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Bank Runs in Emerging-Market Economies:

Evidence from Turkey's Special Finance Houses

by

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Abstract

Recent banking crises in emerging-market countries have renewed debates about deposit insurance. Because insurance erodes banks' incentives to manage risks prudently, some argue that its elimination would improve bank stability. Yet eliminating insurance could be de-stabilizing if it recreates risks of self-fulfilling runs. This paper examines dynamics of depositor behavior during a set of runs on Turkey's Special Finance Houses, an uninsured sub-sector of Islamic banks. Detailed data on withdrawals are analyzed in a vector-autoregressive framework that enables us to distinguish between informational and self-fulfilling elements of runs. We find that both types of dynamics were at work during the runs, suggesting a role for deposit insurance, judiciously used, in ruling out expectational problems that fuel tendencies to run.

Introduction

Recent decades have seen an increase in the incidence of banking crises in emerging-market countries, reflecting combined effects of financial liberalization, mobile global capital, and under-regulation (Kaminsky and Reinhart 1999). Banking and financial crises are a particular problem in countries in intermediate stages of development, perhaps because partially developed credit markets magnify effects of exogenous shocks (Aghion, Bacchetta, and Banerjee 2003). Banking crises also tend to be more severe in emerging-market countries than in the developed world, both in terms of budgetary costs of resolving them and in terms of reductions in real economic activity (Rojas-Suarez and Weisbrod 1996, Caprio and Klingebiel 1996).

The role of deposit insurance in banking crises is a subject of debate. Diamond and Dybvig (1983) demonstrated theoretically that, when first-come-first-served rules are used to accommodate withdrawals, any shift in expectations that makes depositors anticipate a run, whether or not it conveys anything fundamental about a bank's condition, can in fact lead to one. In this case, deposit insurance is beneficial for banking stability since bad news will no longer cause depositors to rush to withdraw, just because they fear that other depositors will. However, deposit insurance also reduces banks' incentives to manage risk prudently. Especially in systems where banks are under-regulated, deposit insurance may lead banks take on too much risk, knowing that the government would absorb depositors' losses should they become insolvent. Thus, it is unclear a priori whether deposit insurance increases or decreases banking stability.[1]

At issue in this debate has been the characterization of depositor behavior during bank runs. In contrast to the Diamond-Dybvig view of runs as self-fulfilling, Chari and Jagannathan (1988) argue that runs are brought on by problems of uncertainty and asymmetric information about banks' financial conditions. In their portrayal, runs reflect a signal extraction problem in which some individuals receive a noisy signal about the bank's return, which may lead them to withdraw funds early; other depositors must infer from observed withdrawals whether a negative signal was received by informed depositors, or whether liquidity needs happen to be high. Here bank runs occur because uninformed depositors misinterpret liquidity shocks as bad

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[1] Demirguc-Kunt and Detragiache (2002) investigate this question empirically, using data on 61 countries in 1980-1997; they find that the probability of a banking crisis is greater when the government offers generous deposit insurance. However, Eichengreen and Artela (2000) show that this result is not robust to changes in econometric specification.

news about the condition of bank assets. But in this perspective bank runs are not inefficient and should be allowed to happen.[2]

Some previous research has attempted to distinguish between informational and self-fulfilling views of bank runs. In studies of bank runs in the U.S. before the introduction of deposit insurance in 1933, it is a consistent finding that runs tended to occur in periods of deteriorating economic fundamentals (Gorton 1988, Calomiris and Gorton 1991). A number of studies also find that banks with weaker pre-run balance sheets tended to face the heaviest withdrawals during them.[3] Similarly, Schumacher (2000) shows that, in the bank runs in Argentina in 1994, deteriorating fundamentals contributed to the onset of the runs, and the banks most likely to lose deposits and fail during the crisis were those that had been weakest before it.[4] While these studies are consistent with an informational view of runs, they do not rule out the possibility that runs have self-fulfilling aspects; they only establish that runs are not 'sunspots' unrelated to fundamental factors. As such, it remains possible that, as Chen (1999) argues, there are *both* first-come-first-served and informational elements at work in bank runs.

To investigate the importance of self-fulfilling and informational dimensions of bank runs, this paper analyzes the dynamics of depositor behavior during a set of runs that occurred in Turkey in the first part of 2001. Turkey's large and troubled commercial-bank sector had been covered by deposit insurance since 1984; combined with problems of insider lending and under-regulation, implicit and explicit promises of government bail-out had caused widespread problems with failure, insolvency and illiquidity in the commercial-banking sector. However, this paper examines a sub-sector of the Turkish banking industry that was not covered by deposit insurance and had not been subject to the same moral-hazard problems: the Special Finance Houses (SFHs). The SFHs are Shariah-compliant bank-like financial institutions in which costs of borrowing and returns to lending are based on risk participation, rather than interest payments. Part of a broad-based international movement to promote principles of Islamic finance, in Turkey Islamic banks are a sub-sector of the banking industry and compete with banks that charge and offer interest; for the most part, they operate much like conservatively managed banks. To our knowledge, the international scholarly literature has not yet included a detailed study of Islamic banking in Turkey, nor has it explored how Islamic banks contend with periods of macro/financial crisis that include bank runs. More generally, there is very little

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[2] See also Jacklin and Bhattacharya (1988) and Samartin (2003).
[3] See, for example, Saunders and Wilson (1996), Calomiris and Mason (1997), and Calomiris and Wilson.
[4] At that time, the Agentine banking system was not covered by deposit insurance, although the government reintroduced limited deposit insurance after a few banks failed.

contemporary empirical evidence on the dynamics of depositor behavior during bank runs, for either the developing or the developed world.[5]

In February 2001, the largest finance house in Turkey became insolvent due to irregular use of funds and was abruptly closed. Occurring at the same time as a macro/financial crisis, runs on the other SFHs erupted, resulting in a sizable loss of deposits in the sector. We argue that, while there were valid reasons for depositors to be concerned about the safety of their funds, their sense of urgency about getting their money out of the SFHs was out of proportion with the risk, and is best interpreted as prompt reaction to noisy bad news that escalated into a panic. Because we have detailed withdrawal information from one SFH, we are also able to investigate how depositors of different sizes reacted to each other's withdrawals, using a vector-autoregressive (VAR) framework. This is to our knowledge the first time VAR analysis has been used to analyze depositor behavior during a bank run. We find that increased withdrawals by moderate-size accountholders tended to boost withdrawals by smaller counterparts, suggesting that the latter viewed the behavior of the former as informative with respect to the SFH's financial condition. Yet we also find that increased withdrawals by smaller accountholders tended to boost withdrawals by moderate-size accountholders, and that increased withdrawals by moderate-size accountholders tended to boost withdrawals by large accountholders -- effects that are more consistent with concerns about self-fulfilling elements of runs. We interpret our findings as consistent with the argument of Chen (1999) –- that there are both first-come, first-serve and informational elements involved in bank runs. This suggests a role of deposit insurance, judiciously used, to rule out inefficient aspects of runs.

The Special Finance Houses in the context of Turkish banking

Turkey's Special Finance Houses (SFHs) are bank-like institutions that offer Shariah-compliant financial services. As such, they make loans and take deposits in ways that respect the Qur'ān's prohibition against interest, based on the idea that it is inequitable and unfair for a lender to earn a fixed return while the borrower bears all the risk and exerts all the effort.[6] Instead, costs of funds to borrowers and returns to lenders are based on mechanisms for sharing profit and loss.[7] In most countries, Islamic banks constitute sub-sectors of national banking industries

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[5] A notable exception is Schumacher (2000).

[6] For recent overviews of principles and practices of Islamic banking and finance, see Ahmad (1994), Iqbal (2001), Zaher and Hassan (2001), and Kahf (2002). Note, however, that there is active discussion within the field of Islamic economics about what exactly the Qur'ān bans; see Kuran (1989: 174, 1995: 158).

