WELCOME!

PLEASE COMPLETE THE FOLLOWING STEPS:

• Register using the following link: [http://tinyurl.com/yc8umf3h](http://tinyurl.com/yc8umf3h)

• ‘Like’ Akuna’s most recent Instagram post (@akunacapital) and follow us on Facebook!

• Look at Akuna’s website: [www.akunacapital.com/careers](http://www.akunacapital.com/careers) for our all of our job postings
THE NEW WAVE IN TECH AND TRADING

Quant Trading and Research at Akuna Capital

Xiongjie Yu
September 13, 2018
Outline

• My background
• History of Akuna
• Intro to trading, options, and futures
• My experience (crypto and valuation research)
• Different roles at Akuna’s quant trading and research team
• Leveraging your physics degree
• Q&A
My background

• PhD in Physics at UIUC from Bryan Clark group, Dec. 2017
  • Worked on many-body localization systems
  • A big part of my research was numerical (C++, python)

• Interned at Akuna in Summer 2016, started full time in Jan. 2018
  • Option beta risk model
  • Crypto currency
  • Valuation research
WHO WE ARE

- Founded in 2011 by Andrew Killion (CEO) and Mitchell Skinner (Head of Trading).

- Akuna Capital derives its name from Akuna Bay in Australia where Andrew spent many weekends cycling and forming the concepts that would guide Akuna Capital’s future.

- Provide liquidity to the derivatives market; primarily serving as options market makers

WHAT WE DO

- Options Market Making
- Relative Value Trading
- Index Products
- Commodities
Offices in:
- Chicago, Illinois ~180
- Shanghai, China ~35
- Boston, Massachusetts ~ 5
- Sydney, Australia ~ 21

Total ~241
Trading, Not Gambling

• Gambling:
  • “I am feeling lucky! All in!”

• Trading:
  • “I want to maximize profits of my strategies subject to risk constraints.”
    • Latency based strategies
    • Correlation based strategies
Options and Futures 101

- **Future:**
  - A legal agreement to buy or sell something at $K at time T

- **Option:**
  - The right, not the obligation, to buy (call) or sell (put) at $K at time T

- **Hedging:**
  - Manage risk exposure by holding offsetting positions
    - “Buy 1 call and sell Δ futures”
OPTIONS MARKET-MAKING

• Buy/sell options to provide liquidity
• Try to capture price spread
• In practice to be profitable
  • Pricing
  • Speed
  • Signals
  • Risk management
My Experience – Valuation Research

What is valuation?

• **Fair price** of an instrument
• **Input** to an option’s price and delta hedging strategy
• **Opinion** about the current market condition
My Experience – Valuation Research

Why is it complicated?

- Price levels are discrete, people buy (“bid”) or sell (“ask”) at different prices

Sounds like a stat mech problem. But, is it in equilibrium state?
Why is it complicated?

- Price levels are discrete, people buy ("bid") or sell ("ask") at separated prices
- Supply and demand can change due to many different order types
- The same/similar instruments are available on different markets
- Market information now is not always the information you can act on.

Sounds like a stat mech problem.
But, is it in equilibrium state?
# My Experience – Crypto Currency

