Competition and auction prices: Evidence from 2009-2010 FDIC failed institutions' P&A transactions

Konstantinos Drakos[*]

Abstract

We test whether the intensity of competition, proxied by the number of bidders or bids, affected winning bids' magnitude, using data from FDIC failed institutions' auctions during 2009-2010. The deposit premium and the asset discount are modeled jointly, using a SURE model augmented by State effects and failed institutions' financial profile, to control for charter value and expected losses on assets assumed. We find that a higher number of bidders (bids) is associated with a higher deposit premium and a lower asset discount, findings which hold strong across alternative specifications. Moreover, a scenario with an additional bidder in each auction shows that it would have economized approximately 22% of the FDIC reserve fund.

Keywords: Auction, Bidders, Competition, Failure, FDIC.

JEL Classification: D44, G33, G34.

[*] Assistant Professor, Department of Accounting and Finance, Athens University of Economics and Business. Postal Address: 76 Patission Street, 10434, Athens, Greece. Email: kdrakos@aueb.gr, Tel: ++30 (210) 8203461.

When a chartered financial institution (commercial bank, thrift) fails it is placed into receivership and the Federal Deposit Insurance Corporation (FDIC hereafter) is in charge of the resolution process. The FDIC's stated policy is that it selects the least costly, among the alternative resolutions methods, compatible with the preservation of banking system's safety and soundness. By and large, in recent failures the Purchase and Assumption[1] (P&A hereafter) method, according to the FDIC, has been less costly compared to the Deposit Payoff[2]. The implementation of a P&A agreement is the product of a first-price sealed auction[3] in which selected invited parties participate[4] (see FDIC Resolutions Handbook[5]). In a typical auction[6], the participating bidders submit their bids, which mainly consist of two elements: (i) a premium on deposits (p hereafter) usually viewed as mirroring the franchise value of the failing institution's deposits[7], and (ii) a discount on the failed institution's assets (d hereafter)[8].

In P&A transactions, three factors determine the size of the initial FDIC cash payment to the acquirer: (i) the asset discount bid, (ii) the franchise value bid for the failed institution's

[1] A P&A transaction is a closed institution transaction in which a healthy institution (the "assuming" bank or thrift) purchases some or all of the assets of a failed institution and assumes some or all of the liabilities, including all insured deposits.

[2] In a Deposit Payoff the FDIC pays off insured depositors and liquidates the failed institution.

[3] In a first-price sealed bid auction each bidder independently submits her bid without knowledge of other bidders' bids, and the object (in our case the failed institution) is sold to the bidder who makes the highest bid, which is also the price she pays.

[4] In compiling the list, the FDIC takes into account several factors such as the failed institution's geographic location, competitive environment, minority-owned status, overall financial condition, asset size, capital level, and regulatory ratings. It should be clear that there is quite large scope in compiling this list and to some extent is rather subjective.

[5] The handbook is downloadable from: http://www.fdic.gov/bank/historical/reshandbook/

[6] Prior to the auction the FDIC holds a meeting with all approved potential bidders where they are informed about the failed institution's financial situation as well as the bidding process protocol. To further enhance the participants' information set, all potential bidders who have signed confidentiality agreements, are invited to conduct due diligence at the failing institution's premises. Essentially, due diligence is the potential bidder's on-site inspection of the books and records of the institution and the assessment of the value of the franchise.

[7] This generally represents the bidder's perception of the value of the customer base.

[8] This generally represents the bidder's perception of the imbedded losses and the level of risk associated with the assets.

deposit base, and (iii) the difference between the book values of the assets acquired and the liabilities assumed. Thus, the auction's outcome is rather crucial because the winning bid's magnitude determines a large fraction of the FDIC's own cash contribution, funded by the Deposit Insurance Fund (DIF hereafter). During periods of intensified failure rates like the past couple of years, enhancing our understanding of the resolution cost determinants becomes even more valuable. To put things into perspective note that, while the FDIC nominally maintains a hard target reserve ratio of 1.25%, due to the recent wave of failures the ratio has rapidly been depleted, reaching a negative territory since the third quarter of 2009, while on September 30, 2010 it stood at -0.15%. Note that the DIF's main funding source is fees paid by insured financial institutions. However, if losses from bank failure resolutions exceed the FDIC's reserves and its capacity to replenish the reserve fund, the losses will eventually be funded by the Federal government and thereby by the taxpayers via the US Treasury's devoted line of credit[9]. Hence, studying the factors that shape the winning bid's magnitude is of utmost importance for the regulator and ultimately the taxpayers.

Despite the importance of the issue, the empirical academic literature has attracted a disproportionately low research share. In particular, there are two strands of literature. The first is centered around the measurement of market reactions regarding failed institutions' winning bidders' stocks (Pettway and Thrifts 1985; James and Wier 1987a, b; Bertin et al., 1989). Essentially, utilizing Event Study techniques these studies explore whether there are significant abnormal returns following the announcement of winning an auction. The second, that is more closely related to the present study, based on observed auction outcomes, primarily attempts to

[9] In 2009 the FDIC requested that the US Treasury's line is increased from 30 billion US dollars to 500 billion.

infer the type of auction that better fits FDIC's auctions (Giliberto and Varaiya 1989; James 1991; Gardner and Stover 1998). The main research questions in this literature are whether such auctions can be categorized as Common Value or Individual Private Value, and also whether the phenomenon known as 'winner's curse' is observed (for a detailed discussion on auctions see French and McCormic 1984; Kagel and Levin 1986; Bramman et al., 1987; Paarsch 1992). To address these questions, requires investigating (i) how the size of the average bid is affected by the number of bidders and the variability of submitted bids in a given auction, and (ii) the impact of the number of bidders on the size of the winning bid.