[7] Several studies point out that profit-and-loss arrangements may entail important principal-agent problems: notably, the borrower has incentives to under-report income and over-invest in assets (see the valuable collection of studies in Iqbal and Llewellyn 2002). Thus, not

and compete with interest-oriented banks; only Iran, Pakistan and Sudan have banking systems that are primarily or exclusively Islamic.[8] While Islamic banks have grown to have 10-20% shares of total deposits in countries such as Egypt and Kuwait, in Turkey their share has remained in a 1-3% range, in part reflecting ambivalence in Turkey towards mixing religious principles with public life. Note, however, that the SFHs frame themselves not as institutions advancing religious principles, but rather as profit-oriented businesses catering to consumer tastes.[9]

First authorized to operate in Turkey in 1983, three foreign-owned finance houses began operations in the 1980s, and another three domestic houses entered the market in the 1990s (see Table 1). The SFHs can engage in all the activities of a commercial bank, as well as leasing and commodity trading. However, they take deposits and make loans in ways that do not involve payment or receipt of interest, but rather are based on risk participation. Their main source of funds is profit-and-loss participation accounts.[10] Depositors invest funds for a given term (1 month, 3 months, 6 months, 1 year, and longer terms up to 5 years), and receive returns based on the investment projects financed with their funds; for each maturity, returns are calculated weekly and reported in newspapers. There is no guarantee of a positive return or return of principal. As such, profit-and-loss accounts are to some extent more like mutual funds with set maturities than they are like traditional bank deposits. The main use of funds by SFHs is short-term loans (typically 4-5 months in duration) provided to small- and medium-sized companies needing capital. This sort of financing, known as *murabaha*, represents 90% of the SFH's total use of funds; as discussed in Kuran (1995: 162), the concentration of lending in this low-risk form implies that returns, if not guaranteed, are highly predictable.[11] SFHs also offer financial leasing and full or partial funding for long-term business projects, known as *mudharabah* and *musharakah* participations respectively. The SFH keeps 20% of income from lending activities and 80% is distributed to accountholders. While the SFH sector had been

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surprisingly, Islamic banks report that monitoring costs and misreporting of income are problems that tilt them against making loans, whereas a customer's reputation, experience, and commitment to Islamic rules would tilt them in favor (Khalil, Rickwood and Murinde 2002). In contrast, Presley and Sessions (1994) argue that profit-and-loss sharing is valuable for overcoming problems of asymmetric information that may inhibit lending.

[8] Moore (1990) compares experiences across countries in the growth of Islamic banking. See Khan and Mirakhor (1990) and Cornelisse and Steffelaar (1995) on full-fledged Islamic banking. Note also that some major conventional banks, like HSBC and Citibank, have launched Islamic banking divisions that operate internationally.

[9] See *Financial Times* (1998).

[10] Profit-and-loss accounts represent 90-95% of the value of SFHs' deposits. The remaining 5-10% are "special current accounts" –- demand deposits that pay no return.

[11] Indeed Kuran (1995: 162), among others, argues that *murabaha* financing does not effectively involve risk-sharing and so should instead be seen as a 'cumbersome form of interest.' Aggarwal and Yousef (2000) make a similar argument.

growing consistently and was viewed as a dynamic sector, as of 2000 it constituted a tiny sliver of the banking sector, holding less than 3% of its total deposits.[12]

Although the SFHs were traditionally regulated separately from commercial banks, the bank law of 1999 had brought them under the same regulatory requirements and apparatus.[13] They were required to meet the same minimum capitalization as banks, the same required reserve ratios, and the same liquidity ratios. Like commercial banks, the SFHs must report weekly to the central bank on their foreign-currency position. However, the Special Finance Houses were not covered by deposit insurance, with the rationale that profit-and-loss accounts involved no guarantee of return of principal.[14]

As Table 2 shows, the balance sheets of the SFHs were notably stronger than those of the commercial banks in the period before the crisis, reflecting their conservative, interest-averse strategies. The SFHs tend to be squarely focused on traditional banking activities of deposit-taking and making loans: in 1999 deposits constituted 88% of their liabilities and loans were 76% of their assets, compared to figures of 62.7% and 28.3% respectively at commercial banks. In place of traditional lending to large businesses (some part of which had shifted to Turkey's emerging capital markets), the commercial banks were increasingly involved in raising short-term non-deposit funds abroad and investing them domestically in government securities paying high interest rates. This practice built a fair amount of risk into banks' balance sheets since investors would want to liquidate their holdings if devaluation risks rose, at the same time as lira-denominated securities became difficult to sell. The SFHs were also much dollarized than commercial banks: in 1999, 93% of their deposits and 86% of their loans were denominated in a foreign currency, compared to shares at commercial banks of 53% and 49% respectively. Finally, although non-performing loans were on the rise at both SFHs and banks towards the end of the 1990s, at commercial banks non-performing loans had risen to 11.7% of total loans, versus 1.6% at the SFHs.[15] That the financial condition of the SFHs was stronger

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[12] Calculated from Treasury Statistics and the *Banks in Turkey* report of the Banks Association of Turkey.

[13] At this time, Turkey had begun concerted efforts to bring its banking regulations in line with the Basel Accord, in anticipation of a possible application for membership in the European Union.

[14] Also unlike commercial banks, failed SFHs would not be transferred to the Saving Deposit Insurance Fund for reconciliation. Given the Turkish government's history of extending the safety net during banking crises, one can ask whether the SFHs may have nonetheless expected the government to step in and bail them out in the event of a financial crisis. This seems unlikely, since the SFHs had variable political support and were periodically threatened with closure by critics in Parliament for their blending of religion and business (see, e.g. *Turkish Probe* 1998).

[15] This includes loans of banks that had been taken over by the Deposit Insurance Fund.

than that of commercial banks is suggested by the fact that their returns to U.S. dollar accounts were lower than those of commercial banks (see figure 1).[16]

The 2001 runs on the SFHs

As in many emerging-market banking crises, the runs on the Special Finance Houses occurred during in a period of macroeconomic and financial crisis. In 1999, Turkey had embarked on an IMF-supported stabilization program that was intended to bring inflation down using a crawling exchange-rate peg, while reducing fiscal imbalances through privatization. But by late 2000, continued heavy government borrowing created doubts about whether the peg could be sustained. In a first wave of pressure on the peg in November 2000, the central bank ran down $7 billion of its reserves to support the Lira, and the crisis abated only when a $10 billion loan was arranged with the IMF. Yet financial markets continued to expect a departure from the peg, and by February 22 the pressure on it became so severe that government had to let the lira float. It immediately depreciated by 30%.

Also during February, the largest finance house, Ihlas Finans, had its license revoked by the Banking Regulation and Supervision Agency (BRSA) and abruptly closed its doors. It emerged that Ihlas principals had irregularly appropriated $1 billion (practically the entire value of deposits) through connected lending to shareholders. This came as a considerable shock: Ihlas had been a well-regarded market leader and had 40% of the sector's deposits.[17] The news put immediate pressure on the other finance houses. Numerous public statements were issued by the BRSA and the individual SFHs concerning the robust finances of the rest of the sector, but they did little to stem a run-off of deposits. As shown in Table 3 and Figure 2, assets of all SFHs declined 63% in the first quarter of 2001; between December 2000 and June 2001, the assets of the 5 remaining houses fell by more than 1/3.[18] Many depositors sought to withdraw their funds before maturity, and initially the SFHs accommodated such requests. But as the runs

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[16] This is not necessarily to say that the balance sheets of the SFHs were rock-solid: for example, ratios of shareholder equity to total assets were lower in the SFHs than in the commercial banks. Wile this difference would be expected given the lower risks of SFHs' assets, in both sectors levels of capital-asset ratios were relatively low by international standards. Note that, for the 1990-93 period, Köfteoğlu (1994) found conventional and Islamic banks to have virtually identical nominal returns, and those at the latter were not more variable than those at the former (cited in Kuran 1995: 161). Kuran (1995: 162) argues that this reflects the *de facto* concentration of SFHs' assets in low-risk, mark-up trade credit.

[17] Concerns about Ihlas's finances first emerged in late 2000, when it seemed to have more trouble in the first wave of financial crisis than would have been expected, but the fact that its problems were severe was not recognized until it was closed.

