Argumentative patterns in the context of dialogical exchanges in the financial domain

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Abstract

The study of argumentative practices in context requires a deep understanding of the characteristics of the activity type under observation. To acquire such a knowledge, pragma-dialectics offers the mid-level analytical tool of the argumentative pattern with particular emphasis on what appears to be a prototypical argumentative pattern in a specific argumentative activity type. The current contribution extends the traditional definition of a prototypical argumentative pattern and applies the notion to the context of dialogical exchanges occurring over the activity type in the financial domain represented by quarterly earnings calls. Upon characterization of the request of confirmation of inference (ROCOI) as a highly recognisable basic prototypical pattern, the second part of the paper showcases an experiment of automatic recognition of such a pattern in question units. Results are encouraging and support further work in the direction of pattern mining.

Keywords

argumentation in context, argumentative patterns, prototypical patterns, financial communication, earnings conference calls, question-and-answer, request of confirmation of inference

1. Introduction

The distinctive features of argumentation practices in specialist domains crucially include the social ontology of the interactions concerned. This component is pivotal in domains, such as finance, where the body of specialist knowledge being developed is ultimately oriented towards practical decision-making, namely towards informing investment decisions, which result in transactions (e.g., trades or other kinds of deals), which have institutional, legally enforceable consequences (e.g., contracts). This leads to the centrality of construct such as the activity type [1] for the modeling of domain specific argumentation, which has long being recognized in argumentation studies [2].

While the notion of activity type can specify at a high level institutional commitments of the arguers, genre conventions, as well as the incentives motivating the participants to argue, a study of the features of specialist argumentation practices also requires more tactical mid-level concepts to fathom the social ontology and the observable sequences of speech acts and chains of inferences. In particular, such mid-level constructs are needed to capture and name recurrent strategies used by arguers to navigate the constraints and affordances of the activity type in pursuit of shared goals and individual incentives.

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This paper adopts the notion of *argumentative pattern* as the pivotal notion to relate the micro-analysis of arguments at the speech-act and inferential level with the constraints and affordances of an economically impactful, highly institutionalized, argumentative activity type in the financial domain, namely the *earnings call*. In the context of an empirical computational study of argumentation in the domain of finance, argumentative patterns that appear to embody contextually significant strategies represent a primary target of mining as well as a primary input of analytics aimed at exploring these argumentative strategies on a large scale.

The first part of this article provides a general definition of the notion of argumentative pattern and a characterization of its relation with activity types, together with an exemplification of significant patterns of the earnings call. The second part present a case study of one such pattern, including an experiment of automated recognition aimed at large scale mining.

2. Argumentative Patterns

The notion of argumentative pattern, first introduced by the pragma-dialectical theory [3], provides a unit of analysis for describing a system of argumentative moves that responds to the constraints and affordances of the activity type. According to pragma-dialectics [4]:

> An *argumentative pattern* consists of a particular constellation of argumentative moves in which, in dealing with a particular kind of difference of opinion, in defence of a particular type of standpoint a particular argument scheme or combination of argument schemes is used in a particular kind of argumentation structure.

Thus, in this account the identification and analysis of patterns mostly focuses on four components: (a) the type of issue they address, (b) the semantic type of the standpoints being argued for, (c) the structure of the argumentation supporting the standpoints and (d) the type of argument schemes they mobilize. The literature also hints at a broader characterization of argumentative patterns in terms of sequences of moves [5], and in this view patterns can be considered as those routes or sequences of moves that participants (typically) choose in a concrete activity type among those that are in principle argumentatively relevant in the resolution of an argumentative discussion in a given context.

Pragma-dialectics furthermore specifies the nature of argumentative patterns in relation to the activity type in terms of a twofold "typicity" [5, 6, 4], distinguishing between *prototypical patterns*, which are directly or indirectly functional to realizing the institutional point of a certain activity type and *stereotypical patterns*, which are not only prototypical but also significantly frequent either in comparison with other activity types or with respect to other patterns in the same activity type.