Giliberto and Varaiya (1989) utilized a sample of 219 P&A auctions on failed commercial banks conducted by the FDIC for the period 1975-1985. Among other research questions, they investigated the effects of bidder competition on the winning bids. They concluded that the expected winning bids increased as more bidders competed to acquire a failed bank. James (1991) predominantly focused on the determinants of realized losses using a sample of 412 bank failures handled by FDIC, that included P&A's, insured deposit payoffs and 'whole bank' transactions, during the period 1985-1988. Then restricting the analysis to P&A transactions, and given that purchase premia directly affect the realized losses, he explored the impact of the number of bidders on the winning bids. His conclusions were that the number of bidders has a significantly positive effect on the winning bid. The study by Gardner and Stover (1998) differs in at least two ways from the above mentioned studies. First their analysis used solely auctions of failed savings and loan associations (thrifts) that were carried out by the Resolution Trust Corporation, which was responsible for resolutions at the time. Their sample consisted of 201 P&A's for the period 1989-1992. Their empirical analysis is also different because they had access to richer information from which to device proxies for bidder competition. Essentially, apart from the number of actual bidders, they also had data on the number of institutions that attended the bid conference as well as those who did due diligence. They also report a positive impact of the intensity of competition among bidders on the winning bids.

The present study employs data recently released from the FDIC regarding failed institutions' auctions held between 2009 and 2010. The main research question is to investigate whether the intensity of competition (proxied by the number of bidders or the number of bids), a critical auction component, exerts significant impact on the winning bid's deposit premium and asset discount, i.e the winning bid's magnitude. Note that the empirical model will control for the failed institutions' charter value and expected losses on assets assumed by using relevant proxies. The study makes a twofold contribution to the literature. First, it provides an empirical analysis of the latest period's auctions and hence permits a comparison with previous findings. Second, an innovative feature of the econometric analysis is that it utilizes a Seemingly Unrelated Regressions (SURE) setup, explicitly allowing for cross-equation dependence of errors (Zellner 1962). This, in contrast to previous studies that consider overall bids, enables to shed light on a possible differential impact of the intensity of competition across deposit premium and asset discount.

The remainder of the paper is as follows. Section I presents the econometric methodology followed. Section II describes the data employed and offers a preliminary statistical analysis. Section III discusses the empirical results. Section IV concludes and derives policy implications.

I. Econometric Methodology

Prior to the bidding process, potential bidders receive a signal vector $\mathbf{q}_i = (q_1, q_2, ..., q_M)$ regarding the underlying value of the financial institution (i) to be auctioned, which is shaped by its charter value and the expected losses on assets assumed. The elements of $(\mathbf{q})$ include hard information such as the financial situation of the failed institution, but may also include qualitative information such as the quality of its management structure and its staff. The elements of the signal vector are partly emitted by the FDIC during the information meeting of invited potential bidders, and partly emitted at the due diligence process[10]. In addition, the vector may also incorporate exogenous, but relevant for the auction, information such as the current and expected economic conditions of the geographic area within which it operates.

Then at the auction process each bidder submits a bid $\mathbf{b}_i = (p_i, d_i)$ for acquiring the failed bank in question, which essentially is a vector whose elements are the deposit premium (p) and the asset discount (d). Given the auction structure it is likely that the deposit premium and asset discount are jointly determined. Therefore, in order to take this into account a bivariate SURE model is deployed[11]. The model assumes that the winning bid's, $\mathbf{b}_i^* = (p_i^*, d_i^*)$, elements are a function of (i) the signal vector $\mathbf{q}_i$, and (ii) the intensity of competition C_i proxied by the log number of bidders $\log(N_i)$ or the log number of bids denoted by $\log(n_i)$:

[10] Due diligence is a potential acquirer's on-site inspection of the books and records of a failing institution.
[11] In case there are cross-effects, i.e the deposit premium is a determinant of the asset discount or vice versa, an Instrumental Variables approach is required. This is something that will be investigated later.

$$\mathbf{b}_i^* = \begin{cases} d_i^* = \alpha_0 + \alpha_1 \cdot \left(C_i\right) + \sum_{m=1}^{M} \gamma_m \cdot q_{i,m} + u_{i,d} \\ p_i^* = \beta_0 + \beta_1 \cdot \left(C_i\right) + \sum_{m=1}^{M} \delta_m \cdot q_{i,m} + u_{i,p} \end{cases} \quad (1)$$

Where α's, β's, γ's, and δ's are constant parameters to be estimated, while $\left(u_p\right)$ and $\left(u_d\right)$ are random disturbances allowed to be correlated.

The analysis focuses on whether the intensity of competition has any impact on the winning bid. In particular, we investigate whether the cross-sectional variation of the number of bidders or the number of bids contains significant explanatory power for the cross-sectional variation of deposit premium and asset discount. Thus the parameters of main interest are $\left(\alpha_1, \beta_1\right)$, which if significant would suggest that indeed the intensity of competition affects deposit premium and / or asset discount. Our priors, based on auction theory, are that $\alpha_1 < 0$ and $\beta_1 > 0$, that is as the number of bidders (bids) increases the asset discount decreases, while the deposit premium increases.

II. Data Issues and Preliminary Analysis

During 2009 and 2010 there have been 297 financial institutions' failures in the USA, out of which in 275 cases the FDIC chose the P&A as the least costly resolution method. For a total of 129 cases there is publicly available information on the FDIC's website regarding several aspects of the bidding process[12]. The information pertinent to the present analysis is the number of

[12] A detailed list of failed institutions for which *Bid Summary* is available is provided in Appendix A.

bidders[13], the number of bids, and also the deposit premium and asset discount of the winning bid. Although the FDIC provides information for losing bids, it withholds the details of the cover (second place) bid, which will be disclosed in due course[14]. Thus, our analysis will focus on winning bids given that the complete distribution of bids is not available, which precludes working with the average submitted bid and / or their variance.

In Table I we report the basic descriptive statistics for the number of bidders, the number of bids, as well as the winning bids' deposit premium and asset discount[15]. The average number of bidders has been 2.54 while there have been just above 4 bids per auction. The average number of bidders is strikingly similar to those reported in previous studies even though the auctions are far apart in time. For instance James and Wier (1987) who studied auctions between 1973-1983 report an average number of 3 bidders, while Giliberto and Varaiya (1989) who studied a similar time period (1975-1985) reported an average of 2.61. James (1991) and Gardner and Stover who studied auctions for later periods, for 1985-1988 and 1989-1992 respectively, reported mean number of bidders of 2.56 and 2.85 respectively.