[18] Calculations from the Association of the SFHs; for details see Yilmaz (2003). Of course the February 22 devaluation lowered the U.S. dollar value of the local-currency deposits, but because such deposits had represented less than 10% of the sector's total deposits, this contributed only minimally to the decline in value.

continued, some had to restrict early withdrawals. On Feb. 21, the special finance houses took out newspaper ads announcing their intention to set up a private insurance fund to cover deposits, with government approval but not financial support.[19] It is not clear, however, that this measure had any effect in stemming the outflow of deposits.

Figure 3 shows daily data on withdrawals from the finance house from which we have detailed data, Kuwait Turk Evkaf Special Finance House (KTEFH). Established in 1988, KTEFH was the third largest finance house and was (and is) foreign-owned: a 62% ownership share is held by the Kuwait Finance House, and 9% shares are held by both the Kuwait Social Security Institution and the Islamic Development Bank.[20] This foreign connection is important since it enabled KTEFH to obtain support from the foreign parent during the liquidity crunch. The data cover the period from February 12, the first business day after the closure of Ihlas had been announced, to April 25, when net flows into the SFH turned positive again. Withdrawals were heavy during the first week of the run; there was perhaps some abatement after ninth day of the run, when the lira had been devalued and the SFHs announced their agreement to set up a private insurance fund. Then the following week there was a regularly scheduled holiday 4-day holiday, with banks open on Friday only –- and KTEFH experienced its greatest number of withdrawals of the whole run.

As can be seen from the dashed line in the figure, the time profile of withdrawals is almost entirely due to withdrawals of amounts less than US$5,000; such withdrawals accounted for 93.3% of the total number of withdrawals during the February-April period. While this might suggest that small accountholders were responsible for the run on KTEFH (and it was certainly them queuing up outside the bank), the distribution of amounts withdrawn suggests a different picture. As Table 4 indicates, though small accountholders made over 90% of the number of withdrawals, they were responsible for less than 15% of the *amount* withdrawn. Accountholders making withdrawals of $20,000 or more made less than 2% of the number of withdrawals, but were responsible for 62% of the amount withdrawn.[21] Comparing these numbers to the distribution of accounts, withdrawals appear to have been more or less proportionate to the distribution of deposits. This suggests that the withdrawals of relatively large accountholders contributed centrally to SFH's liquidity problems -- not because they made withdrawals

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[19] *Turkish Daily News* (2001). This provision became part of the Banks Act No. 4672 (29 May 2001), Article 20/6-b.

[20] Additionally, the General Directorate of Associations Turkey held 18% of shares, with a final 2% owned by other shareholders.

[21] Other studies also find small shares of depositors responsible for large shares of withdrawals. Schumacher (2000: 261) found that, in the first phase of the 1994-95 banking panic in Argentina, some 2,000 accountholders with deposits exceeding $1 million were responsible for 75% of the decrease in the total deposits of the banking system.

disproportionate to their deposits, but rather because only their claims were large enough to run down cash reserves.

Distinguishing between self-fulfilling and informational aspects of runs

To distinguish between self-fulfilling and informational aspects of depositor behavior during bank runs, we examine interactions between withdrawals of different categories of depositors over the course of the run. As discussed above, in informational theories of bank runs, some depositors get early access to information about bank solvency, while others must infer from observed withdrawals whether liquidity needs happen to be transitorily high, or whether there is something fundamentally wrong with the bank. A reasonable assumption in this regard is that relatively large depositors are better-informed about the bank's condition than small depositors. Large depositors are likely to have more skill and experience in collecting and interpreting financial information. They are also more likely to engage in privileged exchange of information with the bank. In the present case, some evidence on this latter point concerns a spike on the 20th day of the run in net withdrawals from profit-and-loss accounts by large depositors (see Figure 4). Curiously, there was no corresponding spike in net withdrawals from *all* accounts, suggesting that deposits into the other account category (special-current accounts) offset withdrawals from profit-and-loss accounts. It turns out that this was the case. The 20th day of the run was March 15, the last day for companies to make tax payments; large depositors had communicated their withdrawal needs to the SFH's officials, who in turn arranged for a cash infusion from the Kuwait Finance House to cover the spike in liquidity needs. Especially if larger depositors indeed engage in privileged exchange of information with the bank, as it seems that they do, and informational elements of runs are important, we would expect all types of depositors to watch the withdrawal behavior of relatively large depositors, and to increase their own withdrawals when those of large depositors rise unexpectedly, since such a rise could be expected to be informative with respect to the bank's condition. However, we would not expect unanticipated fluctuations in withdrawals by small depositors to have much effect on withdrawals overall, since the information content of their behavior is likely to be low.

Potentially, reactions by smaller depositors to withdrawals by larger depositors are also consistent with self-fulfilling runs: Even if neither group of depositors has privileged insights into the bank's condition, withdrawals by both small and large depositors should be influenced especially by shocks to withdrawals by large depositors; because the latter usually hold a disproportionate share of deposits, a shock to their withdrawals will especially reduce other depositors' chances of withdrawing funds. However, unless there are self-fulfilling elements to

runs, we would not expect elevated withdrawals by small depositors to have much effect: they are not likely to have superior insights into the condition of the bank, and the amounts of their withdrawals are limited relative to the bank's total liabilities. Thus, finding reactions of larger depositors to withdrawals of smaller depositors is suggestive of problems with self-fulfilling expectations -- since depositors would seem to be rushing to withdraw because other depositors are rushing to withdraw, not because other depositors' behavior is revealing information about the condition of the bank.

We use vector autoregressive (VAR) analysis to investigate how unexpected changes in withdrawals by some types of depositors affect the withdrawals of others. Depositors are divided into three categories: small depositors, with accounts under \$5,000; medium-sized depositors, with accounts between \$5,000 and \$49,999; and large depositors, with accounts \$50,000. These breaks were chosen to keep each category sufficiently large in terms of levels and numbers of withdrawals; results are qualitatively similar when alternative cut-offs are used.[22] The structure of the model is as follows:

$$X_t^S = \beta_o^S + \sum_{i=1}^{\tau} \beta_{t-i}^{SS} X_{t-i}^S + \sum_{i=1}^{\tau} \beta_{t-i}^{SM} X_{t-i}^M + \sum_{i=1}^{\tau} \beta_{t-i}^{SL} X_{t-i}^L + \varepsilon_t^s \qquad [1]$$

$$X_t^M = \beta_o^M + \sum_{i=1}^{\tau} \beta_{t-i}^{MS} X_{t-i}^S + \sum_{i=1}^{\tau} \beta_{t-i}^{MM} X_{t-i}^M + \sum_{i=1}^{\tau} \beta_{t-i}^{ML} X_{t-i}^L + \varepsilon_t^M \qquad [2]$$

$$X_t^L = \beta_o^L + \sum_{i=1}^{\tau} \beta_{t-i}^{LS} X_{t-i}^S + \sum_{i=1}^{\tau} \beta_{t-i}^{LM} X_{t-i}^M + \sum_{i=1}^{\tau} \beta_{t-i}^{LL} X_{t-i}^L + \varepsilon_t^L \qquad [3]$$

where X_t^S, X_t^M and X_t^L are withdrawals by small, medium and large depositors respectively. Thus, for example, equation [1] expresses withdrawals by small depositors at time t as a function of their own lagged deposits, those of medium and large depositors, and an innovation

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[22] In particular, using alternative sets of cut-offs of {under \$1K, \$1-49K, \$50K+} or {under \$1K, \$1-4.9K, \$5K+}, withdrawals from 'small' accounts rise also after a shock to withdrawals from 'medium-sized' accounts, and vice versa, and withdrawals from 'large' accounts rise after a shock to withdrawals from 'medium-sized' accounts. Analysis based on divisions of depositors into two categories is less consistent, although some divisions also show withdrawals from larger accounts rising after a shock to withdrawals from smaller accounts.

