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Day of the week effect in paper submission/acceptance/rejection to/in/by peer review journals

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HIGHLIGHTS

- Exceptional retrieval of submission dates of scientific papers.
- Exceptional information on acceptance or rejection of scientific papers.
- Unexpected finding about the most probable submission day.
- Unexpected finding about the most often accepted papers if submitted on a given day.
- Relevance of proportionality effects, measure through "entropy distance" arguments.

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ABSTRACT

This paper aims at providing an introduction to the behavior of authors submitting a paper to a scientific journal. Dates of electronic submission of papers to the Journal of the Serbian Chemical Society have been recorded from the 1st January 2013 till the 31st December 2014, thus over 2 years. There is no Monday or Friday effect like in financial markets, but rather a Tuesday–Wednesday effect occurs: papers are more often submitted on Wednesday; however, the relative number of going to be accepted papers is larger if these are submitted on Tuesday. On the other hand, weekend days (Saturday and Sunday) are not the best days to finalize and submit manuscripts. An interpretation based on the type of submitted work ("experimental chemistry") and on the influence of (senior) coauthors is presented. A thermodynamic connection is proposed within an entropy context. A (new) entropic distance is defined in order to measure the "opaqueness" = disorder) of the submission process.

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论文提交/接受/拒稿至同行评审期刊的星期效应

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高亮

- 科学论文提交日期的异常检索。
- 科学论文接受或拒绝情况的异常信息。
- 关于最可能提交日的意外发现。
- 关于在给定日提交时最常被接受的论文的意外发现。
- 比例效应的相关性，通过‘‘熵距离’’论点进行衡量。

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拒稿率
熵
资深合著者

摘要

本文旨在介绍作者向科学期刊提交论文的行为。塞尔维亚化学学会期刊的电子投稿日期从2013年1月1日记录到2014年12月31日，历时两年多。与金融市场不同，这里没有星期一效应或星期五效应，而是存在周二-周三效应：论文更常在周三提交；然而，如果这些论文在周二提交，被接受的比例相对更高。另一方面，周末（周六和周日）并非最终定稿和提交稿件的最佳时间。本文基于提交工作的类型（“实验化学”）以及（资深）合著者的影响进行了解释。在熵的背景下提出了热力学联系。定义了一种（新的）熵距离，用于测量提交过程的“不透明度”（ = 无序）。

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1. Introduction

Human behavior is controlled by many externalities. Much difficulty for selecting and analyzing them resides in the complexity of establishing experimental schemes, in a laboratory, in view of mimicking the real world. Comparison between laboratory outputs and "common sense expectations" is often impaired by the lack of reliable (and unbiased) data on the latter. For socio-physicists, one basic question about behavior is geared toward finding whether there is some unforced regularity in behavior, *e.g.* weekly, monthly, seasonal or with longer time scales. For example, one finds quantitative considerations on human aspects of synchronized behavior or cyclic rhythms, like menstruation, heart beat or birth rates [1–5]. It is well known that there is a day-of-week effect in financial markets [6–13].

Here, we explore the behavior of agents submitting papers for peer review and publication in a scientific journal. We find that, in the case at hand, more papers are submitted on Tuesday, but relatively (to the total number of submitted papers) more papers are accepted for publications if submitted on Wednesday by the author(s). On the other hand, the highest rejection rate occurs for papers submitted on Saturday. Statistical tests are provided to ensure the validity of the findings. These were hardly predictable, whence it seems worth reporting them, even though they suggest further questions and investigations. While it would be interesting to compare our results with those obtained by studying other journals, such data is not easily available. We admit that it might be often possible through IT infrastructure to retrieve dates of submissions of accepted papers. However, the case of rejected papers is rather hopeless: such "trade secrets" are not shared with external researchers. We have been fortunate to get access to such data in the present case.[3]

Our report is a case study. In order to go beyond our observation, we are aware that more data must be made available by editors and/or publishers. Nevertheless, the outlined findings and subsequent hypotheses, short of a model we also agree on this, on behaviors of scientific authors, take into account their work environment. The results suggest some possibly universal feature for submitted manuscripts in so called "hard core science".

As an introduction to our aim, recall that "agents" can be considered as either rational or irrational, but are also influenced by "external fields", in a socio-physics sense [4], *e.g.* in stock market returns [14] or book or record sales [15], respectively. It is logical to admit that an agent behavior is often influenced by the action of others, but could also be intrinsic due to societal constraints or habit,—and memory experience as well [16]. For example, it has been shown that an investor behavior is different, on Monday and Friday with respect to other days of the week, as noticed in many economist reports [6–13], about stock exchange returns on markets in developed countries. For completeness, let us acknowledge that some debate goes on about such a behavior for stock markets pertaining to "emerging countries" [17,18]. Here, we focus some attention on similar behavioral questions outside the financial and economic sphere, but rather in a scientometrics framework.

The best methodology should consider strict investigation rules on whether a "submission weekday behavior effect" exists and is confirmed, using specific data and pertinent quantitative methods, through questions as:

- can one observe and analyze (scientific) agent (behavior) effects?
- can one find out whether there is any daily difference in behavior?
- can one test whether the findings are reliable?

Thereafter some discussion is expected, together with suggestion for further investigations.