The deposit premium[16] has been relatively low with a mean value of 0.5%, spanning a minimum to maximum range between 0% and 5%. This is a pronounced property of the quoted

---

[13] There are several cases where a given bidder submits multiple bids.
[14] According to the FDIC's website "...*the name of the cover bidder, but not the cover bid, will also be provided in cases in which there is a total of three bidders...one year after the transaction or sale has closed...*". and "*The foregoing bid, bidder and methodology information on failed bank sales transactions will be made available under the FOIA, with only very limited information about such transactions (the cover bid) being temporarily withheld to avoid impairment of the FDIC's statutory program for whole-bank resolutions and assets sales*."
[15] In Appendix B we provide the kernel density plots for these variables so the reader can have a complete picture.
[16] Note that typically the deposit premium is expressed in percentage terms, while the asset discount in dollar terms. However, in the FDIC's reported *Bid Summary* there are several instances that they are reported in the opposite manner. For comparison purposes, the present analysis expresses all deposit premia and asset discounts as a percentage of total deposits and total assets respectively.

deposit premia, where in fact in about 61% of the auctions the premium is zero. In contrast, the asset discount was 11% on average, with a minimum of 0% (in just 5 auctions) and a maximum of 45%. The wide range of asset discounts perhaps reflects the sizeable heterogeneity of failed institutions in terms of their assets' quality.

-----Table I-----

Figure 1 depicts the lowess scatter smoothing plots between the number of bidders or the number of bids against (a) deposit premium, which both are positively sloped, and (b) the asset discount, which both are negatively sloped. The graphs indicate that, at least unconditionally, the intensity of competition measures tend to increase the winning bid (increase deposit premium, decrease asset discount).

-----Figure 1-----

The econometric model will condition on the signal vector, which is populated in the following manner. First, in order to capture the general (macro) economic conditions within which a failed bank operates, a set of state zero / one dummies according to the geographic location of each failed institution's headquarters is included. Second, the auctioned financial institution's-specific information is controlled for, by including variables obtained from their balance sheet and income statement the year prior to failure. These data are reported in the FDIC's *Performance and Condition Ratios*. In particular, two alternative sets of variables are employed, which are shown in the following table:

Variable	Definition [a,b]	Expected effect on	
Set 1		p	d
Net interest margin[c]	Total interest income less total interest expense (annualized) as a percent of average earning assets	Positive	Negative
Loss allowances	Allowance for loan and lease losses as a percent of total loan and lease financing receivables, excluding unearned income	Negative	Positive
Noncurrent loans	Total noncurrent loans and leases, loans and leases 90 days or more past due plus loans in nonaccrual status, as a percent of gross loans and leases	Negative	Positive
Tier1	Tier 1 (core) capital as a percent of risk-weighted assets as defined by the appropriate federal regulator for prompt corrective action during that time period	Positive	Negative
Set 2		p	d
Total risk capital	Total risk based capital as a percent of risk-weighted assets as defined by the appropriate federal regulator for prompt corrective action during that time period	Positive	Negative
Noncurrent assets	Noncurrent assets as a percent of total assets. Noncurrent assets are defined as assets that are past due 90 days or more plus assets placed in nonaccrual status plus other real estate owned (excluding direct and indirect investments in real estate)	Negative	Positive
Net loans / core deposits	Loan and lease financing receivables, net of allowances and reserves, as a percent of total domestic deposits, less time deposits of $100,000 or more held in domestic offices	Negative	Positive

Notes: (a) Source: FDIC Performance and Condition Ratios, (b) Data correspond to the year-end prior failure, (c) This variable is common between the two sets.

The *net interest margin* is expected to increase the value of the winning bid (i.e. increase deposit premium and decrease asset discount) since it is a revenue metric and therefore affects positively the institution's charter value. *Tier1* and *total risk capital* are also expected to increase winning bids, since they contain information for the institution's capital adequacy. Although we are dealing with failed institutions, there still may be some cross-sectional variation in the levels of capital adequacy. *Noncurrent loans* and *noncurrent assets* are bound to exert a negative impact on winning bids since as they increase they imply lower asset quality. Bids are expected to depend negatively on *loss allowances* since higher values of the latter reflect lower loan quality. As for *net loans / core deposits* the rationale for a negative effect on winning bids is that they can be viewed as an inverse measure of liquidity.

III. Empirical Results

Tables II and III report the estimation results from the bivariate SURE models using the number of bidders and number of bids respectively. Results in the columns entitled Baseline Model A and B correspond to the full version of the equations appearing in (1) earlier, where two alternative sets of financial variables are included. For comparison purposes, the tables also report two restricted versions that are nested to the full model. Nested Model 1 which essentially is derived if the $\mathbf{q}$ vector is excluded altogether, and Nested Model 2 that is derived if financial information is not included in the $\mathbf{q}$ vector.

The results are qualitatively analogous irrespectively if one uses the number of bidders or the number of bids. Hence, to conserve space the discussion will be based on the results reported in Table II. The explanatory power of Nested Model 1 over deposit premium and asset discount is about 8% and 12% respectively. Nested Model 2, which includes the state dummies, has coefficients of determination soaring to 29% and 37% for the deposit premium and asset discount respectively. Hence, state dummies bring useful information to the model and in statistical terms this suggests that a sizeable part of the submitted bids' heterogeneity is captured by state effects. A plausible economic rationale for this is that bidders take into account the conditions (economic and perhaps other) of the states within which (failed) institutions to be acquired operate. Failed institutions' financial profile that is included in the Baseline Models A and B, over and above state effects, has incremental explanatory power, although of a considerably lesser extent compared to that of state effects. In any case, there is statistical evidence that a fraction, albeit small, of the submitted bids' cross-sectional variation can be explained by variations in failed institutions financial characteristics.

As it regards the individual effects of the financial variables included, there are several insightful findings. According to the results from the Baseline Model A, p is significantly increased for institutions with higher net interest margin. Similarly, d is higher for institutions with higher noncurrent loans, while lower for institutions with higher loss allowances. This last finding is in contrast to our priors, to the extent that higher loss allowances indicate lower quality of assets. Baseline Model B reveals richer effects on the winning bids' behavior. In particular, p is significantly higher for failed institutions with higher net interest margin and total risk capital. In addition, p decreases as loans / core deposits increase. Moreover, the results suggest a weak negative effect of the net interest margin on the d, while a strong positive effect of loans / core deposits is found. These findings are in line with our priors.