The current account builds on the broader idea of idea of patterns as consisting of sequences of argumentatively relevant moves. Thus, in this account patterns may involve, but are not necessarily limited to the combination of a standpoint type, an argument structure and the associated argument scheme, as their characterization can involve any sequence of argumentatively relevant moves, including those (e.g., challenges, critical questions, concessions) which do not involve an argumentation structure or an argument scheme. Importantly, argumentative patterns can emerge from dialectically significant sequences of moves across turns in dialogical

interaction, for instance, in the case study at issue, between question and answer turns. In this respect, a distinction is made between "basic" patterns, which lie in a single turn, and "dialogical" patterns that span across question-and-answer turns (the latter already defined as such by [7]). In either case, prototypical argumentative patterns correspond to sequences of argumentatively relevant moves that are compliant with the constraints and incentives of the communicative exchange and fit (some of) the communicative goals of the activity type. Additionally, the diagnostic criteria for prototypicality adopted here also take into account that the pattern can be contextually recognized by the participants in the conversation themselves as a conventional, recurrent strategy that specifically meets the purposes of the activity type; in that case, the pattern is a also members' category [8].

3. Activity type: Earnings Conference Calls

Earnings Conference Calls (ECCs) are teleconferences listed companies hold following the publication of quarterly results, with the presence of financial analysts. Earnings calls have been analysed [9] as an activity type in terms of their *interaction field*, i.e., the set of institutional goals, commitments and rules associated with the event and the participant roles, and their *interaction scheme*, i.e., the culturally shared script of the interaction, including turn-taking rules and templates for individual turns. As for the *interaction field*, the ECC complements the quarterly disclosures of the firm and, for managers, represents a way of discharging their fiduciary duty towards shareholders, while analysts act on behalf of their investor clients. Specific incentives to argue are associated to each role [7]: while managers have the incentive to defend the market valuation of the firm and persuade shareholders that they deserve to be entrusted with its tenure, analysts have potentially conflicting incentives to critically test managers' standpoints on behalf of their clients and to preserve an amicable relationship with the managers. Regulations bind managers not to disclose hitherto unpublished *material information* [10]; therefore, the entire conversation revolves around *soft information* such as evaluative comments and, most importantly, arguments and explanations connecting the dots between the already disclosed pieces of material information. The *interaction scheme* includes an initial presentation by the managers, followed by a Q&A with the analysts [11], who take turns at asking questions that are immediately answered by executives in the following turn(s). The analysis of argumentative patterns occurring in the Q&A – object of the remainder of the paper – first require that fine grained details of turn-taking and turn design are taken into consideration.

3.1. Text Segmentation in Earnings Conference Calls

Typically, each analyst only has one turn for their questions. As a consequence, their turn design adopts an idiosyncratic question-compression strategy whereby questions on multiple topics are asked within a single turn before any response. Consequently, a question turn by an analyst is a collection of sentences arranged around a number of topics, which triggers one or more answering turns in response (e.g., different managers may choose to answer different questions originating with the same question turn). This turn design and turn taking structure poses a challenge to the analysis of argumentative discussions arising between managers and

analysts. In particular, mid-level segmentation of turns is required to produce argumentatively relevant units from which patterns arise. Additionally, analysts themselves clearly mark their turns as composed of thematic sub-units within the question turn.

These topically homogeneous sequences of utterances that compose the multi-issue question turns can be called Maximal Interrogative Units (MIUs) [12, 13]: question units typically below the level of the turn, but above the level of the clause or individual speech act. MIUs gather a consecutive presentation of individual questions (sometimes mixed with non-interrogative locutions) that may add colour or detail on a topic; constrain scope; and motivate, contextualise or cross-reference. A Maximal Answering Unit (MAU) on the other hand, is a collection of sentences within an answer turn that globally react to an MIU. An MAU can correspond to a single sentence up to the entire turn.

As a direct consequence of this turn design, patterns in ECCs are unit-based and not turn-based. In this context, the previously introduced term *basic patterns* designates patterns that fully develop within a unit (either MIU or MAU), and thus are *intra-unit patterns*, whilst *dialogical patterns* is used for patterns that develop between a MIU and a related MAU, and thus are *inter-unit patterns*.

3.2. Argumentative Patterns in ECCs

Some examples of argumentative patterns in ECCs – both of the intra- and inter-unit type – are presently proposed:

Prefaced questions Within an MIU, the argumentative structure is constituted by discursive moves "preface" and "question". A preface is an assertive statement that can either precede, follow or be contained in a question, providing arguments supporting the relevance of the speech act of the question [14, 15]. Example 1 (ABNB Q1 2021, analyst Justin Post) is an instance of intra-unit argumentation in an MIU, which constitutes a basic argumentative pattern:

(1) ([I think in the letter, it said post listings were stable with Q4,]$_{preface\ 1}$ but [it seems like you're really encouraged by what you're seeing.]$_{preface\ 2}$)$^{\textbf{premises}}$ → ([**So** maybe you could dive in there and tell us, you know, what is encouraging about what you're seeing with hosts]$_{question\ 1}$ and [whether you see – expect a lot of new listings to hit the market over the next year?]$_{question\ 2}$)$^{\textbf{conclusions}}$

Here the two prefaces constitute the argumentative premises in support of the implicit conclusion that the questions are relevant and deserving of an answer. The two questions are thus the explicit counterpart of the conclusion of the inference.

