PREDICTION MARKETS – A LITERATURE REVIEW 2014 FOLLOWING TZIRALIS AND TATSIOPOULOS

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ABSTRACT

In recent years, Prediction Markets gained growing interest as a forecasting tool among researchers as well as practitioners, which resulted in an increasing number of publications. In order to track the latest development of research, comprising the extent and focus of research, this article provides a comprehensive review and classification of the literature related to the topic of Prediction Markets. Overall, 316 relevant articles, published in the timeframe from 2007 through 2013, were identified and assigned to a herein presented classification scheme, differentiating between descriptive works, articles of theoretical nature, application-oriented studies and articles dealing with the topic of law and policy. The analysis of the research results reveals that more than half of the literature pool deals with the application and actual function tests of Prediction Markets. The results are further compared to two previous works published by Zhao, Wagner and Chen (2008) and Tziralis and Tatsiopoulos (2007a). The article concludes with an extended bibliography section and may therefore serve as a guidance and basis for further research.

Keywords: Prediction Markets, Literature Review, Streams of Research, Article Classification, Information Markets

1   INTRODUCTION

In academic research, there are subjects of interest where knowledge and findings are becoming outdated quickly. Literature reviews should represent the knowledge at a certain point in time, but the period when those articles

need refreshment can differ massively in different fields of research. After the first years of research on prediction had passed, the *Journal of Prediction Markets* was established and its first volume was printed in the year 2007. From the first issue, the *Journal of Prediction Markets* became the most important source of information on this topic and featured the most important publications on this subject. In the following years, 108 articles and many editorials as well as additional information have been published in 22 issues and special issues.

The editors started this journal with a categorization and listing of previous research on prediction markets by George Tziralis and Ilias Tatsiopoulos and therefore helped prediction market researchers and other people that were interested in this tool to get an overview about publications and knowledge until that point in time. Work from many sources was showed and helped to understand the streams of research of prediction markets.

Today, after another seven years of academic prediction market research, this article wants to continue the work of Tziralis and Tatsiopoulos and help readers of *Journal of Prediction Markets* to understand the further developments and trends in prediction market research. Although this journal is the most important platform for the exchange of information, publications on prediction markets in other academic journals were identified, analyzed and categorized. A bibliography section supports researchers as well as practitioners in identifying relevant literature for their future works.

1.1 STRUCTURE OF THE ARTICLE

The article is organized as follows. After the introductory chapter, the previous work is presented in section 2. There, two similar studies on which this work is based on are briefly described. The research methodology, including the terminology, databases and a classification scheme, is introduced in section 3. In section 4, the results of the research and categorization are shown in detail. The article concludes in section 5 by presenting some limitations to this study and an extended prediction market bibliography section.
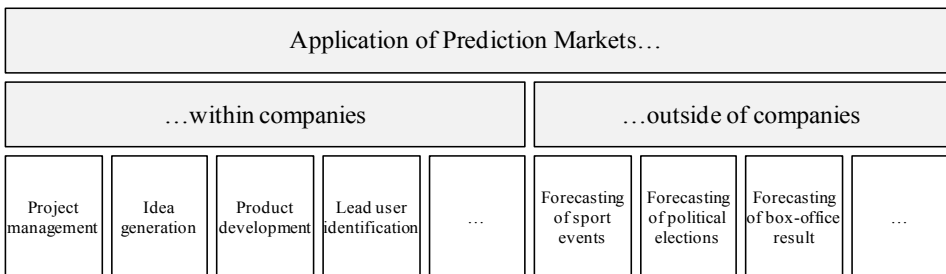
1.2 PREDICTION MARKETS

In the academic literature as in articles published in this journal, there is still no universally accepted definition of the term Prediction Market (Luckner 2008a; Tziralis and Tatsiopoulos 2007a). But following Deck and Porter (2013), "Prediction markets are special case of asset markets where the value of the traded asset is contingent upon the outcome of some uncertain event at or before some prespecified point in time […]". Berg, Nelson and Rietz (2008) describe the primary purpose of Prediction Markets as to aggregate information and to forecast future events. Their main difference to typical

financial markets lies in their primary role as a forecasting tool instead of gaining financial revenues. Thus, Prediction Markets are based on methods from decision theory, collective intelligence and crowdsourcing (Ivanov 2009).

The concept of Prediction Markets gained particular importance as research into the accuracy of their predictions has shown that it is possible to effectively predict future outcomes through the aggregation of information from the trading population (Agrawal, Delage, Peters, Wang and Ye 2011; Graefe, Luckner and Weinhardt 2010). In consequence, companies such as Adidas, General Electric, Gernerla Motors, Google, Hewlett Packard, Intel, Microsoft, Motorola and Yahoo have started to use internal Prediction Markets to improve their forecasting accuracy of project related variables like revenues, costs and completion times (O'Leary 2011a; Ray 2011; Thompson 2012). Further fields of application within companies are the generation of ideas (Soukhoroukova, Spann and Skiera 2012), new product development (Dahan, Soukhoroukova and Spann 2010) and the identification of lead users (Spann, Ernst, Skiera and Soll 2009). Moreover, Prediction Markets are also applied outside companies. In areas like the forecasting of sport events (Borghesi 2009a; Spann and Skiera 2009) and the outcome of political elections (Berg, Forsythe, Nelson and Rietz 2008) this tool has already shown some promising results. Prediction Markets are even applied in the movie industry to predict box-office results (McKenzie 2013). Figure 1 gives a brief overview on the different fields of application of Prediction Markets. Since research in this area is still in its infancy (Zhao, Wagner and Chen 2008), further applications within and outside of companies are conceivable, as well. Graefe (2010b) or Rajakovich and Vladimirov (2009), for example, describe the utilization of PMs in the healthcare sector.