Moving now to the parameters of interest we document that indeed the intensity of competition contains significant information both for the deposit premium as well as for the asset discount. This finding is robust for both proxies of competition intensity, since the (log) number of bidders and the (log) number of bids enter significantly across all model specifications. In particular, the number of bidders (bids) exerts a positive impact on the deposit premium, which implies that as the number of bidders (bids) increases so does the deposit premium, on average. In contrast, we document a strong negative effect of the number of bidders (bids) on asset discount, suggesting that as the number of bidders (bids) increase asset discounts tend to decrease. Moreover, the point estimates denoting the impact of bidders (bids) on deposit premium and asset discount are of similar significance and magnitude across all specifications, further pointing to their robustness.

Note that the Breusch-Pagan test for independence (Breusch and Pagan 1980) is significant in Nested Model 1, while in the rest of the models it is highly insignificant. This suggests that when state effects and failed institutions' financial characteristics are taken into account, errors across the deposit premium and asset discount equations are no longer correlated.

-----Tables II & III-----

In Table IV we report the two baseline models allowing for cross effects between deposit premium and asset discount across winning bids. Essentially this is done to ensure that there is no need for employing an Instrumental Variables estimator. We find that in the presence of the signal vector there are no significant cross-effects. This last finding in conjunction with the Breusch-Pagan test for independence indicates that deposit premium and asset discount are essentially quoted independently and are driven by dissimilar factors. Hence, even an equation-by-equation approach would be appropriate, provided that one has adequately controlled for the signal vector.

-----Table IV-----

Finally, we use the estimated coefficients to obtain dollar estimates for the competition intensity's impact on winning bids. Recall that the econometric specification projects the deposit premium and asset discount on the logarithm of the number of bidders (bids), and therefore the relevant coefficients are semi-elasticities. After straightforward transformations of the estimated coefficients we can recover the change in the winning bid's magnitude due to a given percentage change in the number of bidders (bids). Then, it is rather simple to express this into dollar value using the sample properties of failed institutions' assets and deposits.

In some more detail now, we will set up a hypothetical scenario under which there would be an additional bidder (bid) in each auction. In Tables V & VI we show the outcome of this exercise using the Baseline Model A and B respectively. Let us briefly describe the procedure in the context of asset discount and the number of bidders.

Let j denote the different auction groupings according to the number of bidders $j = 1, 2, ...,$. Then let $\bar{d}_j$ denote the average asset discount in percentage terms and $\bar{A}_j$ the average dollar value of assets for each auction group. Thus, the average dollar asset discount for each group is defined as:

$$\bar{D}_j = \bar{d}_j \cdot \bar{A}_j \qquad \textbf{(2)}$$

As mentioned earlier the relevant point estimate $\hat{\alpha}_1$ corresponds to a semi-elasticity and from elementary econometrics we know that in a linear-log model the following holds:

$$\hat{\alpha}_1 = \frac{\Delta d}{\Delta \log(N)} \approx \frac{\Delta d}{\Delta N / N} \qquad \textbf{(3)}$$

Our scenario is that the number of bidders increases by one for each auction grouping, which implies that the percentage increase is auction grouping-specific and in fact the logarithmic specification produces a declining impact for higher levels of number of bidders. Consequently we can calculate the change on the average asset discount due to an x_j percent increase in the number of bidders for each auction grouping as follows:

$$\Delta \bar{d}_j = x_j \cdot \hat{\alpha}_1 \qquad \textbf{(4)}$$

Then it is straightforward to transform this into an average dollar value multiplying by the mean value of assets:

$$\Delta\overline{D}_j = \Delta\overline{d}_j \cdot \overline{A}_j = x_j \cdot \hat{\alpha}_1 \cdot \overline{A}_j \qquad \textbf{(5)}$$

Since the estimated coefficient of the (log) number of bidders was negative this results in a decrease in the asset discount as the number of bidders increases. Based on the semi-elasticity obtained from Baseline Model A, our calculations show that if in all single-bidder auctions there were two bidders instead, the total gain would have been about 478 million dollars (or 12.92 million per auction). For auctions with two bidders, increasing their number to three would result into a total gain of about 938 million dollars (or 26.81 million per auction). Similarly, moving from three bidders to four would generate a total gain of 180 million dollars (or 6.21 million dollar per auction). The table reports the rest of the cases. If we sum the total gain across all groups we estimate that the overall gain due to a unit increase of bidders would have been about 1.8 billion dollars. A similar procedure for the deposit premium leads to the conclusion that it would have increased by a total of 165 million dollars. The conclusions when we use the Baseline Model B are slightly less conservative, suggesting that the overall gain in terms of the asset discount would have been about 2.5 billion dollars while in terms of the deposit premium 239 million dollars.

Recall that our sample consists of about 46% of all conducted auctions for which information was publicly available. Assuming that the sample is representative, we may conclude that the FDIC's overall gain should be roughly double of our estimate, that is about 3.5 billion dollars. To gauge the overall gain's size, it would be useful to compare it to the FDIC's reserve fund. At year-end 2007, just before the outbreak of the current crisis, and following almost a decade of very low failure rates the DIF grew to more than $52 billion. Thus, our estimated gain would represent about 7% of the 2007 reserve fund. In the post 2008 period the DIF balance reached a record low of negative $20.9 billion at year-end 2009, while as of June 30, 2010, it had recovered slightly but was still a negative $15.3 billion. In terms of the 2010 reserve fund level, our estimate implies that it would have increased it (i.e lowered the deficit) approximately by 22%. As expected, and in accordance with one's intuition, the estimated gains from increased competition in auctions are more valuable during periods of increased failure rates.

-----Tables V & VI-----

IV. Conclusions

This study investigated the impact of the intensity of competition, proxied by the number of bidders or the number of bids, on the magnitude of winning bids in FDIC's failed institutions' auctions for the period 2009-2010. The econometric analysis employed a SURE setup where the deposit premium and the asset discount were treated as a system, that allowed exploring the competition's impact on either of them. Moreover, in order to conduct safer inferences, the model was augmented by state effects as well as failed institutions' financial profile, which proxied the signal vector.

