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乳业危机中的信息传染效应：来自中国证券市场的经验证据[1]

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摘要

以三鹿事件所引发的乳业危机为背景，本文首次提供了信息传染效应在我国证券市场中存在的经验证据。研究表明，在一个(-1, +1)的事件窗口内，食品行业中的非乳业上市公司遭受了一个平均为-2.369%的非正常损失。进一步的，本文发现股权集中度的提高可以减少由于负面信息传染给公司造成的非正常损失，但董事会的特征却与信息传染效应的程度没有显著的联系。本文的研究有助于对我国证券市场中投资者决策行为的理解，也有助于上市公司信息披露的实践。

关键词：乳业危机、信息传染效应、公司治理
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一、引言

自Ball and Brown（1968）的经典研究以来，大量文献考察了盈余公告的信息含量。其中，Firth（1976）首次发现在盈余宣告日前后，与信息宣告者类型相似的公司存在着与宣告者方向相同但幅度略小的股票价格变动，他将这种现象称为信息的传染效应。此后，对信息传染效应的考察逐渐成为盈余信息含量研究中一个非常重要的分支，研究者们分别从不同的角度确认了信息传染效应的存在。例如，Foster（1981）从季度盈余宣告的角度，Baginski（1987）从管理层盈余预测的角度，Szewczyk（1992）从证券发行公告的角度，Firth（1996）从股利变化的角度，Docking *et al.*（1997）从银行贷款损失的角度，Firth *et al.*（2004）从审计师声誉的角度，Gleason *et al.*（2008）从财务报表重述的角度，Donnelly（2008）从财务丑闻的角度，都发现了信息传染效应的存在。

已有研究表明，我国上市公司的盈余公告本身具有信息含量（赵宇龙等，1998），上市公司所发布的业绩预告和业绩快报也同样具有信息含量（蒋义宏等，2003；柳木华，2005）。然而，迄今的研究尚未提供在我国证券市场中信息传染效应是否存在的直接证据。鉴于此，我们感兴趣的是，我国证券市场中的投资者们，是否也会根据公开信息，调整其对于同行业中其他公司未来现金流量和风险的预期，从而引致信息的传染效应？此外，就我国公司治理的实践而言，对于治理结构的有效性至今尚未达成一致的结论。我们认为，其中的原因之一，在于研究中往往难以找到一个恰当的场景，从而能够合理的观测到投资者对不同治理结构的评价。而对于乳业危机中信息传染效应的考察，也为我们从投资者的视角观测其对公司治理有效性的评价提供了一个特殊的机会。简言之，如果投资者认为我国上市公司目前的治理结构是有效的，就会据此对公司的质量做出区分，并进而反应到负面信息传染效应的程度中。也就是说，我们关心的是，如果信息的传染效应存在，那么其程度与公司治理结构之间是否存在明确的联系？换言之，优良的治理结构是否可以减少公司被负面信息传染的程度？

以三鹿事件所引发的乳业危机为背景，我们首次提供了信息传染效应在我国证券市场中存在的证据。我们的研究表明，受乳业危机的影响，在一个（-1, +1）的事件窗口内，食品行业中的非乳业上市公司遭受了一个平均为-2.369%的非正常损失。若以事件期前一天的平均市值计算，这相当于每家公司在三天内额外的蒸发了近1.66亿元的市场价值。这种非正常损失在1%的置信水平上统计显著，并且，本文的检验结果既不因我们对于市场组合的不同衡量，也不随统计检验的不同程序而改变。进一步的，我们构建了横截面的多元回归模型以考察公司治理结构与非正常损失之间的关系。我们发现，股权集中度的提高可以显著减少由于负面信息的传染给公司造成损失。然而，我们没有找到股权性质以及董事会的特征可以减少公司非正常损失的证据。

本文的贡献主要体现在以下两个方面。一方面，本文的研究丰富了我们对我国证券市场中投资者决策过程的理解。本文首次提供了信息传染效应在我国证券市场中存在的经验证据，这表明投资者在其决策过程中，会利用同行业其他公司所披露的公开信息修正其对于所投资公司未来现金流和风险的预期。另一方面，与以往研究中直接建立治理变量与公司价值之间的关系不同，本文尝试从投资者的角度观测

公司治理结构的有效性，为公司治理领域的相关研究提供了新的视角。我们的研究结果表明，在投资者看来，股权的适度集中确实可以成为弱法律保护的替代。

本文其余部分的结构安排如下：第二部分回顾乳业危机事件和建立研究假设；第三部分描述研究设计；第四部分报告和分析实证检验的结果；第五部分是本文的研究结论。

二、事件回顾和研究假设

2.1 三鹿事件和乳业危机

从宠物毒粮、二甘醇牙膏到毒奶粉，三鹿事件实际上是一系列与“中国制造”有关的产品质量安全事件中的一宗。事件源于一种名为三聚氰胺的有机化工中间体，事后的调查确认，由于受此化学物污染，三鹿牌婴幼儿配方奶粉能够导致婴幼儿泌尿系统结石。事实上，从2008年3月开始，全国各地便相继出现大量泌尿系统结石病患儿，及至卫生部9月正式确认奶粉有毒时，全国各地已上报肾结石患儿432例。根据卫生部的统计，截至2008年12月，全国累计报告因食用问题奶粉导致泌尿系统出现异常的患儿共计29.40万人，重症患儿154人，回顾性调查死亡病例达11起。2008年12月，三鹿集团原董事长田文华在庭审时承认，早在2008年5月公司就发现其婴幼儿配方奶粉存在质量问题。然而，在同年8月的经营班子扩大会议中，与会者却决定严格保密，并对外将三聚氰胺称为“A物质”。[4]三鹿事件至此真相大白，三鹿集团知毒卖毒的行为最终得到了确认。

然而，更严重的是，三聚氰胺似乎是整个乳制品行业的毒瘤。2008年9月，国家质检总局对全国婴幼儿奶粉三聚氰胺含量抽检的专项调查显示，有22家企业69批次产品检出了含量不同的三聚氰胺。而在违规企业名单中，赫然包括伊利、蒙牛、雅士利、光明、南山等几乎全部国内知名乳制品企业。至此，三鹿事件已由“个别企业、个别产品”上升为公众对整个中国乳制品行业产品质量的信任危机。

2.2 信息的传染效应

信息传染效应的研究聚焦于同行业其他公司释放信息时非宣告公司的股票价格反应。一般来说，如果某宣告公司的信息会引起非宣告公司股票价格发生系统性的波动，就认为存在信息的传染效应。而就公司的价值评估而言，公司的股票价格取决于投资者对于未来现金流和风险的预期值。也就是说，信息传染效应的根源，在于投资者会借助宣告公司的信息，调整其对于那些非宣告公司未来现金流和风险的预期。

因此，行业中重大事件的发生往往伴随着信息的传染效应。例如，Lang *et al.*（1992）发现，竞争者的破产宣告会使得其竞争对手遭受约1%的非正常损失。Chaney *et al.*（2002）发现，在安然事件爆发后，安达信会计师事务所的其他上市公司客户也经历了一个显著为负的股票价格损失。Akhigbe *et al.*（2005）也提供了安然事件对其同行业公司及与之有商业往来的其他公司信息传染效应存在的证据。

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[4] 详见：叶铁桥，“三鹿事件真相大曝光”，中国青年报，2009年1月1日。

由三鹿事件所引发的乳业危机也可能会引起食品行业中的非乳业公司股票价格的非正常波动。一方面，三鹿事件的爆发不仅使乳制品企业陷入生产和销售的困境，也引发了公众，包括投资者，对整个食品行业产品质量的信任危机。同时，奶粉有毒也使中国制造的国际声誉再次受损，许多国家纷纷建议消费者停止购买和进食由中国所生产的食品。[5]无疑，理性投资者必然预见，这种内忧外困的局面会在相当一段时期内影响整个食品行业的销售业绩。另一方面，国务院将三鹿事件定性为重大安全事故，食品安全引起了政府和社会前所未有的高度关注。作为回应，政府相关部门展开了一系列的食品安全检查，并很有可能会极大的加强对于食品行业的监管力度。[6]可预计的结果是整个食品行业的质量控制成本必然会大幅度上升。因而，乳业危机波及之下，投资者预期食品行业的非乳业公司既可能面临着经营风险的提高，也可能会经历销售利润的下滑。亦即，这些公司在经营风险提高的同时，未来的现金净流入也可能会受到影响。

基于此，我们提出本文的研究假设1：受三鹿事件的影响，食品行业中的其他非乳制品上市公司在事件期内会遭受到显著为负的股票非正常报酬。

2.3 公司治理的作用

理论上说，一个好的公司治理结构可以更有效的保护投资者的利益，减少经理人的自利行为。由于优良的治理结构可以确保对公司的战略指导和对经营管理层的有效监督，因而往往伴随着更为稳健的经营战略和企业行为。同时，优良的治理结构可以保证公司所有重大事件及时准确的得到披露，因而往往伴随着更加透明的公司信息披露体系。由此，当行业内的重大负面消息到达市场时，好的治理结构一方面能以其所保证的一贯稳健的经营行为，向市场参与者传递公司行为合法合规的信心。另一方面，好的治理结构也能以其所保证的一贯高的信息透明度，减少市场参与者对公司未来前景不确定性的担忧。因此，有效的公司治理应当可以减少公司所受负面信息传染的程度。

我们主要从股权结构和董事会特征两个方面考察基于投资者视角的公司治理作用。从股权结构的角度来看，理性的投资者可以从大股东事前稳健经营的意愿和事后强势监督的能力两个方面来判断公司所可能遭受负面信息传染的程度。具体来说，在毒奶粉事件中，由于添加三聚氰胺可以提高奶粉中的蛋白质含量，因而是一种高风险高收益的经营举措。理性的投资者可以预见，在股权相对分散的情况下，由于股东能够以较低的交易成本构建多元化的投资组合，故与人力资本投资相对专用化的经理层相比往往具有更大的风险偏好。此时，为提高公司价值，股东可能会放任甚至敦促经理层选择一些高风险的经营策略。然而，随着股权结构趋于集中，股东的投资专用性逐渐增加，其风险偏好程度也随之减弱。此时，股东会更加倾向于实现相对稳健的经营。基于风险与未来现金折现率相匹配的原理，毒奶粉事件爆发后，市场会迅速调高食品行业中非乳业公司的预期经营风险值，从而降低企业价