FIGURE 1
Fields of application of Prediction Markets

Application of Prediction Markets…								
…within companies					…outside of companies			
Project management	Idea generation	Product development	Lead user identification	…	Forecasting of sport events	Forecasting of political elections	Forecasting of box-office result	…

The development of Prediction Markets in the academic research and the public in general, reveals, that the concept of PMs experienced a growth of attention in recent years (Graefe 2011a; Tziralis and Tatsiopoulos 2007a; Zhao, Wagner and Chen 2008). In order to track of the latest development, comprising the extent and focus of research, this article provides a

comprehensive literature review and research classification on the topic of Prediction Markets.

2   PREVIOUS WORK

Previous to the description of the methodology and results of the study, the related work is presented in the following. The article is based on two studies with similar approaches: In the first study, presented at the *Pacific Asia Conference on Information Systems* (PACIS) in 2008, Zhao, Wagner and Chen (2008) identify 93[1] articles dealing with the topic of Prediction Markets. In the second study, Tziralis and Tatsiopoulos (2007a) give an extended literature review of 155 PM articles.

Study A: Zhao, Wagner and Chen (2008)
"Review of Prediction Market Research: Guidelines for Information Systems Research"

The authors present an analysis of Prediction Market research relevant to Information Systems (IS) in the publication timeframe from 1985 through 2007. Therefore, they performed three steps to search for prior studies dealing with the topic of PMs. First, Zhao, Wagner and Chen (2008) used a search by keywords in the database ProQuest[2]. They applied descriptors such as "prediction markets", "information markets", "decision markets", "idea futures" and "Iowa Electronic Markets" (IEM) in order to build an initial pool of studies. Second, several prominent IS journals and conference papers were searched for the topic of PMs. In the third step, all references of each found paper were examined as to identify additional PM studies. Their search resulted in a total of 119 articles. After removing irrelevant ones, 93[1] articles were left.

Zhao, Wagner and Chen (2008) classified their results in two different ways. On the one side, they develop categories related to the publication outlet based on outlet name and outlet description (e.g. journal mission statement). They differentiate between "Business & Economics", "Politics & Law", "Information Systems", "Prediction Markets", "Electronic Commerce", "Computer Science" and "Education". On the other side, they assign the articles to research themes. Here they distinguish between the four themes "Description", "Theoretical Work", "Use & Applications" and "Legality & Regulation". The classification according to the research theme is consistent with the study "Prediction Markets: An Extended Literature Review" by

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[1] At the outset of the study "Review of Prediction Market Research: Guidelines for Information Systems Research", Zhao, Wagner and Chen (2008) identified 93 relevant PM articles. In the conclusion, however, the authors only mention 92 articles relevant to their study.
[2] The database can be reached under the domain: http://www.proquest.com/

Tziralis and Tatsiopoulos (2007a) *(cf. study B)*. Table 1 shows the assignment of the articles to the different publication outlets and research themes.

TABLE 1
Number of articles by publication outlet and research theme in Zhao, Wagner and Chen (2008)

Research Theme	Publication Outlet							
	Business & Economics	Politics & Law	IS	PMs	Electronic Commerce	Computer Science	Education	Total
Description	5	7	2	0	2	1	0	17
Theoretical Work	20	2	2	2	4	4	0	34
Use & Applications	16	6	5	3	3	1	2	36
Legality & Regulation	3	2	0	0	0	0	0	5
Total	44	17	9	5	9	6	2	92

Adapted from: Zhao, Wagner and Chen (2008)

In total, only 9 articles could be categorized as IS research within the field of Prediction Markets. Since the research on concept and application of Prediction Markets is still relatively new, Zhao, Wagner and Chen (2008) concluded that "only in recent years IS researchers have started to pay attention to PMs". Finally, Figure 2 illustrates the number of relevant articles per research theme. The authors identified 17 descriptive articles (19%), 34 articles (37%) of theoretical work, 36 application-oriented articles (39%) and 5 dealing with legality and regulation (5%).

In the paper "Prediction Markets: An Extended Literature Review", Tziralis and Tatsiopoulos (2007a) provide a review of PM related academic work. In their study, they examined journal articles, conference proceedings papers, books and book chapters, master's theses, doctoral dissertations as well as other unpublished academic working papers and reports that were referring to the concept of PMs. In order to discover relevant prior work, the authors applied several descriptors, namely: "prediction markets", "information markets", "decision markets", "electronic markets", "virtual markets", "political stock markets", "election stock markets", "artificial markets" and "idea futures". As a result, they identified 155 relevant articles to their study, published between 1990 and 2006.