According to our results, the intensity of competition exerts a significant impact on winning bids in FDIC auctions. In particular, higher number of bidders or bids are associated with higher deposit premium and lower asset discount, findings which hold strong across alternative specifications. Moreover, there could be substantial financial gains generated by increasing the number of bidders. As mentioned earlier in most cases participation in these auctions is on an invitation basis, initiated by the FDIC. This highlights that perhaps the FDIC should reconsider the eligibility criteria in an attempt to expand the pool of potential bidders. Clearly, factoring in the impact of competition on auction outcomes, further complicates the FDIC's decision calculus regarding the invitation eligibility criteria.

References

Bertin, W., Ghazanfari, F. and K. Torabzadeh, 1989, Failed bank acquisitions and successful bidders' returns, *Financial Management*, 18(2), 93-100.

Bramman, L., Klein, D. and I. Weiss, 1987, The price effects of increased competition in auction markets, *Review of Economics and Statistics*, 69, 24-32.

Breusch, T. and A. Pagan, 1980, The Lagrange Multiplier test and its applications to model specification in Econometrics, *Review of Economic Studies*, 47, 239–254.

French, K. and R. McCormic, 1984, Sealed bids, sunk costs and the process of competition, *Journal of Business*, 57, 417-441.

Gardner, R. and R. Stover, 1998, The role of information in resolution trust corporation auctions of failed thrifts, *Journal of Financial Services Research*, 14(3), 209-221.

Giliberto, M. and N. Varaiya, 1989, The winner's curse and biddr competition in acquisitions: Evidence from failed bank auctions, *Journal of Finance*, 44(1), 59-75.

James, C. and P. Wier, 1987, Competition in the acquisition market and returns to acquirers: The case of banking , *Journal of Political Economy*, 95, 335-370.

James, C. and P. Wier, 1987, An analysis of FDIC failed bank auctions, *Journal of Monetary Economics*, 20, 141-153.

James, C., 1991, The losses realized in bank failures, *Journal of Finance*, 46(4), 1223-1242.

Kagel, J. and D. Levin, 1986, The winner's curse and public information in common value auctions, *American Economic Review*, 76, 894-920.

Paarsch, H., 1992, Deciding between the common and private value paradigms in empirical models of auctions, *Journal of Econometrics*, 51, 192-215.

Pettway, R. and J. Thrifts, 1985, Do banks overbid when acquiring a failed bank?, *Financial Management*, 14, 5-15.

Zellner, A., 1962, An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias, *Journal of the American Statistical Association*, 57, 348-368.

Appendix A. List of failed institutions with available bid summaries

Commercial Banks (2010): HORIZON BANK, ST. STEPHEN STATE BANK, PREMIER AMERICAN BANK, COLUMBIA RIVER BANK, FIRST NATIONAL BANK OF GEORGIA, 1ST AMERICAN STATE BANK OF MINNESOTA, MARCO COMMUNITY BANK, THE LA COSTE NATIONAL BANK, BANK OF ILLINOIS, LIBERTYPOINTE BANK, THE PARK AVENUE BANK, FIRST LOWNDES BANK, AMERICAN NATIONAL BANK, MCINTOSH COMMERCIAL BANK, DESERT HILLS BANK, BEACH FIRST NATIONAL BANK, TAMALPAIS BANK, CITY BANK, AMERICANFIRST BANK, BROADWAY BANK, AMCORE BANK, EUROBANK, WESTERNBANK PUERTO RICO, R-G PREMIER BANK OF PUERTO RICO, BC NATIONAL BANKS, ACCESS BANK, TOWNE BANK OF ARIZONA, 1ST PACIFIC BANK OF CALIFORNIA, SATILLA COMMUNITY BANK, NEW LIBERTY BANK, SOUTHWEST COMMUNITY BANK, MIDWEST BANK AND TRUST COMPANY, PINEHURST BANK, BANK OF FLORIDA - SOUTHWEST, BANK OF FLORIDA - SOUTHEAST, SUN WEST BANK, GRANITE COMMUNITY BANK, FIRST NATIONAL BANK, WASHINGTON FIRST INTERNATIONAL BANK, NEVADA SECURITY BANK, HIGH DESERT STATE BANK, PENINSULA BANK, HOME NATIONAL BANK, USA BANK, METRO BANK OF DADE COUNTY, FIRST NATIONAL BANK OF THE SOUTH, CRESCENT BANK AND TRUST COMPANY, COMMUNITY SECURITY BANK, HOME VALLEY BANK, SOUTHWESTUSA BANK, THUNDER BANK, WILLIAMSBURG FIRST NATIONAL BANK, COASTAL COMMUNITY BANK, NORTHWEST BANK & TRUST, THE COWLITZ BANK, RAVENSWOOD BANK, PALOS BANK AND TRUST COMPANY, SHOREBANK, SONOMA VALLEY BANK, BUTTE COMMUNITY BANK, PACIFIC STATE BANK, COMMUNITY NATIONAL BANK AT BARTOW, HORIZON BANK, THE PEOPLES BANK, ISN BANK, HAVEN TRUST BANK FLORIDA, FIRST VIETNAMESE AMERICAN BANK, DARBY BANK & TRUST COMPANY, COPPER STAR BANK, FIRST BANKING CENTER, GULF STATE COMMUNITY BANK, ALLEGIANCE BANK OF NORTH AMERICA, PARAMOUNT BANK, EARTHSTAR BANK, UNITED AMERICAS BANK, THE BANK OF MIAMI, CHESTATEE STATE BANK, FIRST SOUTHERN BANK, COMMUNITY NATIONAL BANK.