Closed-list questions Closed-list questions – a category of questions variably called in the literature alternative, multiple choice, or considered the sequence of multiple polar questions – are initiators of a dialogical argumentative pattern. This means that the question in itself is a recurrent structure, that is, a pattern, but it becomes an *argumentative pattern* only when paired with the type of reply it receives [16].

In Example 2 (HAS Q1 2021), the reported MIU displays a closed-list question in boldface type (tagged as *question 2*); the excerpt in the corresponding MAU accepts the second option proposed by the question, that is, that the growth in the Magic Arena segment is a function of the expansion of the market base. The dialogical pattern displayed by the example is therefore the combination of three elements: (a) an alternative question ([17] provides further detail on the categorization and analysis of closed list questions); (b) an answer compliant with both the logical and pragmatic constraints posed by the question, i.e., that exactly one of the proposed options is the correct answer. Particularly, this answer developed within the boundaries of a well-formed reply confirms the second option to be correct, which (c) is the one carrying positive implications.

(2) David Beckel (analyst)
I have two, if I could. First one, just on Arena or MAGIC in general, I guess. [Really impressive growth, obviously, from Arena in the quarter.]$_{preface\ 1}$ [I'm curious, do you have the data sets of – capable of giving you a holistic picture of your player base?]$_{question\ 1}$ [I'm curious more specifically **if that growth is coming at the expense of tabletop or if you're actually expanding the market base,**]$_{question\ 2}$ and [whether or not you expect mobile to further expand the market base.]$_{question\ 3}$ That's my first question.

Brian Goldner (CEO)
So in fact, **you're right. The Magic Arena had historically been expanding. It's accelerating in that effort.** (...)

Allo-patterns Each argumentative pattern may have distinct practical realisations – that is, they have allo-patterns. Due to their interactive nature, inter-unit patterns typically generate a higher number of allo-patterns that may or may not be in finite number. For instance, the closed-list question pattern just introduced – at least in the form initiated by a 2-option alternative question – conceives four allo-patterns:

- ACCEPTANCE of the question framing; selection of the option with positive consequences
- ACCEPTANCE of the question framing; selection of the option with negative consequences
- REJECTION of the question framing, refusing mutual opposition of the options; selection of both options
- REJECTION of the question framing, claiming non-exhaustiveness of the options; selection of neither option (possibly introducing and arguing for a third option)

On top of this, clearly, if one also took into consideration the allo-forms that a closed-list question can embody, the resulting allo-patterns would be more numerous.

4. Case Study of a Prototypical Argumentative Pattern in ECCs

A Request of Confirmation of Inference (ROCOI, previously introduced and qualitatively studied by [7]) is a intra-unit argumentative pattern in ECCs that is originated in MIUs. It is *relevant*

to the discussion in the sense that it appears to create an argumentative confrontation – more specifically, a mixed confrontation [18]. The related inter-unit pattern derives from the association of the ROCOI with the reply that it receives.

A ROCOI is an assertive question, i.e., in which a stance is asserted by the questioner, while the interlocutor is asked to answer whether such a stance is correct. As a consequence, when it is formulated directly, a ROCOI is invariably either a yes/no or closed-list question. Moreover, ROCOIs represent a subcategory of assertive questions in the sense that they make explicit by lexical means the fact that the stance asserted is the result of an inferential process – held either by the questioner or a third party – and/or that what is requested to the interlocutor is not simply a reaction on the validity or correctness of such an inference, but a clear (dis)confirmation of the conclusion. This results in the ROCOI being a challenging question, regardless of the degree of semantic indirectness with which is may be framed.

The ROCOI is a crucial argumentative pattern in ECCs because it structurally features argumentation in the question formulation and, due to its challenging nature in a highly standardised environment that prioritises unthreatening exchanges, it regularly elicits argumentative responses as well.

Based on its distinctive features, ROCOIs can be further distinguished into subcategories. The current contribution will consider a two-way classification on the basis of the linguistic indicators adopted in the question formulation.[1] The two classes are:

1. *Report of inferential operation* (roughly correspondent to a merge of categories 1, 2 and 4 laid out by [7]). For a question to be included in this category, it must comply with the following constraints: (a) the inferential reasoning is displayed in the question itself (and not disconnected from it, being for instance part of a preface) and (b) the focus of the request is on the conclusion or, at most, the inferential process that leads to the conclusion; not on the premise(s) to the inference. An instance is shown in Example 3.

