限售股减持的市场反应与股东行为模式[1]

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摘要

　　本文结合股权分置改革的制度背景，研究了沪深两市限售股减持时的市场反应与限售股股东行为模式。研究发现：公告期内市场反应为负且成倒"U"型，即限售股股东选择了股价升降的周期性高点进行减持；公司基本面、市场状况对其CAR值有较大影响，而股东特征、减持状况对CAR值影响较小。通过建立理论模型和实证分析进一步发现：股东预期能否获得足够的控制权收益成为其选择是否减持和决定减持比例的关键因素，股东特征、减持状况对其有较大影响，而公司基本面、市场状况则影响较小。

关键词：股权分置改革、市场反应、限售股股东行为
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一、引言

中国经济的生命力从来都是与"改革"二字紧密地联系在一起。改革扫清了阻碍经济发展的制度性难题，让中国经济容光焕发、充满活力；资本市场亦是如此。

股权分置制度在中国资本市场建立初期起到了回避争议、加快证券市场探索的作用，但是非流通股与流通股的分割不仅使股东间利益不一致，也扭曲了证券市场定价机制。2005年4月29日，经国务院批准，中国证监会发布了《关于上市公司股权分置改革试点有关问题的通知》，正式宣告了我国股权分置改革试点工作启动。经过三年时间，大部分上市公司都完成了股权分置改革，资本市场摆脱了多年的制度性障碍，国人期待已久的全流通夙愿得以实现。改革如同就医，行动是必须的、前景是美好的，但过程必然是痛苦的。股权分置改革虽然一度成为资本市场牛熊转换的引擎，但为了缓冲非流通股集中转变为流通股对证券市场的冲击，监管部门强制要求限售股解禁与减持遵守"锁一爬二"制度。自2006年6月起，沪深两市千余家完成股改的上市公司陆续进入解禁期，其后几年带来的绵绵限售股解禁与减持压力，也成为市场深幅调整的始作俑者，至今仍是悬于市场上方的巨石。限售股解禁尤其是减持时的市场反应及其股东行为自然成为后股改时期的两大核心问题，引发了学者、投资者和监管部门等各界的广泛关注。

上述改革的制度背景引发了本文的研究问题：减持公告是否具有信息含量和信号传递效应，即限售股股东是否在解禁后选择了股价的周期性高点进行减持？如果限售股减持的确对公司股价造成了影响，哪些因素会影响到市场反应？哪类公司的限售股股东更易产生减持冲动，又是哪些因素决定其减持比例？由于限售股减持为中国资本市场特有，国外并无可以直接参考的文献，唯一比较接近的是国外上市公司在IPO时有部分股份锁定现象，本文尝试借鉴信号传递和控制权理论的基本思想建立分析中国限售股股东减持行为的实证模型与理论模型。从理论贡献上来讲，这一方面可以丰富国外有关锁定期间股东行为的研究文献以及国外成熟理论在新兴市场的应用，另一方面也拓展了国内有关后股权分置改革时期的相关文献。从实务与政策监管角度来说，我们的研究能够为监管者提供后股权分置改革时期监管限售股减持的思路，而这最终将关系到如何保护中小投资者利益这一资本市场的根本问题。

鉴于此，本文以沪深两市完成股权分置改革的上市公司在观察窗口内公告的限售股减持事件为样本，通过理论建模和实证分析对股改后续效应影响进行了探索与研究。具体分为两方面内容：第一是分析上市公司发布限售股减持公告时的市场反应，结果发现公告期内市场反应为负且成倒"U"型，表明限售股股东选择了股价升降的周期性高点进行减持，公司基本面、市场状况对其CAR值有较大影响，而股东特征、减持状况则影响较小；第二是分析减持过程中限售股股东在持有与卖出两种决策行为之间的成本收益权衡，结果发现股东预期能否获得足够的控制权收益成为其选择是否减持和决定减持比例的关键因素，股东特征、减持状况对其有较大影响，公司基本面和市场状况则影响较小。

　　本文后续部分安排如下：第二部分进行相关文献综述；第三部分是限售股股东减持的理论模型；第四部分是研究设计，包括样本选取、数据来源、研究方法、模型、变量等；第五部分是研究减持公告的市场反应和减持的实际影响；第六部分是研究大股东的减持行为；第七部分对本文的实证部分进行敏感性检验；最后第八部分是研究结论、局限与监管建议。

二、相关文献综述

　　非流通股的存在是中国证券市场建立之初为保持国有股东绝对控制地位而进行的特殊制度安排。国外上市公司在IPO时对原有大股东也会有一段时期的流通限制即锁定期，之后股份可自由流通；故国外锁定期间大股东行为的研究文献可以为我们研究中国限售股股东减持行为提供间接参考。这类文献的理论基础是信息不对称理论与信号传递理论。信息不对称理论认为，市场主体对信息的掌握程度不一样，掌握更多信息的一方可以利用信息优势获得收益 (Akerlof, 1970; Spence, 1973)；资本市场中的信息不对称不仅会对市场参与者(包括投资者、上市公司管理层、股东以及监管部门等)的行为产生重大影响，还会对资源的有效配置产生扭曲。信号传递理论在财务领域的应用始于 Ross (1977) 的研究，他最早将信息不对称理论引入资本结构和股利政策的分析，发现拥有高质量投资机会信息的经理可以通过资本结构或股利政策的选择向潜在投资者传递信息。当前有关信号传递理论的研究都是建立在假设公司管理层掌握了外界投资者不可获知信息为前提，也即承认信息不对称现象的存在。Espenlaub *et al.* (2001) 比较了英国IPO锁定期与美国的区别，发现前者在锁定期内对股东和内部人行为的规定更为复杂。Goergen *et al.* (2006)同样以英国IPO锁定期间的上市公司为研究样本，发现监管措施、董事及外部股东持股比例可以解释市场反应程度。Field and Hanka (2001)发现当IPO锁定期结束时，风险投资会比高级管理人员和其他股东更快地出售股份。Brav and Gompers (2003)的研究支持承诺假说，即当内部人有更多道德风险时会选择较长锁定期。Brau *et al.* (2005)研究了中国股权分置改革的过程，发现改革对市场整体是有利的，特别是对那些信息披露质量较低的公司。当股权分置改革完成后，上市公司的中小股东仍不具备直接获取公司内部信息的能力，其信息知晓权利依靠强制性信息披露，而大股东可以通过进入或影响董事会成为公司内部人士，较中小股东而言拥有获取公司经营状况、财务状况和重大事项信息的超然优势，所以上市公司不同股东在预测公司未来发展状况和准确估值定价方面仍存在较大差异，而这种减持期间的信息不对称使得中小股东在限售股减持时机的选择上处于不利地位。由于现行上市公司持股5%以上的股东被定义为上市公司的关联法人或自然人，由此决定了被外界理解为"内部人士"的主要限售股东的减持行为一定是有其"信号含量"的，所以，当上市公司发布大股东减持股票的信息时，市场中处于信息劣势的中小投资者就会将其当作内部信息理解。本文正是基于信号传递理论来研究限售股股东减持时的市场反应问题，这也拓展了该理论在新兴市场的应用。

　　从股权分置改革现有的研究文献来看，大部分都集中于股改过程中有关股改对价以及股改实施时点的市场反应问题。一些文献研究了股改对价的确定，许年行和吴世农(2007)通过研究股权分置改革中对价制定及其影响因素，发现了对价制定过

程的"锚定效应"。沈艺峰等(2006)发现我国股权分置改革中的对价水平存在"10股送3股"的群聚现象，原因可能是上海证券市场保荐机构寡头垄断的结果。张俊喜等(2006)发现企业在制定股改方案过程中全面考虑了公司的财务状况、股市表现且平衡了各方利益。丁志国、苏治和杜晓宇(2006)根据政策中性原则与套利分析理论推导出市场均衡条件下的对价公式，并剖析了试点公司的对价方案，发现部分上市公司的对价支付比例存在明显不合理。另外一些文献研究了对价支付的影响因素，如大股东的控制力、机构投资者比例、非流通股比例和锁定承诺、分红承诺和业绩承诺等(吴超鹏等，2006；肖正根，2006；辛宇和徐莉萍，2007；赵俊强等，2006)。还有一些文献涉及到股改实施过程中的市场反应，如陈蛇、陈朝龙(2005)运用事件研究法分析股改引发的个股价格上涨和市场下跌的股市波动现象，认为股改存在施舍和伤及无辜的机制设计缺陷；曹国华等(2006)发现股改向市场传递了积极的信号，对股价走势存在正面影响，而且股票对价率和现金对价率都对股价走势有着显著影响，但其他承诺方案的影响却不显著。陈睿(2007)通过对完成股权分置改革程序的上市公司的"股改行情"进行经验分析，发现市场对上市公司股改有明显的"先仰后抑"的反应，并存在较普遍的信息泄漏和炒作现象，其中中小市值、对价水平较高和股权集中度高的股票尤为显著。由于股权分置改革采取了"锁一爬二"的制度，股改对市场的影响更主要地会体现在股改基本完成后的限售股陆续解禁与减持。陈晓红等(2006)发现股权分置改革的推进在于增加投资者信心，而非仅提供投资者在这一时期的套利机会。王克敏和廉鹏(2008)发现大股东会利用公司管理层盈余预测的时机来选择减持的时机，蔡宁和魏明海(2009)发现我国证券市场存在配合减持需要的盈余管理行为，王汀汀(2009)利用2007年底以前的减持公告样本进行实证分析发现，减持公告市场效应不显著，说明总体而言市场将减持视为长期压抑的流通愿望的释放。本文则侧重于从更基本因素—控制权收益的角度分析限售股股东何时减持和减持比例的问题，这也丰富了国内后股权分置改革文献的研究成果。

三、限售股股东减持的理论模型

　　限售股股东是否减持其实质是减持收益与持有收益进行比较，[6]以实现其个人收益的最大化。当减持收益大于持有收益时，做出减持决策；当减持收益小于持有收益时，做出继续持有决策。减持股份虽能获得一定数量的转让收益，但代价是没法继续分享公司未来增长带来的收益，特别是主要限售股股东如果大比例减持则意味着放弃原本享有的控制权收益。所以主要限售股股东做出减持抉择时，不仅考虑减持转让收益，更会权衡控制权收益、减持成本和阻力因素。

6　限售股股东期初持股成本低是其减持的重要原因，但该现象具有普遍性，这就很难解释为何不同上市公司之间股权减持比例会有较大差异；同时在限售股股东做出减持决策时，根据财务学基本原理，期初持有成本相当于沉没成本，不再是其估值定价的考虑因素。

借鉴 Shleifer and Vishny (1986) 的模型设计，假定股东期初持有限售股的比例为 α，$0 \leq \alpha \leq 1$。股东判断公司未来以概率 I 可以得到一个正的经过折现后的收益 Z，Z 的累积概率分布为 $F(Z)$，股东为此判断所花费的成本为 $C(I)$。可以看作公司未来发展所带来的价值增量。I 可以看作股东判断的精确程度。$F(Z)$ 的定义域 $Z \in (0, Z_{max}]$。$dC/dI > 0,\ d^2C/dI^2 > 0$。公司如果按照当前经营模式不发生改变时真实价值是 q。股东卖出的限售股比例为 $\beta(0 \leq \beta \leq \alpha)$，在卖出的过程中股东会有一定的成本和阻力 C_T。

股东在持有公司股份 $r\,(0 < r \leq \alpha)$ 之上会根据其持有股份比例获得由控制权所带来的收益 αK，这里的控制权收益既包括控制权私人收益也包括控制权共享收益。本期和下一期持有公司全部股份所带来的收益分别为 K, K^*，其中 K^* 是经过折现后的值。这里"控制权"的含义被理解为股东有实力进入董事会或影响股东大会的结果。

当期股价为 P，如果公司以当期股价全部卖出可得现金收入 $q + \pi$，为当期股东卖出后可得的超额收益，也即溢价。我们假定 $\lambda(0 < \lambda < 1)$ 是股东保留控制权与不保留控制权出售时所能获得超额收益的比例差别。

股东如果卖出限售股（保留控制权）可得收益为：

$$(\alpha - \beta_1)E(Z) + \beta_1(q + \lambda\pi) + (\alpha - \beta_1)q - C_T + (\alpha - \beta_1)K + (\alpha - \beta_1)K^*,\ 0 \leq \beta_1 \leq \alpha - r \tag{1}$$

股东如果卖出限售股（不保留控制权）可得收益为：

$$(\alpha - \beta_2)E(Z) + \beta_2(q + \pi) + (\alpha - \beta_2)q - C_T,\ \alpha - r \leq \beta_2 \leq \alpha \tag{2}$$

股东如果不卖出限售股可得收益为：

$$\alpha E(Z) + \alpha q + \alpha K + \alpha K^* \tag{3}$$

（1）-（2）：$(\beta_2 - \beta_1)E(Z) + (\lambda\beta_1 - \beta_2)\pi + (\alpha - \beta_1)(K + K^*),\ \beta_2 > \beta_1$

当（1）$\geq$（2）时，股东会在卖出限售股（保留控制权）与不卖出限售股之间选择。

当（1）$\leq$（2）时（$\pi > \dfrac{(\beta_2 - \beta_1)E(Z)}{\beta_2 - \lambda\beta_1} + \dfrac{(\alpha - \beta_1)(K + K^*)}{\beta_2 - \lambda\beta_1}$ 才可能实现），股东会在卖出限售股（不保留控制权）与不卖出限售股之间选择。

1. 股东在卖出（保留控制权）与不卖出限售股之间选择

（1）-（3）：$\beta\lambda\pi - \beta E(Z) - C_T - \beta(K + K^*) \geq 0,\ 0 \leq \beta \leq \alpha - r$

市场中其他投资者愿意购买股份时即为：$\lambda\pi - E[Z \mid Z \leq \lambda\pi - C_T \ / \ \beta - (K + K^*)] \leq 0$

满足上式最小的溢价 π 为 $\pi^*(\beta)$；定义 $Z^c(\beta) = \min\{\lambda\pi - C_T \ / \ \beta - (K + K^*)\}$，即卖与不卖无差异时的公司的价值增量。我们可以将这个博弈的最优均衡表述出来：当 $Z \geq Z^c(\beta)$ 时，市场中的其他投资者将以 $\lambda\pi^*(\beta)$ 的溢价来购买股东 β 的股份，而股东也会卖出手中的限售股，交易可以达成，且双方存在唯一的序贯均衡策略（Grossman and Perry, 1984），即出价为 $q + \lambda\pi^*(\beta)$。

所以，股东在卖出限售股的过程中最大化各期收益：

$f = \beta(q + \lambda\pi) + (\alpha - \beta)\{q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)]\} + (\alpha - \beta)(K + K^*)$

引理1：$\pi^*(\beta)$ 会随着 β 的增加而增加

引理 2：$Z^c(\beta)$ 会随着 β 的增加而增加

引理 3：$I^*(\beta)$ 会随着 β 的增加而增加[7]

引理 4：$F[Z^c(\beta)]E[Z \mid Z \le Z^c(\beta)]$ 会随着 β 的增加而增加

命题 1：$\partial f / \partial \alpha > 0$

命题 2：$\partial f / \partial \beta \ge 0$ $(\Delta \ge (K+K^*))$ 或 $\partial f / \partial \beta \le 0$ $(\Delta \le (K+K^*))$[8]

命题 3：$\partial f / \partial C_T \le 0$

2. 股东在卖出（不保留控制权）与不卖出限售股之间选择

（2）-（3）：$\beta\pi - \beta E(Z) - C_T - \alpha(K+K^*) \ge 0$，$\alpha - r \le \beta \le \alpha$

其他投资者愿意购买份额即为：$\pi - E[Z \mid Z \le \pi - C_T / \beta - \alpha(K+K^*) / \beta] \le 0$

满足上式最小的溢价 π 为 $\pi^*(\beta)$；定义 $Z^c(\beta) = \min\{\pi - C_T / \beta - \alpha(K+K^*) / \beta\}$，即卖与不卖无差异时的公司的价值增量。我们可以将这个博弈的最优均衡表述出来：当 $Z \ge Z^c(\beta)$ 时，市场中的其他投资者将以 $\pi^*(\beta)$ 的溢价来购买股东 β 的股份，而股东也会卖出手中的限售股，交易可以达成，且双方存在唯一的序贯均衡策略（Grossman and Perry, 1984），即出价为 $q + \pi^*(\beta)$。

所以，股东在卖出限售股的过程中最大化所得各期收益：

$f = \beta(q + \pi) + (\alpha - \beta)\{q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \le Z^c(\beta)]\}$

引理 5：$\pi^*(\beta)$ 会随着 β 的增加而增加

引理 6：$Z^c(\beta)$ 会随着 β 的增加而增加

引理 7：$I^*(\beta)$ 会随着 β 的增加而增加

引理 8：$F[Z^c(\beta)]E[Z \mid Z \le Z^c(\beta)]$ 会随着 β 的增加而增加

命题 4：$\partial f / \partial \alpha > 0$

命题 5：$\partial f / \partial \beta \ge 0$

命题 6：$\partial f / \partial C_T \le 0$

由引理 1、5 可知，当市场情况比较好，限售股股东可以在当期获得较高的超额收益 π^* 时，我们会观察到更多的限售股在当期被卖出。由引理 2、6 可知，如果限售股股东对未来公司业绩所要求的卖与不卖无差异时的增加值 Z^c 提高时，他们便会卖出一部分原先不会卖出的股份，在当期获得一个较高的收益。由引理 3、7 可知，如果限售股股东卖出一部分原先不会卖出的股份，在当期获得一个较高的收益，这说明其所要求的最有可能实现的最小概率（即最低精确度）I^* 提高。

