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by Ben R. Craig and
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FEDERAL RESERVE BANK OF CLEVELAND

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The authors thank Joseph Ritter, Richard Rogerson, George Pennacchi, and seminar participants at the Federal Reserve Bank of Cleveland for helpful comments.

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Gross Loan Flows

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Abstract

We present a series of stylized facts about gross loan flows and how they vary over time, bank size, and region. We define *loan creation* as the sum of the change in bank loans at all banks that increased loans since last quarter. *Loan destruction* is similarly defined as the absolute value of the change in loans at all banks that decreased loans. The *gross flow* (akin to what the labor literature calls reallocation) is the sum of creation and destruction.

Introduction

Measures of job creation and destruction provide information missed by more popular statistics such as the unemployment rate or net employment growth. Similar measures can also illuminate bank lending. Measures of loan creation and destruction can uncover the diversity behind traditional measures such as total loans. For example, near the peak of the "oil patch" crisis in the southwest, a five percent fall in total loans masked much larger increases and decreases among individual banks.

Heterogeneity across banks matters for a variety of positive and normative questions. Understanding the monetary transmission mechanism requires understanding which banks (if any) are particularly affected by tight money. For example, policymakers should know if reigning in nationwide inflation will crush the rustbelt or restrain only small banks. Policy designed for a non-existent "average bank" may backfire, particularly if it ends up punishing or rewarding a narrow group.

The proper regulatory response to other problems, such as excessive loan growth (perhaps caused by such subsidies as deposit insurance), depends on how widespread the problem is, a factor that aggregate growth rates cannot determine. If only a handful of banks are responsible, a policy of tightening loan standards would be ineffective if it left the high flyers untouched and positively perverse if it fell upon already contracting banks. Concentrated difficulties in a few banks can lead to a general contagion, whereas the same impact spread across the entire system has a negligible effect (Allen and Gale, 2000). Other policies might be designed to target specific sub-groups. The Basle capital standards, for example, had their largest effect on the portfolio composition of undercapitalized banks– precisely the group they were aimed at (Haubrich and Wachtel, 1992).

In models with informational or organizational capital, a given decrease in total loans has a dramatic effect if that decrease arises from bank failures, but almost no impact if spread among many healthy banks(Freixas, Parigi and Rochet 2000). In the Great Depression, bank failures intensified the severity of the depression in the US (Bernanke,

1983), but the more orderly retrenchment of lending by Canadian banks without failures meant a lesser impact on output and employment (Haubrich, 1990).

In this paper, we present a series of stylized facts about gross loan flows and how they vary over time. Though such an exercise provides no definitive conclusions about the transmission of monetary policy or the effectiveness of bank regulations, it adds, we feel, a perspective that offers insights into those problems.

Data: source and construction

We define *loan creation* as the sum of the change in bank loans at all banks that increased loans since last quarter. *Loan destruction* is similarly defined as the absolute value of the change in loans at all banks that decreased loans. The *gross flow* (akin to what Davis and Haltiwanger (1992) call reallocation) is the sum of creation and destruction.

More formally:

Loan Creation: $C_t = \sum_{i,t}(L_{i,t} - L_{i,t-1})$for those i s.t.$L_{i,t} - L_{i,t-1} > 0$.

Loan Destruction: $D_t = \sum_{i,t} |L_{i,t} - L_{i,t-1}|$for those i s.t.$L_{i,t} - L_{i,t-1} < 0$.

Gross Flow: $D_t + C_t$.

For loan data, we take quarterly levels of total loans from the *FFIEC Quarterly Reports of Condition and Income* ("Call Reports"). A small number of small banks were excluded from the sample, such as banks that never made any loans. The data starts in 1959, quarter IV, continuing to 1998:2, and is quarterly on regular basis starting in 1978:2. Because coverage was not uniform, for many calculations we use data starting in 1969:4. Thus for most purposes we have approximately 2 million data points. The loans were adjusted for inflation (using the CPI), converting all amounts into 1982 constant dollars.

Mergers presented a problem because one bank would disappear from the call reports; acquisitions, where the original bank kept its charter and thus continued to report, did not cause a problem. If Bank1 and Bank2 each make $1000 of loans in quarter 1 and quarter 2,

there is no creation or destruction. If lending amounts remain the same, but Bank2 merges into Bank1, Bank1 would show creation of $1000 and Bank2 would show destruction of $1000. We solve this by redefining creation and destruction for periods in which there is a merger, specifically, in this case, we would define creation as $L_{1,t} - (L_{1,t-1} + L_{2,t-1})$. In our time period there were mergers involving 6,889 target banks.

The names of merged banks and the dates such mergers and took place are from the FFIEC file on bank mergers. Further details can be found in Craig and Santos (1999). We used a FORTRAN program to find and identify mergers. Actual mergers often went beyond one bank buying another. In some cases, several banks merged together; in others, the banks merged and then took on a new name. A small number of small banks were dropped because of difficulty interpreting the merger results, either because no successor bank was found or for other reasons (for example, where A bought B, B bought C, and C bought A). These banks were all tiny and had a negligible impact on our result. The final sample had 6,798 target banks.