FIGURE 2
Number of articles per research theme in Zhao, Wagner and Chen (2008)
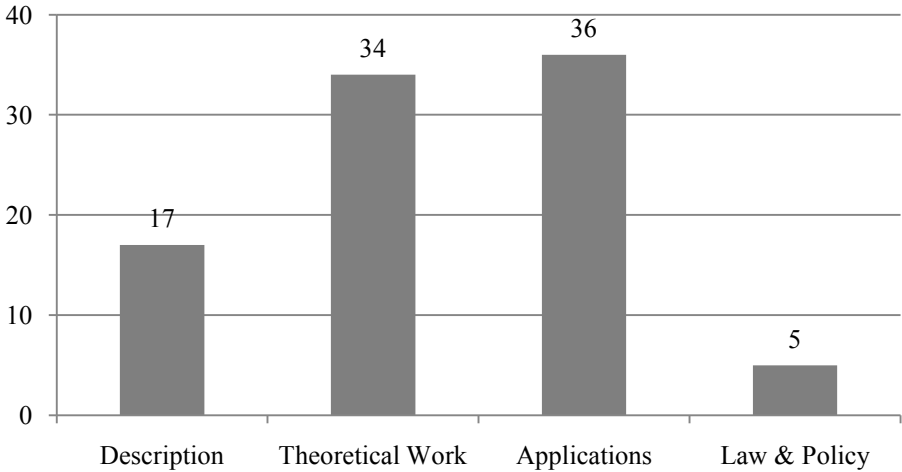
Study B: Tziralis and Tatsiopoulos (2007a)
"Prediction Markets: An Extended Literature Review"

Moreover, Tziralis and Tatsiopoulos (2007a) introduced a classification scheme, which is shown in Figure 3. The 155 articles were grouped into four categories, namely "Description", "Theoretical Work", "Applications" and "Law & Policy". Each of the articles was assigned to one of the categories according to its primary content.

FIGURE 3
Classification of topics in PM literature
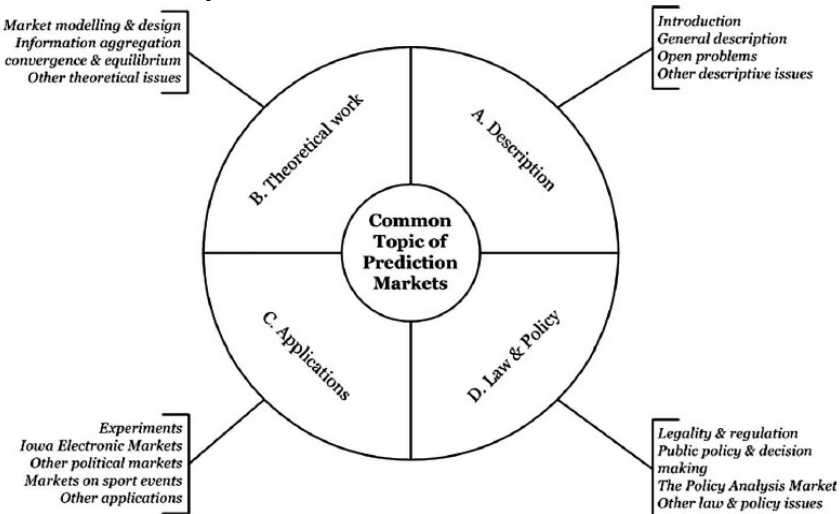
Adapted from: Tziralis and Tatsiopoulos (2007a)

In total, the authors identified 36 articles (23%) of descriptive work, 27 theoretical ones (17%), 72 articles (47%) concerning applications of Prediction Markets and 20 dealing with the topic of law and policy (13%), as Figure 4 illustrates.

FIGURE 4
Number of articles per research theme in Tziralis and Tatsiopoulos (2007a)
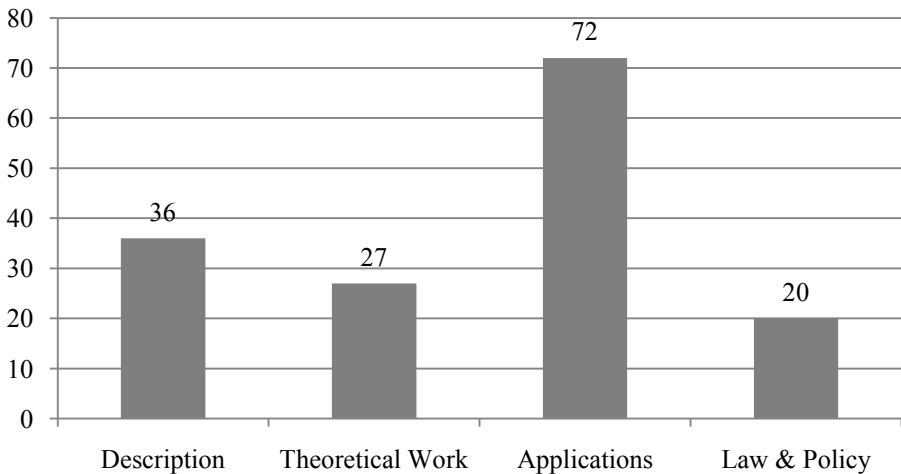
Adapted from: Tziralis and Tatsiopoulos (2007a)

In their conclusion, Tziralis and Tatsiopoulos (2007a) pointed out that "there is a strong need to standardize the terminology used to refer to the PM concept". As already mentioned, there is still no universally accepted definition of the term Prediction Market in the academic literature (Luckner 2008a; Tziralis and Tatsiopoulos 2007a). Besides, the authors stated that a "fully appropriate PM mechanism […] could lead to the expansion of PM research and applications" (Tziralis and Tatsiopoulos 2007a).