Crypto currencies are traded globally on internet and listed exchanges

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Adj. Vol (24h)*</th>
<th>Volume (24h)</th>
<th>Volume (7d)</th>
<th>Volume (30d)</th>
<th>No. Markets</th>
<th>Change (24h)</th>
<th>Vol Graph (7d)</th>
<th>Launched</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Binance</td>
<td>$1,087,161,536</td>
<td>$1,067,161,536</td>
<td>$5,456,031,296</td>
<td>$32,067,216,552</td>
<td>312</td>
<td>18.96%</td>
<td><img src="image1" alt="Graph" /></td>
<td>Jul 2017</td>
</tr>
<tr>
<td>2</td>
<td>OKEx</td>
<td>$859,436,788</td>
<td>$859,436,788</td>
<td>$4,703,519,488</td>
<td>$25,806,818,304</td>
<td>507</td>
<td>7.91%</td>
<td><img src="image2" alt="Graph" /></td>
<td>Jan 2014</td>
</tr>
<tr>
<td>3</td>
<td>Huobi</td>
<td>$847,843,183</td>
<td>$647,843,183</td>
<td>$3,233,220,224</td>
<td>$19,781,180,098</td>
<td>276</td>
<td>13.76%</td>
<td><img src="image3" alt="Graph" /></td>
<td>Sep 2013</td>
</tr>
<tr>
<td>4</td>
<td>Bitfinex</td>
<td>$494,920,779</td>
<td>$494,920,779</td>
<td>$2,276,809,456</td>
<td>$13,886,410,120</td>
<td>82</td>
<td>12.88%</td>
<td><img src="image4" alt="Graph" /></td>
<td>Oct 2012</td>
</tr>
<tr>
<td>5</td>
<td>ZB.COM</td>
<td>$367,713,378</td>
<td>$367,713,378</td>
<td>$2,095,351,520</td>
<td>$9,545,001,594</td>
<td>77</td>
<td>11.67%</td>
<td><img src="image5" alt="Graph" /></td>
<td>Nov 2017</td>
</tr>
<tr>
<td>6</td>
<td>Bithumb</td>
<td>$346,257,733</td>
<td>$346,257,733</td>
<td>$2,013,490,368</td>
<td>$8,094,055,168</td>
<td>42</td>
<td>5.08%</td>
<td><img src="image6" alt="Graph" /></td>
<td>Jun 2016</td>
</tr>
<tr>
<td>7</td>
<td>HuBTC</td>
<td>$308,837,979</td>
<td>$308,837,979</td>
<td>$1,876,426,864</td>
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<td><img src="image7" alt="Graph" /></td>
<td>Feb 2014</td>
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<td>8</td>
<td>Bit-Z</td>
<td>$223,509,175</td>
<td>$223,509,175</td>
<td>$1,185,152,764</td>
<td>$4,597,485,080</td>
<td>147</td>
<td>17.49%</td>
<td><img src="image8" alt="Graph" /></td>
<td>Jun 2016</td>
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<td>9</td>
<td>Bibox</td>
<td>$219,905,846</td>
<td>$219,905,846</td>
<td>$1,143,599,856</td>
<td>$5,681,054,544</td>
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<td><img src="image9" alt="Graph" /></td>
<td>Nov 2017</td>
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<td>10</td>
<td>Coinuper</td>
<td>$209,886,148</td>
<td>$237,202,107</td>
<td>$1,156,046,660</td>
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<td><img src="image10" alt="Graph" /></td>
<td>Feb 2019</td>
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<td>11</td>
<td>BCEx</td>
<td>$177,822,722</td>
<td>$177,822,722</td>
<td>$1,036,605,792</td>
<td>$4,738,632,866</td>
<td>58</td>
<td>3.86%</td>
<td><img src="image11" alt="Graph" /></td>
<td>Aug 2017</td>
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My Experience – Crypto Currency

**Crypto currencies** are traded globally on internet and listed exchanges

- **Emergent market:**
  - New crypto coins can be created
  - New contracts are released more frequently

---

**ETHUSD: Contract Specification**

- The base currency is ETH.
- The quote currency is USD.

**ETH USD**

**Description**

- **ETHUSD** is an ETH/USD perpetual contract priced on the .BETH Index. Each contract is worth 0.001 mXBT per $1 price, currently 0.00018336 XBT.
- Funding is paid and received every 8 hours. The next payout event is at 3:00 PM CDT.
- ETHUSD uses a Premium Index to calculate funding rates. The underlying interest rates are quoted in the .ETHBON8H Index and .USDBON8H Index, and the premium rate is quoted in the .ETHUSD8H Index. These are used to calculate the final funding rate.
- Today, longs will pay 0.0100%, and shorts will receive 0.0100% at 3:00 PM CDT. BitMEX does not charge fees on funding payments.

**Expiry:** This instrument is perpetual and does not expire.

---

A quanto “future” with some tweak and twist!
My Experience – Crypto Currency

**Crypto currencies** are traded globally on internet and listed exchanges

- **Emergent market:**
  - New crypto coins can be created
  - New contracts are released more frequently

- **High risk:**
  - Some internet exchanges are not regulated
  - Values of crypto coins are up to wild speculation

Need to estimate short-term, high-frequency correlation between BTC and ETH. The following equation totally not going to work...

\[
\Sigma = \mathbb{E}[(X - \mathbb{E}[X]) (X - \mathbb{E}[X])^T]
\]
My Experience – Crypto Currency

Crypto currencies are traded globally on internet and listed exchanges.