   (3) Does that mean that customers are reluctant to term out these sort of prices?

2. *Explicit request of (dis)confirmation* (akin to what was already considered category 2 in [7]). This comprises both end-of-sentence tags or phatic expressions such as "right?", or clauses such as "can you confirm (that)", optionally followed by an assertive statement, as displayed in Example 4.

   (4) Can you confirm whether that is the case?

Moreover, a ROCOI is a *prototypical* argumentative pattern in the sense that: (a) such a strategy is recognized as recurrent and typical by participants [19], (b) it pursues some of the communicative goals associated to analysts in the activity type, such as challenging the managers to produce argumentation (c) while respecting the analysts' incentive to maintain a good relationship with managers (since it typically is an *indirect* framing of a challenge), even in the case in which the proposed inference is negative or plays the role of a bait for the company's management, i.e., it displays a not necessarily fully sincere "lifeboat" benevolent interpretation of the situation which is focus of the question.

[1]The driving choice behind such a distinction is the simplification of the categorization already provided in [7] and ensure both robustness in the results and sufficiently large class size to allow the study; the tradeoff was realised by generalising the linguistically-relevant surface characteristics of the original classes.

Presently displayed are the results from the study on the basic ROCOI – further work will also delve into the dialogical relationship with the replies it receives.

4.1. Data and Method

Following, a brief presentation of an exploratory study on the automatic identification of MIUs that contain at least an instance of ROCOI by fine-tuning on this task two pre-trained ML models of the BERT family on three different input configurations (ablation study).

The dataset comprises 53 ECCs from years 2021-2023 for companies Airbnb (ABNB), British Petroleum (BP), Credit Suisse (CS), Door Dash (DASH), Hasbro (HAS), Shell (SHEL), Exxon Mobil (XOM) and Zillow (Z), for a total of 1210 MIUs. Manual annotation allowed for the identification of 155 MIUs featuring ROCOIs; hereby 170 ROCOIs were gathered.[2] The annotation was first carried out by trained assistants, followed by an additional round of dictionary-based search of instances – manually pruned of false positives – performed by the first contributor.[3] Further information about the annotation guidelines is provided in [21].

For each of the ROCOIs, the representation of both the entire MIU and the portion representing the ROCOI itself was assigned a label, according to which of the two classes described above they belonged to, for a total of 118 occurrences for class 1 and 52 occurrences for class 2. The remaining MIUs that did not contain any ROCOI were assigned to a default class 0.

To partially overcome data imbalance both between the portions that do and do not contain a ROCOI (labels 0 vs 1+2) and among the two ROCOI classes (labels 1 vs 2), two strategies were implemented sequentially: first the application a K-Means algorithm to all the examples so to group them in an unsupervised manner into clusters according to their embedding similarity; this to ensure that clusters are evenly represented between train and test sets. Later, the majority class of the train split was randomly undersampled at the level of the most numerous of the minority classes, so to simulate balance among classes.[4] Details on the training and testing sets and the number of examples are provided in Table 1.

	total	train	undersampled train	test
class 0	1055	835	91	214
class 1	118	91	91	27
class 2	52	38	38	14

Table 1
Number of examples for training and testing.

The selected pre-trained models are roberta-large and deberta-v3-large. The models were first

[2]The dataset is available on GitHub: https://github.com/dagosgi/ROCOIs/tree/main/CMNA2024.

[3]Annotators are student assistants, employed with a part-time contract by the project that funds the current contribution. They are second-year Master's students in investor relations with a background in languages/linguistics. Each document was analysed by two to four annotators in variable configuration. The resulting pairwise agreement on the task of selecting the request type associated with a question is moderate to substantial, up to a Cohen's kappa [20] value equal to 0.76.

[4]The minority classes were initially oversampled to the numerosity of the majority class but this approach led to overfitting of the model to the least represented class and was thus discarded.

fine-tuned associating the label to the concatenation of the representation of the MIU and the ROCOI (or the replication of the MIU itself for both fields, if the MIU did not contain a ROCOI). The ablation study later consisted in (a) removing the MIU and training on the ROCOI+label only and (b) removing the ROCOIs and training on the MIU+label only. The testing phase was performed on the text of full MIUs in all cases.

