***Identifying and mitigating “conduct risk” in algorithmic FICC trading***

# **1. Introduction**

## **1.1 Background**

On 9th December 2019 the Senior Managers and Certification Regime (“SMCR”) entered into force for investment firms that are solely regulated by the Financial Conduct Authority (“FCA”) in the UK 1. Introduced in response to scandals that emerged during or after the 2007-08 financial crisis, a core objective of the SMCR is to improve the behaviour of financial sector workers through the introduction of a structured accountability regime, encompassing rules for conduct, certification and senior managers 2. Many other jurisdictions have introduced, or are introducing, similar initiatives in an effort to mitigate conduct risk, most notably the Hong Kong Managers-in-Charge Regime 3.

At the time of writing, a legislative definition of conduct risk does not exist 4. However, Miles 5 offers one in the textbook *Conduct Risk Management*:

*Any behaviour by your staff that undermines trust or value in your business, and that a regulator says creates detriment to customers or a ‘disorderly market’. Includes managers’ inaction, in the form of failure to anticipate and overcome customers’ own biases or ignorance during the product creation and sales processed.*

It is evident from both this definition and the objectives of the SMCR that human behaviour remains the focus of regulators’ attention in the post crisis era. Conversely, financial markets are becoming increasingly automated.

That automation predominates in equity markets is well documented6. However, increasingly sophisticated algorithms are starting to replace human traders and brokers in the origination of transactions across many other asset classes too. A study conducted between 1st November 2016 – 31st October 2018 found 55.5% of trades in agricultural contracts, 67.6% trades in metals contracts and 84.4% trades in FX contracts on US futures markets were executed through algorithmic trading (“AT”)7.

Defined in the EU by Article 4(1) of the second Markets in Financial Instruments Directive (“MiFID II”) as:

*trading in financial instruments where a computer algorithm automatically determines individual parameters of orders such as whether to initiate the order, the timing, price or quantity of the order or how to manage the order after its submission, with limited or no human intervention…*

AT has received considerable attention from researchers with regards to its impact on market quality, market fairness and, to a lesser extent, institutional culture8. Nonetheless, the move to ‘limited or no human intervention’ in the financial markets has, to date, not directly been considered in the context of conduct risk, even if the literature indirectly identifies a host of conduct risks8.

Within the existing AT literature, fixed income, currencies and commodities (“FICC”) markets have so far been in the shadow of research into AT in equities trading for historical reasons. These include: a greater interest in controversial high frequency trading because of popular non-fiction works such as *Flash Boys* 9, 10; economies of scale, i.e. greater opportunity for the deployment of algorithms in highly liquid and fragmented markets11 and incentivisation by trading venues which wish to profit therefrom12. Nevertheless, the growth of AT in FICC markets is likely to accelerate in the aftermath of the COVID-19 outbreak, particularly as exchanges such as the London Metal Exchange (“LME”) were forced to trial the electronic price discovery of major benchmarks as a part of their business continuity measures (London Metal Exchange, 13). Therefore, studying AT in the context of the FICC markets represents a compelling opportunity for researchers to make an original contribution.

Finally, dedicated research into conduct risk as a subject in itself, regardless of financial industry sub-sector, has thus far been scant. Searches for the term ‘conduct risk’ in Business Source Premier, Web of Science, Westlaw, Hein Online, Lexis Nexis and Phil Papers between 4th May 2019 and 29th December 2019 only returned 13 articles (excluding editorials) with this term, or a very similar term in their title. These are listed in Appendix One. Most of these articles are very short pieces written in professional periodicals such as the *Banker* or *Company Lawyer* as opposed to substantive research papers. Consequently, there is considerable scope for researchers to develop this nascent discipline.

## **1.2. Overall research aims and objectives**

"*More longitudinal research on financial regulation is needed to disentangle institutional and individual trading patterns that signal dishonest behaviour, recognising that algorithmic (robot) trading strategies displace 'humans' from direct accountability*"14

 This research project aims to make a significant contribution by informing the policy decisions of regulators and investment firms through:

1. offering evidence in support of a re-calibration of regulatory and industry assessments of conduct risk to specifically accommodate markets in which levels of human intervention become ever more limited and, accordingly, holding humans accountable increasingly difficult;
2. broadening the AT research agenda to consider conduct risks inherent in the FICC markets. The development of AT in FICC requires attention to help regulators and investment firms trading these asset classes identify the unique evolving risks to which they will be exposed; and
3. drawing upon experiences in: (i) comparable financial regulatory systems; and (ii) other highly regulated industries that employ algorithms to devise practical solutions for the management of conduct risk that could be adopted by regulators and firms alike.

