Towards a Theory of Crowding
Very Preliminary

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WEAI ANNUAL CONFERENCE
TOPICS IN CROWDING PANEL
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1. Crowding Idea is Spreading

- *The Crisis of Crowding* by Ludwig Chincarini.

- A new academic literature on crowding has been burgeoning in the last six years.

- For more info, go to: [http://ludwigbc.com/presentations/slides/](http://ludwigbc.com/presentations/slides/)
2. Definition of Crowding


- Menkveld (2017), Tay et al. (2016)

- Investment Banks – Sanford Bernstein group, Bank of America group, JP Morgan Chase, Credit Suisse,
3. Elements of Crowding: What Model Should Explain

1. The process that generates the crowding

   b. System Structure (e.g. VaR models, risk models, (Chincarini (2018), Menkveld (2017)))
   c. Regulation System (e.g. Basel II and Risk on home loans)
3. Elements of Crowding: What Model Should Explain

2. Explains the type of crowding

   a. Types of Holders. Are all traders the same type or are they of different types? How will they behave to different types of shocks?
   b. How is liquidity affected by the crowding?
   c. What is the leverage-adjusted saturation or crowding?
3. **Elements of Crowding: What Model Should Explain**

3. Specifies the Interdependence Between Holders and Relationship to Prices

a. How do different holders affect each other in the system?
b. How does investor Type A’s actions affect investor Type B’s actions?
c. How does behavior affect liquidity and cascade effects?
3. Elements of Crowding: What Model Should Explain

3. Specifies the Interdependence Between Holders and Relationship to Prices - Examples

Table 1: Types of Crowded Spaces

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Verbal</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>$N = 1, L = 1$</td>
<td>Only one type of holder with a similar trading strategy.</td>
<td>Retail investors buying PALM.</td>
</tr>
<tr>
<td>$N &gt; 1, L = 1$</td>
<td>2 or more types of holders with similar trading strategy, but different motivations or risk appetites. Different behaviors.</td>
<td>Commercial banks and hedge funds making similar swap spread trade. Quant hedge fund long value stocks and short growth stocks, and multi-strategy fund focused on energy starting a new portfolio to do similar trade.</td>
</tr>
<tr>
<td>$N &gt; 1, L &gt; 1$</td>
<td>Different holders in terms of behavior and different trades, but despite being different trades lead to a crowding of the space.</td>
<td>A hedge fund long the swap spread (betting that spreads will widen, thus short swap rates and long Treasuries), and a commercial bank or macro hedge fund is long Treasuries. Although trades and motivations are different, they both lead to a rallying Treasury curve. The risk inherent in Treasuries is subject to the behavior of both groups. And both groups’ positions are dependent on risk from the other group.</td>
</tr>
</tbody>
</table>
3. Elements of Crowding: What Model Should Explain

4. How is the total saturation or crowding measured in the model? How can we take it to the data?

   a. The model should specify how one can measure the extent of crowding with full information and with partial information.
   b. Should be implementable and testable with real data.
3. Elements of Crowding: What Model Should Explain

5. Empirical Findings on Crowding


b. Crowded mutual fund holdings (wrt liquidity) leads to factor returns not explained by Fama-French (i.e. short crowded securities, long uncrowded) Tay et al (2016) & Macquarie & Others

c. Popular stocks or high concentration of hedge fund ownership leads to subsequent lower returns. Many studies.
3. Elements of Crowding: What Model Should Explain

5. Empirical Findings on Crowding

d. Different types of equity factors might have different implications for crowding (some with natural anchors and some without). Baltas (2019)

e. Considering the “crowding” of a factor with a valuation metric leads to better investment outcomes. Arnott, Beck, Kalesnik (2016)
3. Elements of Crowding: What Model Should Explain

5. Empirical Findings on Crowding

f. Net positions are important because sometimes the net effect of different strategies is almost zero. (Blitz (2017))

g. Shifting positions amongst oil futures demand (crowding on one side of market) might lead to contango and tracking error of oil futures versus spot oil. (Chincarini & Moneta (2019))
4. Some Ideas and Tools for Models

1. The Swarm Literature (see references at end)

   a. Mainly used to study insect swarms, but may have elements that are useful for financial and/or economic crowding.
   b. A typical modeling strategy is to treat each individual as a moving particle whose velocity is influenced by social (interparticle) attractive and repulsive forces. In contrast, the exogenous forces describe an individual's reaction to the environment, for instance a response to gravity, wind, a chemical source, a light source, a food source, or a predator.
4. Some Ideas and Tools for Models

2. The Network Literature

   a. Since crowding affects prices and the interaction of holders is important, the network literature might offer some tools.
4. Some Ideas and Tools for Models

3. Conventional Finance Literature

   a. Mainly ideas on liquidity and leverage, but could be helpful to tie in.
   b. Some ideas of bubbles and bank runs might be useful.
4. Some Ideas and Tools for Models

4. Other Interesting Literature

a. Liquidity simulation models could be adapted to work with crowding (Withanawasum, Whigham, and Crack (2013) (WWC) and Maslov (2000))

b. OLG models might be useful in a context of lifecycle of investing.