$\varepsilon_t{}^S$. In principle, the innovations to withdrawals by depositors in one category can reflect an unanticipated change in their own withdrawals, and/or responses to a concurrent unanticipated change in withdrawals by depositors in other categories. In practice, additional identifying assumptions are needed to recover these underlying shocks to withdrawals. Here we use a standard recursive approach, ordering the categories of depositors from small to medium to large:

$$\varepsilon_t{}^S = \mu_t{}^S$$
$$\varepsilon_t{}^M = \alpha^{MS} \mu_t{}^S + \mu_t{}^M$$
$$\varepsilon_t{}^L = \alpha^{LS} \mu_t{}^S + \alpha^{LM} \mu_t{}^M + \mu_t{}^L$$

In effect, this specification assumes that, on any given day, the behavior of small accountholders may be observed concurrently by medium and large accountholders, the behavior of medium-sized accountholders may be observed concurrently by large but not small accountholders, and the behavior of large accountholders is not observed concurrently by either small or medium account holders. That medium and large accountholders can observe the behavior of small accountholders concurrently is consistent with their numerical predominance: because they represent over 90% of total accountholders, a large queue outside the bank must be dominated by them. In line with the argument made earlier, the behavior of large depositors is likely to be hard for small and medium-sized depositors to observe concurrently: not only are they few, but also their banking needs may be handled out of public view.[23]

Two versions of the VAR are estimated: one based on withdrawal amounts, and another based on numbers of withdrawals (both expressed in logs). Our data cover the 48 business days of the run, starting on February 12, 2001, and ending on April 25. A vector-autoregressive model will not be appropriate if any of the data series included in the model contain unit roots. Table 5 shows results of three tests: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP), which have as their null hypothesis that the data contain a unit root, and Kwiatkowski-Phillips-Schmidt-Shin (KPSS), which has as its null hypothesis that the data are stationary. All tests on the levels and numbers of withdrawals by small and large depositors show these series to be

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[23] Note that, while VAR results are potentially sensitive to alternative ordering assumptions, that is not the case here: Regardless of the ordering used, in the specifications using levels of withdrawals, shocks to withdrawals by small depositors significantly influence those of medium-sized depositors, and vice versa, while in specifications using numbers of withdrawals, shocks to withdrawals of medium-sized depositors significantly affect those of both small and large depositors. These same findings come out of bivariate and trivariate Granger causality tests.

stationary. For medium-size depositors, the ADF test for the level of withdrawals does not reject the null hypothesis, while that for the number does, but at a 10% level only. Even so, the other two tests show the levels and numbers of withdrawals from medium-sized accounts to be stationary, and the series anyway do not have a characteristic non-stationary appearance (see Figure 5). Consequently, we take this finding to be spurious and treat the series as stationary.

In the VARs for both levels and numbers of withdrawals, we include dummy variables for days of the week; as is apparent from Figure 3, withdrawals especially from smaller accounts tended to be higher on Mondays and to decline somewhat in midweek. Since the level of withdrawals on March 15 was extremely high, in good part due to the tax deadline, we include a dummy variable for this date in the VAR for levels of withdrawals. While inclusion of this dummy makes the model better behaved, results are qualitatively unaffected when it is excluded. A variety of tests were used to determine the number of lags of the X's to include in the analysis; for both VARs, most tests selected a length of one.[24]

Figure 6 shows impulse response functions from the VAR based on amounts of withdrawals; dashed lines around the impulse response show 99 percent confidence intervals. As shown in the first row, a one standard-deviation shock to withdrawals from small accounts significantly boosts withdrawals from such accounts, with the effect dwindling down over the course of the next week. Thus, small depositors appear to be fairly responsive to each other's withdrawal behavior; the relatively slow rate at which the effect dwindles down could reflect slowness of withdrawals due to queues, time lags in the circulation of information, and/or time lags in decisions about what to do. A shock to withdrawals from medium-size accounts also boosts withdrawals from small accounts, although here the effect is of only borderline significance. A shock to withdrawals from large accounts does not significantly affect withdrawals from small accounts, consistent with the idea that the behavior of large depositors is hard for other depositors to observe. Overall, as the variance decomposition shown in Table 6 indicates, almost all of the variance in withdrawals from small accounts is explained by shocks to withdrawals from small accounts; for example, at a 10 day horizon, the share of the variance is 88%.

A shock to withdrawals from medium-size accounts also tends to boost withdrawals within this account category (second row). Here the effect is relatively large initially but tapers way down

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[24] The tests include the Schwartz and Hannan-Quinn information criteria, sequential modified likelihood ratio, and final prediction error. The Akaike information criterion selected a lag length of 9 (from a maximum of 9), but models estimated with 9 lags were poorly behaved.

thereafter; this relatively fast reaction suggests that lags in information flows or decision times may be shorter among medium-size versus small depositors. Again a shock to withdrawals by large depositors does not significantly affect withdrawals of medium-size depositors. However, withdrawals from medium-size accounts do pick up significantly after a shock to withdrawals from small accounts, with the effect taking a week or so to die out. Also, these effects of shocks to small accounts explain a sizable share of variance in withdrawals from medium-size accounts –- almost 2/3 at a 10-day horizon, as shown in Table 6. Thus, medium-size depositors seem to react importantly to the withdrawal behavior of small depositors -– a reaction that is more consistent with concerns about self-fulfilling elements of runs, than with reaction to information.

Lastly (third row), withdrawals from large accounts do not appear to be significantly affected by shocks to withdrawals from small accounts; this suggests that, unlike medium-size depositors, large depositors do not regard elevated withdrawals among small depositors as signaling greater potential for a self-fulfilling run. Withdrawals from large accounts move up a bit after a shock to withdrawals from medium-size accounts, though the effect is borderline in significance. In contrast, large depositors react strongly and immediately to a shock to withdrawals from large accounts, and this effect accounts for the vast majority of the variance in withdrawals from this category (86% at a 10 day horizon). Thus, while large depositors may ignore queues of small depositors outside the SFH, they seem keenly attuned to unexpected changes in withdrawals of depositors like themselves. While this is consistent with the idea that large depositors interpret elevated withdrawals by other large depositors as reflecting news about the SFH's financial condition, another possibility is that, because a loss of large deposits itself erodes the SFH's condition, it may provoke other large depositors to withdraw their funds, regardless of what originally caused the increase in withdrawals.

As an alternative specification, we also ran the VAR based on numbers of withdrawals. As can be seen from Figure 7, several of the results are qualitatively similar to those from the VAR based on withdrawal amounts. Again, within each account category, a shock to the number of withdrawals subsequently boosts the number of withdrawals in that account category; for both small and large depositors, most of the response occurs the next day, whereas for medium-size depositors it takes about a week to die out. Here again, a shock to withdrawals by small depositors tends to boost withdrawals from medium-size accounts, consistent with self-fulfilling elements.

In a finding that differs in the VAR based on numbers of withdrawals, withdrawals from medium-sized accounts tend to boost withdrawals from both small and large accounts, and the

effect is significant in both cases; also, shocks to withdrawals from medium-size accounts contribute appreciably to variance in withdrawals from both small and large accounts, with shares of 25 to 35% at a 10-day horizon (Table 6). Conceivably, the effect on withdrawals from small accounts may be informational: Medium-size depositors may be better informed about the SFH's financial condition than small depositors, and small depositors may be more closely connected to them than they are to large depositors, so that small depositors would view withdrawals from medium-size accounts as containing information on the SFH's condition. At the same time, it seems unlikely that the effect of withdrawals from medium-size accounts on those from large accounts is informational, since medium-size depositors are probably not better informed about the SFH's condition than large depositors. Rather, large accountholders may view withdrawals from more sizable accounts as having the potential to create self-fulfilling problems with solvency, even if the finances of the bank would otherwise be sound; thus, although they may ignore queues of small depositors outside the SFH, there is some evidence that they react to loss of deposits from more sizable accounts.