## **1.3 Research questions**

In consideration of the above, the following ‘overarching’ research question15 is proposed:

*What are the practical consequences of the transformation of the UK FICC markets into algorithmic realms for the management of conduct risk?*

 This question is broken down into the following sub-questions:

1. What new conduct risks could emerge as trading in the UK FICC markets becomes increasingly automated? What implications do these have for human accountability?
2. How useful is potential machine-to-machine regulation? Could this result in the elimination of hitherto human conduct risks in the UK FICC markets? Is this desirable?
3. How do initiatives to mitigate machine-based conduct risk in the UK FICC markets compare to those being taken on comparable markets in the US and within the EEA? Could the financial industry learn any lessons from initiatives taken in other highly regulated industries (e.g. health) to ensure the ethical deployment of automated systems?

# **2. Critical evaluation of research strategies**

## **2.2 Philosophical assumptions**

### **Ontology**

Before proceeding to propose suitable research strategies to address this question, it is important that the researcher is transparent about his *Weltanschauung*. Ladyman17 asserts that all scientists investigate a topic through their own lens, equipped with their own presumptions. According to Baert18, these significantly influence how a research project is conducted. Another researcher with an alternate worldview is likely to approach the same subject in a distinct manner, and possibly arrive at fundamentally different conclusions.

The author’s ontology is shaped by what Allitt19 defines as the “*conservative tradition*”. According to Allitt, this is characterised by: different

1. a scepticism about radical change, “new society” ideas and the ability to change *human* behaviour; and
2. an assumption that the most fundamental questions about *human* society have already been addressed. As Harari20 elucidates:

“*For thousands of years of history was full of technological, economic, social and political upheavals. Yet one thing remained constant: humanity itself. Our tools and institutions are very different from those of biblical times, but the deep structures of the human mind remain the same*”.

At first glance, approaching the study of the impact of disruptive technology on the financial markets through a conservative lens may appear to be paradoxical. However, the author’s assumption is that the deployment of algorithmic technologies in the FICC markets represents natural, gradual evolution that can be controlled as opposed to a sudden and chaotic revolution. Nevertheless, the author acknowledges Harari’s assertions in *Homo Deus* that the current pace of technological disruption is such that one is often unable to comprehend what society will look like even in the relatively near future, for example in the next twenty years.

### **Approach to acquiring knowledge through research**

The author’s ontology informs the employment of a pragmatic approach to acquiring knowledge. Pragmatic conservativism favours a flexible and gradual approach to reform22. Unsurprisingly, this is reflected in pragmatic research methodology advocated by Baert18:

1. the primary research objective is the production of findings that are useful to policymakers (e.g. the FCA) and other interested parties (e.g. regulated investment firms); and
2. the research approach is practical, not rigid. This permits the researcher to quickly react to rapidly evolving situations, critical when studying the impact of new technology.

The author believes this approach is consistent with the outcomes-based approach taken by the FCA since 2013, summarised by then Chief Executive Martin Wheatley:

“*I want the FCA to use its new powers and remit to bring a more human face to the regulation of financial services. A more pragmatic, sophisticated approach to regulation*.”23

It is this “human face” that leads the author to take the first pragmatic research decision: the utilisation of qualitative as opposed to quantitative strategies. This is in recognition that, whilst human intervention may be becoming increasingly limited in certain markets, one cannot (yet) hold a conversation with a trading algorithm. As seen in Culley8, quantitative strategies are currently more suited to studies concerning the impact of algorithmic trading on market quality and fairness, which are typically examined in numerical terms, e.g. price effects. By contrast, conduct risk is concept that has hitherto been guided by human, as opposed to binary, interpretation, and therefore requires a practical approach to investigation and management24.

## **2.3 Possible strategies**

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The author has identified three possible strategies outlined in *Qualitative Research and Evaluation Methods*15 that appear to be most appropriate to the conduct of qualitative research through a pragmatic lens. The advantages and disadvantages of using each strategy in the context of the author’s research topic are considered in this section.