Gross Loan Flows: some elementary facts

Two main questions organize our exploration of the gross flows data. First, how heterogeneous is the bank loan market? Does a small increase in total loans result from a small increase at most banks or from banks with high creation offsetting those with high destruction? How much of loan growth results from banks entering and leaving the market? Is the growth concentrated in fast growing firms, or spread more evenly across banks? Are gross loan flows similar across regions or size classes?

Second, how do gross flows differ over the business cycle? Is there a difference between recessions and expansions? For example, Davis and Haltiwanger (1992), looking at *job* creation and destruction, emphasize several features. They find a high level of both creation and destruction in all time periods. Good times or bad, many plants are hiring workers and many are laying them off. In recessions, however, destruction dominates, and accounts for much most of the movement in employment. We find high levels of both loan creation

and destruction across time, with more even changes over the business cycle.

The basic time series

Our analysis centers on a time series for six variables: loan growth, creation, destruction, gross flow, entry and exit. The time series starts with data for the fourth quarter of 1959, which, since it has a date of December 30, shows up in plots as 1960. A few simple operations on the series, such as plotting the data and calculating persistence will reveal the main characteristics.

Figure 1 plots the growth of real total loans, loan creation, and loan destruction. At least since the early 1970's, when the data becomes more comprehensive, both loan creation and destruction remain high, though variable. Even when net loan growth was negative, such as the early 1980s or the early 1990s, many banks were increasing the number of loans they made. In 1991:2, the total value of loans fell by $20 billion: this was the difference between creation of $40 billion and destruction of $60 billion. Figure 2, which isolates out gross flows and loan growth, reinforces this point: the gross loan flows far exceed the net loan flows. On average gross flows are almost eight time the net flows reported in the aggregate.

Figures 3 and 4 concentrate on creation and destruction separately. Creation shows a general, if irregular, upward trend, and after the Call Report revisions, entry has only a small part in loan creation: most creation is in existing banks. This is not surprising although it contrasts with Davis and Haltiwanger's result which shows a much larger influence from plant creation. Their data is at the plant level whereas ours is at the bank level. Opening a branch (which might correspond to a plant entry) thus would correspond to an existing bank's increase. Exit plays a larger part in destruction, particularly recently, though most destruction still comes about from surviving banks reducing their loans.

Table 1 expresses this in a somewhat different manner. It lists the mean, median, standard deviation, maximum, minimum, and range of gross flows, creation, destruction, entry and exit, as a percentage of total loans beginning in 1969:4. Overall, real total loans

grow at an average (quarterly) rate of 0.7 percent. This is a balance between a creation rate of 3.0 percent and a destruction rate of 2.4 percent. Thus, in an average *quarter* there is a gross change of 5.4 percent of all bank loans, over seven times the net change.

	Gross Flow	entry	exit	Creation	Destruction	loan growth
mean	5.389	0.143	0.384	2.984	2.405	0.732
median	5.413	0.096	0.250	3.047	2.122	1.056
std	1.605	0.153	0.432	1.074	1.210	1.867
max	11.160	0.933	2.958	6.474	6.223	7.272
min	2.416	0.005	0.008	0.661	0.303	-4.712
range	8.745	0.929	2.950	5.813	5.920	11.985

Table 1, LOANS.

It is worth comparing this with the Davis and Haltiwanger data on gross job flows, presented in Table 2.

	creation	destruction	job growth	gross flow
mean	5.201	5.535	-0.306	10.437
median	4.933	5.155	0.037	10.726
std	0.894	1.659	2.167	2.179
max	7.323	11.418	2.591	14.667
min	3.249	3.249	-8.169	0.940
range	4.075	8.169	10.760	13.726

Table 2.

The numbers in Table 2 are quarterly numbers from 1972:2 to 1988:4, a somewhat shorter sample than for loans. The reallocation, creation, and destruction rates for jobs all exceed the equivalent numbers for loans. Admittedly, jobs are not loans and labor markets are not capital markets, but the comparison gives one benchmark for the amount of reallocation. The central fact of large simultaneous creation and destruction remains constant.

Creation and destruction in any one quarter, or even their averages, obscures what happens over time. How much of the original increase in loans survives after several periods? Figures 5 and 6 plot the persistence of creation and destruction up to 8 quarters, along with two standard deviation error bands. Creation shows strong persistence over all eight quarters. On average, creation tends to grow over time, so that eight quarters after the original increase in loans, the bank has increased loans even further. This ought

to be expected in a growing economy, as on net, the number of loans increases over time. Destruction also shows a rather strong persistence, as over eight quarters later, the banks are making even fewer loans than before. The large error bounds, however, indicate that after even three quarters many banks have switched over into the creation range.

Distribution of changes

The numbers on gross loan flows establish one level of heterogeneity in the lending market. To explore this issue further, we need to look at the distribution of growth rates across banks. Figure 7 displays a histogram depicting the distribution of positive growth rates beginning in 1969:4. Two features stand out. Modest increases account for most creation: 49 percent of all loan creation occurred in banks that expanded loans from 0 to 5 percent or from 5 to 10 percent. Large changes are not completely neglible, however. Banks that more than doubled the value of their loans accounted for 8 percent of creation. New entry accounted for another 5 percent. A category we label "strange," comprised of in-sample banks with no loans in the previous period, added 0.6 percent. Thus more than one dollar in eight of new loans is accounted for by banks that either more than doubled the value of their portfolio or did not exist before.