**Emergent market:**
- New crypto coins can be created
- New contracts are released more frequently

**High risk:**
- Some internet exchanges are not regulated
- Values of crypto coins are up to wild speculation

**Numerous opportunities:**
- Same crypto coins on different exchanges
- Crypto pairs, triangles, … (BTC/USD, ETH/USD, ETH/BTC)

<table>
<thead>
<tr>
<th>Market</th>
<th>Price</th>
<th>Open 24H</th>
<th>Range 24H</th>
<th>Last trade</th>
<th>Volume 24H</th>
<th>Change 24H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitfinex</td>
<td>$6,486.50</td>
<td>$6,275.70</td>
<td>$6,268.53</td>
<td>$0.01237</td>
<td>$15,998.46</td>
<td>$210.80</td>
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<tr>
<td>GDAX</td>
<td>$6,484.22</td>
<td>$6,262.00</td>
<td>$6,252.77</td>
<td>$0.04427</td>
<td>$9,237.96</td>
<td>$222.22</td>
</tr>
<tr>
<td>Simex</td>
<td>$6,490.81</td>
<td>$6,278.37</td>
<td>$6,275.89</td>
<td>$0.3976</td>
<td>$9,000.07</td>
<td>$212.43</td>
</tr>
<tr>
<td>Bitstamp</td>
<td>$6,480.00</td>
<td>$6,265.00</td>
<td>$6,253.63</td>
<td>$0.001836</td>
<td>$34,296,088.75</td>
<td>$215.00</td>
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<tr>
<td>Bitlish</td>
<td>$6,492.00</td>
<td>$6,305.28</td>
<td>$6,570.00</td>
<td>$1.00</td>
<td>$4,302.35</td>
<td>$186.72</td>
</tr>
<tr>
<td>itBit</td>
<td>$6,487.31</td>
<td>$6,264.65</td>
<td>$6,254.59</td>
<td>$0.003200</td>
<td>$25,362,169.38</td>
<td>$222.66</td>
</tr>
<tr>
<td>Kraken</td>
<td>$6,493.00</td>
<td>$6,262.00</td>
<td>$6,256.60</td>
<td>$0.07272</td>
<td>$3,855.05</td>
<td>$231.00</td>
</tr>
<tr>
<td>Gemini</td>
<td>$6,484.86</td>
<td>$6,262.61</td>
<td>$6,258.52</td>
<td>$0.001804</td>
<td>$2,155.99</td>
<td>$222.25</td>
</tr>
</tbody>
</table>
Akuna’s Quant Trading and Research team

Trading based on quantitative models and automatic strategies

- **Quant Traders:**
  - execution, observation, strategic thinking

- **Quant Developers:**
  - pricing, automation, system design

- **Quant Researchers:**
  - data analysis, signal discovery, formalizing models

Market data → Trading algorithms → Execution system
Relevant skills for Quants

- **Math skills:**
  - Basics: Linear algebra, probability, differential equations ....
  - Statistics/Data Analysis
  - Stochastic calculus

- **Programming skills (like C++/python):**
  - Numerical methods/analysis
  - Algorithms
  - Data analysis/Machine learning
  - Parallel programming

- Plenty of great online resources/courses
- Take courses in other departments (CS, Statistics)
Why Physics/Grad School?

- Great problem solving and analytical skills
- Solid math skills/background relevant to financial models
  - Coming up with approximations
  - Knowing the limitations of your models
- Used to reading papers and learning new topics quickly
- Ability to work independently
- Fresh ideas and creative solutions
Why Akuna?

- Company culture: collaborative and innovative
- Great place to learn and contribute on the job (for someone from physics background)
- Still really young. More responsibility early. Willing to try new ideas.
- Chicago. Nice office in downtown.
- Lots of company events. Yearly company trips (Utah, New Orleans, Austin, Nashville)
- Also financially rewarding
NOW HIRING

Apply online today at www.akunacapital.com/careers and mention this talk for how you heard about Akuna!

Full Time Opportunities for recent grads:
• Junior Traders
• Junior Quantitative Traders
• Junior Quant Developers
• Junior Quant Researchers
• Junior Developers

Internship opportunities are also available!
QUESTIONS?

XIONGJIE YU
Junior Quantitative Researcher

If you have any follow-up questions, direct them to recruiting@akunacapital.com