###  **Option one: case studies**

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### “*The case study approach to empirical research investigates a particular real-life phenomenon within specific contexts*.”25

The advantages of using a case study strategy include:

1. an opportunity to attain a high level of focus, e.g. in Lenglet and Mol26 research focused solely on the activities of *Shibboleth Securities* for three years, examining how the firm had navigated EU regulations applicable to algorithmic trading; and
2. the possible production of generalisable findings27, e.g. in Ma and McGroarty28 examine automated trading as a case study of ‘Social Machines’ in the financial markets, concluding that high speed information consumption has transformed markets, with positive and negative implications.

 The disadvantages of using this strategy include:

1. obtaining access29. This has proved to be especially problematic in past studies that have examined the culture of high frequency trading firms, e.g. MacKenzie30 and Lange31; and
2. it produces a large amount of data which is very challenging to analyse for a lone researcher32.

 Case study strategies featured in six of the papers reviewed by the author in his systematic literature review of the algorithmic trading literature8. Consequently, an opportunity exists for researchers to make additional contributions regarding the use of this strategy in this field.

 Arnoldi’s33 investigation into how trading algorithms manipulate each other is a good example of the use of a case study based approach that is relevant to conduct risk. Arnoldi selects three types of trading activity to study as cases:

1. algorithms following each other toartificially inflate prices;
2. traders deploying algorithms to trigger resting limit orders; and
3. layering and spoofing type activity in the *Securities and Exchange Commission vs Biremis34* case.

Arnoldi reaches conclusions drawing upon themes in each of his cases, weighing up whether: (a) human beings would have been misled by similar practices in manual markets; and (b) algorithms deceiving each other is necessarily abusive.

###  **Option two: mixed methods**

“*This particular term usually refers to mixing that crosses the quantitative-qualitative boundary*.” 35, 3635, 36[35, 36][35, 36][35, 36](Mixed methods)(35, 36)35, 3635, 36[35, 36](35, 36)35, 3635, 3635, 3635

Often associated with a pragmatist epistemology15, mixed methods strategies confer researchers the following advantages:

1. excellent opportunities to triangulate, reinforcing any findings37 and helping to mitigate against bias36; and
2. strong possibilities for generalisation38.

However, despite these advantages, method mixed strategies pose particular challenges for the lone researcher. Myers29 opines that they result in large sample sizes, something which would be very time consuming to process in the absence of a research team. This is possibly why mixed methods designs were not prominent in the algorithmic trading literature reviewed by the author8.

Perhaps the best example of mixed methods research conducted in relation to automated trading is the British Government Officer for Science’s extensive Final Project Report on *The Future of Computer Trading in Financial Markets 39*. The Foreword and Annex D of the Report confirm that it draws upon more than 50 peer reviewed articles (all taking their own approach to data collection), as well as quantitative data collected from surveys and qualitative data collected from interviews. The scale of the effort to collate this is also outlined in the Foreword, which states that more than 150 academics participated in the project. Furthermore, the lead expert group supervising the project was comprised of 24 people. This demonstrates how labour intensive mixed methods research can be.

###  **Option three: action research**

*“A type of applied research designed to find the most effective way to bring about a desired social change or to solve a practical problem, usually in collaboration with those being researched”* 40

This strong emphasis in identifying practical solutions to real problems makes action research particularly attractive to a researcher employing a pragmatic epistemology. This is because the utility of the researcher’s recommendations can be directly observed in organisation change, as opposed to merely being theoretical contributions in a journal article29.

Despite this significant advantage, action research did not feature in any of the articles considered as part of the author’s review of the algorithmic trading literature8. This is probably because it reportedly a high-risk strategy as:

1. it is very time consuming41, a major challenge for a lone researcher such as the author;
2. it is generally more suitable to single entity and finding an entity that is willing to be the subject can be difficult29; and
3. some journals allegedly will not accept papers that use it owing to concerns regarding researcher neutrality29.

## **2.4 Most suitable strategy**

Taken together, the author’s has selected what Patton15 terms ‘instrumental use multiple case sampling’ as the most suitable strategy to seek answers to the proposed research questions. This entails purposive case selection42, with firms using a variation of algorithmic and high frequency trading techniques that are active in the UK FICC markets comprising the units of study. The author intends to work with a sample size range of between four and ten firms, providing flexibility to respond to new themes or saturation as the research progresses. The author considers that this approach will create strong possibilities for cross-case comparison and insightful policy recommendations.