Due to the background of the present researchers, they were able to obtain very reliable data, see Section 2, on the submission of papers to a scientific journal. Moreover, the outcome, acceptance or rejection, was provided. Whence we are able to measure whether some "day of the week" effect exists through statistical tests,—see Section 3, not only on the most popular day for submission, but also on the day for which the outcome will be the most positive (and the most negative) one. Since the various probabilities of interest are empirically known, it is easy to connect the data description with the notion of entropy, thereby measuring and discussing the disorder of author submission of papers, as in Section 4. An interpretation of the findings is proposed in Section 5; a short conclusion is made in Section 6.

2. Data

We have obtained data about how many papers ($N = 596$, in fact) were electronically submitted to The Journal of the Serbian Chemical Society (JSCS)[4] for the years 2013 and 2014. (The journal contains various sub-sections.) JSCS had an impact factor $= 0.912$ in 2012. A histogram of the day of the week submission is shown in Fig. 1.

Next, let us call the numbers of papers later accepted (N_a) and those rejected (N_r); the day-of-the week values are given in Table 1. Among those 596, $N_a = 262$ were finally accepted for publication. At this time of writing, 2 are still under review, and 38 are not yet published. For completeness, let it be recorded that $N_{nrr} = 23$ were rejected because the authors did not reply to the reviewers remarks in due time, while 7 submissions were withdrawn ($N_w = 7$). (Thus, $N_a + N_r \neq N$).

The relative number (expressed in percentages) of papers accepted or rejected after submission (N_a/N and N_r/N) on a specific day of the week is shown in Table 1 and, for having a good visual inspection, in Fig. 2. It appears that, in contrast to the (more often occurring) submission day (Wednesday, day 3),—the next one being Tuesday, the papers are more often

[3] ON and AD are Journal of the Serbian Chemical Society Sub-Editor and Journal of the Serbian Chemical Society Manager, respectively.
[4] http://shd.org.rs/JSCS/.

1. 引言

人类行为受许多外部因素控制。选择和分析这些因素存在许多困难，这源于在实验室中建立实验方案以模拟真实世界的复杂性。实验室结果与“常识预期”之间的比较往往受到后者缺乏可靠（且无偏）数据的阻碍。对于社会物理学家而言，关于行为的一个基本问题是寻找行为中是否存在某种非强制性的规律性，例如每周、每月、季节性或更长时间尺度。例如，人们发现了一些关于人类同步行为或周期性节律（如月经、心跳或出生率）的定量研究[1–5]。众所周知，金融市场存在一周内效应 [6–13]。

在此，我们探讨代理人提交论文进行同行评审和发表在科学期刊上的行为。我们发现，在所讨论的情况下，星期二提交的论文较多，但相对（相对于提交论文的总数）而言，星期三提交的论文被接受发表的可能性更高。另一方面，星期六提交的论文拒稿率最高。我们提供了统计检验以确保研究结果的可靠性。这些结果几乎难以预测，因此似乎值得报告，尽管它们提出了进一步的问题和调查。虽然将我们的结果与其他期刊的研究结果进行比较会很有趣，但这类数据并不容易获得。我们承认，通过IT基础设施通常可以检索到被接受论文的提交日期。然而，被拒稿论文的情况则相当绝望：这些“商业机密”不会与外部研究人员共享。在本案例中，我们很幸运地获得了此类数据。[3]

我们的报告是一份案例研究。为了超越我们的观察，我们意识到编辑和/或出版商必须提供更多数据。尽管如此，概述的发现和后续假设——除了我们同意的模型之外——也考虑了科学作者的行为及其工作环境。结果表明，所谓的‘‘硬核科学’’中提交的稿件可能具有一些普遍特征。

作为我们目标的介绍，回想一下，‘‘代理’’可以被视为理性或非理性，但也会受到‘‘外部场’’的影响，从社会物理学的角度来看，例如在股票市场回报 [4]，或图书或唱片销量 [14]中分别如此。承认代理行为通常受他人行动的影响是合理的，但也可能是内在的，由于社会约束或习惯——以及记忆经验 [16]。例如，已有研究表明，投资者的行为在一周中的星期一和星期五与其他日子不同，正如许多关于发达国家股票市场回报的经济学家报告 [6–13]，中注意到的。为了完整性，让我们承认，关于‘‘新兴国家’’ [17,18]的股票市场是否存在这种行为存在一些争论。在这里，我们关注类似的行为问题，但超出了金融和经济领域，而是在科学计量学的框架内。

最佳方法论应考虑严格调查规则，以确定是否存在并已确认‘‘提交周几行为效应’’，需使用特定数据和相关的定量方法，通过以下问题进行：

- 能否观察和分析（科学）代理（行为）效应?
- 能否查明是否存在行为上的任何每日差异?
- 能否检验研究结果是否可靠?