Figure 8 depicts the distribution of negative growth rates for the same time period. Again, modest changes dominate: 49 percent of destruction was in banks that decreased loans by between 0 and 10 percent. Large changes are more important than for creation, however. Exits account for 17 percent, and decreases of 95-100 percent account for an additional 2.5 percent. Thus, nearly 20 percent of loan destruction comes from banks that drastically decreased their loans.

In one sense the dominance of banks with smaller growth rates should not be particularly surprising. Most assets are concentrated at the larger banks, which might then be expected to grow slower (see Evans 1987 for a more extensive discussion of this and related issues). Large banks (assets above $5 billion) accounted for 43 percent of the loans in the sample, and 39 percent of the total gross flows, as table 3 panel A shows. The

smallest banks (assets below $50 million) had greater rates of creation and destruction, which gave them a disproportionate share of gross flows, but with only 7 percent of total loans it makes little difference to the aggregates.

Class	total loans	Gross Flow	entry	exit	Creation	Destruction
1	6.756	9.367	14.834	8.932	8.739	10.150
2	5.942	5.540	6.101	6.048	5.569	5.503
3	15.913	15.638	23.088	20.502	15.433	15.894
4	7.555	8.0858	10.431	10.442	7.809	8.428
5	20.081	22.138	24.328	27.637	21.479	22.961
6	43.752	39.232	21.217	26.439	40.971	37.063

Panel A.

class	total loans	Gross flow	entry	exit	creation	destruction
. 1	100	8.509	0.681	0.580	4.658	3.851
2	100	5.189	0.157	0.438	2.895	2.294
3	100	5.470	0.221	0.554	2.996	2.474
4	100	5.956	0.210	0.594	3.193	2.763
5	100	6.136	0.185	0.592	3.304	2.832
6	100	4.991	0.074	0.260	2.893	2.098

% of total loans in class Panel B, TABLE 3

Gross Loan Flows and Business Cycles

From a macroeconomic perspective (as opposed, to say, a corporate finance perspective) the interest in bank lending lies in its interaction with business cycles. An exciting part of the gross job flows literature derived from the prominence of job destruction in recessions. Gross loan flows have the additional possibility of shedding light on the transmission and propagation mechanisms behind business cycles. How do gross flows change over the business cycle, and what accounts for those changes? What has the focus on net changes missed?

Comparing the summary statistics for gross flows in recessions and expansions gives one set of answers. Table 4 does this,using NBER cycle dates for the period 1969:4 to 1998:3.

	Gross Flow	entry	exit	Creation	Destruction	growth
mean	5.548	0.160	0.291	2.575	2.974	-0.311
median	5.456	0.106	0.226	2.648	2.988	-0.104
std	1.375	0.210	0.300	1.101	1.146	1.780
max	7.793	0.846	1.194	4.921	4.930	2.531
min	5.122	0.044	0.216	2.010	1.750	-2.038
range	2.670	0.802	0.978	2.911	3.080	4.568

Recessions Panel A.

	Gross Flow	entry	exit	Creation	Destruction	growth
mean	5.360	0.140	0.401	3.059	2.301	0.861
median	5.385	0.096	0.263	3.101	2.065	1.255
std	1.649	0.142	0.452	1.059	1.198	2.191
max	11.160	0.933	2.958	6.474	6.223	7.327
min	2.416	0.005	0.008	0.661	0.303	-6.669
range	8.745	0.929	2.950	5.813	5.920	13.995

Expansions Panel B, TABLE 4

The numbers in table 4 show a cyclical pattern, but neither creation nor destruction dominates. Loan growth slows, on average, by 1.2 percent (quarterly) in recessions, and this is apportioned between a 0.5 percent drop in creation and a 0.7 percent increase in destruction. Even in recessions, many banks expanded the loans they made. Entries even rose, and more surprisingly, exits, as a percentage of total loans, fell.

The stylized facts thus show neither a uniform reduction by all banks nor a reduction concentrated in a few banks. Even in a recession, many banks expand, few fail, and the decline in lending broad based. Figure 9 confirms this with a histogram of destruction in recessions. Decreases of 10 percent or less account for 62 percent of the destruction in recession quarters, though reductions of 95 percent or more account for a non-trivial 11 percent.

relation to net loan growth

Splitting the sample into recession and expansion periods may create a false dichotomy. (Though negative loan growth is not synonymous with recessions, as a glance at Tabel 5 will show.) A more continuous approach would be to compare the gross and net flows. Periods of low positive or negative growth may be more akin to each other than to times of large changes. We'd like an idea of how changes in creation and destruction contributed to

changes in the net loans. As we discuss further below, different theories have very different predictions about how the market equilibrates aggregate shocks–whether the major margin of adjustment is in creation, destruction, or both.