c. The herding of ants with two different food sources or “investment vehicles”.
4. Some Ideas and Tools for Models

5. Other Pieces and Thoughts on a Model

a. Should have a measure of alpha and 1-alpha, where alpha is the concentration in dollars or saturation of the “crowding” group. In the case of multiple holders, various alpha1, alpha2, etc.
b. Can crowding risk be hedged?
c. Sometimes crowding is dangerous, sometimes it’s just a zero-sum game. What is the distinguishing factor?
d. What triggers exit? When is it endogenous? When is it exogenous?
e. Unlike typical herding – doesn’t need everyone to exit – just a few players that exit can wreak havoc.
4. Some Ideas and Tools for Models

5. Other Pieces and Thoughts on a Model

e. How does leverage and liquidity play a role?

f. Does crowding naturally cause correlation of trading strategies to move to 1. How and when?
5. Esoteric Thoughts on Crowding Modelling

1. Crowding as a Enclosed Space

Crowding in a square. As it gets denser, harder to get out with 1 door, easier with multiple doors. Multiple doors could represent multiple types of holders. One door is one type of holder.
5. Esoteric Thoughts on Crowding Modelling

One major exit, because majority of holders are similar. Smaller exit for other holders.
5. Esoteric Thoughts on Crowding Modelling

Many exits – even though space is saturated, not crowded
5. Esoteric Thoughts on Crowding Modelling

1. Crowding as a Enclosed Space

How is herding different? You can have herding even if people are all entering a massive field. No threat on liquidity, but maybe threat on valuation.
Open Discussion for all Participants

1. TBA
Thank you

- Dr. Ludwig Chincarini, CFA
- University of San Francisco
- United States Commodity Funds

For more information: Buy the books! ;)

A RARE, IN-DEPTH ANALYSIS OF THE 2008 FINANCIAL CRISIS

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A unique blend of storytelling and sound quantitative analysis, The Crisis of Crowding explores the circle of greed from homeowners to real estate agents to politicians to Wall Street. Linking the 2008 financial crisis back to the 1998 crisis of LTCM, The Crisis of Crowding shows how banks, hedge funds, and other market participants repeated the sins of the past and how the collapse of Lehman Brothers led to market insanity thanks to the irrational behaviors of buyers and sellers in the crowded space.

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Thanks

1. I would like to thank everyone for participating in perhaps the first panel on crowding.
Appendix A: Miscellaneous Academic References on Crowding

C. The Crisis of Crowding, Chincarini (2012)
F. “Stock portfolio structure of individual investors infers future trading behavior,” Bohlin and Rosvall (2014)
Appendix A: Miscellaneous Academic References on Crowding

G. “Dimensions of Popularity,” Ibbotson and Idsorek (2014)).


L. “Days to Cover and Short Interest,” Hong et al. (2015)
Appendix A: Miscellaneous Academic References on Crowding

O. “Mutual Fund Crowding and Stock Returns,” Tay et al. (2016)
P. “Hedge fund crowds and mispricing,” Sias et al. (2016)
Appendix B: Swarm Literature

A. “Crowding Factor In Evolutionary Multi-Agent System For Multiobjective Optimization” Kisiel-Dorohinicki, and Socha (2001)
B. “A Primer of Swarm Equilibria” Bernoff, and Topaz (2010)
Appendix C: Network Literature

A. “Learning from neighbors” Bala, and Goyal (1998).
Appendix C: Network Literature Continued

G. “The Economics of Social Networks” Jackson (2005)


I. “Maximizing the Spread of Influence through a Social Network” Kempe, Kleinberg, and Tardos (2003)

J. “Mining the Network Value of Customers” Domingos, and Richardson (2001)


M. “Network Games” Galeotti et al. (2008)
Appendix C: Network Literature Continued


P. “Epidemic Spreading in Scale-Free Networks” Pastor-Satorras and Vespignani (2016)
Appendix D: Conventional Finance Literature

B. “Price pressures” Hendershott, and Menkveld (2013)
D. “The dynamics of the leverage cycle” Aymanns, and Farmer (2014)
F. “Fire Sales in a Model of Complexity” Caballero, and Simsek (2012)
Appendix D: Conventional Finance Literature Continued


L. “Synchronization risk and delayed arbitrage” Abreu, and Brunnermeier (2002)

Appendix E: Other Interesting Literature

B. “Characterising trader manipulation in a limit-order driven market” Withanawasam, Whigham, and Crack (2012)
D. “The equilibrium consequences of indexing” Bond, and Garcia (2018)
E. “Dynamics of crowded and active biological systems” Stefferson (2018)
F. “National Debt In A Neoclassical Growth Model” Diamond (1965)
Appendix E: Other Interesting Literature Continued


I. “Ants, Rationality, and Recruitment” Kirman (1993)

J. “Market Prices of Risk with Diverse Beliefs, Learning, and Catastrophes” Cogley, Sargent, and Tsyrennikov (2012)

Appendix E: Other Interesting Literature Continued

M. “Salience and Asset Prices” Bordalo, Gennaioli, and Shleifer (2013)
N. “The Maturity Rat Race” Brunnermeier and Oehmke (2013)