此后，预计将进行一些讨论，并提出进一步研究的建议。

由于当前研究人员的背景，他们能够获得非常可靠的数据，参见第2节，关于向科学期刊提交论文的情况。此外，还提供了结果，即接受或拒绝。因此，我们能够通过统计检验测量是否存在某些‘‘星期几’’效应——参见第3节，不仅针对提交最热门的日子，还针对结果将是最积极（和最消极）的那一天。由于相关的各种概率是经验上已知的，因此很容易将数据描述与熵的概念联系起来，从而测量和讨论作者提交论文的无序性，如第4节所述。第5节提出了对研究结果的解释；第6节做了简短的结论。

2. 数据

我们已经获得了关于多少论文 ($N = 596$，（实际上）被电子提交到塞尔维亚化学学会期刊（JSCS）[4] 在2013年和2014年的数据。（该期刊包含各种子版块。）JSCS在2012年的影响因子为 $= 0$。912。提交的星期几的直方图显示在图1中。

接下来，让我们称后来接受的论文数量（N_a）和被拒绝的论文数量（N_r）；星期几的值在表1中给出。在596 $N_a = 262$ 篇论文中，最终有596篇被接受发表。在撰写本文时，仍有2篇论文在审稿中，还有38篇尚未发表。为了完整性，让我们记录下来，$N_{nrr} = 23$ 篇论文被拒绝是因为作者没有及时回复审稿人的意见，而7篇投稿被撤回（$N_w = 7$）。（因此，$N_a + N_r \neq N$）。

在特定星期几，提交后接受或拒绝的论文的相对数量（以百分比表示）如表1所示，为了便于直观检查，也在图2中展示。可以看出，与（更常发生的）提交日（星期三，day3）——下一个提交日是星期二——相比，论文在星期二（day 2）提交时更常被接受。然而，被拒绝的论文数量最多的是那些显然在星期三(day3)提交的。然而，以相对术语表示（即某一天提交的论文的百分比），——出乎意料的是，如果提交在星期六（day 6），——也在周日（day 0），——手稿被拒绝的比例最大。星期二提交仍然在比例上是最有利于积极结果的日子。

[3] ON和AD分别是塞尔维亚化学学会期刊的副编辑和塞尔维亚化学学会的经理，[4] http://shd.org.rs/JSCS/。

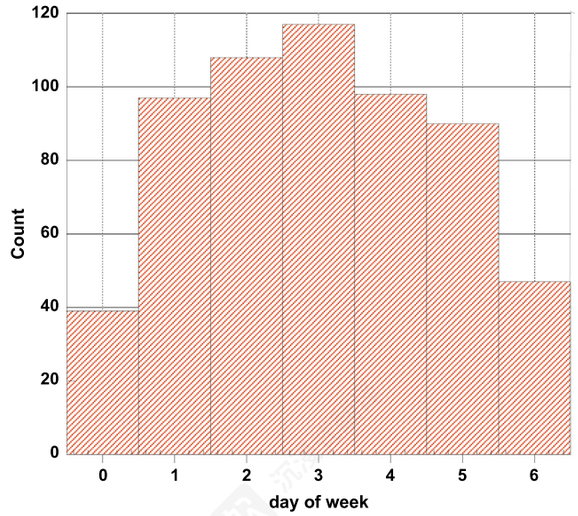


Fig. 1. Number of papers submitted to JSCS according to the week day of submission in 2013 and 2014.

Table 1
Number N of papers *submitted on a given week day* to JSCS in 2013 and 2014, among which are the numbers of papers later accepted (N_a) or rejected (N_r). The relative percentages (per day) are also given. N_{nrr} is the number of papers rejected because the authors did not reply to the reviewers' remarks in due time. N_w are withdrawn submissions. The 95% confidence of a null hypothesis (uniform distribution) for the 6 degrees of freedom $\chi^2 = 12.592$.

		N	N_a	N_r	N_a/N	N_r/N	N_{nrr}	N_w	N_r/N_a
0	Sunday	39	14	25	0.359	0.641	–	–	1.786
1	Monday	97	42	53	0.433	0.546	6	2	1.262
2	Tuesday	108	60	46	0.556	0.426	5	1	0.767
3	Wednesday	117	51	64	0.436	0.547	4	2	1.255
4	Thursday	98	43	54	0.439	0.551	3	–	1.256
5	Friday	90	38	50	0.422	0.556	4	2	1.316
6	Saturday	47	14	33	0.298	0.702	2	–	2.357
	Total:	596	262	325	0.437	0.543	24	7	1.240
	χ^2	62.354	49.260	22.868	–	–	3.488	5	–

accepted when (or if) submitted on Tuesday (day 2). However, the largest number of rejected papers are those apparently submitted on Wednesday (day 3). However, when expressed in relative terms (in percentages of the submitted papers on a given day),—unexpectedly, the greatest proportion of manuscripts gets rejected if submitted on Saturday (day 6),—also on Sunday (day 0). A Tuesday submission still proportionally remains the best day for a positive outcome.

Consider the N_r/N_a ratio which actually emphasizes this rate of rejection. The ratio decreases from 1.79 (Sunday), to 1.26 (Monday), goes to a minimum 0.77 (Tuesday), then increases 1.25, 1.26, 1.32 and 2.36 (Saturday); see Table 1. It seems that a Sunday–Saturday effect can be extracted, if we want to judge the odds on rejection/acceptance probability, while a Tuesday–Wednesday effect is prominent for a paper later acceptance (see Fig. 3).

3. Data analysis

First, observe that the summary statistics in Table 2 show that the distribution of the daily submission, later accepted or not papers, are negatively skewed,—which has to be expected. The kurtosis of each distribution is also negative. However, the skewness of the distribution of percentages is not always negative. The results of the Doornik–Hansen test (based on the skewness and the kurtosis) [19] show that the empirical distributions of all the variables are non-Gaussian.