Foote and Shin (1999) argue for making the comparison by plotting creation and destruction against net loan growth. Figures 10 and 11 do this. In Figure 10, destruction and net loan growth show a strong negative correlation. In Figure 11, creation and net loan growth show a correspondingly strong positive correlation. Neither the destruction margin nor the creation margin dominates. A decrease in loans arises both because some banks contract more than usual, and other banks slow their expansion. An increase in loans arises because some banks expand more than usual, and other banks slow their contraction.

These stylized facts may have implications for theories trying to explain banks' role in transmitting business cycles. One class of models, which concentrates on shocks to the businesses' net worth (Bernanke and Gertler 1989, Kiyotaki and Moore 1997, Carlstrom and Fuerst, 1997) has shown itself able to explain some of the important basic facts of consumption and investment growth. By concentrating on the means (more generally the first moments) of macroeconomic series, however, current models of this class do not emphasize the heterogeneity in the market that leads to gross flows. It may be that adding sectoral or idiosyncratic shocks to these models would enable them to match the gross loan flows data.

Another class of models, which concentrates on shocks to the liquidity of lenders (Monge 1998, den Haan, Ramey, and Watson 1999) has taken a more search-theoretic approach to lending, and thus finds it easier to explain simultaneous loan creation and destruction. Such models often differ in their predictions about the margin of adjustment: for example, in Diamond (1994) cyclical variation proceeds only via job destruction. So it remains to be seen how well these models can match the gross loan flow data.

Clearly, some types of models are ruled out: any model which posits an exclusively aggregate shock has trouble explaining why creation exists even in times of negative loan

growth. That said, the symmetry between creation and destruction might make it easy to overlay an aggregate shock onto a model with sectoral or firm-specific reallocation. For example, a shock that decreased the loans of all banks would increase destruction, lower creation, and move some banks from creation to destruction. Such a shock would have more trouble explaining the distribution of creation and destruction, particularly the large role for exits, but presumably the proper specification of the entry/exit decision could handle that.

Regions

The biggest differences in creation and destruction show up not between recessions and expansions, nor between banks of different sizes, but between different regions of the country. We split the banks up into seven regional categories by Federal Reserve District (this means some states were split). The Seven regions are New England (Boston district), Middle Atlantic (New York and Philadelphia), South East (Richmond and Atlanta), Mid-West (Cleveland, Chicago, and St. Louis), High Plains (Kansas City and Minneapolis), Southwest (Dallas) and West (San Francisco). Figures 12-18 plot creation and destruction as a percent of total loans in each region.

New England shows a pattern that should not be surprising to those who remember concerns about a "capital crunch" in the early 1990s (Bernanke and Lown, 1991). High loan growth (creation well above destruction) in the 1980s gave way to a sharp increase in destruction starting in 1990. Yet the destruction was at times accompanied by high creation rates as well: in 1991:1, although loan destruction was 13.6 percent, creation was 9.9 percent.

The Middle Atlantic region shows fewer large spikes of either creation or destruction, though the period from 1978 to 1988 was rather variable. the early 1990s had a preponderance of destruction before a more balanced pattern returned about 1994.

The South East, MidWest, and High Plains regions show much less variability than New England or the Middle Atlantic regions: creation or destruction rates rarely rise

above 5 percent, and rarely above 10 percent. In these regions creation often lies above destruction for considerable periods, reflecting strong growth in loans. Exceptions are the time of trouble for the "rust belt" in 1980–1982 and the strong seasonal pattern of destruction in the High Plains region starting in 1987:1.

The South West shows the familiar "oil patch" story: after building up loans with strong creation in the early and mid 1980s, extremely high destruction rates reduced loans. In three short months, the third quarter of 1988, banks reduced the value of their loan portfolio by almost a quarter: 24 percent. The drop in the value of total loans was not that amazing–just over five percent–because creation ran at a rather astonishing level of 19 percent. Gross flows in this quarter were 33 percent, a full third. Looking just at the net loan growth, the quarter looks serious enough–the five percent drop in loans is twice as bad as anything the nation as a whole experienced over this time period even in recession. But even this large change masks the much dual collapse and explosion in this region.

The West presents a much calmer region, whose main characteristic resides in the variability of loan destruction.

Conclusion

This paper has aimed at providing some stylized facts about gross loan flows, with an eye towards enriching the discussion of banks' role in business cycles. The main results can be stated rather succinctly.

Gross flows are large: on average, over five percent of total loans are either created or destroyed, each quarter. This is about seven times the net change in loans per quarter. Like loans themselves, total gross flows are concentrated at the large banks, though smaller banks show a greater proportion of creation and destruction than their share of net loan growth would indicate. The bulk of creation and destruction occur in banks making a change of less than 10 percent in their loans, but larger changes (either a doubling or better of the loan portfolio or an entry or exit) have a substantial share, accounting for one seventh of new loans and more than one dollar in six of all loans that a bank does not

replace.

Over the business cycle, creation is higher in expansions and lower in recession, just as destruction is lower in expansions and higher in recessions. This relationship continues to hold if one looks at creation and destruction against net loan growth. Entry and exit do not show such a cyclical pattern.