命题 1、4 表明，限售股股东期初持有的限售股份是影响他们减持中收益的重要因素。由于对于每个公司来讲，期初的持有份额都是一定的，故从同一时点不同公司来看，期初持有份额较大的股东将会在减持的过程中获得较高的收益。命题 2、5 表明，当控制权所带来的收益较大时，限售股股东会尽量减少减持的比例；当控制权所带来的收益较小时，限售股股东便会放弃了对控制权的掌握，即减持的比例越多自身的收益越大。而公司未来业绩增长 Z 是影响股东减持的关键因素，当公司

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[7]　I^* 的具体定义见附录 1 里的证明过程

[8]　Δ 的具体定义见附录 1 里的证明过程

的实际业绩（ROA）较高时，他们不会或尽量少减持自己手中的股份。同时，当第一大股东持股比例越大时，其他限售股股东获得由控制权收益的可能性越小，故卖出的限售股股份越多。另外，股东排名越靠后，即相对持股比例越小时，获得控制权收益的机会越小，越会更多地减持股份。命题3、6表明，在减持的过程中，限售股股东会有一定的减持成本和阻力。成本和阻力越大，股东在减持过程中的收益就越少，从而便会少减持自己手中的股份。当公司一些容易被操纵的业绩指标，如代表成长性的净利润增长率越高时，股东这时想通过做高表像业绩减少减持过程中的阻力，减持的比例反而会越大。

由上述理论模型分析可知，限售股股东的减持比例会受到股东特征、财务状况、减持状况、市场状况和公司特征等相关因素的影响。

四、研究设计

（一）研究样本与数据来源

本文选取了截止2008年3月31日沪深证券交易所实施股权分置改革并复牌交易的上市公司为研究样本，[9]如果这些公司在观察窗口内发布了减持公告，则该次减持事件进入我们初步的研究样本。对上述样本，我们还做了如下剔除：

第一，由于后文要计算减持前、减持中和减持后的超额收益，所以我们剔除了公告中没有明确指出减持起止时间的样本；

第二，对于同一公司同一天公布的不同股东的减持行为，计算市场反应时只计算一次，否则会带来重复计算的问题；

第三，剔除我们在计算市场反应的时间区间内可能发生了重大事项的样本。[10]

第四，由于只有持股超过5%以上的限售股股东才需履行强制减持公告义务，因此本文研究不包括持股不足5%以上限售股股东减持行为。

本文用到的市场、财务数据来自天相投资；减持公告来自Wind资讯，并通过我们逐一手工校对整理。我们共得到有效减持公告1068个，减持公司368家。

（二）模型选取与变量设计

本文采用了事件研究法和多元回归、logistic回归分析法。

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[9] 之所以选择2008年3月31日为研究时间截点，因为：第一，国内通货膨胀压力增大，工业原材料价格飙升，国家宏观经济调控力度增大，美国次级债危机，以及人民币持续升值影响国内外向型经济等等，使得国内外经济环境不确定因素明显增大，导致2008年3月后证券市场振荡剧烈，如将期后这段时间纳入时间窗口，将给超额收益计算带来噪音；第二，3月后工商银行、中国石油等公司IPO网下配售，以及天威保变等定向增发的解禁限售股较多，对证券市场整体影响较大，可能会影响本文的研究。

[10] 由于公司可能发生的重大事项较多，如资产重组、再融资、股权激励、控股股东变更以及其他市场传闻等等，我们很难对其逐一做出明确区分，因此我们剔除了观察窗口内发生7个交易日以上停牌的样本，也就是说，我们认为停牌7个交易日以上的事件很可能构成公司重大事项而影响本文的计算结果，自然这里也有一些发生在2月和3月的样本（例如3月10日，向后取30个交易日，就要取到4月份的数据，这样的样本我们就不考虑了）。

我们用模型（1）考察 CAR 值（根据市场模型计算）[11] 的影响因素：[12]

模型（1）：
$$CAR = \sum 股东特征 + \sum 财务状况 + \sum 减持状况 + \sum 市场状况 + \sum 公司特征$$

模型（1）中，股东特征包括第一大股东和减持股东的性质、持股比例；财务状况包括总资产收益率、增长率、是否为 ST 公司；减持状况包括减持比例、扩容比例、是否为第一大股东减持、减持股东排名、是否为第一次减持等变量；市场状况包括减持时市场的收益率和成交量；公司特征包括公司规模、资产负债率和行业变量。

我们用模型（2）和（3）研究限售股股东的减持行为：

模型（2）：
$$PSELF = SLSH + PLSH + SCSH + PCSH + ROA + GROW + ST + MR + MQ + SHNO + FC + ASSET + LEV + \sum IND$$

模型（3）：
$$LSHC = SLSH + PLSH + ROA + GROW + ST + MR + MQ + FC + ASSET + LEV + \sum IND$$

其中，模型（1）和（2）采用的是一般的多元回归分析，模型（3）采用的是 logistic 回归分析。三个模型中均包含有市场状况的相关变量，但模型（1）表示的是减持后的市场状况，模型（2）和（3）表示减持前的市场状况，是从两个不同的角度来分析限售股股东的减持行为。

本文涉及变量的具体定义及描述性统计如表 1、2 所示。

五、减持公告的市场反应与实际影响

（一）减持公告的市场反应

减持公告在发布前，市场并不知晓，因此我们选取（0,10）日的窗口进行研究，结果见表 3 所示。检验结果表明，减持公告的市场反应显著为负，观察期 CAR 值为 -1.6%。公告发布后，累积超额收益率几乎呈现单边下降趋势，并且全部都在 1% 水平显著，也就是说大股东实际减持对投资者造成的心理影响较大。

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[11] 市场模型 CAR 的具体计算过程见附录 2。
[12] 基于经验，我们认为影响因素可以大致分为五大类：股东特征、财务状况、减持状况、市场状况和公司特征。每一类影响因素可以包含若干个不同的变量。在现有的实证文献中，计算出的累积超额收益通常被用来与一些可能的影响因素回归，但几乎没有文献会对这些解释变量从理论上一一予以阐述。尽管本文亦未对这些影响限售股减持累积超额收益的因素找到各自合理的理论依据，但仍然会在具体的实证分析中对这些解释变量对超额收益可能造成的影响给予经验说明，并判断其预期符号。

表 1　　变量定义与说明

变量	符号	说明
累积超额收益	CAR	减持后30天观察窗口内的累积超额收益。
第一大股东性质	SLSH	哑变量，第一大股东为国有股时取1，否则取0。
第一大股东持股比例	PLSH	第一大股东持有的股份占总股本的比例。
减持股东的性质	SCSH	哑变量，减持股东为国有股时取1，否则取0。
减持股东的持股比例	PCSH	减持股东持有的股份占总股本的比例。
总资产收益率	ROA	公司净利润与总资产的比值。
净利润增长率	GROW	公司净利润的增长率。
是否为ST公司	ST	哑变量，公司为ST类取1，否则取0。
减持比例	PSELF	减持股份占减持股东的持股比例。
扩容比例	PLS	减持股份占流通股的比例。
是否为第一大股东减持	LSHC	哑变量，减持股东为第一大股东时取1，否则取0。
第几大股东减持	SHNO	减持股东排名，如，第三大股东减持时，就取3。
是否为第一次减持	FC	哑变量，减持股东第一次减持时取1，否则取0。
市场收益率	MR	减持前（或后）的差额市场收益率。[13]
市场成交量	MQ	减持前（或后）的差额对数值市场成交量。[14]
公司规模	ASSET	公司总资产的对数值。
资产负债率	LEV	公司负债与总资产的比率。
行业	IND	哑变量，按证监会2001年行业分类标准分类。[15]

（二）减持对市场的实际影响

　　与一般的事件研究不同的是：一般事件研究的时间点是确定的，如某年某月某日，而减持行为往往是一个时间段（例如，某公司公布某股东在2007年8月6日至8日这三个交易日减持了一定的股份数）；而这个时间段有可能是一天，一个星期，甚至几个月。因此，我们认为有必要分别计算各时间段的股票超额收益。我们将减持行为分为三个时间段：减持前、减持中和减持后，分别计算这三个时间段的超额收益情况，减持前和减持后均选择30个交易日。例如，公布的减持时间段为（W,T），我们则研究（W-30,W-1）、（W,T）、（T+1,T+30）这三个时间段的超额收益。计算结果见表4、表5和表6。

　　表4的结果显示，从减持前20个交易日开始，股票的AAR几乎一直为正，从减持前28个交易日开始，CAR值持续为正，并且从减持前第16个交易日开始CAR值持续保持显著。这个结果表明，限售股股东在减持手中股份的时候，股票已经经历了一个上升阶段。

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[13]　以减持后为例，计算差额市场收益率的过程如下：先计算减持后30日（T+1，T+30）的市场日收益率均值，然后计算（T-30，T）这30个交易日的市场日收益率均值，再用前者减去后者。差额市场收益率比单纯计算的阶段日均市场收益率更准确地反映了市场状况的好坏。

[14]　差额对数值市场成交量与差额市场收益率计算类似，只是这里市场成交量首先取对数。

[15]　制造业取2位代码，其他行业取1位代码，共22个行业，取21个哑变量。

表 2   变量描述性统计

	均值	中值	标准差	最小值	最大值
CAR	-0.080	-0.064	0.235	-0.777	0.715
SLSH	0.522	1.000	0.500	0.000	1.000
PLSH	0.351	0.305	0.142	0.060	0.838
SCSH	0.355	0.000	0.479	0.000	1.000
PCSH	0.203	0.141	0.185	0.001	0.750
ROA	0.018	0.015	0.069	-0.733	0.224
GROW	0.166	0.221	9.727	-194.941	102.333
ST	0.085	0.000	0.279	0.000	1.000
PSELF	0.206	0.121	0.238	0.0001	1.000
PLS	0.030	0.025	0.021	0.000	0.196
LSHC	0.275	0.000	0.447	0.000	1.000
SHNO	2.523	2.000	1.812	1.000	10.000
FC	0.332	0.000	0.471	0.000	1.000
MR	-0.002	-0.002	0.007	-0.037	0.015
MQ	0.036	0.094	0.433	-1.173	1.703
ASSET	21.171	21.000	1.121	18.205	27.471
LEV	0.526	0.538	0.233	0.066	2.271

表 3   减持公告的市场反应（n =1068）

	AAR	CAR	CAR的t值		AAR	CAR	CAR的t值
0	-0.003	-0.003	-2.70***	6	-0.0003	-0.013	-3.59***
1	-0.0008	-0.004	-2.26**	7	-0.002	-0.015	-3.91***
2	-0.003	-0.008	-3.53***	8	0.0007	-0.015	-3.66***
3	0.0004	-0.008	-2.98***	9	-0.0005	-0.016	-3.88***
4	-0.003	-0.011	-3.59***	10	0.0007	-0.016	-3.65***
5	-0.0005	-0.012	-3.73***				

注： *表示10%的显著性水平，**表示5%的显著性水平，***表示1%的显著性水平。

　　表5检验了减持过程中股票的超额收益。从总样本来看，股票的日均超额收益率和CAR值仍保持为正，并且在1%水平显著；从分时间段的样本来看，除了31天以上的样本显著性不够，其余样本的日均AAR和CAR值都显著为正。该结果表明，减持行为在当时并未给市场带来冲击，股票走势仍较好。

　　表6对减持后股票的超额收益进行了检验，其结果与表4和表5大相径庭。从减持后的第一天开始，股票的累积超额收益率CAR值就一直显著为负，甚至在减持后的30个交易日里，AAR只出现了一次正值。也就是说，减持后，股票收益率完全呈现出单边下降的趋势，到减持后第三十个交易日，CAR值达到了-8%之多。

　　表7和图1将减持前、减持中和减持后的CAR放在一起，股票的累积超额收益率呈现明显的倒"U"型，并且倒"U"型的右边线远超过了左边线。这说明限售股股东选择了股价升降的周期性高点进行减持，减持时，其他投资者并未意识到这个减持行为，股价表现仍较好；但市场并不认同减持行为，一旦减持完毕，其他投资者意识到时，股价开始下跌。

表 4　　减持前股票的超额收益率（n =990）

	AAR	CAR	CAR的 t 值		AAR	CAR	CAR的t值
-30	-0.001	-0.001	-1.04	-14	0.0003	0.0095	1.71*
-28	0.0002	0.0011	0.53	-12	0.0007	0.01	1.72*
-26	0.0013	0.0038	1.29	-10	0.0016	0.0116	1.92*
-24	-61E-6	0.0041	1.18	-8	0.0009	0.0142	2.23**
-22	-85E-6	0.0035	0.91	-6	0.0041	0.0194	2.90***
-20	0.0016	0.004	0.93	-4	-0.003	0.0185	2.62***
-18	0.0013	0.0068	1.45	-2	0.0045	0.0251	3.35***
-16	0.0017	0.0087	1.66*	-1	0.0053	0.0304	3.95***

注：＊表示10%的显著性水平，＊＊表示5%的显著性水平，＊＊＊表示1%的显著性水平。

表 5　　减持过程中股票的超额收益率（n =1032）

时间段	日均 AAR			CAR		
	均值	中位数	t 值	均值	中位数	t 值
1–2天（n=238）	0.0055**	0.0016*	2.14	0.0078**	0.0018*	2.40
3–7天（n=232）	0.0029**	0.0029***	2.04	0.0103*	0.0133**	1.71
8–30天（n=309）	0.0018***	0.0014***	2.97	0.0265***	0.0181***	2.94
31天以上（n=253）	0.0004	6.53E-5	1.10	0.0136	0.0032	0.66
总样本（n=1032）	0.0025***	0.0007***	3.64	0.0154***	0.0065***	2.58***

注：＊表示10%的显著性水平，＊＊表示5%的显著性水平，＊＊＊表示1%的显著性水平。

表 6　　减持后股票的超额收益率（n=781）

	AAR	CAR	CAR的 t 值		AAR	CAR	CAR的t值
1	-0.002	-0.002	-2.09**	16	-0.001	-0.035	-5.97***
2	-0.002	-0.004	-2.26**	18	-0.002	-0.041	-6.41***
4	-0.002	-0.01	-3.83***	20	-0.002	-0.048	-6.81***
6	-0.001	-0.013	-3.91***	22	-0.002	-0.056	-7.48***
8	0.0013	-0.014	-3.61***	24	-0.002	-0.063	-8.01***
10	-0.001	-0.019	-4.43***	26	-0.001	-0.068	-8.28***
12	-9E-4	-0.023	-4.81***	28	-0.003	-0.072	-8.40***
14	-62E-5	-0.026	-4.95***	30	-0.002	-0.08	-9.00***

注：＊表示10%的显著性水平，＊＊表示5%的显著性水平，＊＊＊表示1%的显著性水平。

表 7　　减持前、减持中和减持后股票的超额收益率

	CAR 值		CAR 值		CAR 值		CAR 值
-30	-0.001	-14	0.0095*	2	0.0329***	18	-0.0041
-28	0.0011	-12	0.01*	4	0.0269***	20	-0.0111*
-26	0.0038	-10	0.0116*	6	0.0239***	22	-0.0191***
-24	0.0041	-8	0.0142**	8	0.0229***	24	-0.0261***
-22	0.0035	-6	0.0194***	10	0.0179**	26	-0.0311***
-20	0.004	-4	0.0185***	12	0.0139**	28	-0.0351***
-18	0.0068	-2	0.0251***	14	0.0109*	30	-0.0431***
-16	0.0087*	0	0.0369***	16	0.0019		

注：　*表示 10%的显著性水平，**表示 5%的显著性水平，***表示 1%的显著性水平。表中的
　　　第 0 天的 CAR 是减持前的 CAR 与减持中总样本的平均 CAR 值相加的结果。

（三）影响 CAR 值的相关因素分析

上面我们清晰地看到，减持行为使股票的超额收益率不断下降，30 天后的 CAR 值达到 -8%。本部分我们将着重研究如此显著的 CAR 值受到哪些因素的影响，如模型（1）所示，我们选择了五大类别的影响因素：股东特征、财务状况、减持状况、市场状况和公司特征。

首先，股东特征会影响 CAR 值。通常情况下，国有企业经营比民营企业稳定，受到政府的支持也比较多，因此，国有企业的限售股股东一旦减持，可能会给投资者带来更坏的预期，CAR 值就会越小，我们预计第一大股东性质 SLSH 与 CAR 呈现反比例关系；减持股东性质对 CAR 的影响则不同，一方面当减持的股东为民营时，其机会主义行为比国有股东可能更大，因此，民营限售股股东减持时的 CAR 值比国有公司会更小，但同时也有类似于与第一大股东性质类似的考虑，因此我们预计 SCSH 与 CAR 的相关性不确定；同时，第一大股东持股比例较大时，减持行为既有可能减少股权集中度，也有可能加强股权集中度，对公司的影响存在不确定性，因此 PLSH 与 CAR 的相关性不确定，而减持股东持股比例较大时，则会对投资者心理和市场资金造成较大冲击，因此 PCSH 与 CAR 预计成负相关。