Next, recall also that the χ^2 value at 0.95% confidence is 18.5476 for 6 degrees of freedom for a uniform distribution. Supposing that the distribution of submitted papers is week day independent, the calculated χ^2 is 62.354,—see Table 1, thereby indicating that the distribution is far from uniform, *i.e.* there are significant differences about the day of the week. There is a markedly significant propensity to submit on Wednesday (day 3 of the week).

Supposing that the distribution of the accepted or rejected papers is week day independent, the calculated χ^2 are found to be equal to 49.260, and 22.868, respectively for N_a, and N_r, thereby indicating that the distribution is far from uniform, *i.e.* there are significant differences about the day of the week positive (or negative) outcomes.

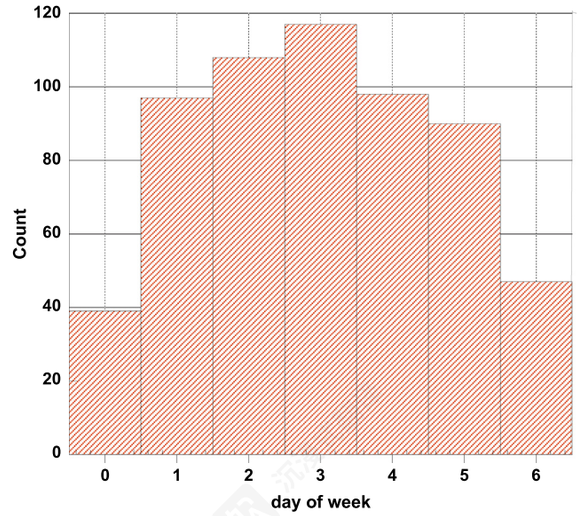


图1。2013年和2014年根据提交日提交到JSCS的论文数量。

表1
2013年和2014年在给定工作日向JSCS提交的论文数量N，其中包含后来被接受（N_a）或被拒绝（N_r）的论文数量。还给出了相对百分比（每天）。N_{nrr} 是因作者未及时回复审稿人意见而被拒绝的论文数量。N_w 是撤回的提交。6个自由度的零假设（均匀分布）的95%置信度。

		N	N_a	N_r	N_a/N	N_r/N	N_{nrr}	N_w	N_r/N_a
0	周日	39	14	25	0.359	0.641	–	–	1.786
1	星期一	97	42	53	0.433	0.546	6	2	1.262
2	星期二	108	60	46	0.556	0.426	5	1	0.767
3	星期三	117	51	64	0.436	0.547	4	2	1.255
4	星期四	98	43	54	0.439	0.551	3	–	1.256
5	星期五	90	38	50	0.422	0.556	4	2	1.316
6	星期六	47	14	33	0.298	0.702	2	–	2.357
	总计:	596	262	325	0.437	0.543	24	7	1.240
	χ^2	62.354	49.260	22.868	–	–	3.488	5	–

如果（或当）在星期二（day 2）提交时，论文被接受。然而，被拒绝的论文数量最多的是那些显然在星期三(day3)提交的。然而，以相对术语表示（即某一天提交的论文的百分比），——出乎意料的是，如果提交在星期六（day 6），——也在周日（day 0），——手稿被拒绝的比例最大。星期二提交仍然在比例上是最有利于积极结果的日子。

考虑 N_r/N_a 比率，它实际上强调了这一拒绝率。该比率从1.79（周日）下降到1.26（周一），降至0.77（周二）的最低点，然后增加到1.25、1.26、1.32和2.36（周六）；参见表1。如果我们想判断拒绝/接受概率的几率，似乎可以提取出周日-周六效应，而周二-周三效应则对论文后期接受更为显著（参见图3）。

3. 数据分析

首先，观察表2中的汇总统计数据表明，已接受或未接受的每日提交论文的分布呈负偏态——这是可以预料的。每个分布的峰度也是负的。然而，百分比分布的偏度并不总是负的。Doornik–Hansen检验（基于偏度和峰度）[19] 的结果表明，所有变量的经验分布均非高斯分布。

接下来，还需记住，对于均匀分布，自由度为6时，95%置信水平下的 χ^2 值为18.5476。假设提交论文的分布与星期几无关，则计算出的 χ^2 为62.354——参见表1，这表明分布远非均匀，即星期几之间存在显著差异。显著倾向于在星期三（一周的第3天）提交论文。

假设接受或拒绝论文的分布与星期几无关，则对于N_a和N_r，计算出的 χ^2 分别为49.260和22.868，这表明分布远非均匀，即正（或负）结果在星期几之间存在显著差异。

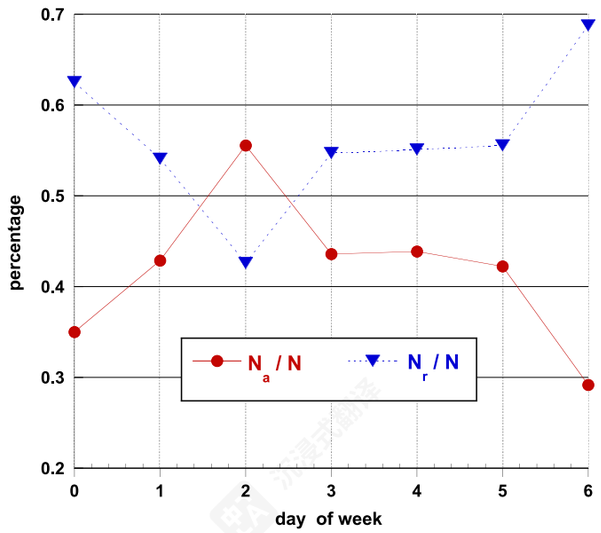


Fig. 2. Percentages of accepted and rejected papers (with respect to the number of papers submitted on a given day) according to the week day of submission to JSCS in 2013 and 2014.