Fine-tuning was performed over five epochs with batch size of 6, optimizing with AdamW and setting the learning rate equal to 2e-5. The baseline against which the pre-trained models are tested is SVM classification with TF-IDF vectorization setting the maximum number of features at 300.

4.2. Results and Discussion

Table 2 displays the F1 values (harmonic mean of precision and recall) in the evaluation of the prediction task for each of the classes on the test set. It shows that the RoBERTa model outperforms the baseline, slightly privileging the majority class among the two ROCOI types – this may also be influenced by the scarcity of examples for class 2 in both train and test sets. It is surprising – but confirmed by multiple runs – that the DeBERTa model strongly underperforms the baseline; such a result must be influenced by the inadequacy of the model for the task at hand – perhaps due to the characteristics of its pre-training dataset.

model	**class 0** (no ROCOI)	**class 1** (*report* ROCOI)	**class 2** (*request* ROCOI)	**accuracy**
SVM	0.95	0.48	0.57	0.91
roberta-large	**1.00**	**0.87**	**0.76**	**0.97**
deberta-v3-large	0.89	0.05	0.00	0.80

Table 2
Micro F1 scores across models and classes and overall accuracy for the model.

Error analysis With reference to the results displayed in Table 2, two tables reporting the confusion matrix for the RoBERTa and DeBERTa model outcomes respectively follow.

Table 3 shows that the classification performed by the RoBERTa model is robust: misclassification only (marginally) affects the distinction between the two classes of ROCOI. This means that binary identification of the presence vs. absence of ROCOIs is perfect.

	class 0 (no ROCOI)	**class 1** (*report* ROCOI)	**class 2** (*request* ROCOI)
class 0	214	0	0
class 1	0	23	4
class 2	0	3	11

Table 3
Confusion matrix, RoBERTa model.

Table 4, on the other hand, confirms the unreliability of the DeBERTa classification. Whereas

the model identifies false positives for classes 1 and 2, it ultimately fails to recognize any type of ROCOI, resorting to classify examples as the default class in nearly the totality of cases.

	class 0 (no ROCOI)	**class 1** (*report* ROCOI)	**class 2** (*request* ROCOI)
class 0	204	9	1
class 1	26	1	0
class 2	14	0	0

Table 4
Confusion matrix, DeBERTa model.

Ablation study The results of the ablation study are reported in Table 5. The pattern that emerges is that RoBERTa is agnostic towards which element of the pair is omitted in the training, and in any case is not capable of satisfactory classification. On the other hand, DeBERTa shows an unexpected better-than-chance performance in the classification of presence vs. absence of the ROCOI in the case only the context, i.e., the MIU, is passed to the model in the training phase. This is probably again linked to the characteristics of the model architecture and its pre-training, and may be worth investigating in further research.

	model	**class 0** (no ROCOI)	**class 1** (*report* ROCOI)	**class 2** (*request* ROCOI)	**accuracy**
Omitted feature: ROCOI					
	roberta-large	0.00	0.19	0.00	0.11
	deberta-v3-large	0.93	0.51	0.50	0.86
Omitted feature: MIU					
	roberta-large	0.00	0.19	0.00	0.11
	deberta-v3-large	0.89	0.06	0.00	0.81

Table 5
Micro F1 scores across models and classes and overall accuracy for the model in the ablation study.

Results appear to support the claim that the ROCOI is a clearly identifiable pattern and that, with the support of the correct instrument for the task, it is possible to reliably classify an interrogative unit as whether it features at least one ROCOI or not, even with a limited set of examples. As expected, more robust results are obtained when feeding a model both the pattern and the context (MIU) in which it is situated.

5. Conclusion and Future Work

The present contribution develops and updates the pragma-dialectical notion of argumentative pattern, implementing it within the specific turn taking and turn design constraints of a specialized domain activity type.

The Q&A sessions of earnings conference calls (ECCs) are shown to feature some characteristic argumentative patterns – both at the intra- and inter-unit level. The last part of the paper is devoted to detailing an example of prototypical argumentative pattern of ECCs, namely the *request of confirmation of inference* (ROCOI), and to an exploratory study that tests its automatic recognition in question units. Results are in line with the expectation that an unmistakable prototypical pattern is detectable with satisfactory results in the case of low-resource fine-tuning of ML models of language.

Future work on this topic will include data augmentation as an alternative method to overcome the physiological data imbalance across classes and the relative rarity of the pattern among MIUs, as well as the extraction of the actual argumentative pattern from a question unit that is acknowledged to contain (at least) one. Finally, the study will include answers to such an intra-turn argumentative pattern and thus investigate its inter-turn counterpart as well.

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