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5 实际上，事件迅速跨出奶粉的界限而蔓延至其他食品。例如，2008年9月，香港食环署检出某款伊利雪糕中含有微量的三聚氰胺，几乎同时，新加坡农粮及兽医局也宣布在一批上海生产的大白兔奶糖中验出含有三聚氰胺。

6 截至2009年2月，备受各界关注的《食品安全法》(草案)已进入第四次审议。

值预估值。此时，如果理性投资者会通过对公司股权结构的分析，甄别大股东事前稳健经营的意愿并将此信息载入到公司股价中，股权相对集中的公司就可能会更少的受到负面信息的传染。另一方面，由于经理层往往受到一定的任期限制，这使其决策视野较股东而言偏短。因此，从事后来看，当公司经营情况变坏时，经理层的理性选择是暂时隐瞒，从而尽力避免任期内的业绩崩盘或者担当替罪羔羊的角色。尽管及时的披露和补救往往可以减少公司的绝对损失，但由于在经营实践中，关于公司具体的生产和运作情况，经理层无疑比股东知道得更多，因此，经理层的这种信息优势可以为他们的隐瞒行为提供一定的条件。在这种情况下，更需要一个强势的大股东，才可能从生产、销售等具体经营层面，对经理层实施更好的监督，从而减少其个人利益目标与公司最优行为相悖时所摧毁的公司价值。理性的投资者应当能够预见到这种信息不对称情境下经理层的道德风险，并且，如果理性投资者能够通过对公司股权结构的分析甄别出大股东事后监督的能力，进而将其载入到公司股价中，也会减少股权相对集中的公司受到负面信息传染的程度。

从董事会的角度来看，一般认为，外部董事所占的比例越高，董事会的独立性越强，也就具有更优的战略指导和监督的作用。同时，一个更大规模的董事会也会增加董事间的交易成本，从而降低董事会成员达成共谋的概率。Donnelly（2008）以Elan生物制药公司财务舞弊案所引起的传染效应为背景，首次从投资者角度考察了董事会特征与信息传染效应程度之间的关系。他发现，一个更加独立的董事会可以显著的减少公司受此事件影响而遭受的股票非正常损失，经验证据也部分支持董事会规模与传染效应程度负相关的结论。然而，在我国，尽管早在2001年6月便开始引入了独立董事制度，但资本市场中至今仍充斥着投资者对于“花瓶董事”的质疑。一方面，我国薄弱的法制环境可能尚不足以驱动独立董事实施对于上市公司的强力监督；另一方面，独立董事也会根据公司知名度、任职风险等因素，自选择就任的上市公司（周繁等，2008）。这意味着，面对分歧时，我国的独立董事往往更倾向于辞职而非持续的干预。正是主要基于上述两方面的原因，之前的研究也没有发现我国上市公司中独立董事存在监督作用的经验证据（伊志宏等，2005；王兵，2007）。此外，就董事会规模而言，尽管规模的扩大可以减少董事会成员间合谋的概率，但是，如Jensen（1993）所指出，董事会规模越大运作上越不具有效率性，易为公司经营者所掌控。亦即，随管理层对公司掌控力的增加，大规模的董事会可能反而不利于发挥监督作用。在我国上市公司中广泛存在内部人控制的背景下，这种情况可能会愈发严重。可以预期的是，当董事会内部争执不下时，管理层一方面会面对较小的监督压力，因为不会受到董事会成员一致的质询；另一方面，管理层也更容易利用各方争执的局面，将最终的结果引导至所期望的方向。因此，给定我国独立董事制度脱胎于国家强制性变迁的事实，给定我国薄弱的法制环境以及内部人控制盛行的制度背景，并考虑之前研究所提供的证据，我们认为，基于投资者视角，董事会的特徵应当与公司所受负面信息传染的程度无关。

基于以上的分析，我们提出本文的研究假设2：公司的股权集中度可以减少信息传染效应的程度，但公司董事会的特征与信息传染效应程度没有显著的联系。

三、研究设计

3.1 事件日的确定

要准确界定毒奶粉事件首次为大众所知的日期并不容易。尽管卫生部对于三鹿事件的官方声明发表于2008年9月11日晚，但在此之前，媒体的相关报导已经使得奶粉门广为人知。在整个事件过程中，来自《东方早报》的记者简光洲由于首次点名批评三鹿集团而受到广泛关注。事后，他所撰写的题为“甘肃14名婴儿疑喝三鹿奶粉致肾病”的新闻稿常常被误读为对毒奶粉事件的首次曝光。然而，根据对相关新闻报导的梳理，我们发现简光洲所做的仅仅是对之前甘肃媒体所做报导的后续调查。[7]简光州所追踪的应当是来自《兰州晨报》9月8日一篇题为“14名婴儿同患肾结石”的新闻稿，而实际上，这篇稿件也只是对与《兰州晨报》同属甘肃日报集团的《西部商报》9月5日题为“8例幼儿肾结石，奶粉作怪？”的新闻稿所做的后续报导。[8]由于从2008年9月5日起，毒奶粉事件开始为公众广泛所知并引起高度关注，我们将这一天确定为事件日，即T_0日。[9]为增强观测传染效应的能力及减少事件窗口中的噪音，我们以事件日前后各1个交易日即T(-1, +1)作为研究的事件窗口。

3.2 样本选择和数据来源

我们选取了所有事件期内在上海证券交易所和深圳证券交易所上市交易的食品行业上市公司作为初始样本。为了得到公司更准确的行业归属，我们分别根据中国证监会的行业分类标准(CSRC)和全球行业分类标准(GICS)筛选出属于食品行业的上市公司，然后将其合并，从而得到101个初始样本。之后，我们依次执行了以下样本筛选程序：(1)根据公司所披露的主营业务产品，我们剔除了明显不属于食品行业的公司；(2)为使结果更准确的反应信息的传染效应，我们剔除了主营业务产品中包含乳制品的公司，因为这些公司在事件期内可能会同时存在传染效应和竞争效应；(3)我们剔除了在事件期内存在无交易情况的公司。最后，我们的样本中一共包括来自食品行业的非乳业上市公司66家。样本选择过程详见下表1。

我们所使用的股票日交易行情和公司财务数据均来自Wind金融研究数据库，市场指数和公司治理数据均来自CCER金融研究数据库。本文的数据处理全部采用Stata 9.0计量分析软件进行。

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7 简光洲在其个人博客中也写到：“9月10日看到甘肃媒体关于14名婴儿可能喝某品牌奶粉而导致肾病的报道……”。详见：http://dfdaily.news365.com.cn/dfbbs/space/viewspacepost.aspx?postid=4438&spaceid=149。

8 来自《东方早报》9月13日题为“三鹿奶粉事件进程”的新闻稿也肯定《西部商报》是首家报导毒奶粉事件的媒体。详见：http://press.idoican.com.cn/detail/articles/20080913002A36/。

9 值得说明的是，尽管只是一家地方性的报纸，但在网络资讯发达的时代，《西部商报》的报导完全可以通过互联网的形式即时对公众产生广泛的影响。事实上，在我国当前的舆论环境下，第一手信息尤其是那些未经官方证实的负面信息往往是通过各种论坛或专业性小网站的形式传播，而非全国性的门户网站。例如最近产生广泛社会影响的南京儿童医院“游戏门”事件以及成都“兰花门”事件等。在本例中，无论新浪、搜狐或是网易等门户网站，对毒奶粉事件的首次报导都在9月11日之后，而百度搜索引擎更是由于涉嫌屏蔽与三鹿有关的负面信息而陷入到信任危机。所以，尽管不能准确还原《西部商报》的报导经由网络传播的具体路径，但为使事件研究能够在第一时间恰当的捕捉到证券市场对毒奶粉事件的估值调整，我们认为本文对事件日的确定尽管并非最理想，却也至少属当前最不差的选择。

表1 样本选择过程

样本选择程序	样本规模(个)
证监会行业分类：制造业／食品饮料	67
全球行业分类标准：日常消费品／食品饮料与烟草	93
合并(剔除重复出现的公司)	101
剔除(减)：明显不属于食品行业的公司	14
剔除(减)：主要产品中包含乳制品的公司	12
剔除(减)：事件期内存在无交易情况的公司	9
最终样本公司数	66

3.3 股票非正常回报的衡量

事件研究中，非正常报酬率的计算方法主要包括均值调整法、市场调整法和市场模型法。在我国，孙铮等(2003)发现，使用均值调整法计算的日超常回报率难以控制市场因素的影响。而陈汉文(2002)的研究表明，虽然市场模型法具有某些优点，但使用该方法在我国证券市场的研究中却存在更容易拒绝零假说的倾向。因此，在本文的研究中，我们参照方轶强等(2005)的做法，采用市场调整法来衡量股票的非正常回报。

具体来说，市场调整法的计算如下式(1)(2)所示。其中，$R_{i,t}$指t时点i公司的日回报率，[10]$AR_{i,t}$为t时点i公司的日非正常回报率。$R_{m,t}$表示t时点的市场回报率，我们分别采用简单算术平均市场指数、流通市值加权市场指数以及上证综指和深证成指三种方法来衡量市场组合的回报率，由此得到的公司日非正常回报率分别以*AR-1*、*AR-2*和*AR-3*来表示。(t_1, t_2)为事件研究期，CAR_{i,t_1,t_2}即为事件期内i公司的累积非正常报酬率。

$$AR_{i,t} = R_{i,t} - R_{m,t} \tag{1}$$

$$CAR_{i,t_1,t_2} = \sum_{t=t_1}^{t_2} (R_{i,t} - R_{m,t}) \tag{2}$$

四、研究结果

4.1 信息的传染效应

我们首先考察事件期内毒奶粉事件对食品行业中其他非乳业上市公司股票非正常回报的影响。由于样本事件日在公历日上的一致性，股票回报的截面相关可能会导致我们高估统计检验的显著性，从而增加研究中犯第一类错误的概率。所以，本文在使用标准事件研究方法的同时，也采用Sefcik and Thompson(1986)所推荐的非