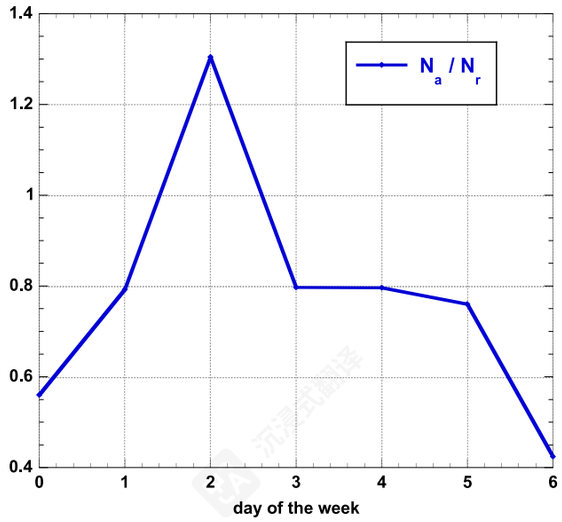


Fig. 3. Ratio of accepted to rejected papers according to the week day of submission to JSCS in 2013 and 2014.

Table 2
Statistical characteristics of the distribution of the number N of papers *submitted on a given week day* to JSCS in 2013 and 2014, and number of papers later accepted (N_a) or rejected (N_r). The characteristics of the percentage distributions are also given.

	N	N_a	N_r	N_a/N	N_r/N	N_r/N_a
Min.	39	14	25	0.298	0.426	0.767
Max.	117	51	64	0.556	0.702	2.357
Sum	599	262	325	2.92	3.93	9.998
Mean	85.6	37.4	46.4	0.418	0.562	1.428
Median	98	42	50	0.429	0.551	1.262
Std Dev.	29.7	17.5	13.3	0.082	0.0807	0.505
Skewn.	−0.694	−0.383	−0.464	0.113	−0.0986	0.758
Kurt.	−1.12	−1.15	−0.864	−0.275	−0.218	−0.138

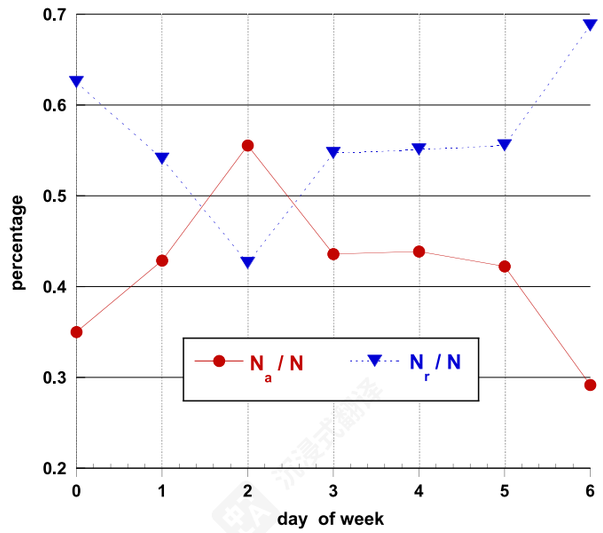


图2。接受和拒绝论文的百分比（相对于某一天提交的论文数量），根据提交到JSCS的星期几，数据来自2013年和2014年。

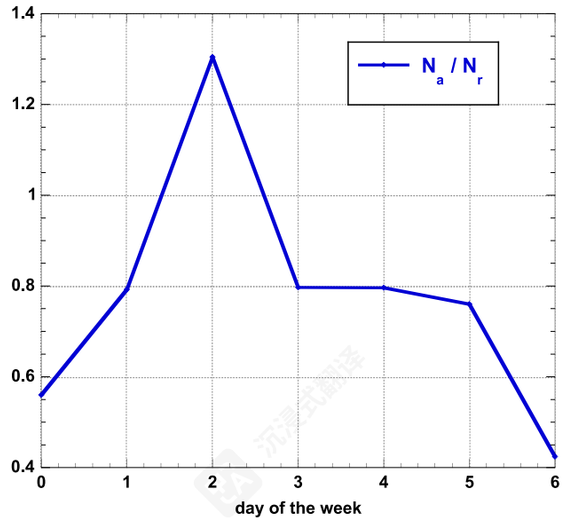


图3。接受与拒绝论文的比率（根据提交到JSCS的星期几），数据来自2013年和2014年。

表2
2013年和2014年提交到JSCS的某一天中论文数量N的分布的统计特征，以及后来接受的论文数量（N_a）或拒绝的论文数量（N_r）。还给出了百分比分布的特征。

	N	N_a	N_r	N_a/N	N_r/N	N_r/N_a
Min.	39	14	25	0.298	0.426	0.767
Max.	117	51	64	0.556	0.702	2.357
Sum	599	262	325	2.92	3.93	9.998
Mean	85.6	37.4	46.4	0.418	0.562	1.428
中位数	98	42	50	0.429	0.551	1.262
标准差	29.7	17.5	13.3	0.082	0.0807	0.505
偏度	−0.694	−0.383	−0.464	0.113	−0.0986	0.758
峰度.	−1.12	−1.15	−0.864	−0.275	−0.218	−0.138

4. Entropy connection

The ratio between the number of papers submitted on a given day ($N_s^{(j)}/N_T$) with j indicating a day of the week $= 0, \ldots, 6$, and N_T the total number of submitted papers can be considered to be a characteristic (empirical) measure of the daily probability $p_s^{(j)}$ of submission. Similarly $N_a^{(j)}/N_a$ (and $N_r^{(j)}/N_r$) can be considered to be a characteristic (empirical) measure of the probability of acceptance (or rejection) for the paper submitted on a given day, *i.e.* $p_a^{(j)}$ and $p_r^{(j)}$ respectively.