其次，企业的财务状况也对 CAR 值构成影响。公司财务状况良好时，减持的股份易于被投资者吸纳，对股价的冲击较小，而公司财务状况较差时，减持对股价无疑是雪上加霜。因此，我们预计总资产收益率 ROA 和净利润增长率 GROW 与 CAR 成正比，而变量 ST 与 CAR 成反比。

再者，减持状况也会影响 CAR 值。当减持的股份占该限售股股东持股数量的比例较大或者第一大股东减持时，减持行为显示了减持股东对公司信心不足；当减持的股份占流通股比例较大时，市场的承受能力越弱，因此我们预计减持比例 PSELF、第一大股东减持变量 LSHC、扩容比例 PLS 均与 CAR 成反比。当限售股股东第一次减持时，市场的负反应会比后续减持更大，因此 FC 与 CAR 成反比。
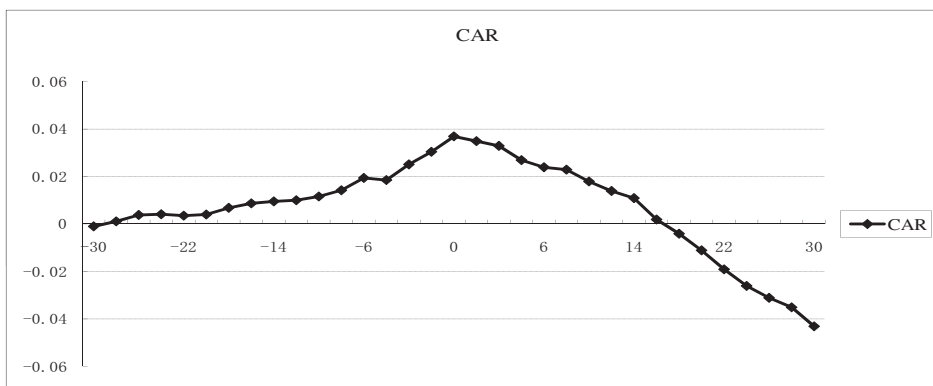
图1　减持前、减持中和减持后的股票超额收益率

　　另外，减持时的市场状况对CAR值的大小也有一定影响。市场状况较好时，资金充裕，投资者也愿意持股，减持股份的抛售对股价的影响相对较小，市场低迷时，投资者则更愿意持有现金，减持对股价的影响较大。因此，预计市场收益率和市场成交量与CAR成正比。

　　最后，我们还加入了规模、资产负债率、行业等常规的公司特征，考察其对CAR的影响。

　　回归前，我们对各变量进行了Pearson相关性检验，大多数变量的相关性小于0.25，同时我们也注意到回归中各变量的VIF值均小于6，因此不存在多重共线性问题。具体的检验结果见表8所示。[16]

　　从表8的检验结果可以看到，一些变量在各回归方程中都很显著，稳定性较好，说明的确存在一些特征影响着CAR值的大小。三个回归方程的Adj-R^{2}分别为0.91%、9.97%和13.35%，也就是，CAR受股东特征和减持状况因素的影响相对较小，主要受公司基本面和市场状况的影响。

　　在股东特征里，第一大股东性质与CAR值成负相关，并在1%水平显著，也就是说，国有控股的上市公司发生限售股股东减持时，对市场造成了较大影响，其余的股东特征变量不显著。

　　企业的财务状况乍看上去对CAR值的影响是矛盾的，*ROA*和我们预期一致，与CAR值显著正相关，而净利润增长率正好和预期相反，与CAR显著负相关。我们认为，总资产收益率指标受公司操纵可能性相对较小，在截面数据中可以较好地反映出公司间盈利能力差别，而增长率则不同，特别是对于微利公司，获得数十倍、甚至数百倍的增长十分平常，容易受到公司操纵，即便真实，可能也并不代表公司实际盈利能力。所以，事实上市场并不认可这种增长，如果增长率高的公司大部分是微利公司，净利润增长率与CAR值的负相关关系就不难理解了。为了进一步验证我们的观点，我们用容易受到操控的*ROE*指标代替*ROA*，回归结果表明ROE不显著，这就说明市场只认同可以较客观反映企业真实盈利能力的指标，而并不认同公司的"表象"业绩。

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[16]　回归时，我们对各变量做了1%的winsorize处理。

减持状况中，哑变量 $LSHC$ 与 CAR 显著负相关，与预期一致，说明第一大股东减持时，投资者的忧虑情绪比较大。其他变量，减持比例、扩容比例、是否为第一次减持等对 CAR 的影响都不显著。市场状况与预期完全一致，市场收益率高、交投活跃时，减持的负面影响偏小。另外，从公司特征的检验来看，规模较大的公司和资产负债率较高的公司，限售股东减持的冲击较小。[17]

六、限售股减持中的大股东行为

（一）大股东的减持比例受何影响

本节我们分析限售股减持中的大股东行为，我们主要关注两个问题：第一是限售股股东的减持比例的影响因素，也就是说，何种情况下，限售股股东减持的股份会较多或较少；第二是第一大股东减持的影响因素，也就是说，何种情况下，第一大股东会采取减持行为。这两个问题我们分别用模型（2）和模型（3）研究。

表9的三个回归方程的 Adj-R^2 分别为44.09%、0.35%和47.37%，这与表7的回归结果正好相反，也就是说，减持比例主要受股权特征和相关减持因素的影响较大，而受公司基本面和市场状况的影响较小。

首先，第一大股东的持股比例与减持比例正相关，且在1%水平显著，也就是说，上市公司的控股股东的控制力较强时，其他大股东"摆脱"控制的欲望会更强烈，因而会更大比例地减持手中股份；或者第一大股东持股比例较大时，其本身也更愿意减持一部分股份。其次，股东排名越靠后，即相对持股比例越小时，越会更多地减持股份。另外，FC 与减持比例显著正相关，表明限售股股东第一次减持时，通常减持的比例较大。

公司的业绩指标与减持特征也存在显著关系，并且与我们上文对业绩指标的分析一致。ROA 与减持比例显著负相关，说明当公司的实际业绩较好时，限售股股东并不愿意大规模减持股份；而当一些容易受到操纵的指标，例如 $GROW$ 较好时，限售股股东减持的比例则较大，该结果进一步说明了限售股股东极有可能存在通过操控业绩，制造假像，并乘机减持股份的行为。

其他指标中，公司规模与减持比例正相关，市场状况与减持比例的关系不显著。[18]

（二）第一大股东减持与否的决定因素

表10中，我们对第一大股东是否减持做了 logistic 回归分析。每个参数对模型的影响力用Wald氏的卡方检定；模型整体的有效度以对数可能率来表示，其值等于（-2 Log Likelihood），该检定是针对模型中所有参数的联合有效度而设计的。

表10的检验结果表明，第一大股东是否减持主要受到两方面因素的影响：第一是其持股比例，与减持概率在1%水平显著正相关，也就是说，第一大股东持股比例越大时，越倾向减持手中的股份；第二是公司的实际业绩（ROA），这与第一大股东的减持倾向显著负相关。这与我们前面得出的结论具有一致性，业绩较好时，限售股股东是不愿意减持股份的。

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[17] 规模大的公司生产经营较稳定，也更透明，减持的负面影响较小不难理解。而资产负债率这个指标表示的含义较多，与CAR显著正相关，或许是因为投资者认为这些高风险公司减持对公司更好，或许是因为我们样本期间市场形势较好，投资者会更偏好高风险高收益的公司，具体原因我们很难说清楚。

[18] 回归中，减持股东的持股比例与减持比例显著负相关是由于数据本身关系引起的，此处并不表示减持股东持股比例越大，越有减持倾向。因为在我们的研究区间，有不少公司股的股份仍为限售股，无限售股份比例相对较少，因此减持股东的持股比例越大，可减持的股份就越少。

表 8　　减持对市场影响的相关因素分析

变量		回归1	回归2	回归3
	intercept	-0.006	-0.036**	-0.358**
		(-0.28)	(-4.22)	(-2.07)
股东特征	SLSH	-0.044***		-0.050***
		(-2.77)		(-3.07)
	PLSH	0.002		-0.063
		(0.03)		(-0.97)
	SCSH	0.007		0.013
		(0.39)		(0.80)
	PCSH	0.037		0.082
		(0.44)		(1.01)
财务状况	ROA		0.508**	0.674***
			(2.50)	(2.97)
	GROW		-0.013***	-0.016***
			(-4.13)	(-4.51)
	ST		0.015	0.015
			(0.58)	(0.55)
减持状况	PSELF	0.016		0.012
		(0.42)		(0.34)
	PLS	-0.608		-0.280
		(-1.55)		(-0.74)
	LSHC	-0.044*		-0.044*
		(-1.67)		(-1.70)
	SHNO	-0.001		-0.003
		(-0.14)		(-0.41)
	FC	0.001		0.003
		(0.10)		(0.25)
市场状况	MR		7.417***	7.203***
			(6.62)	(6.40)
	MQ		0.080***	0.078***
			(4.70)	(4.47)
公司特征	ASSET			0.016*
				(1.82)
	LEV			0.115***
				(2.62)
	IND			Control
	F	2.23	24.64	5.57
	P	0.02	<0.0001	<0.0001
	Adj-R²(%)	0.91	9.97	13.35
	Number	781	781	781

注： 括号内是回归变量的t值，*表示10%的显著性水平，**表示5%的显著性水平，***表示 1%的显著性水平。

七、敏感性检验

（一）CAR的计算方法与事件期选择

首先，本文在计算超额收益时采用了市场模型，该模型虽然具有完美的理论基础，但由于公司 β 值的不稳定性，也常受到学者们的质疑。陈信元、江峰（2005）的研究表明，我国市场的事件检验中，市场调整模型可以作为市场模型的替代，[19]因此本文用市场调整模型计算超额收益重复了文中的检验，我们发现结果并没有改变。同时我们进一步用Fama-French三因素模型计算超额收益，结果没有改变，依然存在倒U型的CAR。[20]

其次，本文计算CAR值时，事件期窗口长短的选择具有一定随意性，减持公告选择了(0,10)的时间窗口，减持对市场的实际影响选择了减持后的30个交易日，这种随意性或许会使文章的结论不可靠。为此，我们采取了变换窗口长度的方法加以验证，减持公告我们又选择了(-1,5)、(0,7)等窗口，减持对市场的实际影响则又选择了减持后20、45、60个交易日计算CAR值，经检验发现没有改变本文的结论。

（二）关于减持时间的检验

首先，本文的研究样本中，有一些可能会引起重复计算的问题。例如，有的公司某股东在连续的两个时段减持了上市公司的股份，这在本研究中是作为两个独立样本检验的，但这两个时间段CAR值计算时显然会发生重迭，该影响可能会扭曲检验结果。为此，我们进行了两个敏感性测试：第一，同一公司同一股东的多次减持，只取第一次进行计算，第二，同一公司同一股东的两次时间相邻的减持，如果相隔三个月以上，则视同两个样本，如果小于三个月，则只取第一次减持。检验的结果也没有改变文章结论。

其次，我们的样本中有一部分减持是在一个月、甚至几个月的时间里完成的，较长的时间使计算的CAR值可能并不能代表减持的影响。在此，我们将减持时间超过1个月的样本剔除，用剩余样本重新检验，结果仍未改变本文的结论。

（三）减持规模的影响

到目前为止，我们的检验基本都是针对整体样本进行的，事实上，我们的样本中包含了不同的减持规模，特别是，有一些样本减持股份的数量很小，只有几万股或者十几万股。我们认为，减持规模对CAR值可能会有较大影响，在此，我们按减持规模的大小进行分类，研究不同规模的减持对市场的影响。

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[19] 市场调整模型计算CAR值时，用股票收益率直接减去市场收益率即可，由于篇幅所限，这里没有列出检验结果，有兴趣的读者可以向作者索取。

[20] 由于篇幅所限，这里没有列出检验结果，有兴趣的读者可以向作者索取。

表 9   限售股股东的减持比例的影响因素分析

变量	回归1	回归2	回归3
Intercept	-0.004	0.200***	-0.328**
	(-0.17)	(21.22)	(-2.31)
SLSH	-0.003		0.007
	(-0.23)		(0.51)
PLSH	0.354***		0.296***
	(6.88)		(5.65)
SCSH	0.006		0.015
	(0.41)		(1.10)
PCSH	-0.475***		-0.450***
	(-9.92)		(-9.45)
ROA		0.341	-0.623***
		(1.50)	(-3.31)
GROW		-0.004	0.007**
		(-1.16)	(2.33)
ST		0.042	0.006
		(1.48)	(0.26)
SHNO	0.069***		0.081***
	(15.28)		(16.78)
FC	0.035***		0.033***
	(3.00)		(2.85)
MR		0.983	0.503
		(0.78)	(0.54)
MQ		0.031	0.013
		(1.63)	(0.94)
ASSET			0.019***
			(2.60)
LEV			-0.052
			(-1.42)
IND			Control
F	141.22	1.74	29.24
P	<0.001	0.1225	<0.0001
Adj-R^2(%)	44.09	0.35	47.37
Number	1068	1068	1068

注： 括号内是回归变量的t值，*表示10%的显著性水平，**表示5%的显著性水平，***表示
1%的显著性水平。

表 **10**　第一大股东减持的影响因素分析 (logistic 回归)

变量	回归 1	回归 2	回归 3
intercept	-3.499***	-0.887***	-5.562***
	(231.60)	(99.91)	(7.07)
SLSH	0.235		0.134
	(2.08)		(0.49)
PLSH	6.521***		6.640***
	(126.14)		(103.28)
ROA		-7.357***	-6.016**
		(10.56)	(3.82)
GROW		0.110***	0.117***
		(11.23)	(7.06)
ST		-0.634**	-0.849**
		(4.79)	(5.36)
FC	-0.123		-0.102
	(0.584)		(0.36)
MR		-17.03	-7.930
		(2.04)	(0.32)
MQ		-0.149	-0.160
		(0.66)	(0.54)
ASSET			0.105
			(0.96)
LEV			0.637
			(1.24)
IND			Control
-2 Log L	179.51	20.59	267.19
Pseudo R-squared (%)	21.4	9.7	22.1
Percent correctly predicted	80.76%	73.84%	80.66%
Number	1068	1068	1068

注：　括号内是回归变量的 Wald 氏的卡方检定值，*表示 10% 的显著性水平，** 表示 5% 的显著
　　性水平，*** 表示 1% 的显著性水平。

　　我们按减持股份占流通股的比例进行分类，[21] 分别以 0.01、0.02、0.03、0.04、
0.05 作为临界点，分类统计的结果见图 2 所示。图 2 的检验结果表明，当减持股份占
流通股比例小于 0.01 时，减持后的 CAR 值大于 -2%，也就是说，对市场的负面影响
较小；大于 0.01 时，影响小于 -8%，对市场影响较大；两组数据的均值 t 检验和中位
数 Wilcoxon Z 检验的显著性都不低于 5%。当减持的股份占流通股比例大于 0.05 时，
CAR 值小于 -10%，也就是说，对市场的负面影响较大。

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[21]　我们认为用减持股份占流通股比例相比较占股份比例可能更能说明问题。文章的研究区间正值
　　股改进行中，很多公司具有大量的未解禁股份，限售股解禁当日往往有较大的下跌幅度这一事
　　实让我们相信股价受到资金面的影响还是较大的，因此，将未解禁股份纳入进来可能会曲解了
　　市场的供求关系。

因此，检验结果表明，不同的减持规模对市场影响是不同的，减持股份占流通股比例小于 0.01 时，对市场影响有限；大于 0.01 时，影响较大，并且负面影响随着减持比例的增大而增加。

（四）稳健标准误差回归

我们对限售股股东减持行为做了稳健标准误差回归分析，检验结果也没有改变文章结论。[22]

（五）盈余管理的影响 [23]

我们选取了多次减持的公司为样本，并且将每家公司最后一次减持为研究对象，发现市场对这类减持行为依然有倒 U 型 CAR，说明盈余管理并不能完全解释这一现象，还应该有更基本的影响因素。按照王克敏和廖鹏 (2008) 与蔡宁和魏明海 (2009) 的研究方法，我们剔除了样本中包含的在减持前期有正向盈余管理、乐观盈利预测的样本，发现结果依然存在并能更深入地看清一些问题。在这些没有进行盈余管理的公司中，国有性质股东减持时市场反应显著为负，这说明在盈余管理机会主义可能性较小时，投资者对国有股东退出后所带来公司政治关系缺失、发展前景担忧是主要影响因素；而在没有这种机会主义行为时，限售股股东第一次减持时比例也会显著降低，说明股东会尽量保持住控制权；由于财务指标的变化减少，自然很难再观察到财务指标的显著影响。这就从侧面说明，除了盈余管理，控制权收益的考虑是限售股股东决策时重要的影响因素。

（六）"抛压" 的影响 [24]