[10] 计算方法为：Ln(当日收盘价／上一交易日收盘价)。

参数bootstrap方法，以获得更稳健的检验结果。具体来说，bootstrap p-value的计算过程如下：

1. 计算每一个样本在事件日的非正常回报，得到样本集A（R_1、R_2……R_n）；
2. 从样本集A中进行有放回的随机抽样得到（R^*_1、R^*_2、……R^*_n），重复上述过程10,000次，得到新的样本集B；[11]
3. 单侧检验的bootstrap p-value＝样本B中观察值大于（或小于）样本A中观察值的数量÷10,000，双侧检验的bootstrap p-value＝2×单侧检验的p-value。

事件研究的结果详见下表2，为保证主要的结果不是由少数几个异常观测值引起，我们也同时执行了对样本公司事件期内非正常报酬的中位数检验。由表2可见，在t =-1时，样本公司尚可获得一个大于零的非正常报酬。然而，在t = 0时，由于毒奶粉事件开始为大众所知并引起高度关注，我们的样本公司平均而言遭受了一个负的非正常报酬，并且，这个非正常报酬在1%的水平上统计显著，既不因我们对市场组合的不同衡量，也不随我们统计检验的不同程序而改变。从整个(-1, +1)的事件期来看，样本公司也经历了显著小于零的股票非正常报酬。也就是说，我们的证据表明，在我国证券市场中，信息的传染效应是存在的。在我们所使用的三种不同市场组合报酬率的代理变量中，根据简单算术平均市场指数得到的股票非正常报酬最小。然而，即便如此，样本公司在整个事件期内也遭受了平均为-2.369%的非正常损失。如果以样本公司2008年9月3日（t = -2）的平均市场价值为基数计算，这意味着每家样本公司在三天内平均的非正常损失达到1.66亿元。[12]显然的，这样一个非正常损失在经济意义上也是非常显著的。

为保证本文结果的可靠性，我们将事件期拉长到T(-5, +5)，新的事件期定义下的检验结果如下表3所示。[13]可以看出，在T(-5, +5)的11个交易日内，样本公司的股票非正常报酬并没有一个固定的模式，并且，从t = +2开始，样本公司没有再体现出显著异于零的非正常回报。[14]拉长时间窗口后，在T(-2, +2)、T(-3, +3)和T(-5, +5)时期内，样本公司的平均累积非正常回报都显著小于零。这说明我们的研究结果是比较稳健的，并不轻易随时间窗口的变化而发生改变。进一步的，剔除T(-1, +1)之后，无论在T(-5, -3)或T(+3, +5)的时期内，样本公司的平均累积非正常回报都是不显著的，这说明前述3个新事件期的结果主要是受到原事件期的影响所致，毒奶粉事件确实是在一个较狭小的时间窗口内引致了样本公司较强烈的市场反应。

上述研究结果表明，食品行业中的非乳业公司在事件期内平均而言遭受了一个显著为负的股票非正常报酬。然而，一种可能的情况是，这种股价波动的模式并非样本公司所独有，我们所观测到的仅仅是事件期内所有制造业公司股价波动模式的一个缩影。为此，我们计算并检验了制造业中其他子行业在事件期内的股票非正常回报，如下表4所示。

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11 新的样本集B 由10000 个由上述随机重复抽样过程所产生的均值、中位数或回归系数组成。

12 样本公司在2008 年9 月3 日的平均市场价值是69.2 亿元，因此，每家样本公司在三天内平均的非正常损失为：69.2 × ($e^{2.369\%}$ – 1) = 1.66 亿元。

13 由于根据三种不同市场组合报酬率的代理变量所得到的检验结果基本相同，此处仅报告采用简单算术平均市场指数衡量市场组合的回报率所得到的结果。

14 从t = +2 开始，样本非正常报酬就不再显著低于市场报酬。这可能是由于我们的T_0日（2008年9月5日）系周五，下一个交易日（T_1日）实际为2008年9月8日，因此，毒奶粉事件的影响可能得以在当周周末被进一步的扩大，从而加快股价对相关信息的吸收速度。

表2 样本公司股票非正常报酬

Panel A：均值检验

变量	统计量	*t* = -1	*t* = 0	*t* = 1	T (-1, +1)
AR-1	均值	0.0029	-0.0132	-0.0133	-0.0237
	T检验值	1.0053	-3.3901	-2.8603	-3.0432
	P值	0.3184	0.0012***	0.0057***	0.0034***
	bootstrap p-value	0.4070	0.0050***	0.0130**	0.0100**
AR-2	均值	0.0063	-0.0248	-0.0263	-0.0448
	T检验值	2.2226	-6.3221	-5.6865	-5.7423
	P值	0.0297**	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.1220	0.0000***	0.0000***	0.0000***
AR-3	均值	0.0068	-0.0304	-0.0312	-0.0548
	T检验值	2.3822	-7.6824	-6.7127	-6.9911
	P值	0.0201**	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.1020	0.0000***	0.0000***	0.0000***
		N = 66	N = 66	N = 66	N = 66

Panel B：中位数检验

变量	统计量	*t* = -1	*t* = 0	*t* = 1	T (-1, +1)
AR-1	中位数	0.0039	-0.0166	-0.0250	-0.0403
	Z 检验值	2.4820	-3.2040	-2.7250	-2.9030
	P值	0.0131**	0.0014***	0.0064***	0.0037***
	bootstrap p-value	0.0090***	0.0000***	0.0040***	0.0020***
AR-2	中位数	0.0056	-0.0280	-0.0377	-0.0636
	Z 检验值	3.9130	-4.9800	-4.7050	-4.6350
	P值	0.0001***	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.0000***	0.0000***	0.0000***	0.0000***
AR-3	中位数	0.0057	-0.0347	-0.0433	-0.0719
	Z 检验值	4.0600	-5.5860	-5.2030	-5.3120
	P值	0.0000***	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.0000***	0.0000***	0.0000***	0.0000***
		N = 66	N = 66	N = 66	N = 66

注：*表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著，以上均为双尾检验，中位数采用Wilcoxon符号秩检验，bootstrap p-value 的计算过程详见四、(一)中的描述。*AR-1*、*AR-2*、*AR-3*分别表示采用简单算术平均市场指数、流通市值加权市场指数以及上证综指和深证成指三种方法来衡量市场组合的回报率而求得的股票非正常回报。

表3 新事件期：样本公司股票非正常报酬

时间／统计量	均值	T检验值	P值
***t* = -5**	-0.0048	-2.2793	0.0259**
***t* = -4**	-0.0036	-0.7758	0.4407
***t* = -3**	-0.0027	-0.5407	0.5906
***t* = -2**	-0.0170	-4.1840	0.0001***
***t* = -1**	0.0029	1.0054	0.3184
***t* = 0**	-0.0133	-3.3902	0.0012***
***t* = +1**	-0.0133	-2.8603	0.0057***
***t* = +2**	0.0026	0.4558	0.6500
***t* = +3**	-0.0034	-1.0948	0.2777
***t* = +4**	0.0009	0.3181	0.7514
***t* = +5**	0.0045	1.1958	0.2361
T(-2, +2)	-0.0381	-3.5820	0.0007***
T(-3, +3)	-0.0442	-3.5397	0.0007***
T(-5, +5)	-0.0472	-3.3758	0.0012***
T(-5, -3)	-0.0112	-1.3479	0.1824
T(+3, +5)	0.0020	0.3292	0.7431

注： *表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著，以上均为双尾检验。*AR*系采用简单算术平均市场指数衡量市场组合的回报率而求得的股票非正常回报。

由表4可以发现，在t_0日，只有电子行业的上市公司遭受了显著为负的股票非正常回报，但电子行业的公司在T(-1, +1)的整个事件期内，其平均非正常回报并不显著异于零。我们也注意到，造纸印刷行业的上市公司在T(-1, +1)的事件期内股票非正常回报显著为负，但该子行业内的公司在t_0日的股票回报与市场平均回报却并无显著性差异。因此，表4的结果表明，食品行业中的非乳业公司在事件期内的股价波动模式是独有的，并非整个制造行业的缩影，也有别于制造业中的其他子行业。这既说明我们之前所得到关于传染效应的证据是可靠的，也说明毒奶粉事件的传染效应并未超越出行业的界限，其信息传递是在行业内的公司间进行的。

进一步的，我们对食品业与制造业中其他子行业公司的非正常回报进行了更为正式的组间均值和中位数的统计检验，结果如下表5所示。明显的，在T_0日，食品行业中非乳业公司的非正常回报低于制造业中其他任何的子行业，并且，这种差异在统计上是非常显著的。[15]亦即，事件研究的结果表明，受到毒奶粉事件负面信息的传染，食品业中非乳业上市公司板块在T_0日遭受了一个无论相对于市场或相对于行业而言都非常显著的非正常损失。

[15] 尽管与“造纸、印刷”以及“电子”这两个子行业的均值比较并不显著，但是，在更不易受到异常值影响的中位数检验中，组间比较的结果都在5%的水平上统计显著。

表4 制造业中其他子行业内公司的非正常回报

行业	统计量	t = -1	t = 0	t = 1	T (-1, +1)
纺织、服装、皮毛	均值	0.0025	-0.0015	-0.0007	0.0003
(n = 67)	T检验值	0.8327	-0.3686	-0.1763	0.0390
造纸、印刷	均值	-0.0052	-0.0029	-0.0106	-0.0187
(n = 32)	T检验值	-1.5811	-0.6967	-2.0890**	-3.2732***
石油、化学、塑胶、塑料	均值	0.0013	-0.0039	-0.0079	-0.0105
(n = 161)	T检验值	0.7901	-1.4182	-2.3980**	-2.0963**
电子	均值	-0.0000	-0.0077	-0.0016	-0.0094
(n = 70)	T检验值	-0.0050	-2.8413***	-0.3822	-1.5808
金属、非金属	均值	0.0022	-0.0010	-0.0056	-0.0044
(n = 138)	T检验值	1.3168	-0.4261	-2.1607**	-1.1131
机械、设备、仪表	均值	-0.0034	-0.0003	0.0027	-0.0010
(n = 237)	T检验值	-2.5212**	-0.1408	1.2519	-0.2735
医药、生物制品	均值	-0.0042	0.0044	0.0004	0.0006
(n = 97)	T检验值	-1.6624*	1.3977	0.1152	0.0882
其他	均值	0.0067	0.0035	0.0206	0.0308
(n = 30)	T检验值	1.3847	0.6017	2.5578**	2.2561**