Discussion

To what extent should we interpret the runs on Turkey's special finance houses as a self-fulfilling Diamond-Dybvig reaction to random bad news, or as a fast yet justified response to noisy information? As found in most previous studies, informational factors clearly were important in triggering these runs. The sudden closure of Ihlas no doubt made depositors revise upward the probability of undetected financial problems in the other finance houses, especially given the tendency among commercial banks for problems turning up at one bank to turn up at others. Moreover, the accompanying macro/financial crisis would also have led to increased withdrawals, both because of devaluation-related concerns about liquidity and solvency within the SFHs and because, fearing disruptions in economic activity, depositors would have wanted to shift their assets into hard-currency cash. Indeed, real GDP declined sharply in 2001, and to the extent that people anticipated this possibility at the onset of the crisis, it would have been prudent for them to put aside a buffer stock of hard-currency cash to be used to support consumption in a period of falling income.

And yet, there were also several elements of *over*reaction in the dynamics of the runs on the SFHs. First, while the failure of Ihlas surely boosted perceived risks of holding deposits in the SFHs, there was no reason to assume that risks of others failing were large or imminent: As much as depositors would have discounted official pronouncements on the solvency of the remaining SFHs, it was also true that, *unlike* Ihlas, the other SFHs had come through the November-December crisis without having faced severe liquidity problems. Thus, the better ex

ante assumption would have been that none of the other SFHs were in as bad shape as Ihlas.[25] Second, depositors initially ran on all of the SFHs, without apparent regard to differences in financial condition or likely ability to mobilize resources to withstand a run. Notable in this regard was the run on KTEFH, which was known to have the backing of its deep-pocketed Kuwaiti parent company. Ex post, the total deposits of the SFH sector not only declined but were also reallocated across SFHs, with KTEFH, Family Finans and Asya gaining market share and Anadolu and Al Baraka losing it (Table 3). However, this reallocation does not seem consistent with ex ante estimations of differences in risk across institutions: based on pre-run returns to U.S. dollar accounts (Table 1), Anadolu and Al Baraka were apparently not regarded as riskier than KTEFH, while Family Finans and Asya seemed to be seen as more so. Rather, the reallocation across houses seemed to reflect their abilities to manage the run on a day-by-day basis. For example, it was rumored that foreign-owned Al Baraka would be able to arrange a line of credit from the Islamic Development bank (one of its shareholders), but such financing never came through, and jitters about its liquidity brought its deposits down by 42% -- compared to the 22% decline experienced by KTEFH.

Third, while the macro/financial crisis no doubt provided impetus for depositors to withdraw funds, concretely there was no reason for the decline in macro/financial conditions to provoke large and immediate withdrawals from the SFHs. Unlike the commercial banks, the highly dollarized, conservatively managed balance sheets of the SFHs did not stand to deteriorate greatly as a result of devaluation: over 90% of their deposits were already in dollar-denominated accounts; with over 80% of their loans dollar-denominated, the 'currency mismatch' between their assets and liabilities was relatively limited; and their assets were overwhelmingly dominated by shorter-term low-risk loans. Moreover, even if people would have wanted to draw down their assets to support consumption during an aggregate downturn, this would not have required sudden and complete withdrawals of funds from the SFHs; given how conservatively the balance sheets of the SFHs had been managed, and the limited increase in risk implied by the failure of Ihlas, depositors could have assumed that they would have been able to withdraw funds to finance spending as needed -- *but for* the concern that other depositors would rush to withdraw their funds. In other words, although the noisy information related to the failure of Ihlas and the devaluation was not at all a 'sunspot,' the development of runs on the SFHs did not grow inevitably out of fundamental economic and financial factors -- but rather likely reflected compound risks of deteriorating fundamentals *and* depositors'

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[25] This assumption would have been confirmed ex post: despite the great pressure on liquidity during the runs, none of the SFHs came close to failing -- although Family Finans (until then named Faisal Finans) did change hands due to problems coping with the runs.

concerns about sequential servicing. Thus, funds flowed out of the SFH sector and into 'mattress cash.'

Conclusion

In sum, while fundamental factors were clearly influential in initiating the runs on Turkey's Special Finance Houses in 2001, the magnitude of withdrawals from the SFHs was in certain respects out of proportion with the risk, suggesting a degree of overreaction. From our analysis of detailed data on withdrawals from a financially strong SFH, we find evidence that both informational factors and self-fulfilling tendencies were at work in the dynamics of the run. Increased withdrawals by moderate-size accountholders tended to boost withdrawals by smaller counterparts, suggesting that the latter viewed the behavior of the former as informative with respect to the SFH's financial condition. Yet we also find that increased withdrawals by smaller accountholders tended to boost withdrawals by moderate-size accountholders, and that increased withdrawals by moderate-size accountholders tended to boost withdrawals by large accountholders -- effects that are more consistent with concerns about self-fulfilling elements of runs. We interpret our findings as consistent with the argument of Chen (1999) –- that there are both first-come-first-served and informational elements involved in bank runs. This suggests that, as much as overly generous deposit insurance has contributed to excessive risk-taking by banks in emerging-market countries, some amount of insurance may be important for ruling out risks of inefficient runs, by reducing relatively uninformed depositors' incentives to rush to withdraw in periods of macro/financial uncertainty. This implies a possibility that some level of partial insurance –- generous enough to cover average depositors, but not so generous to cause moral hazard problems –- could contribute positively to bank stability in emerging-market economies, although further research into the precise trade-offs involved is required.

Table 1. Turkey's Special Finance Houses

	Abbrev.	Est.	Ownership	Total deposits (1999)		Return to 1-year US$ account (2000)
	(a)	(b)	(c)	(d)	(e)	(f)
				Amount (m. of US$)	Share of SFH total	Percent
Al Baraka Turkish Finance House	ABTFH	1984	Foreign	629	23.5	6.1
Family Finance House	FFH	1984	Initially foreign; bought out by Turkish shareholders in 1998	190	7.1	6.6
Kuwait Turkish Evkaf Finance House	KTEFH	1988	Foreign	383	14.3	6.1
Anadolu Finance House	AFH	1991	Turkish	222	8.3	5.9
Ihlas Finance House	IFH	1995	Turkish	1,019	38.1	8.8
Asya Finance House	ASYAFH	1996	Turkish	233	8.7	6.6
Total SFH		-	-	2,676	100	-

Sources: Rates of return: Milliyet Newspaper, 6/16/2000 [www.millyet.com.tr].

Table 2. Comparison of balance sheets of commercial banks and Special Finance Houses

	Commercial banks			Special Finance Houses		
	1998	1999	2000	1998	1999	2000
Composition of assets (percent):						
Liquid (ex. govt.)	18.5	18.9	20.9	12.7	15.9	18.2
Govt. securities	14.6	17.9	11.9	-	-	-
Loans	36.7	28.3	31.2	75.6	76.0	71.4
Permanent assets	8.0	9.3	15.0	8.5	7.0	7.3
Other	22.1	25.6	21.0	2.2	1.1	3.1
TOTAL	100	100	100	100	100	100
As % of total loans:						
FX-denominated	48.6	49.1	41.5	82.7	86.4	80.9
Non-performing loans	7.7	11.7	12.5	1.3	1.6	3.2
Maturity $\leq$ 3 mos.	Na	Na	Na	17.1	16.6	15.2
Composition of liabilities (percent):						
Deposits	64.5	62.7	60.3	86.1	88.0	85.8
Non-deposit funds	13.1	11.0	9.3	-	-	-
Shareholders equity	8.5	8.6	10.9	5.9	5.3	5.9
Net income	4.3	4.4	3.0	1.1	0.9	0.7
Other	8.1	7.3	6.3	6.9	5.8	7.6
TOTAL	100	100	100	100	100	100
As % of total deposit and non-deposit funds:						
FX-denominated	57.0	53.1	51.9	91.5	93.3	91.9
Maturity $\leq$ 3 mos.	78.0	71.0	84.0	85.8	86.5	86.3

Source: Banks Association of Turkey (1999, 2000).

Note: The category 'loans' for the SFHs includes certain commodity-related transactions, in which SFHs place part of their liquid assets with foreign banks in special arrangements. E.g. Citibank-England owns stock in London Metal Exchange Market; SFHs buy these stocks from Citibank, then immediately sell them back on deferred payment terms. This enables the SFHs to earn a safe, fixed, short-term return from commodity buying and selling.