由于大部分减持公告是在减持后才发布的，"抛压" 与 "择机" 这两种可能性都可能出现在限售股股东的减持行为，所以区分这两种行为是非常重要的。如果真的是抛压造成股价短期急剧下跌的话，当我们拉长窗口时，应该能够发现公司的股价会逐渐回归到初始位置。因为当限售股股东大量抛出后，其他投资者如果不认为这是一种信号且继续看好公司发展前景时，他们会再买入公司股票，从而使得公司股价逐步恢复。我们拉长窗口至 60 天 (也即通常解释抛压现象的 2 个月)，并分别用市场模型、市场调整模型和三因素模型计算市场反应，发现公司股价在经过长达 2 个月之后并没有回归到初始位置，这说明并不是抛压造成股价的下跌，而是限售股股东减持向市场传递了信号。

八、研究结论、局限与监管建议

（一）研究结论与局限

本文以深沪两市所有上市公司的限售股减持事件作为样本，对其市场反应、影响因素及股东行为模式进行了实证研究，得出了一些有意义的结论。

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[22] 由于篇幅所限，这里没有列出检验结果，有兴趣的读者可以向作者索取。
[23] 由于篇幅所限，这里没有列出检验结果，有兴趣的读者可以向作者索取。
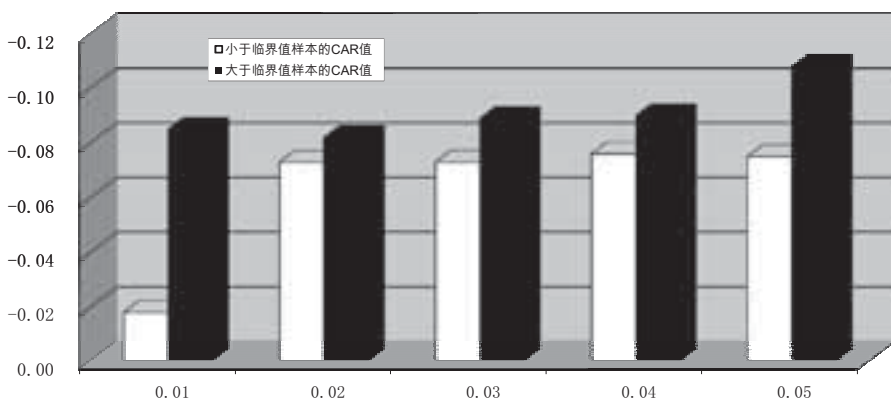[24] 由于篇幅所限，这里没有列出检验结果，有兴趣的读者可以向作者索取。

图2   减持规模对超额收益率的影响

1. 减持公告在短窗口内都表现出负的市场反应。我们进一步将减持行为分为减持前、减持中、减持后三个时间段，研究了长窗口内的超额收益，发现这三个窗口内的CAR值呈现明显倒"U"型，并且倒"U"型的右边线远长于左边线。这说明限售股股东选择了股价升降的周期性高点进行减持，减持时，其他投资者并未意识到这个减持行为，股价表现仍较好。但市场并不认同减持行为，一旦减持完毕，其他投资者意识到时，股价开始下跌。

2. 我们将减持后CAR值的影响因素分为股东特征、减持状况、财务状况、市场状况、公司特征等五大类，发现财务状况和市场状况对CAR值影响较大，股东特征和减持状况对其影响相对较小。具体而言，公司的真实业绩越好时，减持对市场的负面影响越小，而容易受到操纵的"表象"业绩较好时，减持的负面影响反而越大。另外，市场收益率高、交投活跃时，减持的负面影响偏小；国有股股东减持、第一大股东减持时，对市场的负面影响较大。

3. 我们研究了减持中的股东行为特征。首先，我们分析了减持比例的影响因素，发现其主要受股权特征和减持状况的影响，而受公司基本面和市场状况的影响较小。具体而言，第一大股东持股比例与减持比例正相关；股东排名越靠后，即相对持股比例越小时，越会更多地减持股份；限售股股东第一次减持时，通常减持的比例较大。另外，真实业绩与减持比例显著负相关，表象业绩与减持比例正相关，进一步说明了限售股股东极有可能存在通过操控业绩、制造假象并乘机减持股份的行为。其次，我们研究了第一大股东是否减持的影响因素，发现第一大股东持股比例越大时，减持的可能性越大。另外，第一大股东的减持倾向与公司的真实业绩显著负相关，也就是说，业绩较好时限售股股东是不愿意减持股份的。

本文的研究局限在于仅仅关注了宏观经济较为平稳时期，而在金融危机影响下的剧烈波动时期，上述结论能否成立需要证据支持，这也成为今后的研究方向之一。

(二)监管建议

首先，我们认为必须建立和完善限售股减持的事前和事中监管机制。这可以从两个方面入手：第一，有减持意愿的限售股股东必须提前披露减持计划，例如，未来一个月内减持若干股份，这样市场就会形成一定预期，也对投资者有所提示，避免股价大幅波动，也有利于投资者的投资决策；第二，减持过程中即时披露，最好能做到当天披露。目前，很多公司对减持情况采取了阶段性披露的方式，如某一段时间内某股东减持了多少股份，这使市场信息大为滞后，因此当日减持当日披露可以大大提高市场有效性。

其次，加强上市公司业绩监管，防止大股东利用"表象"业绩或虚假信息哄抬股价并趁机减持的行为。我们认为可以采取的监管方式有：第一，由于存在利用半年报或季报业绩炒作的现象，我们建议在近两年的减持高峰期内要求上市公司进行半年报审计，有必要时，要求其进行季报审计；第二，要求上市公司对利润构成及可持续性作合理分析，这既有利于上市公司自律，也有利于投资者更深入地了解公司的利润状况；第三，加强对上市公司资产重组等重大事项传闻核查，要求上市公司及时自查，严密监控股价异动公司。

再次，加强对第一大股东减持行为的监管，必要时，建立强制性股份回购制度。我们建议：第一，第一大股东一次性减持较大比例股份(例如1%以上)时，必须公示减持原因，这样有利于其他投资者了解内情，避免不必要的恐慌情绪；第二，第一大股东累积减持股份达到一定比例(例如5%)时，必须澄清是否有未公布重大事项，公司主业是否运营正常；第三，建立股份回购制度，防止股价剧烈波动。如果上市公司股价由于第一大股东减持出现了大幅下降，监管层有权要求该股东回购公司股份，以稳定市场。

最后，强化上市公司大股东在市场低迷时大规模减持和国有上市公司限售股减持的管理。我们建议：第一，在市场低迷的时候，监管部门可以对上市公司实行"窗口指导"，建议上市公司大股东慎重抛售股份，必要的时候，可以让大规模减持股份的股东必须在减持前提交证券交易所申请，获批后方可减持；第二，我国上市公司大部分是国有控股企业，有必要联合证监会、交易所、国资委等相关政府部门加强对国有企业股权减持的管理，既防止减持对市场造成的波动性，也防止出现不当减持造成国有资产流失。

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附录 1：引理和命题的证明

引理 1

证明：$\beta_2 \geq \beta_1 \Rightarrow \beta_2\lambda\pi - \beta_2 E(Z) - C_T - \beta_2(K+K^*) \geq \beta_1\lambda\pi - \beta_1 E(Z) - C_T - \beta_1(K+K^*)$, $\forall \pi$
且 $\pi^*(\beta)$ 是最小的，故 $\pi^*(\beta_2) \geq \pi^*(\beta_1)$。

引理 2

证明：

$\beta\lambda\pi^*(\beta) - \beta Z^c(\beta) - C_T - \beta(K+K^*) = 0 \Rightarrow Z^c(\beta) = \lambda\pi^*(\beta) - C_T/\beta - (K+K^*)$ ↑

引理 3

证明：

$I^*(\beta) = \arg\max_{I \in [0,1]} \{B(I,\beta) - C(I)\}$

$B(I,\beta) = I * E\{\max[\beta\lambda\pi^* - \beta E(Z) - C_T - \beta(K+K^*)], 0\}$

$\partial^2 B/\partial I^2 = 0$, $d^2C/dI^2 > 0$

且 I^* 随着 $\partial B/\partial I = E\max\{\beta\lambda\pi^*(\beta) - \beta E(Z) - C_T - \beta(K+K^*), 0\}$ 的增加而增加，

$E(Z) \leq \lambda\pi^* - C_T/\beta - K - K^* \leq \lambda\pi^*$，

故 β ↑ $\Rightarrow \beta\lambda\pi^*(\beta) - \beta Z - \beta(K+K^*)$ ↑ $\Rightarrow \partial B/\partial I$ ↑ $\Rightarrow I^*$ ↑。

引理 4

证明：由引理 1、2、3 自然推出。

命题 1

证明：$\partial f/\partial\alpha = q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] + K + K^* > 0$

命题 2

证明：

$\partial f/\partial\beta = \lambda\pi + (\alpha - \beta)\{dI^*(\beta)/d\beta\}F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] + (a - \beta)I^*(\beta)d\{F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)]\}/d\beta - I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] - (K+K^*)$

$= \Delta - (K+K^*)$

由于卖股份的前提即 $\pi \geq E(Z)$，故 $\Delta \geq 0$

当 $\Delta \geq (K+K^*)$，$\partial f/\partial\beta \geq 0$

当 $\Delta \geq (K+K^*)$，$\partial f/\partial\beta \leq 0$

命题 3

证明：

$\partial f/\partial C_T = (\alpha - \beta)I^*(\beta)E[Z \mid Z \leq Z^c(\beta)]dF[Z^c(\beta)]dC_T$

$= (\alpha - \beta)I^*(\beta)E[Z \mid Z \leq Z^c(\beta)]\{dF[Z^c(\beta)]dZ^c(\beta)\}\{dZ^c(\beta)dC_T\} \leq 0$

其中 $dF[Z^c(\beta)]/dZ^c(\beta) \geq 0$, $dZ^c(\beta)/dC_T < 0$。

引理 5

证明：$\beta_2 \geq \beta_1 \Rightarrow \beta_2\pi - \beta_2 E(Z) - C_T - a(K+K^*) \geq \beta_1\pi - \beta_1 E(Z) - C_T - \alpha(K+K^*), \ \forall\pi$

且 $\pi^*(\beta)$ 是最小的，故 $\pi^*(\beta_2) \geq \pi^*(\beta_1)$。

引理 6

证明：

$$\beta\pi^*(\beta) - \beta Z^C(\beta) - C_T - \alpha(K+K^*) = 0 \Rightarrow Z^c(\beta) = \pi^*(\beta) - C_T/\beta - a(K+K^*)/\beta \ \uparrow$$

引理 7

证明：

$I^*(\beta) = \arg\max_{I \in [0,1]}\{B(I,\beta) - C(I)\}$

$B(I,\beta) = I * E\{\max[\beta\pi^* - \beta E(Z) - C_T - \alpha(K+K^*)], 0\}$

$\partial^2 B/\partial I^2 = 0, \ d^2 C/dI^2 > 0$

且 I^* 随着 $\partial B/\partial I = E\max\{\beta\pi^*(\beta) - \beta E(Z) - C_T - \alpha(K+K^*), 0\}$ 的增加而增加，

$E(Z) \leq \pi^* - C_T/\beta - \alpha K/\beta - \alpha K^*/\beta \leq \pi^*$，

故 $\beta \uparrow \Rightarrow \beta\pi^*(\beta) - \beta E(Z) \uparrow \Rightarrow \partial B/\partial I \uparrow \Rightarrow I^* \uparrow$。

引理 8

证明：由引理 5、6、7 自然推出。

命题 4

证明：$\partial f/\partial\alpha = q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] > 0$。

命题 5

证明：

$\partial f/\partial\beta = \pi + (\alpha-\beta)\{dI^*(\beta)/d\beta\}F[Z^C(\beta)]E[Z \mid Z \leq Z^c(\beta)] + (a-\beta)I^*(\beta)d\{F[Z^C(\beta)]E[Z \mid Z \leq Z^c(\beta)]\}d\beta - I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] \geq 0$

由于卖股份的前提即 $\pi \geq E(Z)$，故成立。

命题 6

证明：

$\partial f/\partial C_T = (\alpha-\beta)I^*(\beta)E[Z \mid Z \leq Z^c(\beta)]dF[Z^c(\beta)]dC_T$

$= (\alpha-\beta)I^*(\beta)E[Z \mid Z \leq Z^c(\beta)]\{dF[Z^c(\beta)]dZ^C(\beta)\}\{dZ^C(\beta)dC_T\} \leq 0$

其中 $dF[Z^c(\beta)]/dZ^C(\beta) \geq 0$，$dZ^C(\beta)/dC_T < 0$。

附录 2：CAR（市场模型）的计算过程

首先，我们以三倍于事件期的时间段的日个股收益率和日市场收益率估计单个公司的 α、β 值：

$$R_{i,t} = a_i + \beta_i \times R_{m,t} + \varepsilon_{i,t}$$

其中，$R_{i,t}$ 是第 i 只股票在第 t 天的日收益率，$R_{m,t}$ 是第 t 天的日市场收益率，如该股票属沪市，则用沪市日市场收益率；如该股票属深市，则用深市日市场收益率。

第二步，根据估计出的 α、β 系数，计算事件期内股票的日超额收益：

$$AR_{i,t} = R_{i,t} - E\,[R_{i,t}\,] = R_{i,t} - (\alpha_i + \beta_i \times R_{m,t})$$

其中，$AR_{i,t}$ 是股票 i 在第 t 天的超额收益率，$E[R_{i,t}]$ 是根据市场模型估算的股票 i 在第 t 天的预期收益率。

由此，n 个样本在第 t 天的平均超额收益率（AAR_t）为：

$$AAR_t = \frac{1}{n} \sum_{i=1}^{n} AR_{i,t}$$

最后，可以计算出 n 个样本在事件期 [-W, +T] 的平均累积超额收益率（CAR）：

$$CAR_t = \sum_{j=-w}^{T} AAR_{j,t}$$

Market Reaction to Sales of Restricted Shares and Shareholder Behaviour Patterns[1]

Hongjun Zhu,[2] Lu Li,[3] Hui Wang,[4] and Liyong Yu[5]

Abstract

Under the institutional background of the split-share structure reform, we investigate the market reaction to shareholder sales of restricted shares and the behaviour of holders of those shares. We find that the market reaction around the announcement period is negative and shows an inverted U shape, meaning that holders of restricted shares have chosen to reduce their holdings of those shares at the peak of the cyclical price movements. We also find that company fundamentals and market conditions have a significant impact on CAR values, whereas shareholder characteristics and the extent of shareholding reduction have less. By establishing theoretical models and performing empirical analysis, we further find that shareholder expectations of the availability of adequate benefits of control is the key factor in deciding whether to reduce as well as the proportion of decrease. Shareholder characteristics and the extent of shareholding reduction have a significant impact on this factor, whereas company fundamentals and market conditions have less.

Keywords: Split-share Structure Reform, Market Reaction, Behaviour of Holders of Restricted Shares
CLC codes: F230, F275, F832

I.   Introduction

China's economic vitality has always been closely linked with "reform". The expectation has been that through reform, the institutional problems hindering China's economic development would be solved, and China's economy would become radiant and full of vitality. The same is true for China's capital market.

During the early period of China's capital market, the split-share system played a role in preventing controversy and speeding up exploration of the securities market. The split between non-tradable and tradable shares, however, not only caused inconsistency in the interests between the holders of these two types of shares, but also distorted the pricing mechanism of the stock market. On 29 April 2005, with the approval of the State Council, the China Securities Regulatory Commission (CSRC) issued the *Circular on Issues Relating to the Pilot Reform of Listed Companies' Split Share Structure*, which officially announced the introduction of a pilot reform programme on the split-share structure in China. After three years, most listed companies have completed the split-share structure reform, and the capital markets have been freed from years of institutional barriers.

Like medical treatment, action is necessary for reform, but although the reform outlook is good, the process will inevitably be painful. The split-share structure reform was once the engine of transition from bear to bull markets, but to mitigate the impact on the securities market when non-tradable shares became tradable, the regulatory authorities mandatorily required holders of restricted shares to abide by the rule of a "one-year lock-up, two-year sale limit". Since June 2006, more than 1,000 listed companies in the Shanghai and Shenzhen stock markets have completed their split-share structure reform and entered into a period of relaxing restrictions. But the continuous lifting of restrictions, as well as pressure from shareholder sales of restricted shares in the years following, also initiated the deep fall of the securities markets, which remains a big shadow over the markets to date. The market reaction to the relaxation of restricted shares, especially to their sales, and the behaviour of the holders of these restricted shares have thus become two core issues since the split-share structure reform and have drawn wide attention from scholars, investors, and regulators alike.

The institutional background of the aforesaid reform leads to the following research questions. Does the announcement of shareholding reduction contain the information and signal effect, that is, do holders of restricted shares choose to sell their shares at the cyclical peak price after the sales restriction is lifted? If sales of restricted shares indeed have an impact on a company's stock price, which factors affect the market reaction? Which type of companies tends to have more incentive to sell the restricted shares, and which factors determine the proportion of shares to be sold? Since the sale of restricted shares is a unique phenomenon in China's capital markets, there is no direct reference

from Western literature. The only similar situation is where a portion of shares are locked up when a company goes listed and launches its initial public offering (IPO). We thus try to borrow from the basic ideas of signal transmission theory and control theory to establish an empirical model and theoretical models for analysing the selling behaviour of holders of restricted shares in China. In terms of theoretical contributions, this research enriches the relevant Western literature on shareholder behaviour during the lock-up period and explores the application of mature theories in emerging markets; at the same time, it extends the relevant literature about the post-reform period. In terms of practice and policy regulation, our research provides regulators with clues to regulate the sales of restricted shares during the post-reform period, which ultimately relates to the fundamental problem of how to protect the interests of minority investors in the capital market.