Regions show distinct differences in creation and destruction, most probably linked to specific regional shocks. At times these gross flows become quite large.

In the labor literature, examination of gross flows helped call attention to the heterogeneity in the employment relation. The banking literature as a whole has been well aware of heterogeneity among banks, but in many cases has lacked the proper perspective to make it manageable and relevant. We think that the gross flows approach can help.

Deliberately, these result raise more questions than they answer. In future work, we hope to address issues such as time aggregation problems, how to spot credit crunches, and the usefulness of the data in deciding between different macroeconomic theories.

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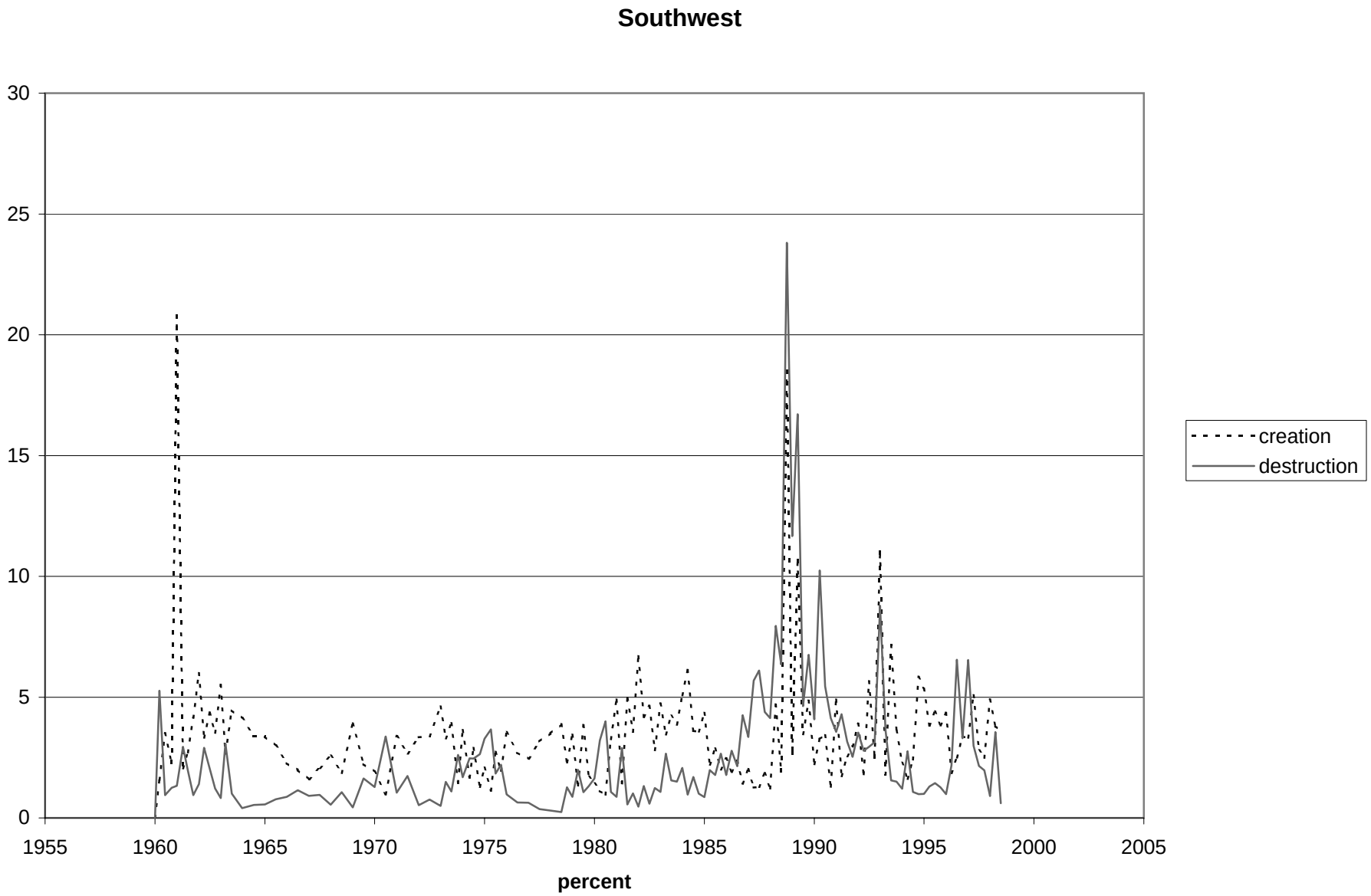
Southwest
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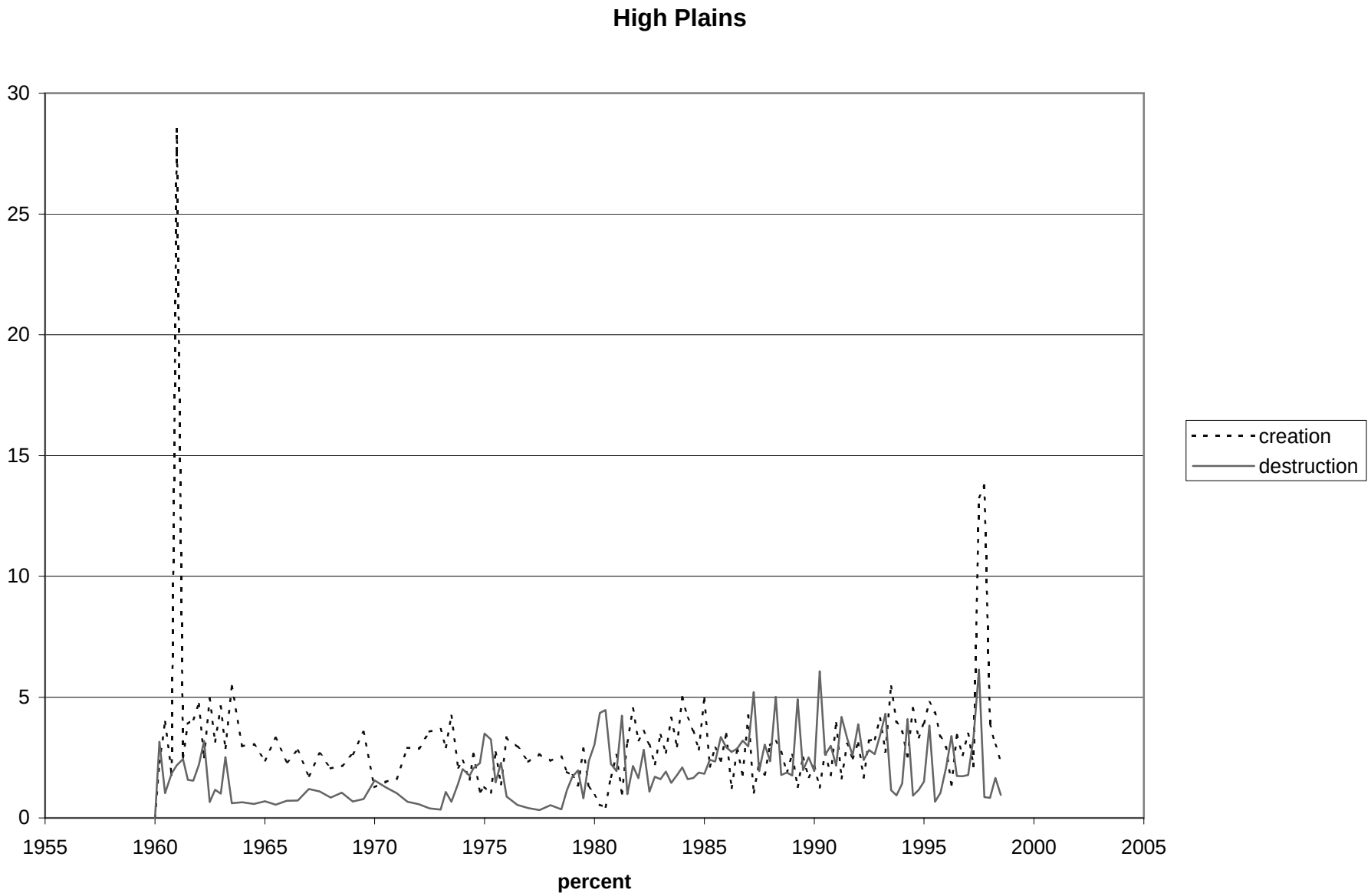
percent
creation
destruction