Table 3. Percent decline in deposits at the SFHs, Dec. 31, 2000, to June 30, 2001

	Percent decline
Al Baraka Turkish Finance House	42.1
Family Finance House	29.4
Kuwait Turkish Evkaf Finance House	22.3
Anadolu Finance House	55.0
Ihlas Finance House	100.0
Asya Finance House	34.2
Total SFH	63.0
Total excluding Ihlas	36.4

Table 4. Distribution of withdrawals by withdrawal amount, and distribution of savings accounts by deposit amount: KTEFH

	Distribution of withdrawals during the run		Distribution of accounts 2001-2002	
	Percent of total:		Percent of total:	
Amount of withdrawal or account:	Number of withdrawals	US$ amount of withdrawals	Number of accounts	US$ amount of deposits
Below $1K	82.2	2.9	90.7	5.4
$1 to 5K	11.1	11.2	6.1	10.3
$5 to 20-25	5.4	24.0	2.5	19.5
Above $20-25	1.3	62.0	0.6	64.8

SOURCE: Authors' calculations from KTEFH data and Banks Association of Turkey (2001).

Table 5. Alternative tests for unit roots in levels and numbers of withdrawals

	Level of net withdrawals (in logs)	Number of transactions (in logs)
Augmented Dickey-Fuller		
Small accounts	-7.97*	-6.31*
Medium-sized accounts	-2.40	-2.73+
Large accounts	-6.16*	-7.14*
Phillips-Perron		
Small accounts	-11.95*	-6.33*
Medium-sized accounts	-8.00*	-7.80*
Large	-6.16*	-7.16*
Kwiatkowski-Phillips-Schmidt-Shin		
Small accounts	0.4143 †	0.1289 †
Medium accounts	0.1250 †	0.1181 †
Large accounts	0.1839 †	0.2194 †

* The null hypothesis of a unit root can be rejected at a 5% level.

+ The null hypothesis of a unit root can be rejected at a 10% level.

† The null hypothesis of stationarity can*not* be rejected at a 5% level.

Notes: ADF tests were performed with lag lengths chosen by the Akaike Information Criterion and a maximum lag of 6. Critical values for at 5% and 10% levels are -2.92 and -2.60 for the ADF and PP tests, and 0.4630 and 0.3470 for the KPSS test.

Table 6. Variance decomposition: Share of variance in forecast error explained by shocks to withdrawals from different account categories, by forecast horizon (in days)

	Small accounts			Medium-sized accounts			Large accounts		
	Small	Med.	Large	Small	Med.	Large	Small	Med.	Large
Levels of withdrawals									
1	100.0	0.0	0.0	41.4	58.6	0.0	1.1	0.3	98.6
2	91.4	7.1	1.5	51.2	47.1	1.6	1.9	7.5	90.6
3	90.2	8.6	1.2	56.6	42.1	1.3	2.6	7.9	89.5
4	89.2	9.8	1.0	59.9	38.9	1.2	3.4	8.2	88.4
5	88.6	10.4	0.9	62.0	36.9	1.1	4.1	8.3	87.6
6	88.3	10.9	0.9	63.4	35.6	1.0	4.6	8.4	87.0
7	88.0	11.2	0.8	64.4	34.7	0.9	5.0	8.4	86.6
8	87.8	11.4	0.8	65.1	34.0	0.9	5.3	8.5	86.2
9	87.7	11.5	0.8	65.6	33.5	0.9	5.6	8.5	86.0
10	87.6	11.6	0.7	65.9	33.2	0.9	5.8	8.5	85.7
Numbers of withdrawals									
1	100.0	0.0	0.0	0.6	99.4	0.0	0.4	12.6	87.0
2	90.7	8.2	1.1	4.5	94.7	0.7	0.4	23.6	75.9
3	83.6	15.3	1.0	6.8	92.4	0.9	0.8	28.9	70.3
4	79.3	19.7	1.0	7.9	91.2	0.9	1.4	31.7	66.9
5	76.6	22.4	1.0	8.5	90.6	0.9	1.8	33.4	64.8
6	74.9	24.1	1.0	8.9	90.2	0.9	2.1	34.5	63.4
7	73.7	25.2	1.0	9.1	90.0	0.9	2.3	35.2	62.4
8	73.0	26.0	1.0	9.3	89.8	0.9	2.5	35.7	61.8
9	72.4	26.5	1.0	9.4	89.7	0.9	2.6	36.1	61.3
10	72.1	26.9	1.0	9.4	89.6	0.9	2.6	36.3	61.0

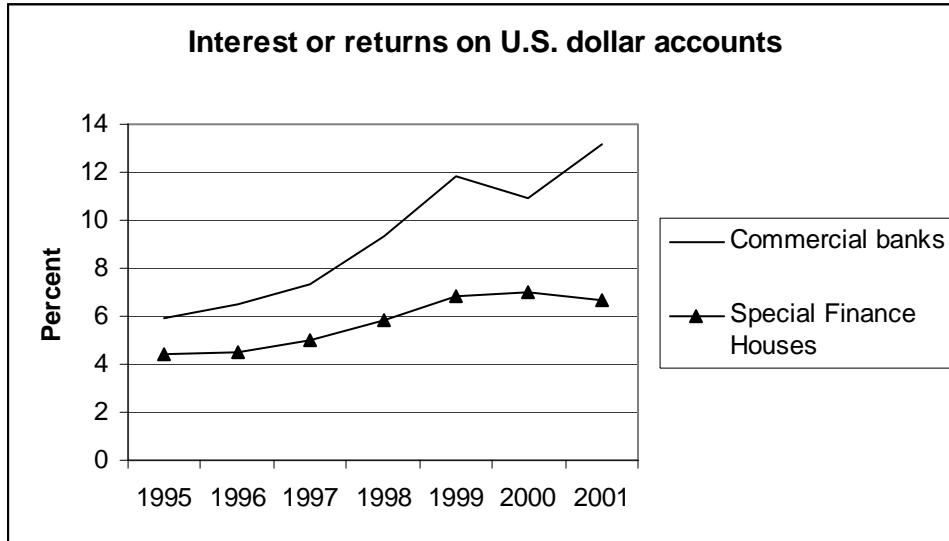Figure 1. Comparison of returns to U.S. dollar accounts, Commercial banks and Special Finance Houses

Interest or returns on U.S. dollar accounts

Figure 2. Levels of deposits at the Special Finance Houses, June 2000-March 2002
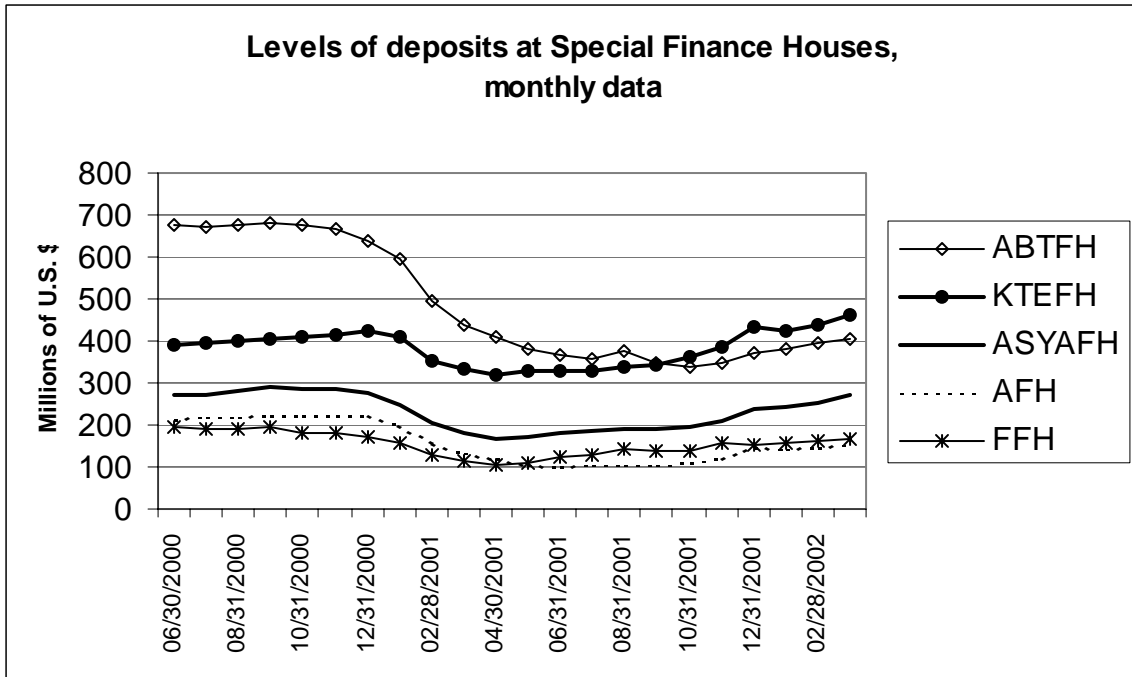
Levels of deposits at Special Finance Houses, monthly data