This article is based on the research methodology applied by Tziralis and Tatsiopoulos (2007a) and is supposed to continue the research in the field of Prediction Markets.

3   RESEARCH METHODOLOGY

After briefly describing the concept and the different fields of application of Prediction Markets in section 1, section 2 focused on two related studies. The third section outlines the research methodology in detail. This includes on the one hand the terminology and on the other hand the data collection process and applied databases, as the selection of descriptors and databases is

crucial to the success of the literature review. After that, a literature classification scheme is presented in section 3.3.

3.1 TERMINOLOGY

In the academic literature, different terms are used to describe the concept of Prediction Markets, although authors refer to the same mechanism. In addition to the absence of a universally accepted definition, as noted in section 1, a generally adopted descriptor does not exist either (Tziralis and Tatsiopoulos 2007a; Zhao, Wagner and Chen 2008).

Thus, to ensure the identification of a comprehensive literature pool on the topic of PMs, several keywords were used. To guarantee consistency, the selection of keywords is mostly consistent with the keywords used by Tziralis and Tatsiopoulos (2007a). In total, seven descriptors were applied, namely: "prediction markets", "decision markets", "information markets", "virtual markets", "political stock markets", "election stock markets" and "idea futures".

3.2 DATA COLLECTION

The search for PM literature was conducted through the use of three different online databases. Since this literature review is supposed to continue the work of Tziralis and Tatsiopoulos (2007a), the publication timeframe was set to 2007 until 2013. In the following, the proceeding is presented in detail.

First, the catalogues of *Business Source Complete* (EBSCO Host)[3], *ECONIS* (ZBW – Deutsche Zentralbibliothek für Wirtschaftswissenschaften)[4] and *Web of Science* (Thomson Reuters)[5] were applied. Those databases are widely known and offer a comprehensive access to academic journals and other scientific literature, such as ebooks, citation databases and links to relevant working papers from private websites such as university or department sites. The search results were analyzed in order to identify relevant literature and eliminate those that were not related to the topic of Prediction Markets. Second, relevant articles for which no direct access to the full text was available were searched in further sources like ProQuest, the publishers' websites, additional portals (SFX Citation Linker) or Google Scholar[6]. 16 articles could be added to the study by only analyzing the abstract, since no full text was available *(cf. Table 4, Appendix)*. Besides, 19 articles were directly provided by the authors upon request. Third, the relevant articles were categorized according to the classification scheme presented in section 3.3 of the article.

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[3] The database can be reached under the domain: http://search.ebscohost.com/
[4] The database can be reached under the domain: http://www.zbw.eu/
[5] The database can be reached under the domain: http://webofknowledge.com/
[6] Google Scholar can be reached under the domain: http://scholar.google.com/

The study incorporates academic journal articles, contributions in collective editions, conference proceedings, dissertations, master's theses, working papers, accepted manuscripts and articles published in topic related journals.

*For an outline of all reviewed articles please refer to Table 5, Appendix.*

3.3 CLASSIFICATION SCHEME

Next to the search for literature related to the topic of Prediction Markets, the processing of the research results was essential to the article. For this purpose, all relevant articles were assigned to categories based on their primary content. It has to be noted that, due to their content, some articles matched multiple categories. In such case, the relevant article was dedicated to the best matching category and thus was assigned only once.

In order to guarantee the comparability to the two previous studies, described in chapter 2, a similar approach was taken. Therefore, the classification scheme is mostly identical to that of Tziralis and Tatsiopoulos (2007a). In total, four main research themes were established, differentiating between "Description", "Theoretical Work", "Applications" and "Law & Policy". In addition, the category "Applications" was further divided into four subcategories, since the research has shown that a large number of articles are application-oriented. Hence, "Functionality", "Errors", "Comparisons" and "Participants" were created as subcategories to increase the informational value of the article.

An overview of the different literature categories and the four subcategories is provided in Figure 5.

FIGURE 5
Classification scheme of PM literature
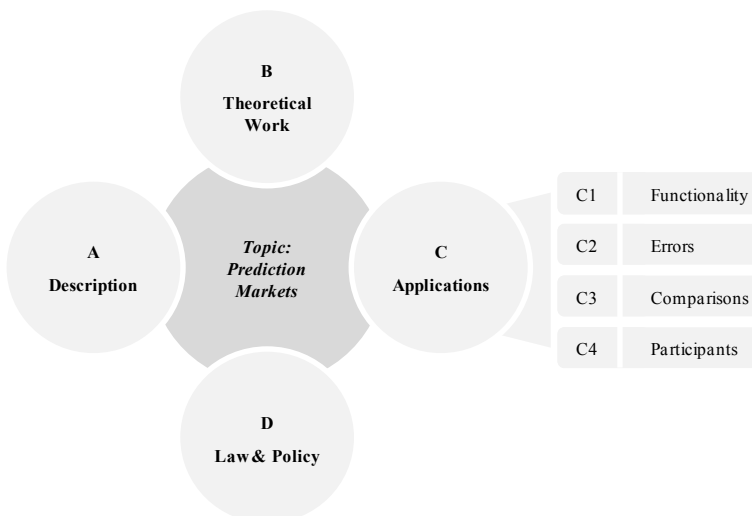
A) Description

This category contains descriptive literature, including short introductory texts and general explanations of the PM concept. Mostly, basic information is at the center of attention. Besides, the category covers articles dealing with open issues and proposals for further research. Also further descriptive literature, such as reviews, summaries and the introduction to other areas of application are part of this category.