Figure 17


High Plains
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creation
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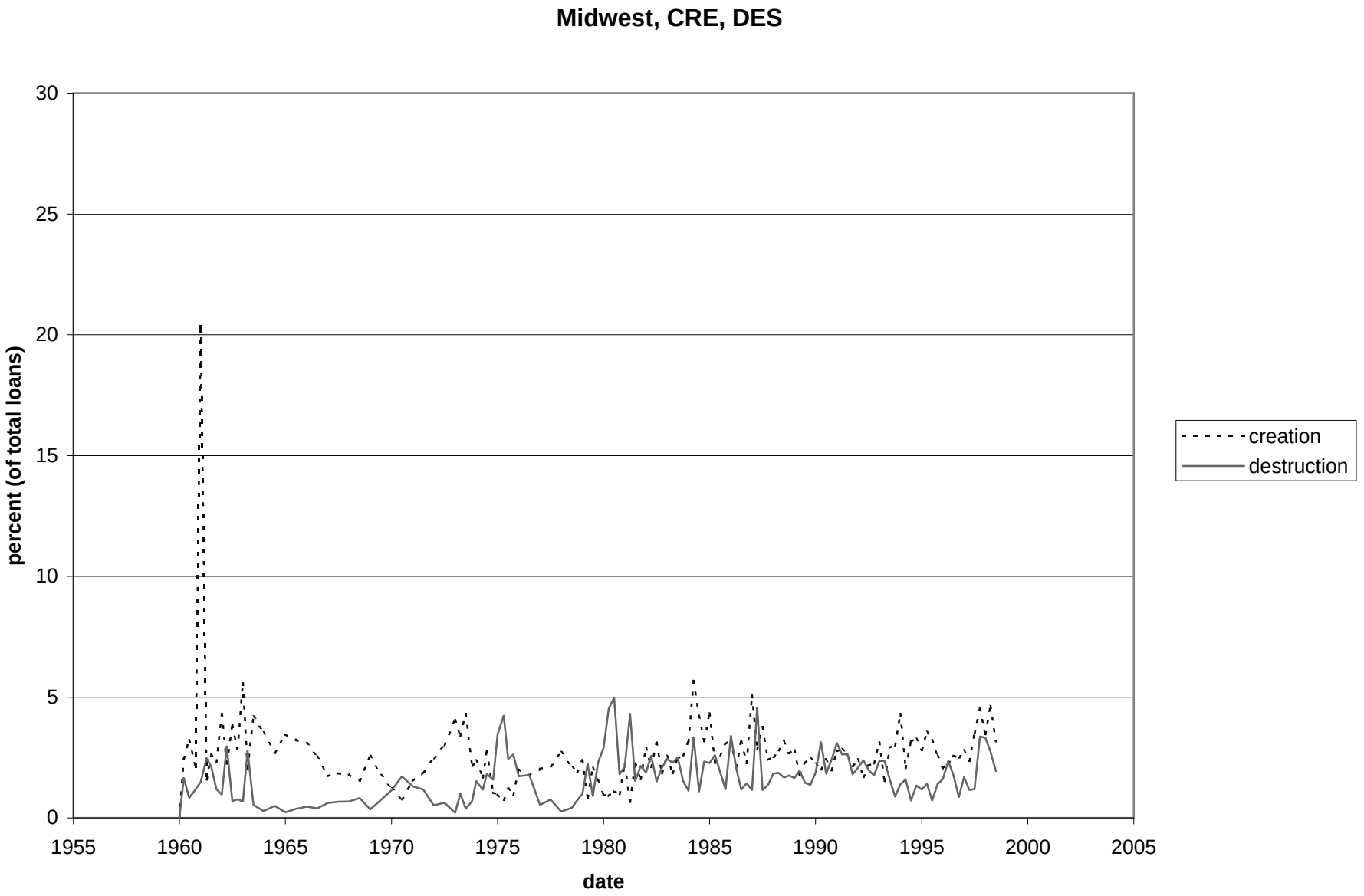
Figure 16


Midwest, CRE, DES
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creation
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Figure 15