注：*表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著，以上均为双尾检验。此处的行业分类采用CSRC标准，*AR*系采用简单算术平均市场指数衡量市场组合的回报率而求得的股票非正常回报。在计算过程中，我们剔除了在(-1, +1)期间没有交易的公司。为满足统计推断的基本要求，我们将木材、家具中的6个样本合并到类别为其他的子行业样本中进行测试。

4.2 公司治理的作用

4.2.1 模型设定和主要变量的定义

我们建立如下多元回归模型以考察公司治理与传染效应程度之间的关系：

$$CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \Sigma CONTROL_i + \xi \quad (3)$$

其中，CAR_i是公司i在事件期内的累积非正常报酬。$CONCENTRATION_i$表示公司的股权集中度，用第一大股东的持股比例衡量。DI_i表示公司董事会的独立性，我们使用独立董事总人数的自然对数衡量。$DSIZE_i$表示公司董事会的规模，用董事会总人数的自然对数衡量。

参照之前的研究(Loughran *et al*., 1995; Barber *et al*., 2001)，我们控制了可能对股票非正常报酬产生影响的公司风险、成长性、以及市场价值。我们使用公司最近24个月的Beta值衡量风险，使用近3年销售收入的算术平均增长率衡量成长性，对公司的市场价值进行了自然对数的变换处理。此外，考虑到我国证券市场中不同所有权性质下的公司行为的异质性，在回归过程中，我们还对公司最终控制人的性质施加了控制。本文所涉及的主要变量的定义和衡量方法如下表6所示。

表5 食品业与制造业中其他子行业公司非正常回报的组间比较

Panel A: $t = T_0$

比较组	均值差异	T检验值	Z检验值	N
食品 VS. 制造业所有其他子行业	-0.0120	-3.0595***	-3.4360***	898

Panel B: $t = T_0$

比较组	均值差异	T检验值	Z检验值	N
食品 vs. 纺织、服装、皮毛	-0.0117	-2.0179***	-2.1600**	133
食品 vs. 造纸、印刷	-0.0104	-1.6403	-2.0450**	98
食品 vs. 石油、化学、塑料、塑胶	-0.0094	-1.8896**	-2.5620**	227
食品 vs. 电子	-0.0055	-1.1732	-1.7770**	136
食品 vs. 金属、非金属	-0.0123	-2.9052***	-3.1560***	204
食品 vs. 机械、设备、仪表	-0.0130	-2.9809***	-3.2030***	303
食品 vs. 医药、生物制品	-0.0176	-3.5483***	-3.6510***	163
食品 vs. 其他	-0.0168	-2.3941**	-2.5290**	96

注： *表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著，以上均为双尾检验。T检验值系组间均值检验的结果，Z检验值系组间中位数Wilcoxon秩和检验的结果，此处的行业分类采用CSRC标准，*AR* 系采用简单算术平均市场指数衡量市场组合的回报率而求得的股票非正常回报。

表6 变量定义

	变量名称	变量符号	变量说明
被解释变量	累积非正常报酬	*CAR*	参见三、(三)、1中的描述
解释变量	股权集中度	*CONCENTRATION*	第一大股东的持股比例
	董事会独立性	*DI*	独立董事总人数的自然对数
	董事会规模	*DSIZE*	董事会总人数的自然对数
控制变量	公司风险	Beta	以2007年12月为基准，最近24个月的 β 值
	公司市值	*LnMV*	2007年末公司市场价值的自然对数
	公司成长性	*GROWTH*	近3年销售收入的算术平均增长率
	所有权性质	*OWNERSHIP*	国有上市公司取值为1，否则为0

4.2.2 回归结果

多元回归的主要结果支持我们所提出的研究假设2。并且，尽管我们用三种不同的方法代理市场组合报酬率而得到不同的回归子，同时采用bootstrap回归程序以校正截面相关所可能带来的时间效应问题，检验结果都是基本相同的，这也说明我们的回归结果比较稳健。具体来说，如下表7所示，我们发现，无论是董事会的独立性，抑或董事会的规模，与公司所受传染效应的程度都没有显著的联系。也就是说，从投资者的角度，在一个较短的时间窗口内，我们的研究没有找到独立董事可以对公司经营管理行为实施切实有效的监督的证据。我们也发现，公司的股权集中度的提高可以显著减少所受负面信息的传染程度。这说明，在我国证券市场中，拥有一个相对强势的大股东，由于缓解了监督过程中的搭便车问题，确实可以对公司价值产生积极的影响。

表7 公司治理与信息传染效应

Equation:

$$CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \sum CONTROL_i + \xi$$

变量名称	变量符号	因变量：*CAR-1*	因变量：*CAR-2*	因变量：*CAR-3*
截距	Constant	-0.4987	-0.5274	-0.6142
		[-2.85***, -2.43***]	[-2.96***, -2.55**]	[-3.52***, -3.06***]
股权集中度	*CONCENTRATION*	0.1126	0.1073	0.1139
		[1.87*, 1.83*]	[1.79*, 1.75*]	[1.89*, 1.89*]
董事会独立性	*DI*	-0.0269	-0.0277	-0.0267
		[-0.96, -0.73]	[-0.99, -0.76]	[-0.95, -0.73]
董事会规模	*DSIZE*	0.0678	0.0676	0.0678
		[1.57, 1.23]	[1.58, 1.25]	[1.57, 1.23]
公司风险	Beta	-0.0278	-0.0294	-0.0274
		[-1.13, -0.98]	[-1.18, -1.02]	[-1.11, -0.97]
公司市值	*LnMV*	0.0157	0.0162	0.0156
		[1.86*, 1.63]	[1.89*, 1.68*]	[1.84*, 1.66*]
公司成长性	*GROWTH*	-0.0085	-0.0085	-0.0085
		[-1.06, -0.92]	[-1.04, -0.92]	[-1.06, -0.92]
所有权性质	*OWNERSHIP*	-0.0139	-0.0146	-0.0137
		[-0.86, -0.84]	[-0.90, -0.88]	[-0.84, -0.82]
N			58[16]	
F统计量/Wald chi2		[4.50***, 19.57***]	[4.50***, 19.87***]	[4.49***, 20.82***]
adj-R^2		0.2324	0.2303	0.2325

注：*表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著。*CAR-1*、*CAR-2*、*CAR-3*分别表示采用简单算术平均市场指数、流通市值加权市场指数以及上证综指和深证成指三种方法来衡量市场组合的回报率而求得的股票累积非正常回报。回归中不存在需要引起关注的共线性问题。在系数下方的方括号中，前者为根据稳健标准误所得到的t值，后者为根据稳健标准误在bootstrap程序下所得的的z值。

[16] 由于数据缺失的原因，回归分析中损失有效样本8 个，最终参与回归的样本公司数为58 家。

4.2.3 改变对董事会独立性的衡量方法

为增强本文研究结论的稳健性，我们也考虑分别采用以下两种方法改变对董事会独立性的衡量：(1) 独立董事占董事会总人数的比例；(2) 借鉴 Donnelly (2008) 的做法，设置虚拟变量 *DI-RANK*，当独立董事人数大于 3 时赋值为 1，否则为 0。稳健性测试的结果如下表 8 所示。我们发现，改变对董事会独立性的衡量方法之后，主要研究结果并没有发生变化。股权集中度依然与股票累积非正常回报正相关且统计显著。董事会的独立性与传染效应的程度之间依然不存在显著的联系。值得注意的是，在使用 *DI-RANK* 表征董事会独立性时，我们发现董事会规模的扩大可以减少负面信息传染效应的程度，这与 Donnelly (2008) 的研究结果是一致的。

表 8 改变对董事会独立性的衡量方法

Equation: $CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \sum CONTROL_i + \xi$

		因变量：*CAR-1*					
变量名称	**变量符号**	**系数**	**T值**	**Z值**	**系数**	**T值**	**Z值**
截距	Constant	-0.4431	-2.25**	-2.01**	-0.5468	-3.49***	-3.06***
股权集中度	*CONCENTRATION*	0.1120	1.87*	1.85*	0.1118	1.95*	1.90*
董事会独立性	*DI-RATE*	-0.0908	-1.01	-0.81			
	DI-RANK				-0.0262	-1.22	-1.17
董事会规模	*DSIZE*	0.0410	1.27	1.07	0.0830	2.36**	1.94*
公司风险	Beta	-0.0275	-1.12	-0.97	-0.0271	-1.16	-0.99
公司成长性	*GROWTH*	-0.0080	-1.01	-0.87	-0.0077	-1.02	-0.89
公司市值	*LnMV*	0.0159	1.93*	1.70*	0.0153	1.88*	1.71*
所有权性质	*OWNERSHIP*	-0.0144	-0.88	-0.85	-0.0142	-0.88	-0.86
N		58			58		
F统计量/Wald chi2		[4.09***, 20.72***]			[5.54***, 27.24***]		
adj-R^2		0.2333			0.2502		

注：*表示在10%的水平上显著，**表示在5%的水平上显著，***表示在1%的水平上显著。回归中不存在需要引起关注的共线性问题。对每一个回归系数，我们依次报告根据稳健标准误所得到的 t 值以及根据稳健标准误在 bootstrap 程序下所得的的 z 值。

五、结论和讨论

以三鹿事件所引发的乳业危机为背景，本文首次提供了在我国证券市场中信息传染效应存在的直接证据。研究结果表明，受乳业危机的影响，在一个 (-1, +1) 的事件窗口内，食品行业中的非乳业上市公司遭受了一个平均为 -2.369% 的非正常损失。进一步的，我们构建横截面的多元回归模型以考察公司治理结构与非正常损失之间的关系。我们发现，股权集中度的提高可以显著的减少由于负面信息传染给公司造成的损失，这与 La Porta *et al.* (1998) 认为股权集中度是弱投资者保护的替代机制是一致的。然而，我们没有找到股权性质以及董事会的特征可以减少公司非正常损失的证据。