B) Theoretical Work

In this category, the focus is on articles of theoretical nature. This covers topics such as the processing of information or the modeling of markets, including design issues, market makers and the general market framework.

C) Applications

Within this category, articles dealing with the actual implementation of PMs are comprised. Next to practical function and accuracy tests of Prediction Markets, topics such as manipulation and bias in PMs, the composition and behavior of people participating in PMs and comparisons between different PMs or other forecasting methods are incorporated.

D) Law & Policy

The last classification category covers literature that deals with the legality and regulation of Prediction Markets and the potential of PMs in improving policy analysis and public decision making. Besides, works that deal with the Policy Analysis Market (PAM) and thereby with issues such as international affairs and terrorism, are included.

In Table 2 the four main categories, including the four subcategories are defined in detail.

4   RESEARCH RESULTS

In the following section, the results of the literature review are analyzed and presented in detail.

During the research, about 800 articles were found *(cf. Table 5, Appendix)*. After eliminating those which were duplicates or not relevant to this study, the review resulted in a total of 318 articles relevant to the topic of Prediction Markets, published between 2007 and 2013. Of those, 16 articles were added to the study after analyzing the abstract, since no full text was available and 19 articles were directly provided by the authors upon request.

TABLE 2
**Definition of classification categories**

Research Theme	Content		
A **Description**	Introductory literature: short introductory texts concerning PMs. General description: basic explanation of the concept of PMs. Open issues: literature which addresses basic questions (no satisfactory solution available yet). Further descriptive literature: taxonomy, introduction to other areas of application, literature reviews and summaries.		
B **Theoretical Work**	Theoretical considerations and argumentations. Theoretical evidence. Market modeling and design issues of PMs. Processing of information (information aggregation process). Further theoretical literature such as the interpretation of PM prices.		
C **Applications**	Application of the PM concept in laboratory and field experiments. Function test of theoretical considerations.	**C1** Functionality	Functionality and forecasting accuracy of PMs. Modification of individual parameters (no comparison). Applications of PMs: political markets (e.g. IEM), sport markets, GHPM, HSX and further practical implementations.
		C2 Errors	Manipulation. Bias (e.g. favourite-longshot bias, over- & underpricing, momentum). Illiquidity. Arbitrage.
		C3 Comparisons	Comparison to other forecasting methods. Comparison between different PMs.
		C4 Participants	Structure and composition of participants. Background of participants. Attitude of participants. Behavior of participants.
D **Law & Policy**	Legality and regulation of PMs. The Policy Analysis Market (PAM): PM application designed for issues, such as international affairs and terrorism. Public policy and decision making: The works of this subcategory address the potential of PM in improving policy analysis and public decision making. Other law and policy issues such as taxation.		

Overall, 78 articles (24%) are of descriptive nature, 52 articles (16%) are theoretical works, 170 are application-oriented articles (54%) and 18 are dealing with the topic of law and policy (6%). Figure 6 provides an overview of the distribution among the four research themes.

Looking at the 170 articles in the applications category more detailed, one can see that 57 articles (33%) are of the functionality of Prediction Markets, 36 are dealing with the topic of errors and the failure of PMs (21%), 59 articles (35%) are containing comparisons and 18 are investigating the structure and composition of participants of a Prediction Market (11%).

The distribution among the application-based subcategories "Functionality", "Errors", "Comparisons" and "Participants" is shown in Figure 7.

FIGURE 6
Number of articles per research theme
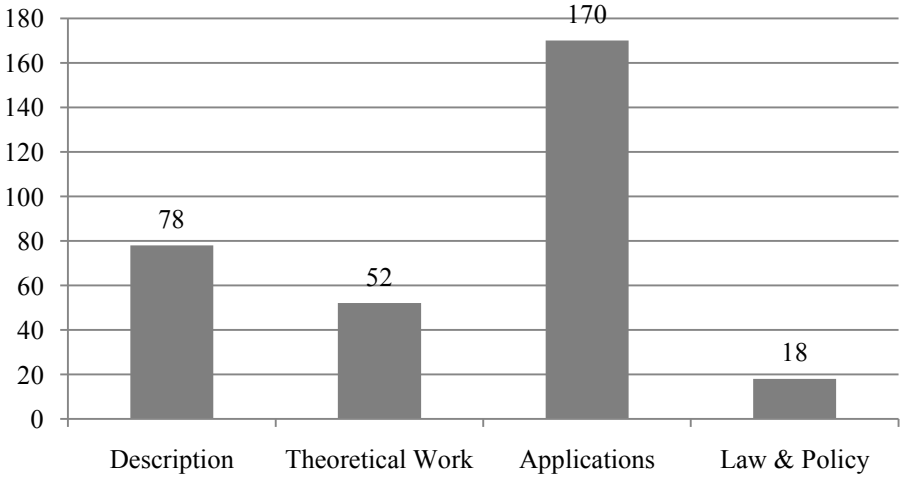
FIGURE 7
Number of articles per application-based subcategory
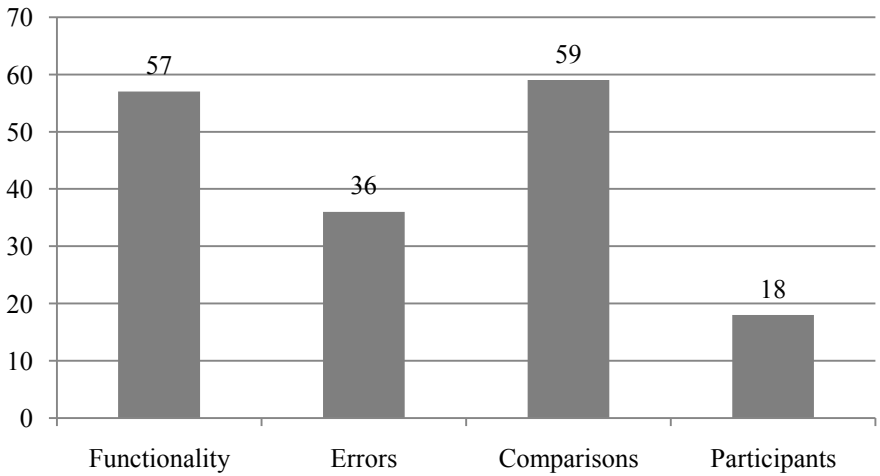
A detailed outline of all relevant articles and their assignment to the different classification groups is presented in Table 3.