As our sample we take listed companies in the Shanghai and Shenzhen stock markets that announce shareholding-reduction events within the observation window after completing the split-share structure reform. We then explore and study the follow-up effect of the reform through theoretical modelling and empirical analysis. This paper consists of two parts. First, we analyse the market reaction to the announcements by listed companies on sales of restricted shares and find that the market reaction is negative and shows an inverted U shape; this indicates that holders of restricted shares have chosen to reduce their shareholdings at the cyclical peak price. In addition, company fundamentals and market conditions have a bigger influence on the values of their cumulative abnormal return (CAR), whereas shareholder characteristics and the extent of shareholding reduction have less of an impact. Second, we analyse how the holders of restricted shares weigh costs and benefits between holding and selling during the reduction, and find that shareholder expectations as to the availability of adequate benefits of control is the key factor in deciding whether to sell the shares as well as the proportion of shares to be sold. Shareholder characteristics and the extent of shareholding reduction have a bigger influence on CAR values, whereas company fundamentals and market conditions have less.

The remainder of this paper is organised as follows. Section II reviews related literature. Section III describes the theoretical model for shareholding reduction by holders of restricted shares. Section IV explains the research design, including sample selection, data sources, research method, models, and variables. Section V studies the market reaction to the announcement of shareholding reduction and the actual impact of the reduction. Section VI explores the shareholding-reduction behaviour of majority shareholders. Section VII contains the sensitivity test of the empirical results, and the final section describes the research conclusions, limitations, and regulatory proposals.

II. Related Literature Review

The presence of non-tradable shares was a special institutional arrangement to maintain the absolute control status of state-owned enterprises in the early stages of China's securities markets. In Western markets, when listed companies launch their IPOs, there is a period of sales restriction, or lock-up period, for their original majority shareholders. After this period, the shares can be traded. The research literature on majority shareholder behaviour during the lock-up period thus provides an indirect reference for our research into the shareholding reduction of holders of restricted shares. The theoretical bases of such literature are the asymmetric information theory and the signal transmission theory. According to the former, different market subjects grasp different amounts of market information, and the one who obtains more information benefits from this advantage (Akerlof, 1970; Spence, 1973). Information asymmetry in capital markets not only affects the behaviour of market participants significantly (including investors, management of listed companies, shareholders, and regulators), but also distorts the effective allocation of resources. The signal transmission theory has been applied in the financial field since the study by Ross (1977), who was the first scholar to introduce the asymmetric information theory into the analysis of capital structure and dividend policy. He finds that managers who own high-quality investment opportunities can transmit information to potential investors by choosing policies of either capital structure or dividends.

Current research related to the signal transmission theory is all built on the assumption that management has information that outside investors cannot obtain, assuming the existence of information asymmetry. Espenlaub *et al.* (2001) compare the difference between the IPO lock-up period in the UK and that in the US, and find that the former has far more complex regulations on the behaviour of shareholders and insiders during this period. Goergen *et al.* (2006) similarly select UK listed companies during the IPO lock-up period as the study sample and find that regulatory measures and the shareholding proportions of directors and outside shareholders may explain the degree of market response. Field and Hanka (2001) find that when the IPO lock-up period ends, venture capital funds sell shares more quickly than senior management and other shareholders. The study of Brav and Gompers (2003) supports the commitment hypothesis, that is, when insiders have more moral risks, they will choose a relatively longer lock-up period. Brau *et al.* (2005) study China's split-share structure reform and find that it is beneficial for the overall market, especially for those companies with lower quality of information disclosure.

Since the split-share structure reform, the minority shareholders of listed companies still lack direct access to internal information, and their rights to be informed rely on mandatory information disclosure. Majority shareholders, on the other hand, have an extraordinary advantage in getting information about the company's operating status, financial conditions, and other important matters by participating among or influencing

the board of directors and turning into insiders. Great differences will thus exist among shareholders' predictions of the company's future and the accuracy of their evaluation and pricing of the company. This information asymmetry puts minority shareholders at a disadvantage when choosing the timing for selling their restricted shares. Since current shareholders of more than 5 per cent of total shares issued are considered to be related legal persons or natural persons of the listed company, outsiders will think that the selling behaviour of major holders of restricted shares, who are interpreted as "insiders", must have "signal content". Therefore, when listed companies publish information about majority shareholder selling, minority shareholders who are at an information disadvantage will interpret the behaviour as internal information. This paper is based on the signal transmission theory in examining the market reaction to these sales by holders of restricted shares, thereby extending the application of the theory in emerging markets.

Most existing research literature on the split-share structure reform focuses on the calculation of consideration and the stock market reaction to the timing of reform implementation. Some literature studies the determination of consideration during the reform process. Xu and Wu (2007) find the "anchoring effect" during the process of determining consideration by studying its influencing factors in the course of the reform. Shen *et al.* (2006) find a clustering phenomenon such that consideration is provided compensating three shares for every 10 that become tradable during the reform. This phenomenon probably arises from the oligopoly of sponsoring institutions in the Shanghai securities market. Zhang *et al.* (2006) find that listed companies take into account the company's financial condition and stock market performance and strike a balance between each party's interests during the reform process. Ding, Su, and Du (2006) deduce the consideration formula under market equilibrium according to the principle of neutral policy and the theory of arbitrage analysis, and analyse the consideration scheme of pilot companies; they find that the compensation levels of some listed companies are obviously unreasonable. Other literature studies the factors influencing consideration payment, such as majority shareholder control, the proportion of institutional investors, the proportion of non-tradable shares and the lock-up period, dividend commitment, and corporate performance commitment (Wu *et al.*, 2006; Xiao, 2006; Xin and Xu, 2007; Zhao, 2006). Some literature is related to market reaction during the reform process, such as the study of Chen and Chen (2005), which analyses the surge in individual stock prices and the market decline caused by the split-share structure reform using the event study method. The authors find defects in the mechanism design of the reform. Cao *et al.* (2006) find that the reform sends a positive signal to the market and has a positive influence on share price, and that the share consideration ratio and cash consideration ratio both have a significant impact on the stock price as well, but that impacts from other commitment programmes are not significant. Chen (2007) empirically analyses the uptrend triggered by the reform in listed companies that have completed it, and finds that

the market first boosts share prices and then suppresses them; moreover, the phenomena of information leakage and speculation are relatively widespread, and are more obvious for those listed companies with small to medium market capitalisation, higher levels of consideration, and high ownership concentration. Because the split-share structure reform has adopted the policy of a "one-year lock-up, two-year sale limit", its impact on the capital market will be embodied mainly in the current lifting of restrictions and sales of the restricted shares. Chen *et al.* (2006) find that the promotion of the split-share structure reform is intended to increase investor confidence, not just to provide investors with arbitrage opportunities in this period. Wang and Lian (2008) find that majority shareholders choose the timing for selling their shares by taking advantage of management's timing of earnings forecasts. Cai and Wei (2009) find that earnings management is used to help shareholders sell their shares in China's securities markets. Wang (2009) conducts an empirical analysis on a sample of companies announcing sales of restricted shares before the end of 2007 and finds that these announcements show no significant market effects, indicating that the market generally regards sales of restricted shares as the release of long-term repressed desire for liquidity. This paper focuses on the more fundamental factor – the benefits of control – to analyse the timing at which holders of restricted shares sell their shares and the proportion of shares sold. This thereby enriches the Chinese literature of research on the post-reform period.

III. Theoretical Model for Sales by Holders of Restricted Shares

The decision of holders of restricted shares to reduce their shareholdings is essentially based on comparing gains from holding the shares with gains from selling them to maximise personal gains.[6] When gains from sales are greater than those from holding, shareholders will reduce their shareholdings; when gains from sales are less than those from holding, they will continue to hold their shares. Although a certain amount of transfer income can be gained from sales, the cost is that the shareholders no longer benefit from the listed company's future growth. In particular, if major holders of restricted shares reduce their shareholdings to a large extent, they are giving up their benefits of control. Therefore, when the major holders of restricted shares make decisions on their shareholdings, they not only consider the transfer income from sales, but also weigh the benefits of control, cost of shareholding reduction, and resistance factors.

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[6] A low shareholding cost is an important reason for holders of restricted shares to sell their shares. This is a universal phenomenon. Thus, it is hard to explain why there are great differences among the proportions of shares sold by shareholders of various listed companies. In addition, when holders of restricted shares choose to reduce their shareholdings, their original shareholding costs are no longer a factor for evaluating and pricing their shares, because these costs are treated as sunk costs according to the basic principles of finance.

Following the model design of Shleifer and Vishny (1986), we assume that the original shareholding proportion of holders of restricted shares is α, and $0 \leq \alpha \leq 1$. The shareholders estimate that they can acquire from the company's future growth a positive gain Z after discounting with a probability I. The cumulative probability distribution of Z is $F(Z)$. Shareholders spend $C(I)$ on this estimation. Z can be seen as the value increment of the company's future development. I can be seen as the accuracy of shareholder estimations. The domain of definition of $F(Z)$ is $Z \in (0, Z_{max}]$. $dC/dI > 0$, $d^2C/dI^2 > 0$. If there is no change to the current operating model, the true value of the company is q. The shareholders' selling proportion of restricted shares is β $(0 \leq \beta \leq \alpha)$. There will be some cost and resistance C_T in selling.

The benefits of control will be aK when the shareholding proportion of shareholders of the listed company exceeds r $(0 < r \leq \alpha)$. The benefits of control include not only private but also shared benefits. The benefits arising from holding all shares of the listed company during the current period and the next are K and K^*, respectively. K^* is a discounted value. "Control" herein has the meaning that the shareholder is able to sit on the board of directors or to influence the results of the general meeting of shareholders.

The current share price is P. If the company sells all shares at this price, it will obtain cash income $q + \pi$. π is the abnormal return after shareholders sell their shares, that is, the premium. We assume that λ $(0 < \lambda < 1)$ is the proportion difference between the abnormal returns when shareholders retain control and those when they do not.

If shareholders sell restricted shares but retain control, they can obtain benefits as

$$(\alpha - \beta_1)E(Z) + \beta_1(q + \lambda\pi) + (\alpha - \beta_1)q - C_T + (\alpha - \beta_1)K + (\alpha - \beta_1)K^*, \ 0 \leq \beta_1 \leq \alpha - r. \quad (1)$$

If shareholders sell restricted shares and do not retain control, they can obtain benefits as

$$(\alpha - \beta_2)E(Z) + \beta_2(q + \pi) + (\alpha - \beta_2)q - C_T, \ \alpha - r \leq \beta_2 \leq \alpha. \quad (2)$$

If shareholders do not sell the restricted shares, they can obtain benefits as

$$\alpha E(Z) + \alpha q + \alpha K + \alpha K^* \quad (3)$$

(1) − (2): $(\beta_2 - \beta_1)E(Z) + (\lambda\beta_1 - \beta_2)\pi + (\alpha - \beta_1)(K+K^*), \ \beta_2 > \beta_1$.

When (1) $\geq$ (2), the shareholders will choose to sell their restricted shares but retain control, or not to sell their shares. When (1) $\leq$ (2)

$(\pi > \dfrac{(\beta_2 - \beta_1)E(Z)}{\beta_2 - \lambda\beta_1} + \dfrac{(\alpha - \beta_1)(K+K^*)}{\beta_2 - \lambda\beta_1}$ can be realised), the shareholders will choose

to sell the restricted shares and not retain control, or not to sell their shares.

i.   Shareholders choosing to sell and retain control of, or not to sell, their restricted shares.

(1) – (3): $\beta\lambda\pi - \beta E(Z) - C_T - \beta(K+K^*) \geq 0, \ 0 \leq \beta \leq \alpha - r$

When other investors in the market are willing to buy their shares, the equation is

$\lambda\pi - E[Z \mid Z \leq \lambda\pi - C_T / \beta - (K+K^*)] \leq 0$.

The value to meet the minimum premium π in the above formula is $\pi^*(\beta)$. The definition is $Z^c(\beta) = \min\{\lambda\pi - C_T / \beta - (K+K^*)\}$, that is, the company's value increment when there is no difference between selling and not selling. We can formulate the optimal equilibrium of this game as follows: when $Z \geq Z^c(\beta)$, other investors in the market will buy the shares at a premium of $\lambda\pi^*(\beta)$, and the shareholders will sell their restricted shares. The transaction can be reached, while both sides have a unique sequential equilibrium strategy (Grossman and Perry, 1984), that is, the offer price is $q + \lambda\pi^*(\beta)$.

Therefore, the shareholders maximise their returns in different periods when selling restricted shares:

$$f = \beta(q + \lambda\pi) + (\alpha - \beta)\{q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)]\} + (\alpha - \beta)(K+K^*)$$

Lemma 1: $\pi^*(\beta)$ will increase as β increases.

Lemma 2: $Z^c(\beta)$ will increase as β increases.

Lemma 3: $I^*(\beta)$ will increase as β increases.[7]

Lemma 4: $F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)]$ will increase as β increases.

Proposition 1: $\partial f / \partial \alpha > 0$

Proposition 2: $\partial f / \partial \beta \geq 0 \ (\Delta \geq (K+K^*)$ or $\partial f / \partial \beta \leq 0 \ (\Delta \leq (K+K^*))$[8]

Proposition 3: $\partial f / \partial C_T \leq 0$

ii.   Shareholders choosing to sell and not to retain control of, or not to sell, their restricted shares

(2) – (3): $\beta\pi - \beta E(Z) - C_T - \alpha(K+K^*) \geq 0, \ \alpha - r \leq \beta \leq \alpha$

The shares other investors are willing to purchase are

$\pi - E[Z \mid Z \leq \pi - C_T / \beta - \alpha(K+K^*) / \beta] \leq 0$.

The value to meet the minimum premium π in the above equation is $\pi^*(\beta)$. The definition is $Z^c(\beta) = \min\{\pi - C_T / \beta - \alpha(K+K^*) / \beta\}$, that is, the company's value increment when there is no difference between selling and not selling. We can formulate the optimal equilibrium as follows: When $Z \geq Z^c(\beta)$, other investors in the market will buy shares from shareholder β at a premium of $\pi^*(\beta)$, and the shareholder will sell his restricted shares, so the transaction can be reached; both sides also have a unique sequential equilibrium strategy (Grossman and Perry, 1984), that is, the offer price is $q + \pi^*(\beta)$.

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[7]   The specific definition of I^* can be found in the proof process in Appendix 1.

[8]   The specific definition of Δ can be found in the proof process in Appendix 1.

Therefore, shareholders maximise their returns in different periods when selling restricted shares:

$$f = \beta(q + \pi) + (\alpha - \beta)\{q + I^*(\beta)F[Z^C(\beta)]E[Z \mid Z \leq Z^C(\beta)]\}$$

Lemma 5: $\pi^*(\beta)$ will increase as β increases.

Lemma 6: $Z^c(\beta)$ will increase as β increases.

Lemma 7: $I^*(\beta)$ will increase as β increases.

Lemma 8: $F[Z^C(\beta)]E[Z \mid Z \leq Z^C(\beta)]$ will increase as β increases.

Proposition 4: $\partial f / \partial \alpha > 0$

Proposition 5: $\partial f / \partial \beta \geq 0$

Proposition 6: $\partial f / \partial C_T \leq 0$

As seen from Lemmas 1 and 5, when the market situation is relatively good and holders of restricted shares may obtain a higher abnormal return in the current period, we observe that more restricted shares will be sold in that period. As seen from Lemmas 2 and 6, if the value increment of the company's future performance required by holders of restricted shares increases when there is no difference between selling and not selling, the shareholders will sell a part of their shares that they had not planned to sell, and will obtain a higher return in the current period. As seen from Lemmas 3 and 7, if holders of restricted shares sell a part of their shares that they had not planned to sell, they will obtain a higher return in the current period, indicating that the minimum probability I^* (or minimum accuracy) they require has increased.

Propositions 1 and 4 show that the original restricted shares held by shareholders is an important factor influencing their returns from reducing shares. Since the original shareholding proportions in each listed company are certain at the beginning of the period, viewed from different companies at the same point of time, shareholders who originally hold bigger proportions of shares will obtain higher yields when reducing their holdings. Propositions 2 and 5 show that when the benefits of control are relatively large, the holders of restricted shares will, to the greatest extent, reduce the proportion of shares to be sold; when the benefits of control are relatively small, they will give up control; that is, the more they reduce the proportion of shareholdings, the higher the returns they will obtain. The increment of the company's future achievement Z, however, is the key factor influencing shareholder selling actions. When the real operating achievement of the company is relatively high, they will not reduce shareholdings, or else they will reduce the proportions of shares to be sold. Meanwhile, the higher the proportion of shares held by the largest shareholder, the smaller the possibility that other holders of restricted shares will obtain benefits of control, so the latter will sell more restricted shares. In addition, the lower the relative proportion of shares held by shareholders, the smaller the chance of obtaining benefits of control, and thus the more shares they will sell. Propositions 3 and 6 show that during the selling of shares, holders of restricted shares have to face certain sales costs and resistance. The greater the cost and resistance,

the fewer the benefits to be gained by shareholders from selling their shares, and so fewer shares will be sold. When certain corporate performance indicators vulnerable to manipulation trend upwards, such as net profit which represents growth, the proportion of shares sold by holders of restricted shares will increase instead, because they want to enhance apparent performance in order to reduce resistance during the sale.