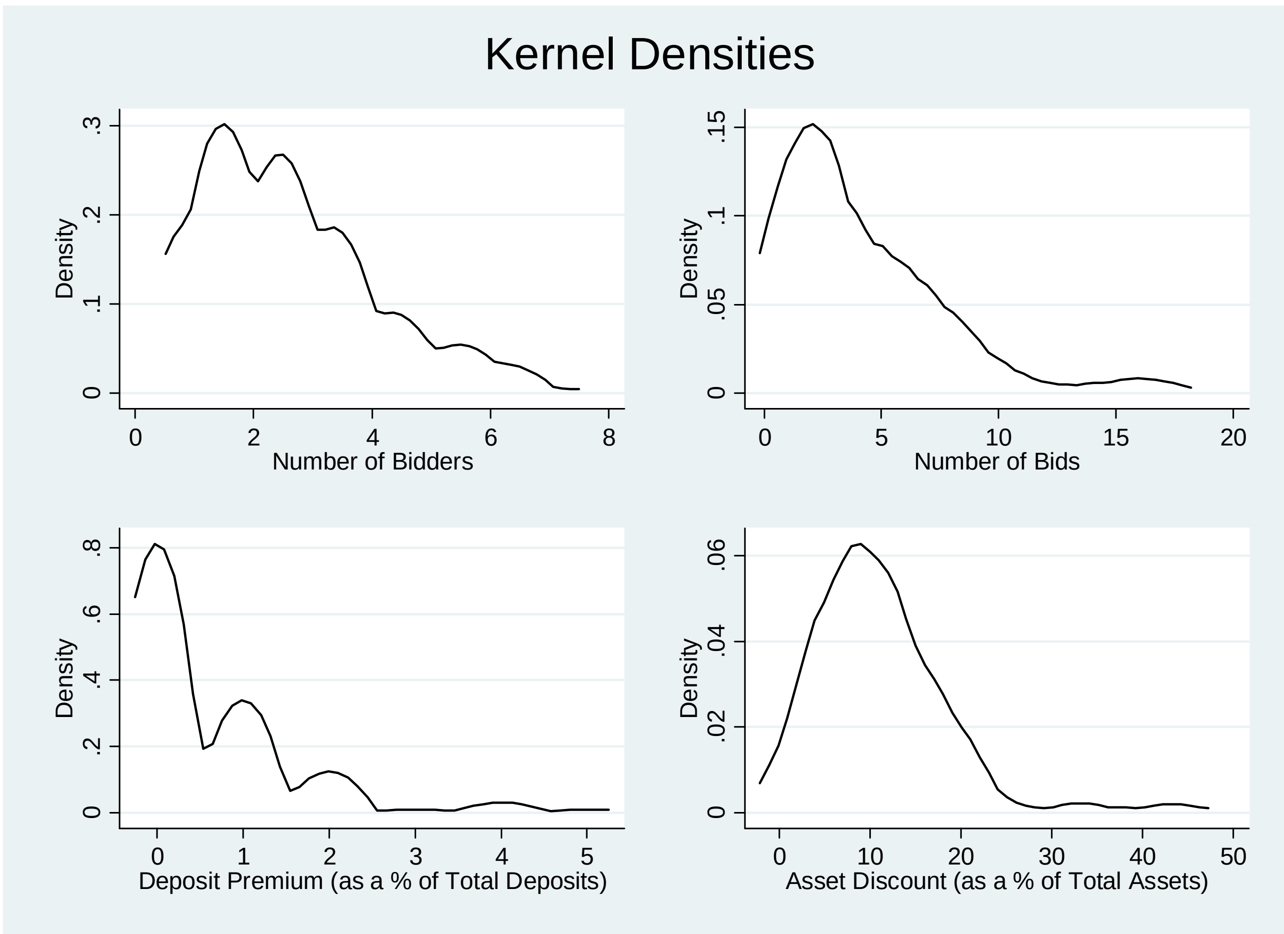
Commercial Banks (2009): STRATEGIC CAPITAL BANK, CITIZENS NATIONAL BANK, BANK OF LINCOLNWOOD, COOPERATIVE BANK, SOUTHERN COMMUNITY BANK, FIRST NATIONAL BANK OF ANTHONY, MIRAE BANK, METROPACIFIC BANK, NEIGHBORHOOD COMMUNITY BANK, HORIZON BANK, FOUNDERS BANK, MILLENNIUM STATE BANK OF TEXAS, THE FIRST NATIONAL BANK OF DANVILLE, ROCK RIVER BANK, THE JOHN WARNER BANK, THE ELIZABETH STATE BANK, THE FIRST STATE BANK OF WINCHESTER, VINEYARD BANK, NATIONAL ASSOCIATION, TEMECULA VALLEY BANK, WATERFORD VILLAGE BANK, FIRST BANKAMERICANO, FIRST STATE BANK, COMMUNITY NATIONAL BANK OF SARASOTA COUNTY, COLONIAL BANK, INBANK, IRWIN UNION BANK AND TRUST COMPANY, UNITED COMMERCIAL BANK, PROSPERAN BANK, ORION BANK, THE BUCKHEAD COMMUNITY BANK, VALLEY CAPITAL BAN.

Thrifts (2010): KEY WEST BANK, BUTLER BANK, LINCOLN PARK SAVINGS BANK, TIERONE BANK, WOODLANDS BANK, TURNBERRY BANK, OLDE CYPRESS COMMUNITY BANK, BAYSIDE SAVINGS BANK, IMPERIAL SAVINGS AND LOAN ASSOCIATION, LOS PADRES BANK, MARITIME SAVINGS BANK, BRAMBLE SAVINGS BANK, APPALACIAN COMMUNITY BANK.

Thrifts (2009): SUBURBAN FEDERAL SAVINGS BANK, GUARANTY BANK, IRWIN UNION BANK, CENTURY BANK, FIRST FEDERAL BANK OF CALIFORNIA, PEOPLES FIRST COMMUNITY BANK.

Appendix B. Figures

Figure 1



Tables

Table I. Descriptive statistics of variables (based on 129 failed institutions' auctions)[a]				
Main Variables	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Bidders	2.54	1.44	1	7
Bids	4.06	3.44	1	17
Deposit Premium[b]	0.50%	0.90%	0%	5.00%
Asset Discount[c]	11.00%	7.40%	0%	45.00%
Control Variables				
Net interest margin	2.75	1.06	0.38	9.42
Loss allowances	-1.96	36.55	-404.04	76.55
Noncurrent loans	12.48	7.13	0.12	33.86
Tier1	4.78	2.99	-4.98	12.68
Total risk capital	6.22	3.73	-6.60	19.88
Noncurrent assets	28.54	35.32	0.50	279.41
Loans / core deposits	91.55	27.27	44.04	189.12

Notes: (a) Source: FDIC *Historical Statistics on Banking, Failures and Assistance Transactions*, individual auctions' bid summaries, (b) The deposit premium is expressed as a percentage of failed institution's total deposits, (c) The asset discount is expressed as a percentage of failed institution's total assets.