本文的研究有助于我们对投资者决策行为的理解。既然信息传染效应存在，就说明投资者会利用市场中的公开信息调整其对于非宣告者未来现金流和风险的预期。本文也同样有助于上市公司披露的实践行为。由于信息宣告具有相互作用的特征，那么，适当选择本公司信息披露的时机，以及对于其他公司信息宣告所产生的不利后果进行恰当的干预，就可能是必要的。此外，由于信息传染效应的存在，市场监管者在权衡政策的成本与收益时，也可能需要充分考虑微观经济主体行为的外部效应所引致的社会成本。

限于数据的可获得性，样本规模可能会在一定程度上影响本文研究结论的可推广性。进一步的研究可以考虑扩大对“质量危机”事件的界定，如果能够恰当扩大研究中的样本数量，不仅有助于研究结论的推广，不同性质的产品质量危机还可以为研究者提供更为丰富的信息。另一个重要的方向是对Morck *et al.*(2000)的深入研究。我们认为，考察外生事件对证券市场的冲击，可以为股价同步性及其影响因素的检验提供一个更为乾净的场景。进一步的研究可以考虑以乳业危机为场景，实证检验地区产权保护程度、公司层面的信息环境以及第二类代理问题对股价同步运动的影响。

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The Contagion Effect during the Dairy Crisis: Evidence from the Chinese Securities Market[1]

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Abstract

Against the background of the recent dairy crisis, we provide for the first time in this paper evidence for the existence of an information contagion effect in the Chinese securities market. We find that the average abnormal return is -2.369 per cent for non-dairy-listed companies in the food service industry in a (-1, +1) case window. Further analysis indicates that a negative cumulative abnormal return (CAR) could be reduced by enhancing the concentration of ownership. The CAR does not, however, have any significant relation to the characteristics of the board of directors. This study contributes to understanding the decision-making behaviour of investors and the disclosure practices of listed companies in China.

Keywords: Dairy Crisis, Information Contagion Effect, Corporate Governance
CLC codes: G14, G34, M41

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I. Introduction

Since the seminal study of Ball and Brown (1968), researchers have paid much attention to the information content of earnings announcements. Among them, Firth (1976) finds that the stock prices of peer firms move slightly in the same direction during the announcement day. He calls this the information contagion effect. Since then, the contagion effect has become an important branch of studies on information content. Researchers have confirmed the existence of a contagion effect from different sources, such as quarterly earnings announcements, management forecasts of earnings, announcements of corporate offerings of securities, dividend changes, announcements of loss suffered from bank loans, auditor reputation, accounting restatements, and financial fraud (Foster, 1981; Baginski, 1987; Szewczyk *et al*., 1992; Firth *et al.*, 2004; Gleason *et al.*, 2008; Donnelly, 2008).

Although the extant literature provides evidence that earnings announcements, earnings forecasts, and preliminary earnings estimates of Chinese listed companies have information content (Zhao *et al.*, 1998; Jiang *et al.*, 2003; Liu *et al.*, 2006), studies still have not provided direct evidence supporting the existence of a contagion effect in the Chinese securities market. Therefore, we are interested in whether Chinese investors would adjust their expectations about the future cash flows and risks of peer firms according to public information, which in turn would lead to information contagion. In addition, there is still no consensus over the effectiveness of the practice of Chinese corporate governance. We believe that one of the most important reasons for this lies in the difficulties of finding an appropriate scene that would permit us to observe the effectiveness of corporate governance from the perspective of investors. The inspection of the contagion effect during the recent dairy crisis may provide us this special opportunity. In short, if investors believe that the current governance structure of Chinese listed companies is effective, they will accordingly distinguish between companies in terms of quality, and thus respond according to the extent of negative effects. That is to say, if an information contagion effect does exist, we are concerned as to whether an explicit relation exists between the extent of the effect and corporate governance, or in other words, can the extent of infection be reduced by a good corporate governance structure?

Using the recent dairy crisis triggered by the Sanlu incident as our basis, we provide for the first time evidence that the contagion effect does exist in the Chinese securities market. Our evidence shows that non-dairy companies in the food industry suffered an average abnormal return of -2.369 per cent in the (-1, +1) event window in response to the impact of the dairy crisis. If we use the average market capitalisation on the day before the event period in the calculation, this means an extra loss of nearly 166 million renminbi for each company over three days. The abnormal return is significant at the 1 per cent level and robust for different measures of the market portfolio and different test procedures. Additionally, we use a cross-sectional multiple regression model to examine the relationship between the abnormal losses and corporate governance. We

find that the negative cumulative abnormal return (CAR) could be reduced by enhancing the concentration of ownership structure, whereas there is no evidence showing the governance role of the board of directors.

This study contributes to the literature primarily in the following two respects. First, our findings enrich the understanding of the decision-making processes of Chinese investors. We provide for the first time evidence for the existence of a contagion effect in the Chinese securities market, which suggests that investors will use the information released by peer firms to revise their expectations concerning future cash flows and the risk of the shares in their hands. On the other hand, unlike previous studies that usually investigate directly the relation between governance structure and firm value, this paper attempts to observe the effectiveness of corporate governance from an investor's point of view, which in turn may provide a new perspective for related research in this field. Our results indicate that a concentrated ownership structure could be an alternative mechanism to weak legal protection in the eyes of investors.

The remainder of the paper is organised as follows. Section II reviews the dairy crisis and develops the hypotheses. Section III describes the sample and research design. Section IV presents the empirical results and our interpretation. Section V concludes the paper.

II. The Dairy Crisis and Hypothesis Development

2.1 The Sanlu Incident and the Dairy Crisis

From pet food to diethylene glycol toothpaste to poisonous milk, the Sanlu incident is one of a number of safety-related incidents connected with products made in China. Investigations after the incident confirmed that the Sanlu infant formula was contaminated by melamine, an intermediate organic chemical, which caused many infants to suffer from urinary stones. In fact, since March 2008 a large number of children had been found to have urinary tract stones across the country. Upon formal confirmation by the Ministry of Health (MOH) in September 2008, 432 cases of kidney stones in children were reported around China. According to the statistics provided by the MOH, a total of 294,000 babies suffered abnormalities in their urinary systems after taking the contaminated formula, including 154 severe cases and 11 deaths. Wenhua Tian, former President of Sanlu Group, admitted in court in December 2008 that the quality problems of infant formula had been discovered by the company as early as May 2008. But in August that same year, attendants at an enlarged management meeting decided to keep it confidential, instead describing melamine as "Material A" when they announced the case to the public.[4] Finally, it was discovered that Sanlu Group knowingly violated the law as the truth of the Sanlu incident was exposed.

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[4] See "The Truth of the Sanlu Incident" by Tieqiao Ye in *China Youth Daily* on 1 January 2009.

But more importantly, melamine seems to have been a malignant tumor in the entire dairy industry. In September 2008, a special survey conducted by the State General Administration of Quality Supervision showed that 69 batches of different products from 22 companies total were detected to contain melamine. The list of enterprises in breach comprised Yili, Mengniu, Ashley, Bright, and Nanshan, so that almost all the well-known dairy companies in China were included. Thus, the Sanlu incident was no longer an individual case, but instead aroused a crisis of confidence in product quality of the entire Chinese dairy industry.

2.2 The Information Contagion Effect

Studies related to contagion effects usually focus on a company's stock price reaction when new information is released by other companies in the industry. Generally speaking, a contagion effect is perceived if the stock price of a company is systematically affected after a peer firm announces corporate information. Since the stock price of the company is decided by investors' expectations of its future cash flows and risks, the source of the contagion effect lies in the adjustment of such expectations according to the information released by peer firms.

Therefore, the occurrence of an important event is usually accompanied by a contagion effect. For example, Lang *et al.* (1992) find that the bankruptcy announcement of a competitor would cause its rival to suffer an abnormal loss of about 1 per cent. Chaney *et al.* (2002) find that other clients of Arthur Andersen also experienced a significant loss in stock prices after the Enron case. Akhigbe *et al.* (2005) also provide evidence of the contagion effect on companies in the same industry and those companies having business relationships with Enron.

It is possible that the stock prices of non-dairy companies in the food industry were also systematically affected by the dairy crisis. Not only were production and marketing in distress, but there was also a crisis of confidence regarding the quality of products throughout the food industry. Meanwhile, the international reputation of "Made in China" was tarnished once again by the Sanlu incident, as many countries advised consumers to stop buying and eating food produced in China.[5] Undoubtedly, rational investors would anticipate that sales in the food industry would be negatively affected for a considerable time. On the other hand, the Sanlu incident was classified as a major security event by the State Council, and the issue of food safety aroused unprecedented attention from the government and society. To address the public's concerns, a series of food safety inspections have been conducted, and supervision of the food industry is likely to be greatly enhanced. It is predicted that the cost of quality control of the entire

[5] In fact, the incident quickly spread beyond infant formula to other food products. For example, one type of Yili ice-cream was detected as containing melamine by the Food and Environmental Hygiene Department of Hong Kong in September 2008. Meanwhile, the Agri-Food and Veterinary Authority of Singapore announced that White Rabbit Creamy Candy from Shanghai was detected as also containing melamine.

food industry will increase significantly.[6] Therefore, investors may expect that non-dairy companies in the food industry are likely to face both an increase in operating risks and a decline in sales profits as a result of the dairy crisis. In other words, for the non-dairy companies in the food industry, both operating risks and future cash flows would be negatively affected. Based on this phenomenon, we propose our first hypothesis:

H1: The non-dairy companies in the food industry will suffer a significantly negative abnormal return during the event period as a result of the dairy crisis.

2.3 The Role of Corporate Governance

In theory, since managers' self-interest activities would be reduced by good corporate governance, the interests of investors could be more effectively protected. Since a company's strategies can be guided and management effectively supervised, good corporate governance is often accompanied by more robust business strategies and corporate behaviour. At the same time, since all major events are disclosed in a more timely and accurate manner, good corporate governance is also usually accompanied by a more transparent information disclosure system. Therefore, since good corporate governance guarantees prudent business behaviour, market participants will remain confident in the legal compliance of the company's actions even when major negative news within the industry reaches the market. At the same time, fears of uncertainty about the company's future can also be reduced by the high information transparency ensured under good corporate governance. Therefore, the extent of infection that a company suffers should be reduced by effective corporate governance.