# 3. Explanation of data collection

## 3.1 Types of data to be collected

### **Primary data: Interviews**

Taking what Patton15 calls a ‘pragmatic interview approach’, the author intends to conduct ‘elite interviews’43. The main justification for this approach is that, at the time of writing, algorithms are ‘black boxed’, meaning that a researcher seeking a deeper understanding about their purpose or functionality is practically limited to conducting interviews with their creators or users32. Today, one cannot interview the machine44.

The primary constraints associated with this approach are: gaining access (per option one in section 2.3, above), lack of cooperation45, managing both the researcher’s and interviewees’ finite time effectively and, similarly, place constrictions (‘macro’ level, i.e. more achievable if in one jurisdiction, here, the UK and ‘micro’ level, i.e. conducting in person may be more challenging than performing remotely).

The specifics of the interview design are set out in the table below.

|  |  |  |
| --- | --- | --- |
|  | **Approach** | **Justification(s)** |
| **Who?** | Chief executive officers, compliance officers, software developers, traders in UK firms employing algorithmic trading techniques. | Obtain a broad range of accounts from management, ‘front’ office, and control functions. In keeping with precedent set by previous studies of algorithmic trading culture, e.g. MacKenzie46, Currie and Seddon47 and Borch et.al.48.  |
| **Sampling approach** | Purposive. 30-50 range in multiple organisations, approximately 3-5 per case. This adopts the recommendation by Saunders and Townsend49.  | Pragmatic flexibility to expand investigation when new leads uncovered in an interview, but to stop once saturation reached. Per Creswell, cited in Saunders and Townsend49 not merely seeking a ‘round number’. Out of 22 articles reviewed by Culley8, almost a quarter were within this range, see Appendix Two. |
| **Where?** | Face-to-face at interviewees’ offices preferred, or telephone.  | Easier to build a rapport in person, but possible telephone interviews to maintain flexibility in recognition of elites’ busy schedules as suggested by Harvey 43 (**mitigate time constraint**). |
| **How long?** | 45 minutes – 1 hour in single sessions if possible. Not longitudinal but may have to schedule follow up sessions in some instances. | Recommended by Harvey 43 as ideal length of time to collect rich data from elites. Guards against fatigue, respects busy schedules (**mitigate time and place constraints**). |
| **Interview type** | Semi-structured with open questions. | Some structure to ensure consistency across interviews, but openness to new ideas without leading29. Many of interviews hitherto conducted in relation to AT research have been unstructured, see Appendix Two. This is used by these authors because this technique is reportedly favoured in ethnographic research for its ability to generate many leads50. Still, this approach is unsuitable here because it is too time intensive 51. for a lone researcher working on a part-time basis like the present author.  |
| **Recording** | Taped interviews if possible, professionally transcribed but participants anonymous. | Tape recording is faithful to interview conducted, including lengthy pauses and ‘fillers’ as opposed to merely being author’s account. Professional transcription will be expensive but will save the author time (**mitigate time constraint**), whilst maintaining anonymity will encourage ‘full and frank’ accounts in otherwise secretive businesses (**mitigate access constraint**). |

Per Gill et.al.52 the conduct of interviews should lead to the collection of the following types of data from participants:

* perspectives;
* experiences;
* ideologies; and
* rationales

concerning a particular topic.

### **Primary data: focus group**

Once the standalone interview data has been collected and analysed (see section 4, below), the author intends to hold a focus group session to discuss and validate his findings.

According to Thomas53 a focus group is a type of group interview where the interviewer plays the role of a neutral moderator. The principal constraints associated with focus groups are: a limit on the number of questions the moderator can ask in the time available, preventing some participants from ‘dominating’ the group and ensuring ‘reserved’ participants speak up.