Thereafter, one can obtain something which looks like a contribution to a Shannon information entropy [20,21] for a given day j, *e.g.* for submission:

$$H_s^{(j)} \equiv -p_s^{(j)} \ln(p_s^{(j)}), \tag{4.1}$$

leading to $H \equiv \sum_{j=0}^{6} H^{(j)}$. One obtains: $H_s = 1.8880$, $H_a = 1.8393$, and $H_r = 1.9082$, respectively. Such values have to be compared to the entropy of full disorder $H = \ln(7) = 1.9459$, markedly higher than the others. Indeed, to estimate the validity of an empirical distribution, it is practical to compare each ($H^{(j)}$) measure to their related maximum disorder number, *i.e.* $\ln(N^{(j)})$. Thus, we define the relative "distance" to the maximum entropy (full disorder) as[5]

$$d^{(j)} = 1 - \frac{H^{(j)}}{\ln(N^{(j)})}. \tag{4.2}$$

Eq. (4.2) measures the information loss if the empirical probability ($p^{(j)}$) is taken as an approximation to that arising from the uniform distribution. Then, $d^{(j)}$ contributes to a correct evaluation of the entity of the deviation of the set of data. Therefore, $d^{(j)}$ can be interpreted as a proxy of the degree of opaqueness (or of disorder) of the "paper submission market". The $d^{(j)}$'s are respectively equal to 0.02975, 0.05478, and 0.01937 for the submitted, accepted and rejected cases.

5. Interpretation

Some reasoning on the findings can be proposed. Much is due to the type of journal, type of papers, and type of authors! Recall that the journal is rather specialized,—in chemistry. It can be expected (and it is observed) that most papers are reporting rather experimental data, and are often co-authored. It should be of common knowledge that much work is produced every day of the week in an active laboratory, but much writing (after data analysis) occurs often during week-ends. Moreover, young researchers are not expected to bother their advisor during the week end. Thus, much discussion between them occur at the beginning of the week. The senior author is prone to request some revision of the writing, inducing a delay in the submission process, thereby leading to a more frequent submission of papers on the middle of the week. The higher frequency of acceptance of papers for the Tuesday submission is conjectured to occur because the paper is better written and does not need an extra day of revision before submission.

Concerning the effect of week-end submission, it can be conjectured that researchers who submit on Saturday or Sunday do so less willingly during the week because they work under pressure (someone or themselves expect a manuscript to be sent by Monday,—an unwilling task for a weekend). Maybe these scientists are less eager to read very carefully once again their manuscript or are less inspired to draw important conclusions or to demonstrate significant relations in the results. Moreover, since it is remarkable that the probability of a paper (later) acceptance (N_a/N_r) is higher when the paper is submitted on Tuesday, it seems that it is not worthwhile to wait an extra day (or more) to polish a paper.

If necessary, we re-emphasize to the reader that the role of the author is the concern: the role of the editor is irrelevant. For example, one might have imagined that the editor plays some role in the rejection of papers, yet electronically submitted by an author on a given day. On this remark, it can be observed that the number of desk rejected papers, *i.e.* N_{dr} is equal to 161. Their day of submission distribution is quasi uniform, as depicted in Fig. 4; statistically, a χ^2 test leads to $\chi^2 \simeq 9.74$, quite below the $\chi^2 = 12.59$, corresponding to the 95% confidence of a null hypothesis (uniform distribution) for the 6 degrees of freedom.

6. Conclusion

In summary, there is quite a number of studies on the "day of the week" effect on financial markets. To the best of our knowledge, this is the first time that one quantifies submission of scientific papers, thus the behavior of scientific agents in such a process, *i.e.* considering some author's brain work and scientific activity content. Moreover, to take into a specific outcome (later acceptance or rejection) does not seem to have been studied.

It has also been shown that the analysis should take into account the relative size of daily submissions within a week. This normalization is relevant in order to observe whether the acceptance and rejection rates (= probabilities) will differ depending on the day of submission.

[5] The astute reader observes that this definition is different from the "Kullback–Leibler divergence" measure [22]; the present one is closer to a thermodynamic interpretation.