The above theoretical model analysis shows that the proportion of shares to be sold is subject to shareholder characteristics, financial status of the company, extent of shareholding reduction, market conditions, and company characteristics.

IV. Research Design

i.   Research samples and data sources

We choose those companies listed in Shanghai and Shenzhen stock markets that have implemented the split-share structure reform and resumed trading as of 31 March 2008 as our research sample.[9] If a company released announcements on shareholding reduction during the event window, we select this event as our initial sample. In addition, we remove the following from these samples:

1. Since we have to calculate abnormal returns before, during, and after shareholding reduction, we remove those samples whose announcements did not specify the start and end time of shareholding reduction.

2. As for different sales behaviours by different shareholders of the same company announced on the same day, we consider only one announcement when calculating market reaction; otherwise, overlapping calculations would occur.

3. We remove those samples with significant events during the time range we use to calculate market reaction.[10]

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[9] The reasons for selecting 31 March 2008 as the cut-off point for the research period are as follows. First, the increase in domestic inflation pressure, the soar in prices of industrial raw materials, the intensity of macroeconomic regulation and control, the US subprime crisis, and renminbi appreciation all have affected the export-oriented economy in China. These events have increased remarkably the uncertainties in the domestic and international economic environments, resulting in the sharp fluctuation in securities markets after March 2008. Including this period in the time window would thus bring noise to the calculation of abnormal returns. Second, after March 2008, the Industrial and Commercial Bank of China, China Petroleum, and other companies launched IPO offline allotments, and a great number of restricted shares were relaxed through the private placement of Baoding Tianwei. These events had a relatively great impact on the overall stock markets and could have affected the research of this article.

[10] Since many significant events may happen to listed companies, such as asset restructuring, refinancing, equity incentives, change in the controlling shareholder, and market rumours, it is difficult to distinguish clearly among these events. So we remove sample companies that suspend trading more than seven trading days during the observation window; that is, we believe that an event causing a suspension of more than seven days is likely to constitute a significant event of the listed company, and may affect the results of our research. Naturally, announcements on shareholding reductions made in February and March are also considered. For instance, if the announcement was published on 10 March, data of April would need to be taken since we would need to collect data for the 30 days after 10 March, so we do not consider this kind of sample.

4. Since only those shareholders holding more than 5 per cent of restricted shares are required to fulfil the obligation of announcing their sales of shares, we do not include the shareholding-reduction behaviour of those holding less than 5 per cent.

The market data and financial data used in this article are all taken from TX Investment Consulting Co. Ltd. Announcements on shareholding reduction are sourced from Shanghai Wind Information Co. Ltd., all of which we proofread and trim one by one. We retain 1,068 effective announcements on sales of restricted shares involving 368 listed companies.

ii. Model selection and variable design

We adopt the methods of an event study and analyses of multiple regression and logistic regression.

We use Model (1) to investigate the influencing factors[11] of CAR values, which we calculate according to the market model.[12]

Model (1):

$$CAR = \sum shareholder\ characteristics + \sum financial\ status + \sum extent\ of\ reduction + \sum market\ conditions + \sum company\ characteristics$$

In Model (1), *shareholder characteristics* includes the nature and shareholding proportions of the largest shareholder and of those shareholders selling restricted shares; *financial status* includes the return on total assets, growth rate, and special treatment of the company, if any; *extent of reduction* includes such variables as the proportion of shareholding reduction, expansion ratio, whether shares are sold by the largest shareholder, ranking of the shareholders selling the restricted shares, and whether it is a first sale; *market conditions* includes the market return rate and turnover during the shareholding reduction; *company characteristics* includes company size, asset-liability ratio, and industry variables.

We use Models (2) and (3) to study the shareholding-reduction behaviour of holders of restricted shares.

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[11] Based on our experience, we believe that influencing factors can be classified into five categories: shareholder characteristics, financial status, extent of shareholding reduction, market conditions, and company characteristics. Each category of influencing factors contains different variables. In the existing empirical literature, calculated CAR values are often used for regressions with some possible influencing factors, but such literature barely provides any theoretical elaboration for these explanatory variables one by one. Although this article has also not found a reasonable theoretical basis for the respective factors that can influence CAR values from shareholding reduction, descriptions would be given in specific empirical analyses based on our experience about the possible impact on CAR values imposed by these explanatory variables.

[12] The specific calculation process for the market model CAR can be found in Appendix 2.

Model (2):

$$PSELF = SLSH + PLSH + SCSH + PCSH + ROA + GROW + ST + MR + \\ MQ + SHNO + FC + ASSET + LEV + \textstyle\sum IND$$

Model (3):

$$LSHC = SLSH + PLSH + ROA + GROW + ST + MR + MQ + FC + ASSET + \\ LEV + \textstyle\sum IND$$

Models (1) and (2) adopt general multiple regression analysis, and Model (3) uses logistic regression analysis. All three models contain variables related to market conditions, but Model (1) shows market conditions after sales of restricted shares, whereas Models (2) and (3) show market conditions before the sales. These models analyse the shareholding-reduction behaviour of holders of restricted shares from two different perspectives.

Tables 1 and 2 show respectively the specific definitions of variables involved in this study and descriptive statistics.

Table 1 Variable Definitions and Descriptions

Variables	Symbol	Descriptions
Cumulative abnormal returns	CAR	Cumulative abnormal returns within the 30-day observation window after the sales of restricted shares.
Nature of largest shareholder	SLSH	Dummy variable, taking the value of 1 when the largest shareholder is state-owned, and otherwise 0.
Proportion of shares held by largest shareholder	PLSH	Proportion of shares held by the largest shareholder in total capital shares.
Nature of shareholder selling restricted shares	SCSH	Dummy variable, taking the value of 1 when the shareholder is state-owned, and otherwise 0.
Proportion of shares held by shareholder selling restricted shares	PCSH	The proportion of shares held by the shareholder selling the restricted shares in total capital shares.
Returns on total assets	ROA	A ratio of net profit to total assets.
Net profit growth rate	GROW	Growth rate of a listed company's net profit.
Whether a company is ST	ST	Dummy variable, taking the value of 1 if the listed company has been specially treated, and otherwise 0.
Proportion of shareholding reduction	PSELF	Proportion of shares sold in total shares held by the shareholder selling the restricted shares.

Variables	Symbol	Descriptions
Expansion ratio	*PLS*	Ratio of shares sold to total tradable shares.
Whether sold by largest shareholder	*LSHC*	Dummy variable, taking the value of 1 when the largest shareholder is selling the shares, and otherwise 0.
Ranking of shareholder selling the restricted shares	*SHNO*	For example, taking the value of 3 when the third largest shareholder is selling the restricted shares.
Whether it is a first sale of restricted shares	*FC*	Dummy variable, taking the value of 1 if yes, and otherwise 0.
Market return rate	*MR*	Difference in rate of market returns before (or after) the sales.[13]
Turnover	*MQ*	Difference in the logarithm of turnover before (or after) shareholding reduction.[14]
Company size	*ASSET*	Logarithm of total assets.
Asset-liability ratio	*LEV*	Ratio of a company's liabilities to total assets.
Industry	*IND*	Dummy variable, classified according to the industry classification standard published by the CSRC in 2001.[15]

V. Market Reaction to and the Actual Effect of Announcements on Shareholding Reduction

i. Market reaction to announcements on shareholding reduction

Before the announcement on shareholding reduction is released, the market knows nothing about it. So we choose day (0, 10) as our research window. Table 3 shows the test results, that the market reacts negatively to announcements on shareholding reduction, and that the CAR value during the above observation window is -1.6 per cent. After the announcement is released, CAR values show an almost unilateral decline, and all are at the significance level of 1 per cent, meaning that the actual shareholding reduction by majority shareholders has a significant psychological impact on investors.

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[13] For example, after the sale of restricted shares, we calculate the difference in rates of market returns as follows: first, calculate the daily average market return rate for the 30 days after the date of sale (T+1, T+30); then calculate the daily average market return rate for 30 trading days (T-30, T). Then subtract the latter result from the former. The difference between the market return rates reflects market conditions more accurately than the average daily market return rate calculated by simple arithmetic.

[14] Calculation of the difference in the logarithm of turnover is similar to that of the difference in market return rates. But the logarithm of turnover must be calculated first.

[15] The manufacturing sector is represented by a 2-digit code, and other industries are represented by a one-digit code. So, a total of 22 industries are represented by 21 dummy variables.

Table 2 Descriptive Statistics of Variables

	Mean	Median	Standard Deviation	Minimum	Maximum
CAR	-0.080	-0.064	0.235	-0.777	0.715
SLSH	0.522	1.000	0.500	0.000	1.000
PLSH	0.351	0.305	0.142	0.060	0.838
SCSH	0.355	0.000	0.479	0.000	1.000
PCSH	0.203	0.141	0.185	0.001	0.750
ROA	0.018	0.015	0.069	-0.733	0.224
GROW	0.166	0.221	9.727	-194.941	102.333
ST	0.085	0.000	0.279	0.000	1.000
PSELF	0.206	0.121	0.238	0.0001	1.000
PLS	0.030	0.025	0.021	0.000	0.196
LSHC	0.275	0.000	0.447	0.000	1.000
SHNO	2.523	2.000	1.812	1.000	10.000
FC	0.332	0.000	0.471	0.000	1.000
MR	-0.002	-0.002	0.007	-0.037	0.015
MQ	0.036	0.094	0.433	-1.173	1.703
ASSET	21.171	21.000	1.121	18.205	27.471
LEV	0.526	0.538	0.233	0.066	2.271

Table 3 Market Reaction to Announcements on Shareholding Reduction (n = 1068)

	AAR	CAR	CAR t-value		AAR	CAR	CAR t-value
0	-0.003	-0.003	-2.70***	6	-0.0003	-0.013	-3.59***
1	-0.0008	-0.004	-2.26**	7	-0.002	-0.015	-3.91***
2	-0.003	-0.008	-3.53***	8	0.0007	-0.015	-3.66***
3	0.0004	-0.008	-2.98***	9	-0.0005	-0.016	-3.88***
4	-0.003	-0.011	-3.59***	10	0.0007	-0.016	-3.65***
5	-0.0005	-0.012	-3.73***				

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

ii. Actual impact on the market by shareholding reduction

Unlike a general event study in which the point of time is certain, such as a specific date, the behaviour of shareholding reduction often occupies a period of time (for example, one listed company announced that one of its shareholders sold a certain number of his shares in the three trading days from 6 August to 8 August 2007). Furthermore, the period may be one day, one week, or even several months. Therefore, we consider it necessary to calculate abnormal returns during various periods. We group the shareholding-reduction behaviour into three periods – before, during, and after the reduction – and calculate the abnormal returns over these three periods, respectively. The periods before and after reduction are set at 30 trading days. For example, if the

announced time period of shareholding reduction is (W, T), we study the abnormal returns over the three periods of (W-30, W-1), (W, T), and (T +1, T +30). Tables 4, 5, and 6 show the calculation results.

The results in Table 4 show that the average annual return (AAR) values are almost always positive over 20 trading days before reduction. CAR values remain positive over 28 trading days before reduction, and significant over 16 trading days before reduction. The results indicate that the stock price has already been trending upward when holders of restricted shares sell their shares.

Table 5 examines the abnormal returns during shareholding reduction. For the total sample, the daily rate of abnormal returns and the CAR value remain positive and significant at the 1 per cent level. For samples of different periods, those of more than 31 trading days show very low significance, while the daily average values of AAR and CAR of the remaining samples are all significantly positive. The results show that shareholding-reduction behaviour has not had any impact on the market during the reduction, and the trend of stock prices remains good.

Table 6 examines the abnormal returns after shareholding reduction. The results are much different from those of Tables 4 and 5. From the first day after the reduction, CAR values are significantly negative. During the 30 trading days after reduction, AAR appears positive only once. In other words, after shareholding reduction, the stock return rates show a completely unilateral trend of decline. On the 30th trading day after reduction, the CAR value reaches as low as -8 per cent.

Table 7 and Figure 1 collectively illustrate CAR values before, during, and after shareholding reduction. The CAR rate shows an obvious inverted U shape, the right side of which is much lower than the left. This indicates that holders of restricted shares choose to sell their shares at the cyclical peak of the stock price. During the reduction, other investors are not aware of the sales, and so the stock price still performs well. The market, however, does not agree with the reduction behaviour; therefore, once the sales are completed, and other investors realise they have taken place, the stock price starts to decline.

Table 4 Abnormal Return Rate Before Shareholding Reduction (n = 990)

	AAR	CAR	CAR t-value		AAR	CAR	CAR t-value
-30	-0.001	-0.001	-1.04	-14	0.0003	0.0095	1.71*
-28	0.0002	0.0011	0.53	-12	0.0007	0.01	1.72*
-26	0.0013	0.0038	1.29	-10	0.0016	0.0116	1.92*
-24	-61E-6	0.0041	1.18	-8	0.0009	0.0142	2.23**
-22	-85E-6	0.0035	0.91	-6	0.0041	0.0194	2.90***
-20	0.0016	0.004	0.93	-4	-0.003	0.0185	2.62***
-18	0.0013	0.0068	1.45	-2	0.0045	0.0251	3.35***
-16	0.0017	0.0087	1.66*	-1	0.0053	0.0304	3.95***

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 5 Abnormal Return Rate During Shareholding Reduction (n = 1032)

	Daily AAR			CAR		
Time	Mean	Median	t-value	Mean	Median	t-value
1-2 days (n = 238)	0.0055 **	0.0016 *	2.14	0.0078 **	0.0018 *	2.40
3-7 days (n = 232)	0.0029 **	0.0029 ***	2.04	0.0103 *	0.0133 **	1.71
8-30 days (n = 309)	0.0018 ***	0.0014 ***	2.97	0.0265 ***	0.0181 ***	2.94
31 days or more (n = 253)	0.0004	6.53E-5	1.10	0.0136	0.0032	0.66
Total sample (n = 1032)	0.0025 ***	0.0007 ***	3.64	0.0154 ***	0.0065 ***	2.58 ***

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

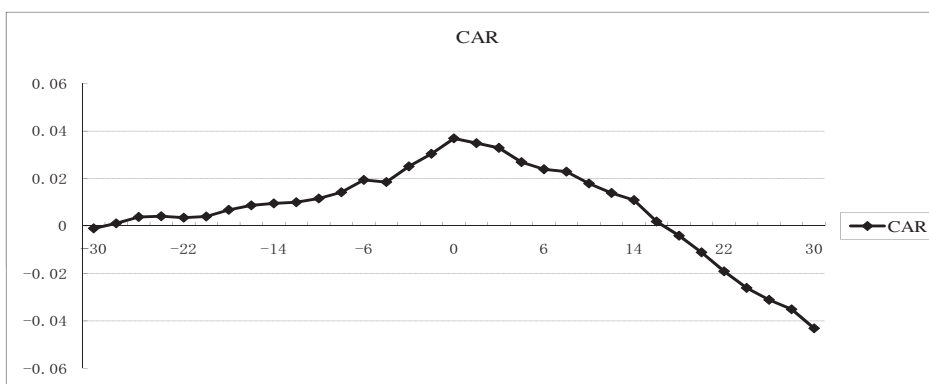**Table 6** Abnormal Return Rate After Shareholding Reduction (n = 781)

			CAR				CAR
	AAR	CAR	t-value		AAR	CAR	t-value
1	-0.002	-0.002	-2.09**	16	-0.001	-0.035	-5.97***
2	-0.002	-0.004	-2.26**	18	-0.002	-0.041	-6.41***
4	-0.002	-0.01	-3.83***	20	-0.002	-0.048	-6.81***
6	-0.001	-0.013	-3.91***	22	-0.002	-0.056	-7.48***
8	0.0013	-0.014	-3.61***	24	-0.002	-0.063	-8.01***
10	-0.001	-0.019	-4.43***	26	-0.001	-0.068	-8.28***
12	-9E-4	-0.023	-4.81***	28	-0.003	-0.072	-8.40***
14	-62E-5	-0.026	-4.95***	30	-0.002	-0.08	-9.00***

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 7 Abnormal Return Rate Before, During, and After Shareholding Reduction

	CAR values		CAR values		CAR values		CAR values
-30	-0.001	-14	0.0095*	2	0.0329***	18	-0.0041
-28	0.0011	-12	0.01*	4	0.0269***	20	-0.0111*
-26	0.0038	-10	0.0116*	6	0.0239***	22	-0.0191***
-24	0.0041	-8	0.0142**	8	0.0229***	24	-0.0261***
-22	0.0035	-6	0.0194***	10	0.0179**	26	-0.0311***
-20	0.004	-4	0.0185***	12	0.0139**	28	-0.0351***
-18	0.0068	-2	0.0251***	14	0.0109*	30	-0.0431***
-16	0.0087*	0	0.0369***	16	0.0019		

Note: *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively. CAR on
        day 0 in the table is the CAR before shareholding reduction plus the average CAR of the
        total sample during the reduction.