Table II. SURE models for Deposit Premium and Asset Discount on the number of bidders								
	Nested Model 1[a]		**Nested Model 2[b]**		**Baseline Model A**		**Baseline Model B**	
Dependent variable	*p*	*d*	*p*	*d*	*p*	*d*	*p*	*d*
Covariate	**Point estimates (z-scores)[c]**							
Log(Number of bidders)	**0.468*** (3.37)**	**-4.525*** (-4.27)**	**0.437*** (2.97)**	**-4.590*** (-4.23)**	**0.329** (2.21)**	**-3.033*** (-2.75)**	**0.375*** (2.70)**	**-4.156*** (-3.94)**
State Dummies	-	-	Included	Included	Included	Included	Included	Included
Net interest margin	-	-	-	-	0.296** (2.52)	-0.286 (-0.33)	0.364*** (3.52)	-1.348* (-1.71)
Loss allowances	-	-	-	-	0.001 (0.70)	-0.024* (-1.73)	-	-
Noncurrent loans	-	-	-	-	-0.011 (-0.77)	0.338*** (3.11)	-	-
Tier1	-	-	-	-	0.035 (1.22)	0.149 (0.70)	-	-
Total risk capital	-	-	-	-	-	-	0.048** (2.01)	-0.273 (-1.50)
Noncurrent assets	-	-	-	-	-	-	-0.002 (-0.94)	-0.022 (-1.07)
Loans / core deposits	-	-	-	-	-	-	-0.007** (-2.10)	0.057** (2.05)
Diagnostics								
R-squared	8.11%	12.37%	29.59%	37.22%	37.43%	43.79%	39.20%	42.68%
Overall significance test	11.39***	18.20***	54.20***	76.48***	77.16***	100.50***	83.18***	96.06***
Zero State effects (by equation)	-	-	38.09	51.07**	44.19*	67.65***	36.21	62.20***
Zero State effects (system)	-	-	87.42**		109.87***		97.06***	
Zero financial profile effects (by equation)	-	-	-	-	16.17***	15.08***	20.40***	12.29**
Zero financial profile effects (system)	-	-	-	-	30.31***		31.89***	
Breusch-Pagan test[d]	2.951*		1.66		0.361		0.159	

Notes: (a) Does not include the signal vector, (b) Signal vector includes only state dummies, (c) One, two, three asterisks denote significance at the 10, 5 and 1 percent level respectively, (d) The null hypothesis is that residuals across equations are independent and the statistic is distributed as a chi-square with 2 degrees of freedom.

Table III. SURE models for Deposit Premium and Asset Discount on the number of bids								
	Nested Model 1[a]		Nested Model 2[b]		Baseline Model A		Baseline Model B	
Dependent variable	*p*	*d*	*p*	*d*	*p*	*d*	*p*	*d*
Covariate	**Point estimates (z-scores)[c]**							
Log(Number of bids)	**0.307*** (3.17)**	**-3.027*** (-4.09)**	**0.285*** (2.75)**	**-3.047*** (-3.98)**	**0.233** (2.25)**	**-2.046*** (-2.66)**	**0.258*** (2.65)**	**-2.758*** (-3.71)**
State Dummies	-	-	Included	Included	Included	Included	Included	Included
Net interest margin	-	-	-	-	0.303** (2.59)	-0.351 (-0.40)	0.373*** (3.61)	-1.460* (-1.85)
Loss allowances	-	-	-	-	0.001 (0.79)	-0.026* (-1.85)	-	-
Noncurrent loans	-	-	-	-	-0.011 (-0.78)	0.344*** (3.17)	-	-
Tier1	-	-	-	-	0.038 (1.32)	0.125 (0.58)	-	-
Total risk capital	-	-	-	-	-	-	0.050** (2.09)	-0.294 (-1.60)
Noncurrent assets	-	-	-	-	-	-	-0.002 (-0.94)	-0.022 (-1.08)
Loans / core deposits	-	-	-	-	-	-	-0.007** (-2.01)	0.053* (1.90)
Diagnostics								
R-squared	7.23%	11.48%	28.94%	36.35%	37.52%	43.61%	39.08%	41.98%
Overall significance test	10.05***	16.74***	52.53***	73.66***	77.45***	99.76***	82.76***	93.33***
Zero State effects (by equation)	-	-	37.99	50.39**	37.24	68.65***	41.32	61.41***
Zero State effects (system)	-	-	86.56***		103.59***		101.20***	
Zero financial profile effects (by equation)	-	-	-	-	17.71***	16.62***	21.49***	12.52**
Zero financial profile effects (system)	-	-	-	-	33.23***		33.02***	
Breusch-Pagan test[d]	3.293*		1.972		0.367		0.212	

Notes: (a) Does not include the signal vector, (b) Signal vector includes only state dummies, (c) One, two, three asterisks denote significance at the 10, 5 and 1 percent level respectively, (d) The null hypothesis is that residuals across equations are independent and the statistic is distributed as a chi-square with 2 degrees of freedom.