4. 熵关联

在给定一天提交的论文数量与星期几 $= 0$（即星期一至星期六）之间的比率 ($N_s^{(j)}/N_T$)，以及提交论文总数 N_T 可以被视为每日提交概率 $p_s^{(j)}$ 的一个特征（经验）度量。类似地 $N_a^{(j)}/N_a$ （$N_r^{(j)}/N_r$）也可以被视为给定一天提交论文接受（或拒绝）概率的特征（经验）度量，即 $p(j)^j$ a 和 $p(j)^j$ r 分别。

此后，可以得到类似于给定一天 j 的香农信息熵 [20,21] 贡献，例如对于提交：

$$H_s^{(j)} \equiv -p_s^{(j)} \ln(p_s^{(j)}), \tag{4.1}$$

由此得到 $H \equiv \sum_{j=0}^{6} H^{(j)}$。得到：$H_s = 1.8880$、$H_a = 1.8393$ 和 $H_r = 1.9082$，分别。这些值必须与完全无序 $H = \ln(7) = 1.9459$ 的熵进行比较，明显高于其他值。实际上，为了估计经验分布的有效性，将每个 ($H(j^j)$) 度量与其相关的最大无序数进行比较是实用的，即 $\ln(N(j^j))$。因此，我们将与最大熵（完全无序）的相对“距离”定义为 [5]

$$d^{(j)} = 1 - \frac{H^{(j)}}{\ln(N^{(j)})}. \tag{4.2}$$

公式(4.2)衡量了当经验概率($p(j^j)$)被视为均匀分布的近似值时，信息损失的程度。然后，$d(j^j)$ 有助于正确评估数据集偏差的实体。因此，$d(j^j)$ 可以被解释为“论文投稿市场”不透明度（或无序程度）的代理指标。对于已提交、已接受和被拒的案例，$d(j^j)$分别等于0.02975、0.05478和0.01937。

5. 解释

可以对研究结果提出一些推论。这很大程度上归因于期刊类型、论文类型和作者类型！回想一下，该期刊相当专业——化学领域。可以预期（并且观察到）大多数论文报告的是实验数据，并且通常是合著的。众所周知，在活跃的实验室里，每天都有大量工作产出，但数据分析后的写作通常发生在周末。此外，年轻研究人员不期望在周末打扰他们的导师。因此，他们之间的讨论通常发生在每周初。资深作者倾向于要求对写作进行一些修改，这会导致提交过程延迟，从而导致论文在每周中旬提交得更频繁。周二提交论文的高接受率据推测是因为论文写得更好，不需要在提交前额外一天进行修改。

关于周末提交的影响，可以推测在星期六或周日提交论文的研究者，在平日期间提交的意愿较低，因为他们承受着压力（有人或自己期望在星期一之前发送稿件——这对周末人来说是不情愿的任务）。也许这些科学家不太愿意再次仔细阅读他们的稿件，或者不太有灵感得出重要结论或在结果中展示重要关系。此外，由于当论文在星期二提交时，论文（后来）接受的概率 (N_a/N_r) 更高，这表明没有理由多等一天（或更多天）来润色论文。

如果需要，我们再次向读者强调，作者的角色是关键：编辑的角色无关紧要。例如，人们可能曾设想编辑在论文拒稿中扮演某种角色，而论文是由作者在特定某天电子提交的。对此评论，可以观察到 desk 拒稿论文的数量，即 N_{dr}，等于 161。它们的提交日期分布近似均匀，如图 4 所示；从统计角度看，一个 χ^2 检验导致 $\chi^2 \simeq 9.74$，远低于 $\chi^2 = 12.59$，对应于 6 个自由度的零假设（均匀分布）的 95% 置信水平。

6. 结论

总而言之，关于‘‘星期效应’’对金融市场的影响已有相当数量的研究。据我们所知，这是首次有人量化科学论文的提交过程，从而研究科学行为体在此过程中的行为，即考虑某些作者的脑力工作和科学活动内容。此外，针对特定结果（后续接受或拒绝）的研究似乎尚未进行。

研究也表明，分析时应考虑一周内每日提交的相对数量。这种标准化有助于观察接受率和拒稿率（= 概率）是否会因提交日期而异。

[5] 敏锐的读者会注意到，这个定义与‘‘Kullback–Leibler 散度’’度量 [22] 不同；目前的这个更接近于热力学解释。

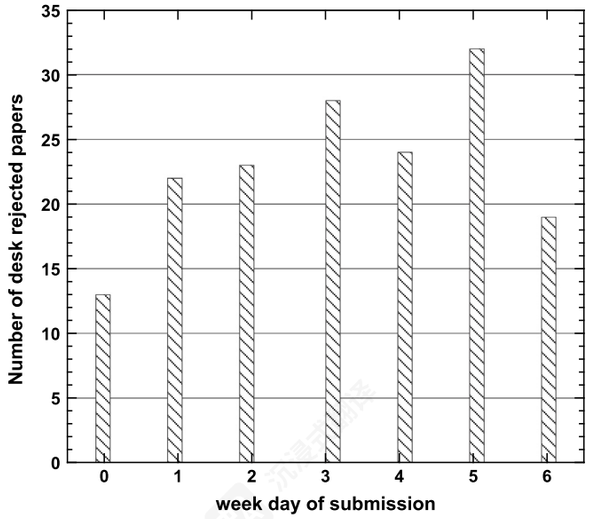


Fig. 4. Distribution of desk rejected papers according to the week day of (electronic) submission to JSCS in 2013 and 2014. The χ^2 test confirms the *quasi* uniform distribution.