TABLE 3
Assignment of relevant literature to research theme

Research Theme		Articles
A **Description**		[2, 7, 10, 13, 22, 30, 37, 44, 49, 66, 67, 70, 73, 75, 80, 83, 91, 92, 97, 101, 102, 103, 107, 111, 122, 123, 125, 127, 128, 129, 130, 133, 135, 139, 144, 149, 152, 154, 159, 163, 168, 175, 180, 181, 182, 183, 192, 208, 213, 216, 217, 218, 219, 224, 231, 234, 235, 243, 247, 252, 253, 255, 257, 258, 262, 264, 266, 272, 273, 294, 295, 299, 305, 306, 307, 316, 317, 318]
B **Theoretical Work**		[1, 3, 4, 8, 11, 29, 51, 57, 58, 59, 60, 61, 62, 80, 83, 84, 90, 95, 104, 109, 110, 111, 113, 114, 117, 134, 139, 147, 158, 166, 168, 174, 181, 182, 187, 206, 214, 215, 218, 219, 225, 241, 259, 260, 296]
C **Applications**	C1 Functionality	[6, 12, 14, 17, 25, 45, 50, 52, 53, 66, 74, 77, 96, 102, 108, 112, 115, 143, 146, 151, 152, 153, 154, 164, 169, 170, 175, 180, 184, 186, 189, 191, 193, 194, 195, 204, 216, 222, 224, 234, 236, 238, 240, 249, 257, 263, 266, 269, 270, 273, 274, 282, 297, 300]
	C2 Errors	[15, 27, 31, 35, 36, 38, 40, 41, 43, 48, 71, 78, 81, 85, 89, 100, 116, 132, 142, 167, 172, 192, 202, 205, 208, 221, 228, 229, 231, 244, 271, 284, 294, 295]
	C3 Comparisons	[9, 16, 19, 20, 23, 24, 26, 32, 33, 34, 39, 42, 46, 54, 55, 72, 73, 82, 86, 94, 101, 105, 106, 120, 122, 127, 128, 130, 133, 144, 157, 160, 162, 173, 183, 190, 200, 201, 220, 232, 235, 246, 250, 251, 254, 258, 264, 265, 267, 272, 276, 278, 279, 283, 286, 288, 289, 290]
	C4 Participants	[47, 56, 67, 75, 92, 149, 161, 165, 196, 213, 230, 239, 256, 275, 277, 287, 298, 299]
D **Law & Policy**		[5, 18, 21, 28, 63, 69, 91, 136, 137, 138, 141, 156, 185, 197, 198, 199, 268, 301]

The concept of Prediction Markets experienced a growth of attention in the academic literature as well as in the public in recent years (Graefe 2011a; Tziralis and Tatsiopoulos 2007a; Zhao, Wagner and Chen 2008). This fact has led to a significant increase in publications, as shown by Tziralis and Tatsiopoulos (2007a) and Zhao, Wagner and Chen (2008). As from the beginning of the 21st century, the number can be described as being sharply increasing. This trend continues until 2009, as Figure 8 indicates. During the period of 2000 through 2009, the Compound Annual Growth Rate (CAGR) amounts to approximately 32%. In 2010, there is a decline and in 2011, a peak of 62 publications can be observed. However, in the years from 2012 through 2013, there is a decline in PM publications. Nevertheless, the number of publications remains at least on the same level as 2005 even in the years after 2011. Future research has to reveal whether this development of declining publications continues.

The whole set of articles, identified in this study, is structured as follows. Application-oriented literature and descriptive works form together nearly 80% of the publications, whereby already more than the half of the 318 relevant articles represent applications. Within the application-oriented publications, forecasting accuracy and functionality of Prediction Markets account for one third. Another third is of comparisons between either different PMs or other forecasting tools and PMs. Both findings show that the performance of Prediction Markets is currently at the center of interest.