Figure 3. Number of transactions, by number of business days into the run, Kuwait Turkish
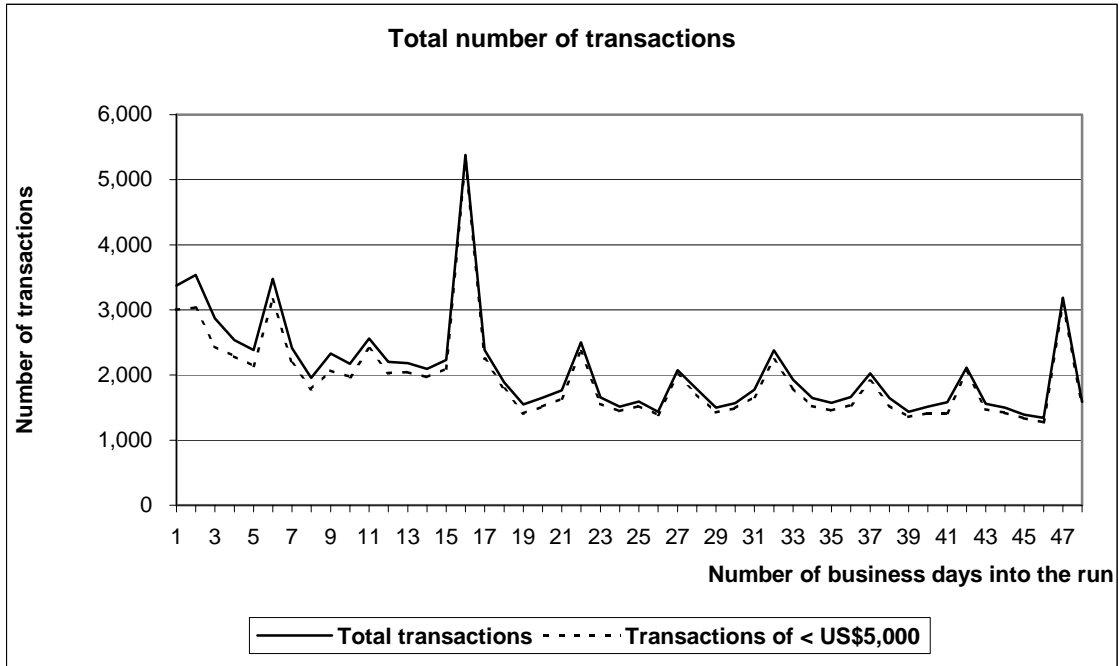Evkaf Finance House

Total number of transactions

Figure 4. Total amount of net withdrawals from profit-and-loss accounts, in millions of US$, by number of business days into the run, Kuwait Turkish Evkaf Finance House
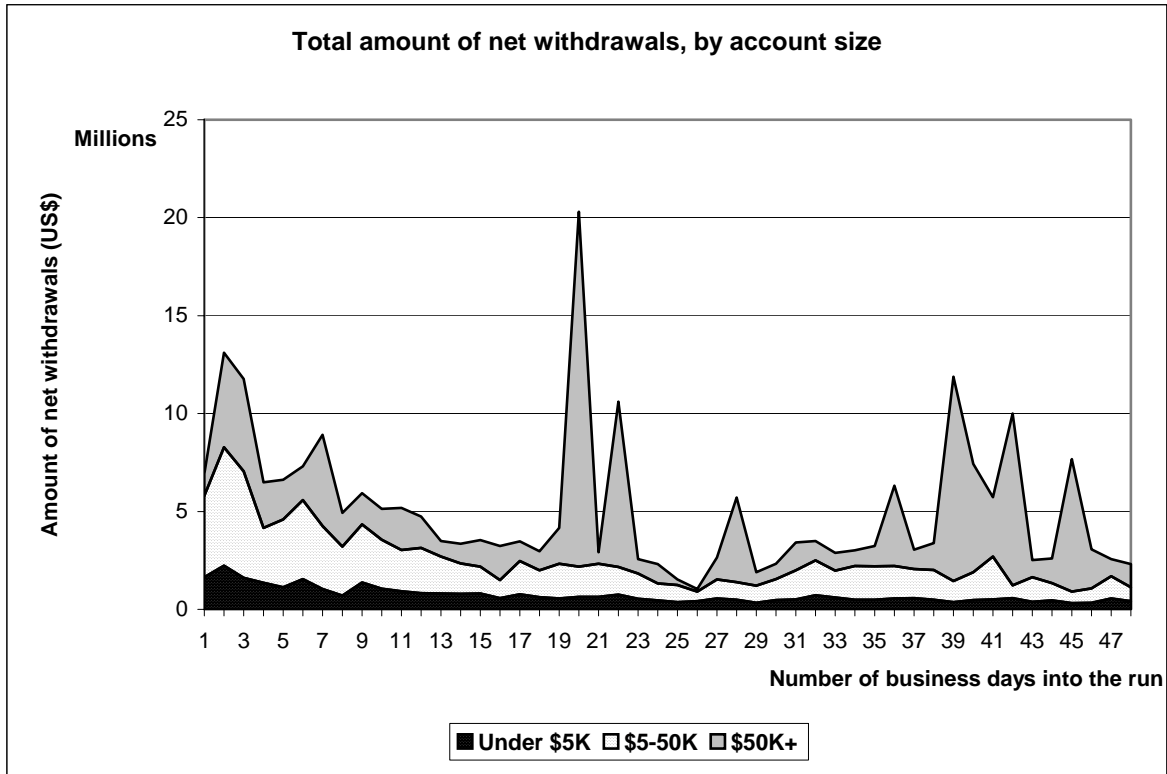
Figure 5. Numbers of withdrawals from medium and large accounts, by number of business
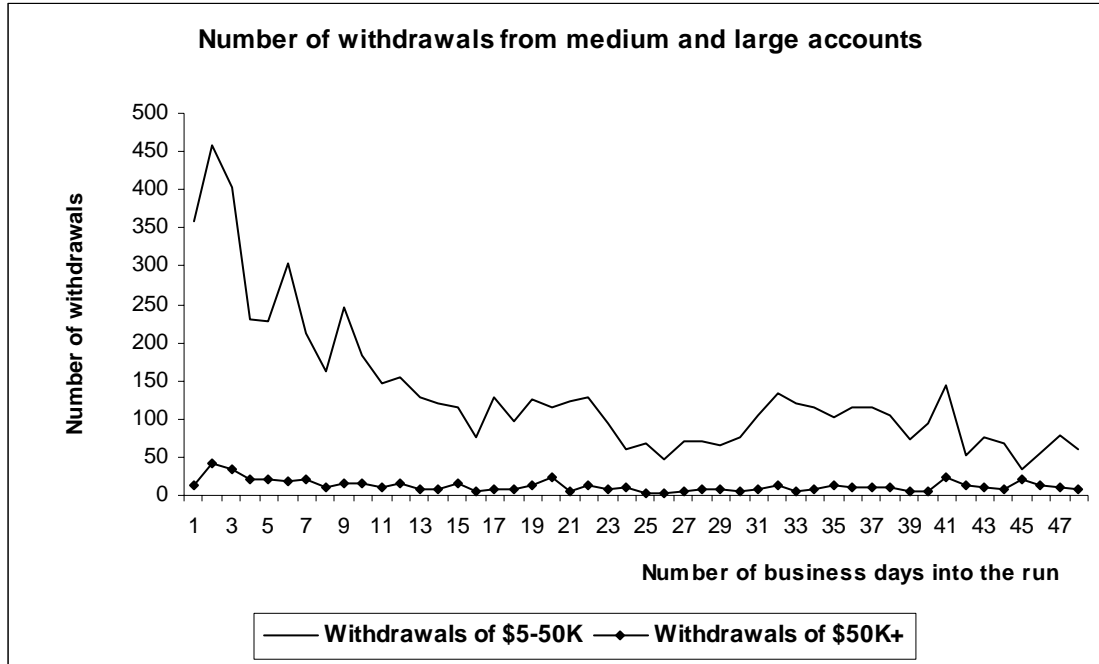days into the run, Kuwait Turkish Evkaf Finance House