According to our results, it seems that weekend days (Saturday and Sunday) are not the best time to finalize and submit manuscripts; it would be further intriguing to see how many of such papers are desktop rejected compared to peer-review rejected. Of course, the fate of the manuscript highly depends on other participants in the peer-review and publishing process [23], namely editors and reviewers. In order to reveal (possible) "day of the week" effect in the entire process of scientific publication, it would be of interest to investigate when reviewers are informed that they should review a paper, when they accept (or refuse) to review the submission, when they comment on the paper, and when editors finally accept or reject papers during the week, but such data for the JSCS are alas not available.

Moreover, this type of investigation on editors and reviewers bears upon other sets than the one here investigated in the peer review process community. In fact, the role of editors and reviewers in slowing down or speeding up a review process (independently of the day of submission) can be studied. In Ref. [24], we discuss that the peer review process can be separated into distinguished stages for going through the peer review process. We have introduced the notion of completion rate,—a measure of the probability that an invitation sent to a potential reviewer results in a finished review. Using empirical transition probabilities and probability distributions of the duration of each stage, a directed weighted network can be created. Its analysis allows to obtain the theoretical probability distributions of review time for different classes of reviewers. Through these simulations, we test the impact of some modifications of the editorial policy on the efficiency of the whole review process. Practically, the results may act as a guide in determining the optimal number of reviewers [24]. However, it should be noticed that this data analysis and subsequent modeling pertain to reviewers and editors behaviors,—not to authors as examined in the present paper. Nevertheless, day of week behavior of editors and reviewers might be interesting complementary subjects to be considered for a better transparency of the peer review process.

In conclusion, let us offer a few specific suggestions for further research lines on authors. It would be interesting to see: (i) whether, in other types of journal, there is a general trend in authors' behavior when choosing the submission day of the week, also (ii) whether single author papers "behave" differently of co-authored papers, (iii) if "more theoretical" or "more experimental" papers "behave" differently, and (iv) whether the day of submission of a revised version is pertinent. Moreover, if the acceptance rate is due to a fine writing quality (and interesting results), does the number of citations by others depend on the day of submission? has a day of submission (and necessarily acceptance) a real impact on science?

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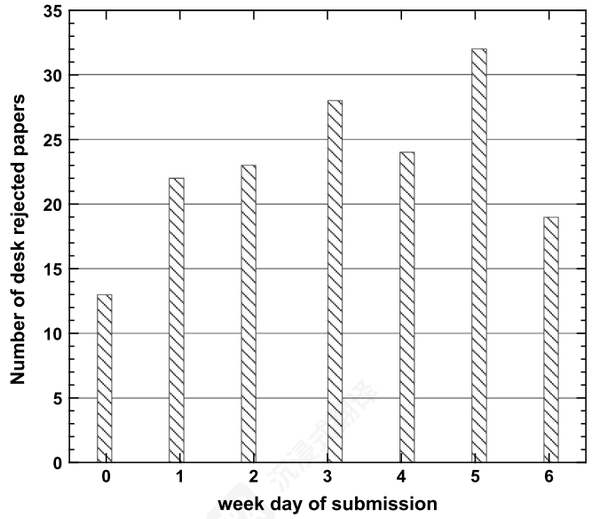


图4. 根据2013年和2014年向JSCS提交（电子）稿件的工作日分布的拒稿论文分布。χ^2 测试证实了近似均匀分布。

根据我们的结果，周末（星期六和周日）似乎并不是最终定稿和提交稿件的最佳时间；进一步有趣的是，有多少此类论文是因桌面拒稿而非同行评审拒稿。当然，稿件的命运很大程度上取决于同行评审和出版过程中的其他参与者 [23]„ 即编辑和审稿人。为了揭示（可能的）“‘星期几’”效应在整个科学出版过程中，研究审稿人何时被告知应评审论文、何时接受（或拒绝）评审提交、何时对论文进行评论，以及编辑在一周内何时最终接受或拒稿，将很有意义。但遗憾的是，JSCS的相关数据并不可用。

此外，对编辑和审稿人的此类研究涉及其他群体，而非此处研究的同行评审过程社区。事实上，编辑和审稿人在减缓或加快评审过程（与提交日期无关）中的作用可以被研究。在Ref. [24],中，我们讨论同行评审过程可以划分为不同的阶段以完成同行评审。我们引入了完成率的概念——即向潜在审稿人发出的邀请导致完成评审的概率的度量。使用经验转移概率和每个阶段的持续时间概率分布，可以创建一个有向加权网络。其分析可以得出不同审稿人类别评审时间的理论概率分布。通过这些模拟，我们测试了编辑政策某些修改对整个评审过程效率的影响。实际上，这些结果可以作为确定最佳审稿人数量 [24] 的指导。然而，应该注意的是，这些数据分析及后续建模涉及的是审稿人和编辑的行为——而非本文所考察的作者。尽管如此，编辑和审稿人的工作日行为可能是值得考虑的有趣补充主题，以增强同行评审过程的透明度。

总之，让我们就作者进一步研究方向提出几点具体建议。有趣的是要看看：(i) 在其他类型的期刊中，作者在选择提交周几时是否存在普遍的行为趋势，也(ii) 单作者论文是否与合著论文表现不同，(iii) “理论性更强”或“实验性更强”的论文是否表现不同，以及(iv) 修改后版本提交的日子是否相关。此外，如果接受率是由于写作质量好（且结果有趣），那么他人在提交日当天引用的数量是否也取决于提交日？提交日（且必然是接受日）是否对科学发展有真正的影响?

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