FIGURE 8
Number of published PM articles per year[7]
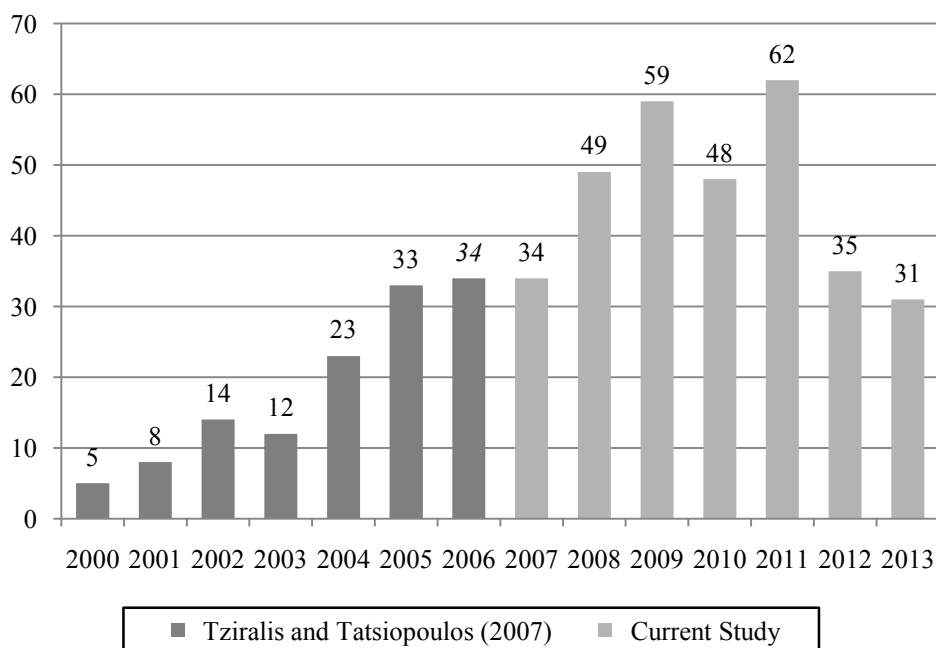
The years from 2000 through 2006 are adapted from: Tziralis and Tatsiopoulos (2007a)

A research theme that stays rather unaddressed is the topic of law and policy with only 6% of all relevant articles within the research. This is quite surprising since the national legislation of Prediction Markets could be essential to their further establishment. But the percentage of articles appears as mostly constant over the years (3% - 12%) *(cf. Figure 10, Appendix)*. The number of articles that are of theoretical nature, covering 15% of all relevant articles, declines from 11 in 2010 to almost zero publications (one article) in 2013 *(cf. Figure 11, Appendix)*.

The overall distribution of research themes among the pool of articles, as outlined in Figure 9, is mostly similar to that presented by Tziralis and Tatsiopoulos (2007a). Only the share of articles concerning legislation and policies is higher in the work of Tziralis and Tatsiopoulos (2007a). Comparing the current analysis to the results of Zhao, Wagner and Chen (2008), there is a shift between the categories "Theoretical Work" and "Applications", as they identified a higher share of theoretical research.

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[7] Examined period in 2006 covers only 8 months.

However, the distributions of descriptive work and legislation related literature appear similar to the current study.

FIGURE 9
Comparison of the distribution of research themes among three studies
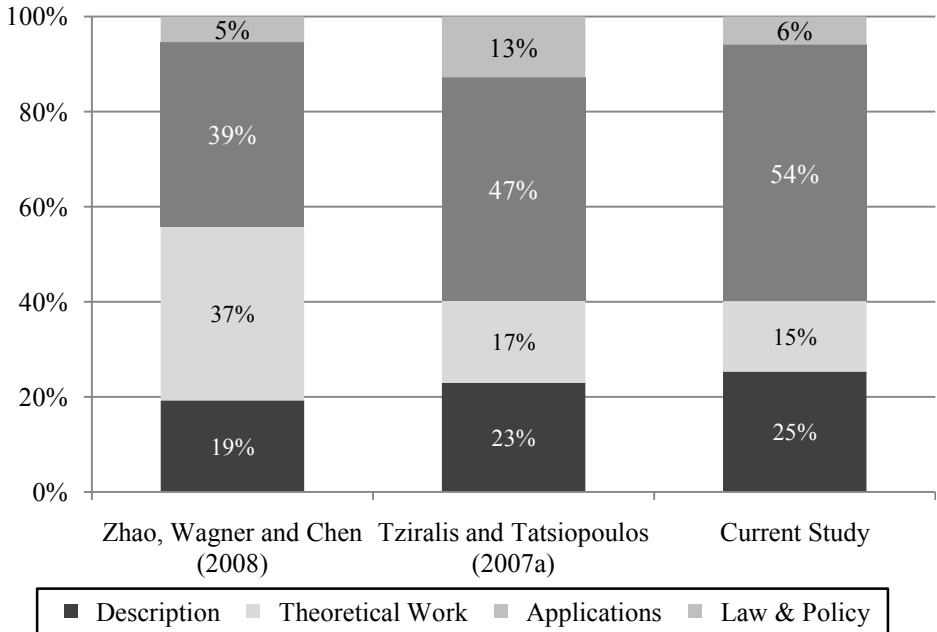
5   CONCLUSION

Since the concept of Prediction Markets as a forecasting tool gained growing interest in the academic research, within companies and the public in general, an annually increase in the publication trend until the year 2009 has been the consequence. Considering Tziralis and Tatsiopoulos (2007a), the publications remained on the same level as 2005 even in the years after 2009. In order to track the latest development of research, comprising the extent and focus of research, this article aimed to provide a comprehensive review and classification of the literature related to the topic of Prediction Markets.