Figure 6. Impulse response functions based on amounts of withdrawals:
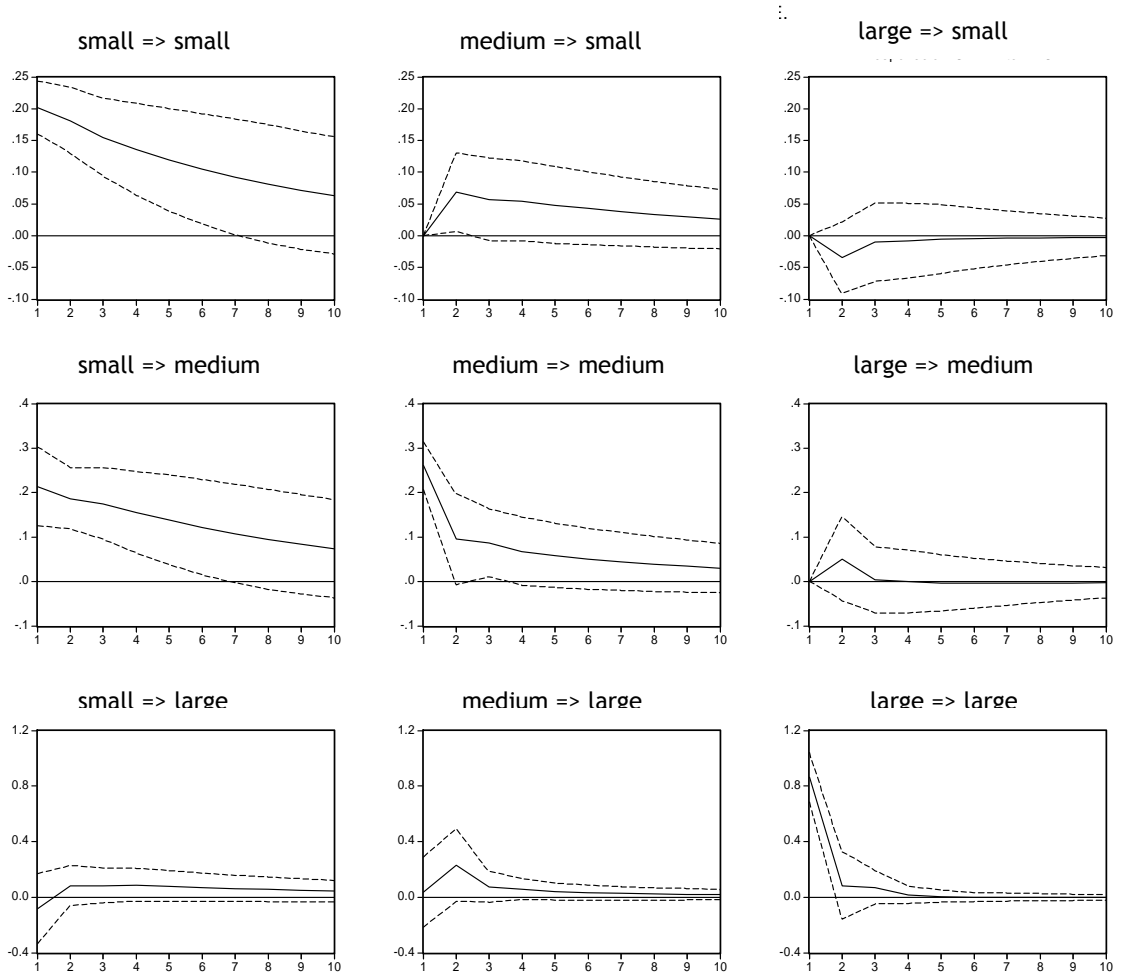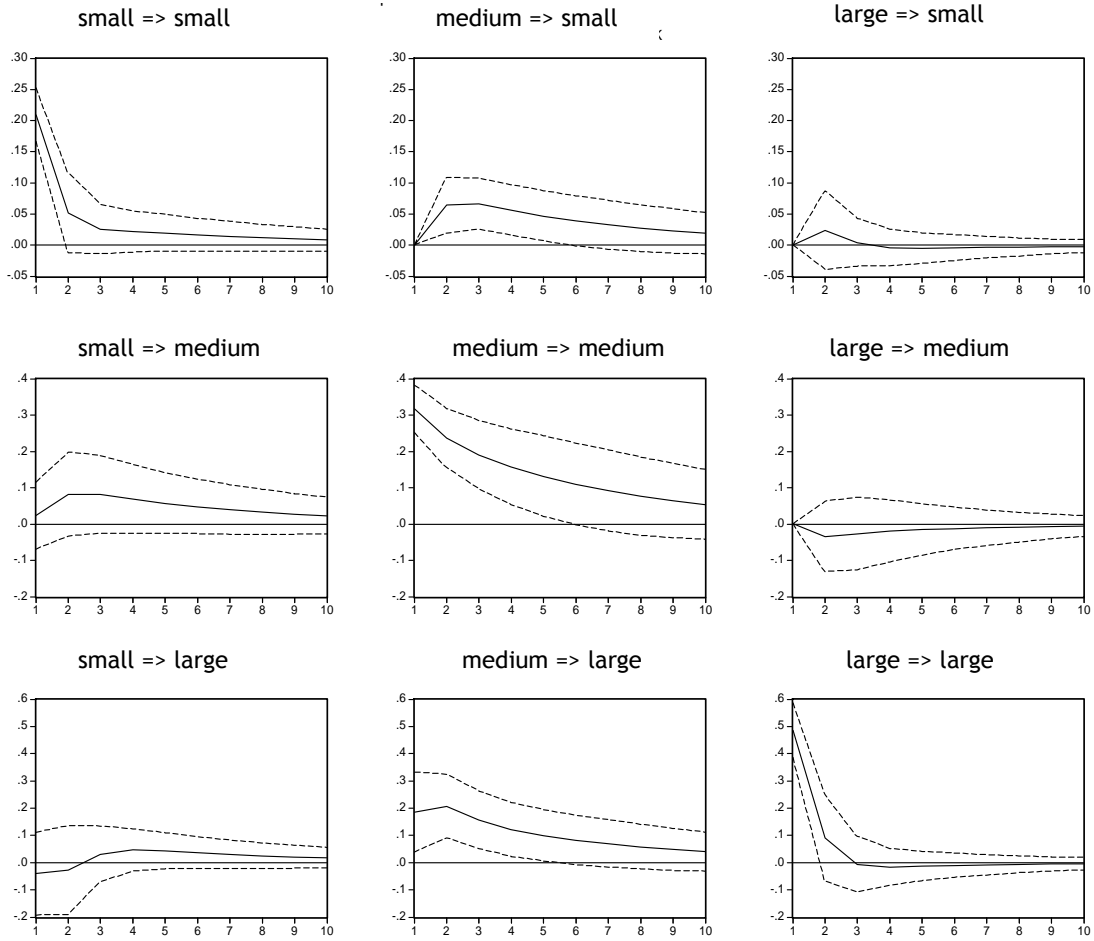One standard-deviation innovation with 95% confidence bands

Figure 7. Impulse response functions based on numbers of withdrawals:
One standard-deviation innovation with 95% confidence bands

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