We investigate the role of corporate governance primarily from the two aspects of ownership structure and board characteristics based on the perspective of investors. For ownership structure, rational investors can judge the level of transmission of negative information both from the will to conduct sound operations before the event and from the ability of controlling shareholders to exercise strong oversight after the event. Specifically regarding the Sanlu incident, because adding melamine could increase the protein content in infant formula, it is a typical behaviour of high risk and high return. Rational investors could predict that because shareholders are able to build a diversified investment portfolio with lower transaction costs in the case of relatively dispersed equity ownership, they often have a greater risk preference compared with managers who put a lot of investment into specialised human capital. Therefore, shareholders may allow and even urge the executives to choose some high-risk business strategies in order to maximise the company's market value. But because the ownership structure tends to be more concentrated, specific investments by shareholders will also increase, while their degree of risk preference will tend to be reduced. At this moment, shareholders will be more inclined to achieve a relatively stable business. On the basis of the matching

[6] As of February 2009, the Food Safety Law (Draft) has been under its fourth consideration.

principles of risk and future cash discount rates, we expect that the business risk of non-dairy companies in the food industry will rapidly increase following the outbreak of the Sanlu incident. As a result, the market value of these companies will be reduced. In this case, if rational investors can identify a will by controlling shareholders to run corporate operations prudently, and if they load this information into the company's share price, the company with a concentrated ownership structure may be less subject to the transmission of negative information. On the other hand, the limited tenure of executives often leads to a shorter vision in the decision-making process than that of shareholders. Therefore, after the incident, the rational choice for managers would be to cover up the incident temporarily to try to avoid becoming scapegoats. Although timely disclosure and remedies can often reduce a company's absolute loss, executives will no doubt know more than the shareholders about the company's specific production and operations, and such an information advantage may help them conceal the truth. In such a case, a strong controlling shareholder is needed even more to better monitor executives in respect of production, marketing, and other specific operational activities, thereby reducing the extent of corporate value destroyed when the executives' self-interest objectives are inconsistent with the optimal behaviour of the company. Rational investors should be able to anticipate such moral hazards on the part of managers under a situation of asymmetric information, and if they can distinguish between the different powers of supervision among controlling shareholders by analysing the company's ownership structure, and then load this information into the company's share price, the extent of transmission of negative information can also be reduced.

For the board of directors, it is generally believed that the higher the proportion of outside directors, the stronger the independence and the better the strategic guidance and oversight role the board has. Meanwhile, a larger board will increase transaction costs between the directors, thereby reducing the probability of collusion reached by board members. Donnelly (2008) investigates for the first time the relationship between contagion effects and board characteristics from the investor's perspective based on the effects arising from the financial fraud of Elan. He finds that a company's abnormal losses can be reduced by a more independent board; at the same time, empirical evidence also partially supports the negative correlation of board size with the extent of a contagion effect. But even though the system of independent directors was introduced into China as long ago as June 2001, investors still question the real function of these directors. On the one hand, China's weak legal environment may be insufficient to drive independent directors to implement strong supervision over listed companies; on the other hand, an independent director will also consider a number of factors when choosing which company's board to sit on, such as the company's reputation and the risk of sitting on the board (Zhou *et al.*, 2008). This means that independent directors are often more inclined to resign rather than intervene continuously when differences arise. Owing to the above two reasons, previous studies have found no evidence for the supervisory role of

independent directors in Chinese listed companies (Yin, 2005; Wang, 2007). In addition, while expanding the board's size could reduce the probability of collusion between board members, as Jensen *et al.* (1993) point out, the larger the scale of the board, the less efficient it is, and the more easily it can be controlled by the executives. In other words, effective supervision may be subject to the negative impact of board size. Given the widespread insider control in Chinese listed companies, such a situation may grow worse. It is expected that supervision of the executives would be less aggressive when the board of directors are having a dispute. Executives may also find it easier to lead the argument in their desired direction when the situation is chaotic. Therefore, given that the Chinese independent director system was mandatorily implemented, and given the weak legal environment and prevalence of insider control, considering the evidence above we believe that, from the investor's perspective, the board's characteristics will have no explicit relation to the extent of the transmission of negative information.

According to the above analysis, we thus propose our second hypothesis:

H2: The extent of the information contagion effect could be reduced by a concentrated ownership structure, but has no relation to board characteristics.

III. Research Design

3.1 Event Day

It is difficult to define accurately the first time the Sanlu incident became known to the public. Although the MOH officially released a statement on the incident on the evening of 11 September 2008, the public already knew much about it before the announcement from media coverage. The reporter Jian from the *Oriental Morning Post* gave a critical commentary on the Sanlu Group that received extensive attention. His later news story titled "14 Babies in Gansu Suspected of Kidney Disease Caused by Sanlu Infant Formula" is often considered to be the first exposure of the Sanlu incident. But after collecting relevant news stories, we find that what Jian wrote was just a follow-up survey of news reports by the media in Gansu.[7] What Jian evidently tracked was a news report titled "14 Babies Suffering from Kidney Stones" in the *Lanzhou Morning News* on 8 September 2008. In fact, this news report in turn was only a follow-up report of a press story titled "8 Cases of Child Kidney Stones due to Infant Formula?" on 5 September 2008 in the *Western Business Daily*, which belongs to the same group as the *Lanzhou Morning News*.[8] Thus, from 5 September 2008, the Sanlu incident began to be exposed and to cause broad public concern; therefore, we set it as our event day and

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[7] See: http://dfdaily.news365.com.cn/dfbbs/space/viewspacepost.aspx?postid=4438&spaceid=149. Jian also wrote in his personal blog that he had read reports about 14 babies in Gansu taking a certain brand of formula who suffered kidney failure on 10 September.

[8] See: http://press.idoican.com.cn/detail/articles/20080913002A36/. The press story from the *Oriental Morning Post* on 13 September, titled "Process of the Sanlu Infant Formula Incident" also affirmed that the *Western Business Daily* was the first newspaper to report the incident of poisonous infant formula.

denote it as T_0.[9] To enhance our observing capability and reduce the noise in the event period, we use a (-1, +1) event window.

3.2 Sample Selection and Data Source

We include all listed companies in the Chinese A-share market in the event period as our initial samples. To obtain a more accurate industry partition for each company, we use the industry classification standards of both the China Securities Regulatory Commission (CSRC) and the Global Industry Classification Standard (GICS) to screen listed companies belonging to the food industry, and then combine them to obtain 101 initial samples. Afterwards, we carry out the following sample selection procedures sequentially: (1) According to the disclosures of the main business products, we remove those companies clearly not belonging to the food industry; (2) to make the results respond more accurately to the contagion effect, we exclude those companies whose main business products include dairy products, because these companies may respond to both the contagion effects and competitive effects at the same time; and (3) we remove those companies that have no trading during the event period. In the end, our sample includes 66 listed non-dairy companies in the food industry. Table 1 details the process of sample selection.

Table 1 Process of Sample Selection

Procedures of sample selection	Sample size
CSRC: Manufacturing/Food and beverage	67
GICS: Consumer staples/Food, beverage, and tobacco	93
Merge (excluding repeated companies)	101
Less: clearly not belonging to the food industry	14
Less: main products include dairy	12
Less: no trading during the event period	9
Final sample	66

We take the daily stock trading price and company financial data from the Wind financial research database, and market indices and corporate governance data from the CCER financial research database. All data are processed by Stata 9.0.

[9] It is worth noting that although the incident was reported by only one local newspaper, in the internet era news from the *Western Business Daily* could be quickly transferred to the public via the internet. In fact, under the current press situation in China, first-hand information, especially negative information without official confirmation, is often transmitted through a variety of forums and professional small sites rather than national portal sites, such as the recent incident of "Game Gate", about a children's hospital in Nanjing, and the incident of "Orchid Gate" in Chengdu. In this case, portal sites, including Sina, Sohu, and Netease, provided the first report about the Sanlu incident after 11 September. The well-known search engine Baidu even underwent a crisis of confidence because it was suspected of shielding negative information about Sanlu Group. Therefore, although we can hardly restore accurately the paths along which the report by *Western Business Daily* passed, we believe that for the event study to capture the appropriate valuation adjustment of the securities market against the toxic infant formula incident, the determination of the event day in this paper is the least bad choice, although not the ideal choice.

3.3 Measurements of Abnormal Returns

The methods for calculating abnormal returns in the event study include the market adjustment method, the market model method, and the mean adjustment method. Chen (2002) finds that although the market model method has its own advantages, it has a greater tendency to reject the nul1 hypothesis in research on the Chinese securities market. Therefore, we prefer to use the market adjustment method following Fang *et al*. (2005) to calculate abnormal returns.

Specifically, the market adjustment method is calculated as shown in the following equations (1) and (2), where, $R_{i,\,t}$ refers to the daily returns of company i at time t;[10] $AR_{i,\,t}$ refers to the daily abnormal returns of company i at time t; and $R_{m,\,t}$ refers to the market returns at time t. We also use three methods to measure the return of the market portfolio, consisting of simple arithmetic average, weighted average by the market value of A shares, and the SSE Composite Index and SZSE Component Index. The corresponding calculations of daily abnormal returns are represented as *AR-1, AR-2,* and *AR-3*. (t_1, t_2) refers to the event period, and $CAR_{i,\,t_1,\,t_2}$ refers to the abnormal returns of company i in the event period.

$$AR_{i,\,t} = R_{i,\,t} - R_{m,\,t} \tag{1}$$

$$CAR_{i,\,t_1,\,t_2} = \sum_{t\,=\,t_1}^{t_2} (R_{i,\,t} - R_{m,\,t}) \tag{2}$$

IV. Empirical Results

4.1 The Information Contagion Effect

We first examine the impact of the Sanlu incident on the abnormal stock returns of listed non-dairy companies in the food industry. Owing to consistency in calendar time of the event day, cross-sectional correlation of stock returns could lead to overestimating the significance of statistical tests, thereby increasing the probability of type I errors. Therefore, we use the non-parametric bootstrap method recommended by Sefcik and Thompson (1986) to address this issue. Specifically, bootstrap p-values are calculated as follows:

1. For each sample, calculate abnormal returns in the event period and obtain sample A $(R_1, R_2 \ldots R_n)$;
2. Carry out a random sample with replacement from sample set A and obtain $(R^*_1, R^*_2, \ldots R^*_n)$; repeat this process 10,000 times to get a new sample set B.[11]

[10] Calculated as Ln $(P_{i,\,t}/P_{i,\,t-1})$.