Figure 1 Abnormal Return Rates Before, During, and After Shareholding Reduction

iii. Analysis of related factors affecting CAR values

As seen from the above tables and figure, shareholding reduction causes CAR rates to continue falling; after 30 trading days the CAR value reaches -8 per cent. In this section, we focus on those factors influencing such significant CAR values. As indicated in Model (1), we choose five categories of influencing factors: shareholder characteristics, financial status, extent of reduction, market conditions, and company characteristics.

First, shareholder characteristics will affect CAR values. Typically, the operation of state-owned enterprises is more stable than that of private enterprises, and they can secure more support from the government than can the latter. Therefore, when shareholders of state-owned enterprises sell their restricted shares, investor expectations may worsen, and CAR values will be lower. We expect that the nature of the largest shareholder (*SLSH*) will show an inverse relationship to CAR. But the impact of the nature of holders of restricted shares on CAR differs. When shareholders selling the restricted share are private enterprises, they may be more opportunistic than state-owned shareholders, and so CAR values will be lower when private enterprises reduce their shareholdings. But considering the similarity to the nature of the largest shareholders, we anticipate that the correlation between *SCSH* and CAR will be uncertain. Meanwhile, when the largest shareholders hold a large proportion of shares, their sales of restricted shares may reduce or increase ownership concentration, so the impact on the listed company is uncertain. Therefore, the correlation between *PLSH* and CAR will be uncertain. When shareholders selling restricted shares hold a large proportion of shares, the impact on investor sentiment and market capital will be relatively large. So the correlation between *PCSH* and CAR is expected to be negative.

Second, the listed company's financial status will also affect the value of CAR. When a listed company is in good financial condition, the shares to be sold are easily absorbed by investors, so the impact on stock price will be smaller. But when the financial condition of the listed company is poor, shareholding reduction will undoubtedly drive the stock price down. Therefore, we expect that the total return on assets (*ROA*) and the net profit growth rate (*GROW*) will be directly proportional to CAR, and CAR will be inversely proportional to the variable *ST*.

Third, the extent of shareholding reduction will also affect the CAR value. When the shares sold account for a large proportion of the shares held by holders of restricted shares, or when the largest shareholders reduce their shareholdings, the sales indicate that they lack confidence in the listed company. A larger proportion of shares sold in total tradable shares makes it more difficult for the market to bear the selling pressure. Therefore, we anticipate that the expected proportion to be reduced (*PSELF*), the variable of the largest shareholder selling the restricted shares (*LSHC*), and the expansion ratio (*PLS*) will all be inversely proportional to CAR. When the holders of restricted shares sell their shares for the first time, the negative market reaction will be more significant than that caused by further selling. So *FC* will be inversely proportional to CAR.

In addition, market conditions during the course of shareholding reduction will also have a certain impact on CAR values. When market conditions are good, liquidity is abundant, and investors are willing to hold shares, the sales of restricted shares will have a smaller impact on share prices. But when the market is bearish, and investors prefer to hold cash, the sales of restricted shares will have a bigger impact on share prices. Therefore, the market return rate and turnover are expected to be directly proportional to CAR.

Finally, we add other conventional company characteristics, such as firm size, leverage, and industry, to examine the impact on CAR.

Before regression, we conduct a Pearson correlation test on each variable, and find that the correlations of most variables are less than 0.25. We also note that the variance inflation factor (VIF) values of the variables in the regression are all less than 6, and so multicollinearity is not a problem. Table 8 shows specific test results.[16]

As seen from these results, some variables are significant in each regression equation and are fairly stable, indicating that some characteristics do affect the CAR value. The adj-R^2 values in the three regression equations are 0.91 per cent, 9.97 per cent, and 13.35 per cent, respectively, meaning that the impact of shareholder characteristics and extent of shareholding reduction on CAR is relatively small; instead CAR values are affected mainly by company fundamentals and market conditions.

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[16]   Regarding the regression, we winsorise each variable by 1 per cent.

For shareholder characteristics, the nature of the largest shareholder has a negative correlation with the CAR value, which is significant at the 1 per cent level, meaning that sales of restricted shares by shareholders of state-controlled listed companies have a relatively large impact on the market, whereas variables of other shareholder characteristics are not significant.

Apparently, the impact of the financial status of listed companies on the value of CAR is contradictory. *ROA* is consistent with our expectation and has a positive correlation with the CAR value, whereas the growth rate of net profit is opposite our expectation with a significantly negative correlation. We believe that the listed company is less likely to manipulate the rate of return on total assets, and that differences in inter-company profitability are better reflected by cross-sectional data. On the other hand, growth rates differ from the rate of return on total assets, especially for low-profit companies, which may easily post several times, or even hundreds of times, the growth, which the listed company can easily manipulate. Even if the growth rate is real, it may not represent the company's actual profitability. So in fact the market does not recognise such growth. If companies with a high growth rate are mostly low profit, it is not difficult to understand that the growth rate of the net profit would have a negative correlation with the CAR value. To further validate our point of view, we use the easily-manipulated *ROE* indicator to replace *ROA*. Regression results on *ROE* show that it is not significant, indicating that the market recognises only those indicators that objectively reflect the company's actual profitability instead of its superficial achievements.

With respect to the extent of shareholding reduction, the dummy variable *LSHC* has a significantly negative correlation with CAR, as expected, indicating that investors are more anxious when the largest shareholder sells its restricted shares. Other variables, such as the proportion of shareholding reduction, expansion ratio, and whether this is a first sale, do not significantly affect CAR. Market conditions are thus fully consistent with our expectation. When the market return rate is high and trading is active, sales of restricted shares have a low impact. In addition, as seen from the test on company characteristics, larger companies and those with a higher asset-liability ratio endure a relatively weaker impact from the sales of restricted shares.[17]

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[17] The production and management of large-scale companies are steadier and more transparent. It is natural that only a slight negative impact would be caused by shareholding reduction. The asset liability ratio, however, has many implications and has a significant positive correlation with CAR. This may be because investors believe that shareholding reduction is better for those companies with high risk, or because the market conditions are relatively good over our sample period such that investors prefer high-risk and high-yield companies. We cannot provide specific reasons.

Table 8 Analysis of Related Factors Influencing the Market during Shareholding Reduction

	Variable	Regression 1	Regression 2	Regression 3
Intercept		-0.006	-0.036**	-0.358**
		(-0.28)	(-4.22)	(-2.07)
Shareholder characteristics	SLSH	-0.044***		-0.050***
		(-2.77)		(-3.07)
	PLSH	0.002		-0.063
		(0.03)		(-0.97)
	SCSH	0.007		0.013
		(0.39)		(0.80)
	PCSH	0.037		0.082
		(0.44)		(1.01)
Financial status	ROA		0.508**	0.674***
			(2.50)	(2.97)
	GROW		-0.013***	-0.016***
			(-4.13)	(-4.51)
	ST		0.015	0.015
			(0.58)	(0.55)
Extent of shareholding reduction	PSELF	0.016		0.012
		(0.42)		(0.34)
	PLS	-0.608		-0.280
		(-1.55)		(-0.74)
	LSHC	-0.044*		-0.044*
		(-1.67)		(-1.70)
	SHNO	-0.001		-0.003
		(-0.14)		(-0.41)
	FC	0.001		0.003
		(0.10)		(0.25)
Market conditions	MR		7.417***	7.203***
			(6.62)	(6.40)
	MQ		0.080***	0.078***
			(4.70)	(4.47)
Company characteristics	ASSET			0.016*
				(1.82)
	MQ			0.115***
				(2.62)
	IND			Control
F		2.23	24.64	5.57
P		0.02	<0.0001	<0.0001
Adj-R^2 (%)		0.91	9.97	13.35
Number		781	781	781

Note: Figures in brackets are t-values of regression variables; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

VI. Behaviour of Majority Shareholders in the Sale of Restricted Shares

i. What affects the proportion of shareholding reduction by majority shareholders?

In this section, we analyse the behaviour of majority shareholders in the course of shareholding reduction. We focus on two issues: first, factors influencing the proportion of shares sold by holders of restricted shares, that is, the circumstances under which they will sell more or fewer shares; and second, factors influencing the shareholding reduction of the largest shareholders, that is, the circumstances under which they will sell their shares. We use Models (2) and (3) to examine these two issues, respectively.

The adj-R^2 values of the three regression equations in Table 9 are 44.09 per cent, 0.35 per cent, and 47.37 per cent, respectively. These are completely opposite the regression results in Table 7; in other words, the proportion of shares sold is affected mainly by equity characteristics and related factors of shareholding reduction, while company fundamentals and market conditions have less effect.

First, the shareholding proportion of the largest shareholder is positively correlated with its proportion of shareholding reduction, which is significant at the 1 per cent level. This can mean one of two things: when the controlling shareholder has a higher level of control in the listed company, the other majority shareholders have a stronger desire to break free from that control and so will sell their shares by a large proportion, or else when the largest shareholder holds a higher proportion of shares, he is more willing to sell part of his shares. Second, lower-ranked shareholders or shareholders holding relatively lower proportions of shares sell more shares. In addition, *FC* has a significantly positive correlation with the proportion of shareholding reduction, indicating that the proportion of shares sold is usually relatively large when the holders of restricted shares sell their shares for the first time.

Corporate performance indicators have a significant correlation with the characteristics of shareholding reduction, which is consistent with our analysis in the preceding sections. *ROA* has a significantly negative correlation with the proportion of reduction, indicating that when the company's actual performance is good, the holders of restricted shares are largely unwilling to sell their shares, but when some easily manipulated indicators such as *GROW* are good, the proportion of shares sold is larger. The results further explain that holders of restricted shares are very likely to manipulate the company's performance to create opportunities for selling the shares.

For other indicators, company size is positively correlated with the proportion of shareholding reduction, whereas market conditions have no significant correlation.[18]

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[18] In regression, the proportion of shares held by holders of restricted shares has a significantly negative correlation with the proportion of shareholding reduction because of the correlation among the data themselves. This does not mean that a greater proportion of shares held by holders of restricted shares will lead to a higher inclination to sell their shares, since in our period of study, the shares of many listed companies are still sales restricted. The proportion of unrestricted shares is relatively small, so the greater the proportion of shares held by holders of restricted shares, the fewer shares they can sell.

Table 9 Analysis of Factors Influencing the Proportion of Shares Sold by Holders of Restricted Shares

Variable	Regression 1	Regression 2	Regression 3
Intercept	-0.004	0.200***	-0.328**
	(-0.17)	(21.22)	(-2.31)
SLSH	-0.003		0.007
	(-0.23)		(0.51)
PLSH	0.354***		0.296***
	(6.88)		(5.65)
SCSH	0.006		0.015
	(0.41)		(1.10)
PCSH	-0.475***		-0.450***
	(-9.92)		(-9.45)
ROA		0.341	-0.623***
		(1.50)	(-3.31)
GROW		-0.004	0.007**
		(-1.16)	(2.33)
ST		0.042	0.006
		(1.48)	(0.26)
SHNO	0.069***		0.081***
	(15.28)		(16.78)
FC	0.035***		0.033***
	(3.00)		(2.85)
MR		0.983	0.503
		(0.78)	(0.54)
MQ		0.031	0.013
		(1.63)	(0.94)
ASSET			0.019***
			(2.60)
LEV			-0.052
			(-1.42)
IND			Control
F	141.22	1.74	29.24
P	<0.001	0.1225	<0.0001
Adj-R^2(%)	44.09	0.35	47.37
Number	1068	1068	1068

Note: Figures in brackets are t-values of regression variables; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

ii.   Factors determining whether the largest shareholders sell their shares

As Table 10 shows, we conduct a logistic regression analysis on whether the largest shareholders will sell their shares. We analyse each parameter's influence on the model using Wald's chi-square test; the overall validity of the model is signified by the logarithm likelihood, whose value is equal to (-2 Log Likelihood). This test is designed for the united validity of all parameters in the model.

The test results in Table 10 show that whether the largest shareholders will reduce their shareholdings is influenced by two major factors. The first is the shareholding proportion of the largest shareholder, which has a significantly positive correlation with the probability of shareholding reduction at the 1 per cent significance level; in other words, the larger the proportion of shares held by the largest shareholder, the more it will tend to sell its shares. The second is the company's actual performance *(ROA)*, which has a significantly negative correlation with the tendency of the largest shareholder to sell its shares. This is consistent with our previous conclusion that holders of restricted shares are not willing to reduce their shareholdings when company performance is good.

VII.   Sensitivity Test

i.   CAR calculation method and the selection of event periods

First, we adopt the market model in calculating abnormal returns. Although it has a perfect theoretical basis, scholars often question this model because of the instability of its β value. The study of Chen and Jiang (2005), however, shows that the adjusted market model can be used as an alternative to the market model for event examination in the Chinese market,[19] and so we use the adjusted market model to calculate abnormal returns and repeat the earlier tests. We find that the conclusions still hold. We further use the Fama-French three-factor model to calculate abnormal returns and find the same results in that the CAR values still show an inverted U shape.[20]

Second, when we calculate CAR values, selection of the duration of the event period windows is somewhat arbitrary. We select (0, 10) as the time window for announcements on shareholding reduction, and choose 30 trading days after the sale of shares for examining the actual market impact of the shareholding reduction. Because this arbitrariness may render our conclusions unreliable, we also change the length of the time windows to verify the conclusions. We select (-1, 5) and (0, 7) as the time windows for announcements on shareholding reduction, and choose 20, 45, and 60 trading days after the sale of shares to calculate CAR values for examining the actual market impact. Through verification, we find that our conclusions still hold.

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[19]   When using the adjusted market model, we calculate the CAR value by subtracting the market return from the stock return. The test results are not listed herein for simplicity.

[20]   For simplicity, the test results are not listed herein.

Table 10 Analysis of the Factors Influencing the Shareholding Reduction of the Largest Shareholders (Logistic Regression)

Variable	Regression 1	Regression 2	Regression 3
intercept	-3.499***	-0.887***	-5.562***
	(231.60)	(99.91)	(7.07)
SLSH	0.235		0.134
	(2.08)		(0.49)
PLSH	6.521***		6.640***
	(126.14)		(103.28)
ROA		-7.357***	-6.016**
		(10.56)	(3.82)
GROW		0.110***	0.117***
		(11.23)	(7.06)
ST		-0.634**	-0.849**
		(4.79)	(5.36)
FC	-0.123		-0.102
	(0.584)		(0.36)
MR		-17.03	-7.930
		(2.04)	(0.32)
MQ		-0.149	-0.160
		(0.66)	(0.54)
ASSET			0.105
			(0.96)
LEV			0.637
			(1.24)
IND			Control
-2 Log L	179.51	20.59	267.19
Pseudo R-squared (%)	21.4	9.7	22.1
Percent correctly predicted	80.76%	73.84%	80.66%
Number	1068	1068	1068

Note: The figures in brackets are the Wald's chi-square test values of the regression variables; *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

ii. Verification of the time period of shareholding reduction

Some samples in the research may lead to double counting. For example, a shareholder of a company may sell its shares in two consecutive periods, which our research studies as two independent samples. Obviously, this doubles the calculations of the CAR values during these two periods, which may distort the results. Therefore, we carry out two sensitivity tests. First, we select only the first sale when the same shareholder of the same company sells his shares more than once. Second, when the

same shareholder of the same company sells his shares in two consecutive periods but the time interval between the two events is more than three months, we regard them as two samples; if the interval is less than three months, we select only the first sale as a sample. Verification results do not change our conclusions.

Moreover, for some samples, the shareholding reduction is completed over a period of one month or even several months. During a long period, CAR values may not represent the impact of shareholding reduction. Therefore, we remove samples that require more than one month to complete the selling, and use the remaining samples to re-examine the results. We find that our conclusions still hold.

iii. Impact of the size of shareholding reduction

So far, our verifications are aimed at the overall samples. In fact, our samples include different scales of shareholding reduction; in particular, only tens of thousands or about a hundred thousand shares are sold in some samples. We believe that the scale of reduction may greatly affect CAR values. Therefore, we classify the samples according to different scales of reduction and study their impact on the market.

We classify samples according to the proportions of shares sold in tradable shares,[21] and take 0.01, 0.02, 0.03, 0.04, and 0.05 as the critical points. Figure 2 shows the results of the classification statistics. The test results show that when the ratio of shares sold to tradable shares is less than 0.01, and the CAR value after shareholding reduction is greater than -2 per cent, the impact on the market is less negative; when the ratio is greater than 0.01, and the CAR value is less than -8 per cent, the impact is greater. The t-test of mean values and the Wilcoxon Z-test of logarithms of the two data groups both have significance levels of at least 5 per cent. When the ratio is greater than 0.05, and the CAR value is less than -10 per cent, the market impact is more negative.

Thus, the test results show that different scales of shareholding reduction have different effects on the market. When the ratio of shares sold to tradable shares is less than 0.01, market impact is limited; when it is greater than 0.01, there is greater impact, and the greater the ratio, the greater the negative impact on the market.

iv. Regression of robust standard error

We conduct a regression analysis of robust standard errors on the shareholding-reduction behaviour of holders of restricted shares. The test results do not change our conclusions.[22]

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[21] We believe that the proportion of shares sold in tradable shares is more explanatory than the proportion of shares sold in total issued shares. The periods researched in this article coincide with the process of the split-share structure reform, and many companies have a large number of restricted shares. The fact that the stock price tends to tumble on the day when the restriction is lifted makes us believe that it is affected largely by the capital side. Therefore, selecting restricted shares as the research samples may lead to misunderstanding the relation between supply and demand in the market.