Table IV. SURE models for Deposit Premium and Asset Discount including cross-effects								
	Baseline Model A				**Baseline Model B**			
Dependent variable	*p*	*d*	*p*	*d*	*p*	*d*	*p*	*d*
Covariate	**Point estimates (z-scores)[a]**							
Log(Number of bidders)	**0.286* (1.87)**	**-2.775** (-2.47)**	**0.337** (2.29)**	**-3.956*** (-3.65)**	-	-	-	-
Log(Number of bids)	-	-	-	-	**0.203* (1.92)**	**-1.862** (-2.38)**	**0.229** (2.24)**	**-2.599*** (-3.40)**
Deposit Premium	-	**-0.781 (-1.20)**	-	**-0.532 (-0.80)**	-	**-0.789 (-1.21)**	-	**-0.617 (-0.92)**
Asset Discount	**-0.014 (-1.20)**	-	**-0.009 (-0.80)**	-	**-0.014 (-1.21)**	-	-0.010 (-0.92)	-
State Dummies	Included	Included	Included	Included	Included	Included	Included	Included
Net interest margin	0.292** (2.49)	-0.054 (-0.06)	0.352*** (3.36)	-1.154 (-1.40)	0.298** (2.55)	-0.112 (-0.13)	0.358*** (3.42)	-1.229 (-1.49)
Loss allowances	0.001 (0.52)	-0.023* (-1.65)	-	-	0.001 (0.58)	-0.025* (-1.76)	-	-
Noncurrent loans	-0.006 (-0.43)	0.329*** (3.03)	-	-	-0.006 (-0.43)	0.335*** (3.08)	-	-
Tier1	0.037 (1.29)	0.176 (0.82)	-	-	0.155 (0.72)	0.155 (0.72)	-	-
Total risk capital	-	-	0.045* (1.89)	-0.247 (-1.34)	-	-	0.047* (1.94)	-0.263 (-1.41)
Noncurrent assets	-	-	-0.002 (-1.01)	-0.024 (-1.14)	-	-	-0.002 (-1.02)	-0.024 (-1.15)
Loans / core deposits	-	-	-0.007* (-1.93)	0.053* (1.87)	-	-	-0.006* (-1.83)	0.048* (1.72)
Diagnostics								
R-squared	37.43%	43.79%	39.20%	42.68%	37.52%	43.61%	39.08%	41.98%
Chi-square[b]	78.82***	102.23***	83.92***	96.82***	79.14***	101.52***	83.75***	94.33***
Breusch-Pagan test[c]	0.361		0.159		0.367		0.212	
Notes: (a) One, two, three asterisks denote significance at the 10, 5 and 1 percent level respectively, (b) Overall significance test, (c) The null hypothesis is that residuals across equations are independent and the statistic is distributed as a chi-square with 2 degrees of freedom.								

Table V. Calculations based on Baseline Model A with number of bidders[a]							
Panel A. Assets							
Based on sample data				*Scenario: bidders increase by 1 in all auctions*			
Number of Bidders	**Assets**[b] **(in $ 000)**	*d*	**Discount**[c] **(in $ 000)**	*d*	**Discount (in $ 000)**	**Gain**[d] **(in $ ml)**	**Total Gain**[e] **(in $ ml)**
1	426,423	15.05	64,176	12.02	51,256	12.92	478.06
2	1,775,651	10.98	194,966	9.47	168,154	26.81	938.43
3	621,146	9.03	56,089	8.03	49,878	6.21	180.13
4	1,090,921	7.09	77,346	6.34	69,164	8.18	114.54
5	2,156,379	6.81	146,849	6.21	13,3911	12.93	90.56
6	383,116	12.11	46,395	11.61	44,479	1.91	11.49
7	3,172,915	2.70	85,668	2.30	72,977	12.69	12.69
Panel B. Deposits							
Based on sample data				*Scenario: bidders increase by 1 in all auctions*			
Number of Bidders	**Deposits (in $ 000)**	*p*	**Premium (in $ 000)**	*p*	**Premium (in $ 000)**	**Gain (in $ ml)**	**Total Gain (in $ ml)**
1	375,145	0.21	810	0.54	2,044	1.23	45.66
2	1,399,731	0.54	7,586	0.70	9,889	2.30	80.58
3	517,622	0.68	3,566	0.79	4,128	0.56	16.29
4	957,953	1.21	11,629	1.29	12,417	0.78	11.03
5	1,907,483	1.85	35,421	1.92	36,677	1.25	8.78
6	341,102	0	0	0.05	179	0.18	1.07
7	2,420,738	0	0	0.04	1,114	1.11	1.11

Notes: (a) Assets, *d*, Deposits, and *p* correspond to the sample mean values conditional on the number of bidders, (b) *d* and *p* are expressed as percentages of total assets and total deposits respectively, (c) Discount and Premium are defined as Assets**d* and Deposits**p* respectively, (d) Gain is the difference in Discounts and Premia based on sample data and those estimated under the scenario that bidders were increased by 1, (e) Total Gain is obtained by multiplying the average gain with the number of auctions conditional on the number of bidders.

Table VI. Calculations based on Baseline Model B with number of bidders[a]

Panel A. Assets

Based on sample data				*Scenario: bidders increase by 1 in all auctions*			
Number of Bidders	**Assets[b] (in $ 000)**	*d*	**Discount[c] (in $ 000)**	*d*	**Discount (in $ 000)**	**Gain[d] (in $ ml)**	**Total Gain[e] (in $ ml)**
1	426,423	15.05	64,176	10.89	46,454	17.72	655.71
2	1,775,651	10.98	194,966	8.90	158,068	36.89	1,291
3	621,146	9.03	56,089	7.65	47,571	8.51	247.03
4	1,090,921	7.09	77,346	6.05	66,011	11.33	158.68
5	2,156,379	6.81	146,849	5.97	128,925	17.92	125.46
6	383,116	12.11	46,395	11.44	43,848	2.54	15.28
7	3,172,915	2.70	85,668	2.11	67,208	18.46	18.46

Panel B. Deposits

Based on sample data				*Scenario: bidders increase by 1 in all auctions*			
Number of Bidders	**Deposits (in $ 000)**	*p*	**Premium (in $ 000)**	*p*	**Premium (in $ 000)**	**Gain (in $ ml)**	**Total Gain (in $ ml)**
1	375,145	0.21	810	0.96	3,623	2.81	104.10
2	1,399,731	0.54	7,586	0.72	10,211	2.62	91.85
3	517,622	0.68	3,566	0.81	4,206	0.64	18.57
4	957,953	1.21	11,629	1.30	12,527	0.89	12.57
5	1,907,483	1.85	35,421	1.93	36,852	1.43	10.01
6	341,102	0	0	0.06	204	0.20	1.22
7	2,420,738	0	0	0.05	1,270	1.27	1.27

Notes: (a) Assets, *d*, Deposits, and *p* correspond to the sample mean values conditional on the number of bidders, (b) *d* and *p* are expressed as percentages of total assets and total deposits respectively, (c) Discount and Premium are defined as Assets**d* and Deposits**p* respectively, (d) Gain is the difference in Discounts and Premia based on sample data and those estimated under the scenario that bidders were increased by 1, (e) Total Gain is obtained by multiplying the average gain with the number of auctions conditional on the number of bidders.

Figures

Figure 1