[11] The new sample set B is composed of means, medians, or regression coefficients produced by the repeated random sampling processes described above.

3. Compute one-tailed p-values as the number of observations in sample B with values greater (lower) than those in sample A ÷ 10,000, and two-tailed p-values as 2 × one-tailed p-values.

Table 2 details the empirical results. To ensure that the main results are not caused by some outliers, we also carry out the median test. As shown in Table 2, there is still an average abnormal return greater than zero for sample companies in t = -1. However, as the Sanlu incident begins to become publicly known, our sample companies suffer an average negative abnormal return on t = 0, statistically significant at the 1 per cent level. The above results do not change whether we use a different measure for the market portfolio or different procedures for the statistical test. Over the entire event period, the sample companies also incur a significant abnormal loss. In other words, our evidence shows that an information contagion effect does exist in the Chinese securities market. Among the three proxies for the market portfolio, the abnormal return calculated by the method of arithmetic average has the smallest value. Even so, the sample companies still suffer an average loss in abnormal return of -2.369 per cent over the whole event period. If calculated with the average market value of sample companies on 3 September 2008 (t = -2), each sample company would suffer an abnormal loss of 166 million renminbi over three days.[12] Obviously, the abnormal loss is also very significant economically.

Table 2 Abnormal Returns for Sample Companies

Panel A: Mean Test

Variable	Statistics	t = -1	t = 0	t = 1	T (-1, +1)
AR-1	mean	0.0029	-0.0132	-0.0133	-0.0237
	t-value	1.0053	-3.3901	-2.8603	-3.0432
	p-value	0.3184	0.0012***	0.0057***	0.0034***
	bootstrap p-value	0.4070	0.0050***	0.0130**	0.0100**
AR-2	mean	0.0063	-0.0248	-0.0263	-0.0448
	t-value	2.2226	-6.3221	-5.6865	-5.7423
	p-value	0.0297**	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.1220	0.0000***	0.0000***	0.0000***
AR-3	mean	0.0068	-0.0304	-0.0312	-0.0548
	t-value	2.3822	-7.6824	-6.7127	-6.9911
	p-value	0.0201**	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.1020	0.0000***	0.0000***	0.0000***
		N = 66	N = 66	N = 66	N = 66

[12] The average market value of the sample companies on 3 September 2008 was 6.92 billion renminbi, so the average abnormal loss for each sample company in three days can be calculated as 69.2 × ($e^{2.369\%}$ – 1) = 166 million renminbi.

Panel B: Median Test

Variable	Statistics	t =-1	t = 0	t = 1	T (-1, +1)
AR-1	median	0.0039	-0.0166	-0.0250	-0.0403
	z-value	2.4820	-3.2040	-2.7250	-2.9030
	p-value	0.0131**	0.0014***	0.0064***	0.0037***
	bootstrap p-value	0.0090***	0.0000***	0.0040***	0.0020***
AR-2	median	0.0056	-0.0280	-0.0377	-0.0636
	z-value	3.9130	-4.9800	-4.7050	-4.6350
	p-value	0.0001***	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.0000***	0.0000***	0.0000***	0.0000***
AR-3	median	0.0057	-0.0347	-0.0433	-0.0719
	z-value	4.0600	-5.5860	-5.2030	-5.3120
	p-value	0.0000***	0.0000***	0.0000***	0.0000***
	bootstrap p-value	0.0000***	0.0000***	0.0000***	0.0000***
		N = 66	N = 66	N = 66	N = 66

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. These are all two-tailed tests. The Wilcoxon signed-rank is used in the median test; the process for calculating the bootstrap p-value is detailed in Sub-section 4.1.

To ensure the reliability of our results, we extend the event window into T (-5, +5); Table 3 shows the empirical results under the new definition.[13] As shown, no fixed pattern exists for abnormal returns of the sample companies in the 11 trading days during T (-5, +5). Neither is there ever an abnormal return significantly less than zero starting from t = +2.[14] Under longer event windows, the *CAR* of the sample companies is significantly less than zero in the T (-2, +2), T (-3, +3), and T (-5, +5) periods. This shows that our results are relatively robust, that is, not easily changed with the alteration of event windows. Furthermore, the sample's *CAR* is not significant regardless of the T (-5, -3) or T (+3, +5) periods when T (-1, +1) is excluded. This means that the results of the three new event windows are mainly the product of the impact of the original event period, showing that a strong market reaction is indeed caused by the Sanlu incident in a relatively narrow time window.

[13] Since the three proxies of market portfolio lead to similar results, we report just the results that measure the market return using the arithmetic average market index.

[14] Starting from t = +2, the abnormal returns of the sample companies are no longer less than the market returns. This may be because day T_0 (5 September 2008) was a Friday, so the next trading day (day T_1) was 8 September 2008. Therefore, the impact of the Sanlu incident may have further expanded over the weekend, and the process of information being absorbed into the stock prices was subsequently speeded up.

Table 3 New Event Period: Abnormal Returns of Sample Companies

Date/Statistics	Mean	t-value	p-value
***t* = -5**	-0.0048	-2.2793	0.0259**
***t* = -4**	-0.0036	-0.7758	0.4407
***t* = -3**	-0.0027	-0.5407	0.5906
***t* = -2**	-0.0170	-4.1840	0.0001***
***t* = -1**	0.0029	1.0054	0.3184
***t* = 0**	-0.0133	-3.3902	0.0012***
***t* = +1**	-0.0133	-2.8603	0.0057***
***t* = +2**	0.0026	0.4558	0.6500
***t* = +3**	-0.0034	-1.0948	0.2777
***t* = +4**	0.0009	0.3181	0.7514
***t* = +5**	0.0045	1.1958	0.2361
T (-2, +2)	-0.0381	-3.5820	0.0007***
T (-3, +3)	-0.0442	-3.5397	0.0007***
T (-5, +5)	-0.0472	-3.3758	0.0012***
T (-5, -3)	-0.0112	-1.3479	0.1824
T (+3, +5)	0.0020	0.3292	0.7431

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test). *AR* refers to the abnormal return calculated using the simple arithmetic average method to measure the return of the market portfolio.

The above results show that the non-dairy companies in the food industry suffer significantly negative abnormal returns in the event period. However, another likely scenario is that this pattern is not unique to the sample companies but is a miniature of stock price movement for all manufacturing companies. To this end, we calculate and test the abnormal returns of other sub-sectors in the manufacturing industry in the event period, as shown in Table 4.

From Table 4, we find that only the listed companies in the electronics industry suffer significantly negative abnormal returns, but the abnormal returns do not differ significantly from zero in the T (-1, +1) of the entire event period. We also note that the abnormal returns of companies in the paper and printing industry are significantly negative, but their abnormal returns do not differ significantly from zero on day t_0. Therefore, the results of Table 4 show that the stock price movement of non-dairy companies in the food industry is unique; it is neither a microcosm of the entire manufacturing industry nor the same as other sub-sectors of manufacturing. This shows not only that our evidence on the contagion effects is reliable, but also that the contagion effects of the Sanlu incident do not go beyond the boundary of industry, and thus its transfer of information is passed between intra-industry companies.

Table 4 Abnormal Returns of Non-Food Companies in the Manufacturing Industry

Industry	Statistics	$t = -1$	$t = 0$	$t = 1$	T (-1, +1)
Textiles, clothes, and furs	mean	0.0025	-0.0015	-0.0007	0.0003
(n = 67)	t-value	0.8327	-0.3686	-0.1763	0.0390
Paper and printing	mean	-0.0052	-0.0029	-0.0106	-0.0187
(n = 32)	t-value	-1.5811	-0.6967	-2.0890**	-3.2732***
Petroleum, chemistry,					
and plastics	mean	0.0013	-0.0039	-0.0079	-0.0105
(n = 161)	t-value	0.7901	-1.4182	-2.3980**	-2.0963**
Electronics	mean	-0.0000	-0.0077	-0.0016	-0.0094
(n = 70)	t-value	-0.0050	-2.8413***	-0.3822	-1.5808
Metals and non-metals	mean	0.0022	-0.0010	-0.0056	-0.0044
(n = 138)	t-value	1.3168	-0.4261	-2.1607**	-1.1131
Machinery, equipment,					
and instruments	mean	-0.0034	-0.0003	0.0027	-0.0010
(n = 237)	t-value	-2.5212**	-0.1408	1.2519	-0.2735
Medicine and biological					
products	mean	-0.0042	0.0044	0.0004	0.0006
(n = 97)	t-value	-1.6624*	1.3977	0.1152	0.0882
Other	mean	0.0067	0.0035	0.0206	0.0308
(n = 30)	t-value	1.3847	0.6017	2.5578**	2.2561**

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test). *AR* refers to the abnormal return calculated using the simple arithmetic average method to measure the return of the market portfolio. We use the CSRC standard for industrial classification, and remove companies without trading during the event period. To meet the basic requirements of statistical inference, we merge six samples from the wood and furniture industry into the category of other.

Furthermore, we conduct a more formal test on the difference in mean and median between non-dairy companies in the food industry and companies in other sub-sectors of manufacturing. The results are shown in Table 5. Obviously, the abnormal returns of non-dairy companies in the food industry are far less than the comparison group; moreover, this difference is statistically significant.[15] The event study results indicate that on day T_0, non-dairy companies in the food industry suffer a significant abnormal loss whether compared with the market or with the industry.

[15] While the mean test with the paper and printing and the electronics sub-sectors is not significant, both differences in the median test, which is more susceptible to outliers, are statistically significant at the 5 per cent level.