The specifics of the focus group design are set out in the table below.

|  |  |  |
| --- | --- | --- |
|  | **Approach** | **Justification(s)** |
| **Who?** | Elites similar to those for the one-to-one interviews but: (a) adding informed ‘outsiders’, i.e. persons who do not work for an algorithmic trading firm but who are familiar with their operations such as representatives from regulators and trading venues; and (b) different ‘insiders’, e.g. traders from the one-to-one interviews. | Addition of ‘outsiders’ will ensure validation of research findings from a different perspective and will be particularly useful for determining their utility in informing new policies. Use of different ‘insiders’ to those approached during standalone interviews will help ensure representatives from firms feel more able to ‘speak up’ because they won’t be talking about issues specific to their particular organisations (**mitigate ‘reserved participant’ constraint**).  |
| **Sampling approach** | Purposive. Between 6-10 participants. | Thomas53 argues optimum is 8 participants ‘all with something in common’.  |
| **Where?** | ‘Neutral’ venue, possibly those of an industry or professional association in central London.  | Convenience, close proximity to where many of participants are likely to work.  |
| **How long?** | One session, maximum two hours in length. | Per those for interviews, but a little longer to provide enough time for discussion.  |
| **Interview type** | Semi-structured, 5-6 core questions to encourage discussion with emphasis on strong moderation | Myers29 suggests this as optimal number of questions (**mitigate time and ‘dominance’ constraints**).  |
| **Recording** | Taped session, professionally transcribed. | Per those for interviews. |

### **Secondary data**

 The researcher should collect a range of supplementary secondary source data, including:

* regulations;
* regulatory notices such as enforcement actions;
* public reports; and
* publicly available information about firms employing algorithmic trading techniques.

The justification for seeking this data is to provide context.

As the author does not intend to collect any data that is not publicly available, few major constraints are foreseen other than potential overload.

## 3.2 Potential ethical issues and their mitigation

Using insights from Kara54, the author has identified the following potential ethical issues that could arise when conducting the research:

1. failure to protect confidential data, e.g. interviewees disclose sensitive information and their identity is accidentally revealed to a third party;
2. lack of reciprocity: the researcher benefits from the time and insight of the researched, but offers nothing in return; and
3. decline in researcher’s well-being: the author is conducting the research on a part-time basis, balancing this with work and family commitments. This risks researcher ‘burn out’.

The author intends to take the following steps to address these risks:

1. to protect confidentiality: offer of use of non-disclosure agreements, informed consent regarding collection and recording of data with opportunity for participants to withdraw consent at any time, and anonymisation of interview data all of these steps are recommended by 55;
2. to ensure reciprocity: sharing results with interviewees, e.g. providing copies of research articles; and
3. to prevent ‘burn out’: scheduled ‘time out’ slots, e.g. to spend time with family or to take a holiday.

The author is currently self-funded, so there is currently no possibility of a conflict of interest developing because of association with a third-party sponsor.

As the author is affiliated with the University of Southampton, approval from the University’s Ethics Committee will be sought before any primary research commences.

## 3.3 Relevant quality criteria to ensure the validity of the research

The quality criteria proposed by Patton15 for the validation of pragmatic studies is highly relevant to assessing the intended study. To summarise, this entails determining whether the study:

1. aids decision making through useful findings and lessons learned;
2. identifies a target audience / beneficiaries;
3. actively involves the target audience, demonstrating usefulness;
4. is practical and grounded in ‘real-world’ affairs, ensuring credibility to target audience; and
5. provides timely release of results to aid contemporaneous use.

These criteria reflect that “knowledge is socially constructed”56 in qualitative studies. Whilst the researcher will retain a full audit trail of his research, its validity should not merely be judged on the basis of slavish adherence to procedure. This is consistent with the outcomes-focused approach to conducted regulation which is advocated by the FCA57.

# 4. Strategies for data analysis

The author of the data analysis report will use the strategies set out in this section.

## 4.1 Coding

 The interview transcripts should contain a lot of data. Following recommendations in Miles27, the researcher should use these transcripts to build a ‘codebook’ comprised of first and second cycle codes. During the first cycle, the researcher will attempt to detect items of significance and patterns across the interviews. In the second cycle, the researcher will build upon the first cycle codes to try and identify fewer, richer findings. It is at this stage that the researcher will seek to make extrapolations in terms of causes, themes and relationships so useful lessons can be learned from the primary data.

## 4.2 Content analysis

Content analysis should be performed on the written sources collected. This will involve coding in a manner similar used to analyse the primary data.