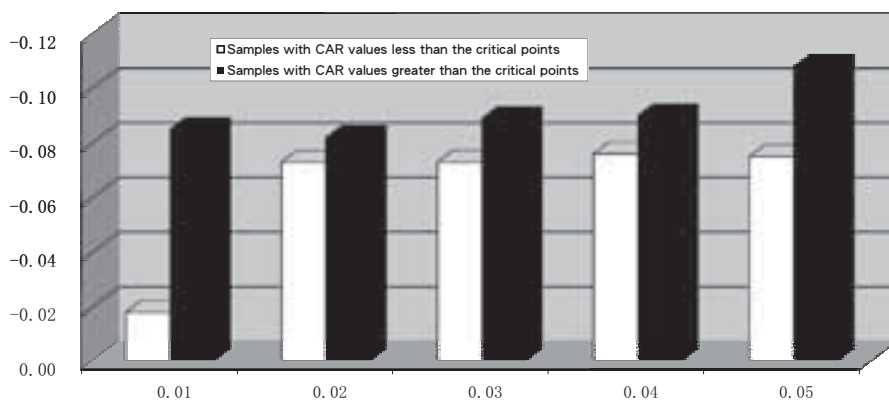[22] For simplicity, the test results are not listed herein.

Figure 2 Impact of Shareholding Reduction Scales on CAR

v. Impact of earnings management[23]

We select listed companies experiencing a number of shareholding reductions as our samples, and select the last sale of shares of each company as our research objects. We find that the CAR values continue to show an inverted U shape, indicating that earnings management does not fully explain this phenomenon, and there should be more fundamental influencing factors. Following the research methods of Wang and Liao (2008) and Cai and Wei (2009), we remove the samples that have positive earnings management and optimistic profit forecasts, and find the same results such that more in-depth explanations can be found for some issues. Among those listed companies without earnings management, when shareholders of a state-owned nature reduce their shareholdings, the market reaction is significantly negative. This indicates that when opportunistic earnings management is less likely, the main factors are investor concerns about the loss of political relations and a gloomy development future arising from the retreat by state-owned shareholders. When such opportunistic behaviour is absent, the proportion of shares sold by holders of restricted shares will also be significantly reduced, indicating that shareholders will try to maintain control. As changes in financial indicators decrease, it is naturally hard to observe their significant effects. This indicates that, in addition to earnings management, benefits of control are also an important factor that holders of restricted shares should consider when making decisions about shareholding reduction.

vi. "Selling-pressure" effect[24]

Since most announcements on shareholding reduction are released after the sale, both "selling pressure" and "opportunity hunting" may appear in the shareholding reduction by holders of restricted shares. It is thus important to distinguish between these two types of behaviour. If a short-term sharp decline in the stock price is really caused

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[23] For simplicity, the test results are not listed herein.
[24] For simplicity, the test results are not listed herein.

by selling pressure, we should find that the company's stock price gradually returns to its original position when we stretch the time window. This is because other investors will buy the company's stocks, allowing the stock price to gradually recover, when they do not regard sales by holders of restricted shares as a signal, and will continue to expect good prospects of the listed company. We therefore stretch the time window to 60 days (the usual two-month period for explaining the selling pressure phenomenon), and calculate the market reaction using the market model, the adjusted market model, and the three-factor model, respectively. We find that after two months, the stock price does not return to its original position, indicating that it is not selling pressure that has caused the stock price to decline; rather it is because holders of restricted shares have passed a signal to the market.

VIII. Conclusions, Limitations, and Proposals for Regulation

i. Research conclusions and limitations

This article takes all sales of restricted shares of the listed companies in the Shenzhen and Shanghai stock markets as samples and empirically examines market reaction, influencing factors, and shareholder behaviour. Some meaningful conclusions can be drawn.

1. Announcements on shareholding reduction within a short time window cause a negative market reaction. We further divide shareholding-reduction behaviour into three time periods, namely before, during, and after the sales of restricted shares. We study the abnormal returns in the long time windows and find that the CAR values in the three time windows show an obvious inverted U shape, and that the right side of the inverted U is longer than the left. This shows that holders of restricted shares choose to sell their shares at the cyclical peak price, when other investors are unaware of the shareholding-reduction behaviour as it happens, and so the stock price still performs well. But the market does not agree with the shareholding-reduction behaviour. Once the sales are completed, the stock price starts to decline when other investors realise they have taken place.

2. We classify the factors influencing CAR values into five categories: shareholder characteristics, extent of shareholding reduction, financial status, market conditions, and company characteristics, and find that financial status and market conditions have a greater impact on CAR, whereas shareholder characteristics and extent of shareholding reduction have less. Specifically, the better a company's real performance, the smaller the negative impact on the market from shareholding reduction; whereas the better the easily manipulated "apparent" performance, the greater the negative impact from shareholding reduction. In addition, when the market return rate is high and trading active, the negative

impact from shareholding reduction is small, whereas the market impact caused when both state-owned shareholders and the largest shareholders reduce shares is significant.

3. We study shareholder behaviour in the course of shareholding reduction. First, we analyse factors influencing the proportion of the reduction, and find that shareholder characteristics and the extent of reduction are the key influencing factors, whereas company fundamentals and market conditions have less effect. Specifically, the proportion of shares held by the largest shareholder is positively correlated with the proportion of shareholding reduction; lower ranked shareholders or shareholders holding lower proportions of shares will sell more of their shares. Holders of restricted shares usually sell a larger proportion when selling them for the first time. In addition, a company's real performance has a significantly negative correlation with the proportion of shareholding reduction, whereas apparent performance has a positive correlation, further indicating that holders of restricted shares are quite likely to manipulate performance in order to create opportunities for selling their shares. Second, we study the factors influencing whether the largest shareholders will sell their shares, and find that the greater the proportion of shares they hold, the greater the likelihood they will sell. In addition, the tendency of the largest shareholders has a significantly negative correlation with the company's actual performance; that is, holders of restricted shares are unwilling to sell their shares when the company performs well.

The research limitation of this article is that it focuses only on a period when the macro-economy is relatively stable; the aforesaid conclusions still need support from more evidence when the market is in sharp fluctuation under the influence of a financial crisis. This is one direction for our future research.

ii.   Proposals for regulation

First, we believe it is necessary to establish and perfect the regulatory mechanisms before and during shareholding reduction. This could start in two respects. First, holders of restricted shares who are willing to sell their shares must disclose their selling plans in advance. For example, it should be announced that a certain number of shares will be sold in the coming month, so that the market can form a certain expectation and investors can notice some suggestion. This could help avoid price fluctuations for investors in making their investment decisions. Second, real-time disclosure during shareholding reduction should be introduced; it would be even better if the disclosure on shareholding reduction could be made on the same day. Currently, many companies disclose information on shareholding reduction in stages, such as when a shareholder sells a certain number of shares during a certain period, causing the market information to lag remarkably. Therefore, same-day disclosure could greatly increase market effectiveness.

Second, supervision of the performance of listed companies should be strengthened to prevent large shareholders from driving up stock prices and selling their shares by utilising apparent performance or false information. We believe that the regulatory approaches that could be taken are as follows: (1) because performances to be

announced in semi-annual reports or quarterly reports are used to drive up stock prices, we suggest requiring listed companies to receive semi-annual auditing in the coming two years, which will be the peak period for sales of restricted shares; if necessary, quarterly auditing should be required; (2) listed companies should be required to make a reasonable analysis of profit structure and sustainability, which would be conducive to the self-discipline of listed companies and also help investors better understand the company's profitability; (3) verification of rumours about significant matters involving listed companies, such as asset restructuring, should be strengthened by requiring the companies to promptly conduct a self-examination, so as to closely monitor those listed companies with unusual volatility in stock prices.

Third, to strengthen the regulation of shareholding reduction by large shareholders, if necessary a mandatory buy-back system should be established. We suggest the following: (1) when the largest shareholders sell a large proportion of shares at one time (for example, more than 1 per cent), they must announce the reasons for such shareholding reduction, which would help other investors avoid unnecessary panic; (2) when sales by the largest shareholders cumulatively reach a certain proportion of shares (e.g. 5 per cent), they must clarify whether major issues exist that have not been announced or whether the company's main business is operating normally; and (3) a buy-back system should be established to protect stock prices from volatility; if the stock price of a listed company slumps because its largest shareholder sells his shares, regulators should be entitled to require this shareholder to buy back the shares in order to stabilise the market.

Finally, to strengthen control over large sales by majority shareholders during a downturn and over the shareholding-reduction behaviour of state-owned shareholders, we suggest the following: (1) during the downturn, regulators may provide guidance to listed companies and suggest that major shareholders sell their shares prudently, if necessary by requiring those who want to sell a large portion of their shares to submit applications to the stock exchanges in advance for approval; (2) since most Chinese listed companies are state-controlled, it is necessary to enhance control over shareholding reduction by state-owned shareholders through the joint efforts of the CSRC, stock exchanges, the State-owned Assets Supervision and Administration Commission (SASAC), and other relevant government departments, which would not only help prevent market volatility caused by shareholding reduction, but also prevent the loss of state assets caused by improper reduction.

References

Please refer to pp. 162 – 164.

Appendix 1: Proof of lemmas and propositions

Lemma 1

Proof: $\beta_2 \geq \beta_1 \Rightarrow \beta_2 \lambda\pi - \beta_2 E(Z) - C_T - \beta_2(K+K^*) \geq \beta_1\lambda\pi - \beta_1 E(Z) - C_T - \beta_1(K+K^*)$, $\forall \pi$

Since $\pi^*(\beta)$ is the smallest, $\pi^*(\beta_2) \geq \pi^*(\beta_1)$.

Lemma 2

Proof:

$\beta\lambda\pi^*(\beta) - \beta Z^c(\beta) - C_T - \beta(K+K^*) = 0 \Rightarrow Z^c(\beta) = \lambda\pi^*(\beta) - C_T / \beta - (K+K^*) \uparrow$

Lemma 3

Proof:

$I^*(\beta) = \arg \max_{I \in [0,1]} \{B(I, \beta) - C(I)\}$

$B(I, \beta) = I^* E \{\max[\beta\lambda\pi^* - \beta E(Z) - C_T - \beta(K+K^*)], 0\}$

$\partial^2 B / \partial I^2 = 0, \; d^2C / dI^2 > 0$

I^* increases as $\partial B / \partial I = E\max \{\beta\lambda\pi^*(\beta) - \beta E(Z) - C_T - \beta(K+K^*), 0\}$ increases, and $E(Z) \leq \lambda\pi^* - C_T / \beta - K - K^* \leq \lambda\pi^*$.

Therefore, $\beta \uparrow \Rightarrow \beta\lambda\pi^*(\beta) - \beta Z - \beta(K+K^*) \uparrow \Rightarrow \partial B / \partial I \uparrow \Rightarrow I^* \uparrow$.

Lemma 4

Proof: Naturally introduced from **Lemmas 1, 2, and 3**.

Proposition 1

Proof:

$\partial f / \partial\alpha = q + I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] + K + K^* > 0$

Proposition 2

Proof:

$\partial f / \partial\beta = \lambda\pi + (\alpha - \beta)\{dI^*(\beta) / d\beta\}F[Z^C(\beta)]E[Z \mid Z \leq Z^c(\beta)] + (a - \beta)I^*(\beta)d\{F[Z^C(\beta)]E[Z \mid Z$
$\leq Z^c(\beta)]\}d\beta - I^*(\beta)F[Z^c(\beta)]E[Z \mid Z \leq Z^c(\beta)] - (K+K^*)$
$= \Delta - (K+K^*)$

Since the premise of selling shares is $\pi \geq E(Z)$, therefore $\Delta \geq 0$.

When $\Delta \geq (K+K^*)$, $\partial f / \partial\beta \geq 0$.

When $\Delta \leq (K+K^*)$, $\partial f / \partial\beta \leq 0$.

Proposition 3

Proof:

$$\partial f \,/\, \partial C_T = (\alpha - \beta)I^*(\beta)E[Z\,|\,Z \leq Z^c(\beta)]dF[Z^c(\beta)]dC_T$$

$$= (\alpha - \beta)I^*(\beta)E[Z\,|\,Z \leq Z^c(\beta)]\{dF[Z^c(\beta)]dZ^c(\beta)\}\{dZ^c(\beta)dC_T\} \leq 0,$$

whereas $dF[Z^c(\beta)] \,/\, dZ^c(\beta) \geq 0,\ dZ^c(\beta) \,/\, dC_T < 0$.

Lemma 5

Proof: $\beta_2 \geq \beta_1 \Rightarrow \beta_2\pi - \beta_2 E(Z) - C_T - \alpha(K+K^*) \geq \beta_1\pi - \beta_1 E(Z) - C_T - \alpha(K+K^*),\ \forall \pi$

Since $\pi^*(\beta)$ is the smallest, $\pi^*(\beta_2) \geq \pi^*(\beta_1)$.

Lemma 6

Proof:

$$\beta\pi^*(\beta) - \beta Z^c(\beta) - C_T - \alpha(K+K^*) = 0 \Rightarrow Z^c(\beta) = \pi^*(\beta) - C_T \,/\, \beta - a(K+K^*)/\, \beta \uparrow$$

Lemma 7

Proof:

$$I^*(\beta) = \arg\max_{I \in [0,\ 1]}\{B(I,\ \beta) - C(I)\}$$

$$B(I,\ \beta) = I^*E\ \{\max[\beta\pi^* - \beta E(Z) - C_T - \alpha(K+K^*)],\ 0\}$$

$$\partial^2 B \,/\, \partial I^2 = 0,\ d^2C \,/\, dI^2 > 0$$

I^* increases as $\partial B \,/\, \partial I = E\max\ \{\beta\pi^*(\beta) - \beta E(Z) - C_T - \alpha(K+K^*),\ 0\}$ increases, and $E(Z) \leq \pi^* - C_T \,/\, \beta - \alpha K \,/\, \beta - \alpha K^* \,/\, \beta \leq \pi^*$.

Therefore, $\beta \uparrow \Rightarrow \beta\pi^*(\beta) - \beta E(Z) \uparrow \Rightarrow \partial B \,/\, \partial I \uparrow \Rightarrow I^* \uparrow$.

Lemma 8

Proof: Naturally introduced from **Lemmas 5, 6, and 7**.

Proposition 4

Proof: $\partial f \,/\, \partial\alpha = q + I^*(\beta)F[Z^c(\beta)]E[Z\,|\,Z \leq Z^c(\beta)] > 0$.

Proposition 5

Proof:

$$\partial f \,/\, \partial\beta = \pi + (\alpha - \beta)\{dI^*(\beta) \,/\, d\beta\}F[Z^C(\beta)]E[Z\,|\,Z \leq Z^c(\beta)] + (a - \beta)I^*(\beta)d\{F[Z^C(\beta)]E[Z\,|\,Z$$

$$\leq Z^c(\beta)]\}d\beta - I^*(\beta)F[Z^c(\beta)]E[Z\,|\,Z \leq Z^c(\beta)] \geq 0$$

Since the premise of selling shares is $\pi \geq E(Z)$, therefore it is a true statement.

Proposition 6

Proof:

$$\partial f \,/\, \partial C_T = (\alpha - \beta)I^*(\beta)E[Z\,|\,Z \leq Z^c(\beta)]dF[Z^c(\beta)]dC_T$$

$$= (\alpha - \beta)I^*(\beta)E[Z\,|\,Z \leq Z^c(\beta)]\{dF[Z^c(\beta)]dZ^c(\beta)\}\{dZ^c(\beta)dC_T\} \leq 0,$$

whereas $dF[Z^c(\beta)] \,/\, dZ^c(\beta) \geq 0,\ dZ^c(\beta) \,/\, dC_T < 0$.

Appendix 2: The computation process of CAR (market model)

First, we estimate α and β values based on the daily return of individual stocks and daily market returns during tripled event time periods:

$$R_{i,t} = a_i + \beta_i \times R_{m,t} + \varepsilon_{i,t}$$

where $R_{i,t}$ is the daily return of stock i on day t; $R_{m,t}$ is the daily market return on day t; if the stock is listed in the Shanghai market, we adopt the daily market return of the Shanghai Stock Exchange; if the stock is listed in the Shenzhen market, we adopt the daily market return of the Shenzhen Stock Exchange.

The second step, based on the estimated α and β coefficients, calculates daily returns over the event period:

$$AR_{i,t} = R_{i,t} - E\,[R_{i,t}] = R_{i,t} - (\alpha_i + \beta_i \times R_{m,t}),$$

where $AR_{i,t}$ is the daily abnormal return of stock i on day t, and $E[R_{i,t}]$ is the expected return of stock i on day t estimated based on the market model.

Thus, the average abnormal returns AAR_t of n samples on day t are as follows:

$$AAR_t = \frac{1}{n} \sum_{i=1}^{n} AR_{i,t}$$

Finally, we calculate the average cumulative abnormal return (CAR) of n samples in the event period of $[-W, +T]$:

$$CAR_t = \sum_{j=-w}^{T} AAR_{j,t}$$