Table 5 Comparison between Non-dairy Food Companies and Other Manufacturing Companies

Panel A: $t = T_0$				
Compared groups	**Difference**	**t-value**	**z-value**	**N**
Non-dairy food vs. other manufacturing sub-sectors	-0.0120	-3.0595***	-3.4360***	898
Panel B: $t = T_0$				
Compared groups	**Difference**	**t-value**	**z-value**	**N**
Non-dairy food vs. textiles, clothes, and furs	-0.0117	-2.0179***	-2.1600**	133
Non-dairy food vs. paper and printing	-0.0104	-1.6403	-2.0450**	98
Non-dairy food vs. petroleum, chemistry, and plastics	-0.0094	-1.8896**	-2.5620**	227
Non-dairy food vs. electronics	-0.0055	-1.1732	-1.7770**	136
Non-dairy food vs. metals and non-metals	-0.0123	-2.9052***	-3.1560***	204
Non-dairy food vs. machinery, equipment, and instruments	-0.0130	-2.9809***	-3.2030***	303
Non-dairy food vs. medicine and biological products	-0.0176	-3.5483***	-3.6510***	163
Non-dairy food vs. other	-0.0168	-2.3941**	-2.5290**	96

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively (two-tailed test). *AR* refers to the abnormal return calculated using the simple arithmetic average method to measure the return of the market portfolio. We use the CSRC standard for industrial classification. The t-value is obtained by t-tests for means and the z-value by the Wilcoxon rank sum test for medians.

4.2 Role of Corporate Governance

4.2.1 Model and Variables

We examine the relationship between the contagion effects and corporate governance using the following multiple regression model:

$$CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \Sigma CONTROL_i + \xi \,, \quad (3)$$

where CAR_i refers to the cumulative abnormal returns of company i during the event period; $CONCENTRATION_i$ refers to the concentration of ownership structure for company i, measured by the ownership percentage held by the controlling shareholder; DI_i refers to the independence of the board, measured by the natural logarithm of the total number of independent directors; and $DSIZE_i$ refers to board size, measured by the natural logarithm of the total number of board directors.

Following previous studies (Loughran *et al*., 1995; Barber *et al*., 2001), we control for corporate risk, growth, and the natural logarithm of market value, which may impact abnormal returns. We use the company's beta values for the most recent 24 months to measure risk, and the arithmetic average sales growth rate for the most recent three years to measure company growth. In addition, considering the heterogeneity of corporate behaviour resulting from different ownership properties in the Chinese securities market, we also control for the impact of the ownership property of the ultimate controlling shareholder. Table 6 presents the definitions and measurements of the main variables involved in this paper.

Table 6 Definitions of Variables

Name	Symbol	Definition
Cumulative abnormal returns	*CAR*	See paragraph 3.3
Concentration of ownership structure	*CONCENTRATION*	Ownership percentage of the controlling shareholder
Board independence	*DI*	Natural logarithm of the total number of independent directors
Board size	*DSIZE*	Natural logarithm of the total number of directors
Risk	Beta	Beta values for the most recent 24 months
Market capitalization	*LnMV*	Natural logarithm of market capitalisation
Growth	*GROWTH*	Arithmetic average sales growth rate for the most recent three years
Ownership property	*OWNERSHIP*	Assigned a value of 1 when a state-owned enterprise, and 0 otherwise

4.2.2 Regression Results

The main results support Hypothesis 2 and are robust even when using three different ways to proxy for the market portfolio and the bootstrap procedure to correct cross-sectional correlation. Specifically, as shown in Table 7, we find that both board independence and board size have no explicit relation to the extent of the contagion effects. In other words, from an investor's point of view, we find no evidence that independent directors implement effective monitoring within a relatively short window. We also find that the abnormal loss suffered from the transmission of negative information can be significantly reduced by a more concentrated ownership structure. This shows that in the Chinese securities market, a relatively strong controlling shareholder can have a positive impact on the company's value resulting from mitigation of the free-rider problem.

Table 7 Corporate Governance and Contagion Effects

Equation:

$$CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \sum CONTROL_i + \xi$$

Independent variables	Dependent variables		
	CAR-1	*CAR-2*	*CAR-3*
Constant	-0.4987	-0.5274	-0.6142
	[-2.85***, -2.43***]	[-2.96***, -2.55**]	[-3.52***, -3.06***]
CONCENTRATION	0.1126	0.1073	0.1139
	[1.87*, 1.83*]	[1.79*, 1.75*]	[1.89*, 1.89*]
DI	-0.0269	-0.0277	-0.0267
	[-0.96, -0.73]	[-0.99, -0.76]	[-0.95, -0.73]
DSIZE	0.0678	0.0676	0.0678
	[1.57, 1.23]	[1.58, 1.25]	[1.57, 1.23]
Beta	-0.0278	-0.0294	-0.0274
	[-1.13, -0.98]	[-1.18, -1.02]	[-1.11, -0.97]
LnMV	0.0157	0.0162	0.0156
	[1.86*, 1.63]	[1.89*, 1.68*]	[1.84*, 1.66*]
GROWTH	-0.0085	-0.0085	-0.0085
	[-1.06, -0.92]	[-1.04, -0.92]	[-1.06, -0.92]
OWNERSHIP	-0.0139	-0.0146	-0.0137
	[-0.86, -0.84]	[-0.90, -0.88]	[-0.84, -0.82]
N		58[16]	
F statistic/Wald chi2	[4.50***, 19.57***]	[4.50***,19.87***]	[4.49***, 20.82***]
adj-R^2	0.2324	0.2303	0.2325

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *CAR-1*, *CAR-2*, and *CAR-3* refer to the abnormal return calculated using the simple arithmetic average method, the weighted average by market value of A shares, and the SSE Composite Index and SZSE Component Index to measure cumulative abnormal returns of the market portfolio, respectively. No serious collinearity problem occurs in the regressions. The figures on the left in square brackets are t-values based on robustness standard errors, whereas the other figures are z-values obtained from the bootstrap procedure.

4.2.3 Alternative Measures of Board Independence

We also consider the following two methods to proxy for board independence to enhance the robustness of our conclusions: (1) we note the proportion of independent directors to the total number of board members; and (2) following Donnelly (2008), we set a dummy variable *DI-RANK*, which takes the value of 1 when the number of independent directors is greater than 3, and 0 otherwise. Results of the robustness test are shown in Table 8. We find no changes in the main results after changing the measure

[16] Because of missing data, the final number of sample companies in the regression is only 58.

for board independence. Ownership concentration is still significantly and positively correlated with the extent of the contagion effect, whereas there is still no correlation between the latter and board independence. We find that the extent of the contagion effect can be reduced by expansion of the board when using *DI-RANK* to proxy for board independence, which is consistent with Donnelly (2008).

Table 8 Changing the Measurement of Board Independence

Equation: $CAR_i = \alpha_0 + \alpha_1 * CONCENTRATION_i + \alpha_2 * DI_i + \alpha_3 * DSIZE_i + \beta_j * \sum CONTROL_i + \xi$

	Dependent variables: *CAR-1*					
Independent variables	**Coefficient**	**T-value**	**Z-value**	**Coefficient**	**T-value**	**Z-value**
Constant	-0.4431	-2.25**	-2.01**	-0.5468	-3.49***	-3.06***
CONCENTRATION	0.1120	1.87*	1.85*	0.1118	1.95*	1.90*
DI-RATE	-0.0908	-1.01	-0.81			
DI-RANK				-0.0262	-1.22	-1.17
DSIZE	0.0410	1.27	1.07	0.0830	2.36**	1.94*
Beta	-0.0275	-1.12	-0.97	-0.0271	-1.16	-0.99
GROWTH	-0.0080	-1.01	-0.87	-0.0077	-1.02	-0.89
LnMV	0.0159	1.93*	1.70*	0.0153	1.88*	1.71*
OWNERSHIP	-0.0144	-0.88	-0.85	-0.0142	-0.88	-0.86
N		58			58	
F statistic/Wald chi2		[4.09***, 20.72***]			[5.54***, 27.24***]	
adj-R^2		0.2333			0.2502	

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively. *CAR-1*, *CAR-2*, and *CAR-3* refer to the abnormal returns calculated using the simple arithmetic average method, the weighted average by market value of A shares, and the SSE Composite Index and SZSE Component Index to measure cumulative abnormal returns of the market portfolio, respectively. No serious collinearity problem occurs in the regressions. The figures on the left in square brackets are t-values based on robustness standard errors, whereas the other figures are z-values obtained from the bootstrap procedure.

V. Conclusion

Examining the dairy crisis triggered by the Sanlu incident, we provide for the first time evidence that the information contagion effect does exist in the Chinese securities market. Our evidence shows that the abnormal return for non-dairy companies in the food industry is -2.369 per cent on average in a (-1, +1) event window resulting from the impact of the dairy crisis. Additionally, we construct a cross-sectional multiple regression model to examine the relationship between abnormal losses and corporate governance. We find that a concentrated ownership structure can help to mitigate the abnormal losses caused by the Sanlu incident, which is consistent with the idea that concentration of

ownership could be an alternative mechanism for a weak legal environment, as argued by La Porta *et al.* (1998). We do not, however, find any evidence that the extent of the contagion effect has any relation to the characteristics of the board.

This study may help us further understand the decision-making processes of investors. Since the contagion effect does exist, this indicates that investors will adjust their expectations concerning the future cash flows and risks of companies that have not yet made announcements by using the public information of peer firms. This paper may also help in the disclosure practices of listed companies. Considering the interaction of information announcements, a company may need to choose the timing of disclosures and to intervene in the negative consequences of information announcements by other companies. In addition, because a contagion effect exists, market regulators may also need to take full account of the social costs arising from external effects when making a trade-off between a policy's costs and benefits.

Subject to data availability, the widespread applicability of the conclusions may be limited to some extent by the sample size. Further studies could consider expanding the definition of a "product quality crisis", and if the sample size could be expanded appropriately, it would help not only to promote the conclusions of this study, but also to obtain more extensive information owing to the different nature of the product quality crisis. Another important direction for further studies would be to extend Morck *et al*. (2000). We believe that a much cleaner testable scene could be provided by using the impact of exogenous events on the securities market. Further research based on the dairy crisis could empirically test the impact of property rights protection, company-wide information environments, and type II agency problems on simultaneous stock price movements.

References

Please refer to pp. 67-68.