## 4.3 Data display

 Once the initial analysis has been completed, the researcher will construct a case-ordered matrix display to facilitate cross-case comparison. Again, this step is based on techniques advocated by Miles27 to facilitate the drawing of robust conclusions. These techniques include:

* identifying patterns and themes in the data;
* determining plausibility of the data;
* considering if the data is sufficiently representative;
* triangulating between different data sources; and
* deliberately looking for alternative evidence and explanations in the data.

## 4.4 Minimising bias

Finally, the researcher will purposively look for contrarian evidence and explanations during the data analysis stage. Miles27 argues that these not only aid understanding but help to counteract researcher bias.

# 5. Summary and statement of proposed strategy

The adoption of a pragmatic research framework to identify: (i) conduct risks in the FICC markets; and (ii) potential solutions to mitigate them is consistent with the approach favoured by the FCA to regulate these markets in the UK. The application of this framework in the form of a multiple case sampling strategy that draws upon data from the conduct of elite interviews and supporting secondary sources will contribute lessons learned that are useful to firms using AT techniques and their regulators.

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# Appendix One: Papers that directly consider conduct risk (as at 29th December 2019)

|  |  |  |
| --- | --- | --- |
| **Title** | **Author** | **No. of Google Scholar citations** |
| Assessing conduct risk: a new challenge for sustainable corporate governance | ManesManes (58) | 0 |
| Conduct risk: meaning, interpretation and dissension | de Pascalis 59 | 0 |
| Why is managing conduct risk critical for a firm’s board? | Baijal60 | 1 |
| Benchmarked and comparative conduct risk reviews: fit for future purpose | Stears and McCormick61 | 0 |
| Conduct risks now a prudential concern. | Alexander62 | 0 |
| Conduct, reputation and control. | Imeson63 | 0 |
| Legal and Conduct Risk in the Financial Markets: Third Edition Book Review | Johnston64 | 0 |
| The challenge of assessing and shaping bank conduct, ethics and culture: Insights from the social sciences. | Connell65 | 0 |
| Data key to managing conduct risk. | Szehofner and Mallem66 | 0 |
| Regulating conduct of financial institutions in Australia: is culture the new frontier of regulation? | Adams, Borsellino and Young67 | 1 |
| Regulators push banks to take the lead on addressing conduct risk | Alexander68 | 0 |
| Misconduct in banks: approaching the issue from a systemic perspective | Minto69 | 0 |
| The Financial Conduct Authority and financial conduct: hand in glove? | Baber70 | 0 |

## Appendix Two: overview of interview approach taken in other papers (as at 29th December 2019)

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| --- | --- | --- | --- |
| **Author(s)** | **No. of organisations** | **No. of interviewees** | **Interview type** |
| Arnoldi 33 | Undisclosed | 3 | Unstructured |
| Beverungen and Lange 71 | 1 | 21 | Undisclosed |
| Borch 10 | Undisclosed | 30 | Undisclosed |
| Borch and Lange 72 | Undisclosed | 62 | Semi-structured, open ended |
| Borch et al. 73 | Undisclosed | 62 | Undisclosed |
| Clark and Ranjan 74 | Undisclosed | 30+ | Undisclosed |
| Clark et al. 75 | Undisclosed | 30+ | Undisclosed |
| Coombs 76 | Undisclosed | 15 | Undisclosed method individual interviews and focus group |
| Cooper et al. 77 | 19 | 28 | Unstructured |
| Currie and Seddon 14 | Undisclosed | 23 | Undisclosed |
| Currie and Seddon 47 | Undisclosed | 23 | Unstructured |
| Kauffman et al. 78 | Undisclosed | Undisclosed | Undisclosed |
| Lange 31 | 5 | 82 | Undisclosed |
| Lenglet and Mol 26 | 1 | Undisclosed | Structured and unstructured |
| MacKenzie 79 | Undisclosed | 33 | Undisclosed |
| MacKenzie 80 | Undisclosed | 65 | Undisclosed |
| MacKenzie44 | Undisclosed | 72 | Undisclosed |
| MacKenzie 81 | Undisclosed | 194 | Unstructured |
| MacKenzie 46 | Undisclosed | 338 | Undisclosed |
| MacKenzie et al.82 | Undisclosed | 19 | Unstructured |
| Seyfert 83 | 25 | 50 | Semi-structured |
| Zook and Grote 84 | Undisclosed | Undisclosed | Undisclosed |