance Computer II Blueprint	83214
Rocket Launcher II Blueprint	78481
Rapid Light Missile Launcher II Blueprint	66592
Nanofiber Internal Structure II Blueprint	54262
Heavy Assault Missile Launcher II Blueprint	52430
Medium Shield Extender II Blueprint	-8454
Damage Control II Blueprint	-9759
Gravimetric ECM II Blueprint	-23195
Torpedo Launcher II Blueprint	-48125
Rapid Heavy Missile Launcher II Blueprint	-60909
Ballistic Control System II Blueprint	-66157
5MN Microwarpdrive II Blueprint	-298119

Margin Chart


Margin - Isk/item
2.5M
2M
1.5M
1M
0.5M
0
Magnetometric ECM II Blueprint
Information Command Burst II Blueprint
Armor Command Burst II Blueprint
Radar ECM II Blueprint
Skirmish Command Burst II Blueprint
Large Shield Extender II Blueprint
Shield Command Burst II Blueprint
Dual 180mm AutoCannon II Blueprint
Gyrostabilizer II Blueprint
EM Shield Amplifier II Blueprint
Multispectrum Shield Hardener II Blueprint
Cruise Missile Launcher II Blueprint
Missile Guidance Enhancer II Blueprint
Missile Guidance Comp
Rocket Laun