Overall, 316 relevant articles, published in the timeframe from 2007 through 2013, were identified and assigned to the herein presented classification groups. Looking closer at the distribution of the different research themes among the articles, it appears that application-oriented literature (164 articles) and works of descriptive nature (77 articles) are accounting for the bulk of the literature pool. Following the definition of the classification groups given in Table 2 on page 11, the recent research

concentrates primarily on actual function tests and potential fields of application of Prediction Markets. It can be concluded that the fundamentals of the concept have been sufficiently investigated in the academic research and thus the overall forecasting performance of Prediction Markets is currently at the center of interest. Thereby, the concept has already shown some reliable results as Scheiner, Haas, Leicht and Voigt (2013) conclude in their meta-analysis. Some companies have started to experiment with Prediction Markets (Graefe 2010a), but in order to obtain long term acceptance of the concept even within a wider range of companies, it is important to further link theory and laboratory experience with the daily business of companies. Otherwise the concept might remain set aside compared to other forecasting tools in companies.

There are also some limitations to this study. First, it has to be noted that, due to their content, some articles could be matched to multiple categories. In such case, the relevant article has been assigned to the best matching category and thus was assigned only once. Second, even though three different online databases and seven descriptors have been applied, this article cannot claim to be exhaustive. For sure, there are additional, no less relevant works on the topic of PMs than included in this study. Nevertheless, this article provides an extended literature review and may serves as a guidance and basis for further research.

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# APPENDIX

TABLE 4
Articles categorized by abstract

Articles with access only to the abstract	Articles
(∑ 16)	[77, 89, 130, 133, 160, 208, 211, 220, 244, 245, 257, 258, 263, 277, 302, 303]

TABLE 5
Number of search results by descriptor and database

Descriptor	Database			
	Business Source Complete (EBSCO)	ECONIS (ZBW)	Web of Science (T. Reuters)	Total
Prediction Markets	199	144	181	524
Decision Markets	46	0	3	49
Information Markets	100	n/a	n/a	100
Virtual Markets	58	n/a	n/a	58
Political Stock Markets	2	n/a	7	9
Election Stock Markets	1	n/a	0	1
Idea Futures	42	0	0	42
Total	448	144	191	783

From authors upon personal request	33

The use of the descriptor "prediction markets" yielded in the most results with 524 articles. Even though only one database was applied for the descriptors "information markets" and "virtual markets", they yielded in the second/third highest amount of results. The descriptors "political stock markets" and "election stock markets" showed only a few search outcomes. Table 5 lists all search results per descriptor (including duplicates and irrelevant articles).

FIGURE 10
Distribution of research themes by publication year
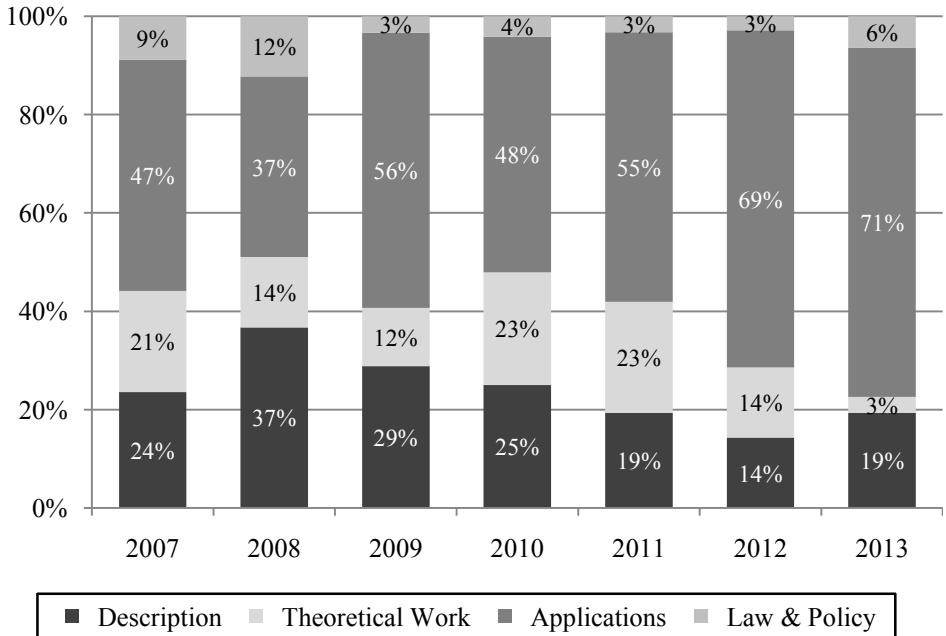
Comparing the distribution of research themes over the years, as shown in Figure 10, it appears that articles comprising topics of law and policy (3% - 12%) stay mostly constant while application-oriented ones (37% - 71%) show the highest variation. Literature of theoretical nature (3% - 23%) and descriptive literature (14% - 37%) display medium variations.

FIGURE 11
Number of PM publications by year and research theme