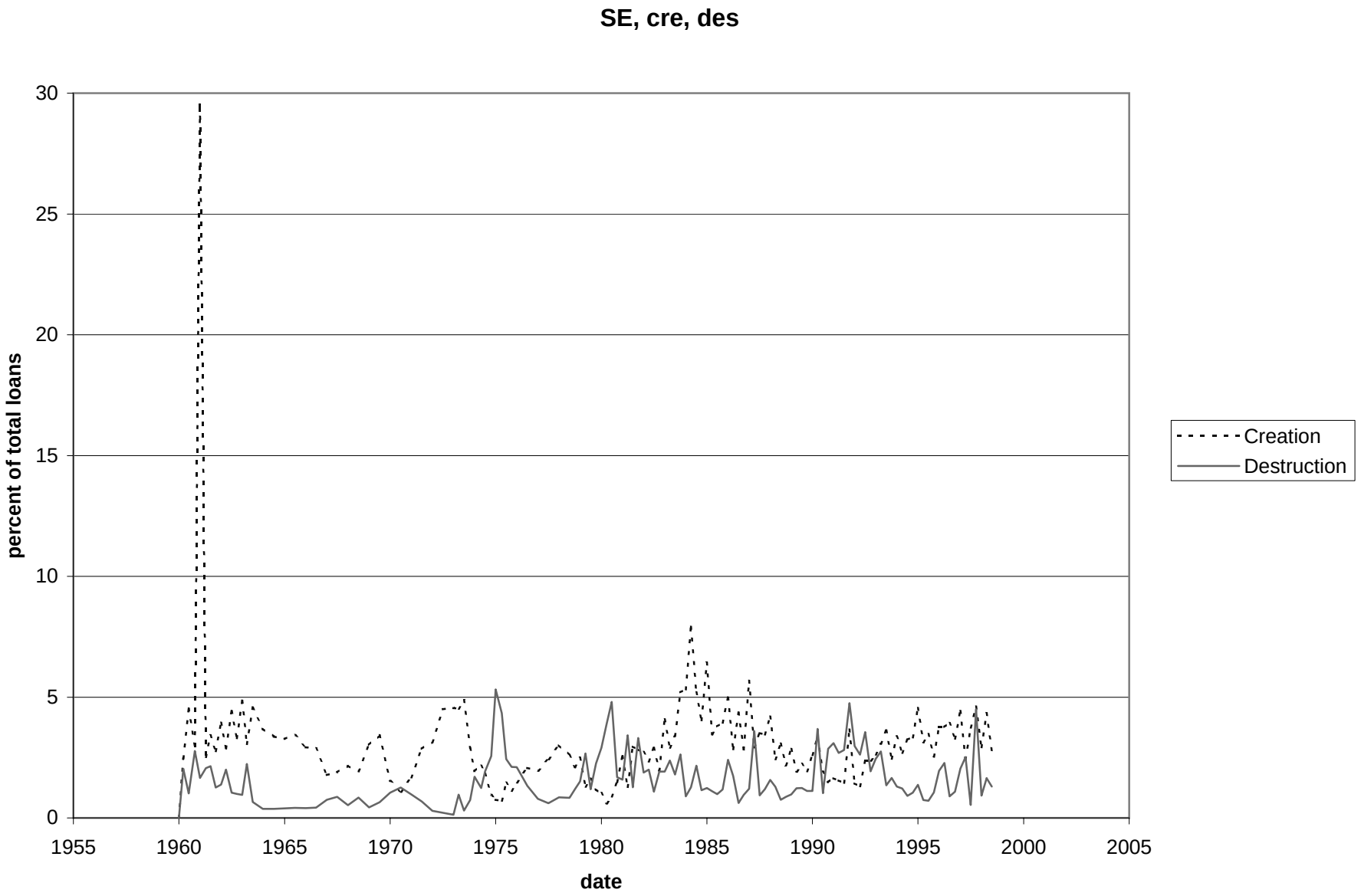
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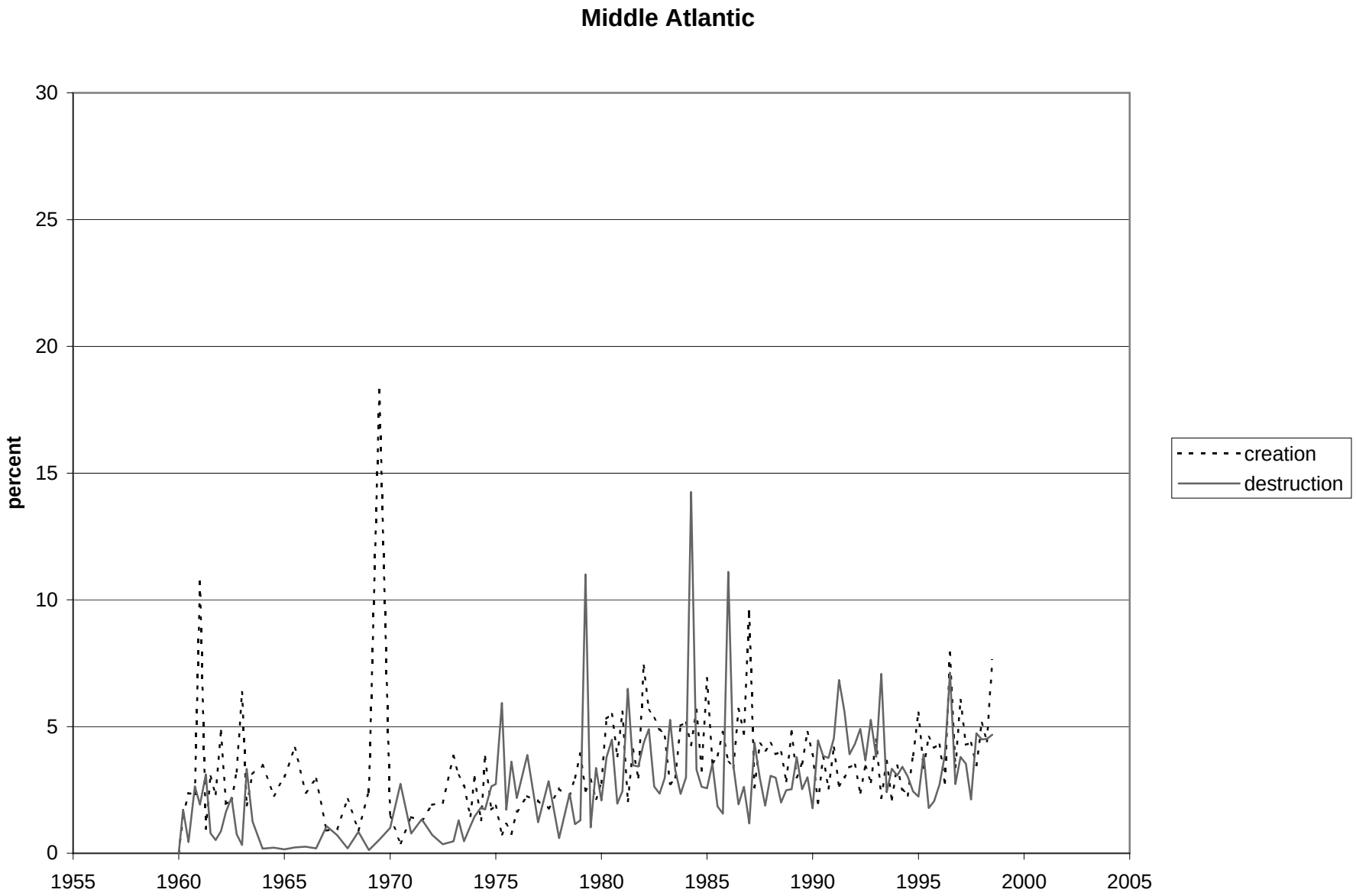
Figure 14


Middle Atlantic
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creation
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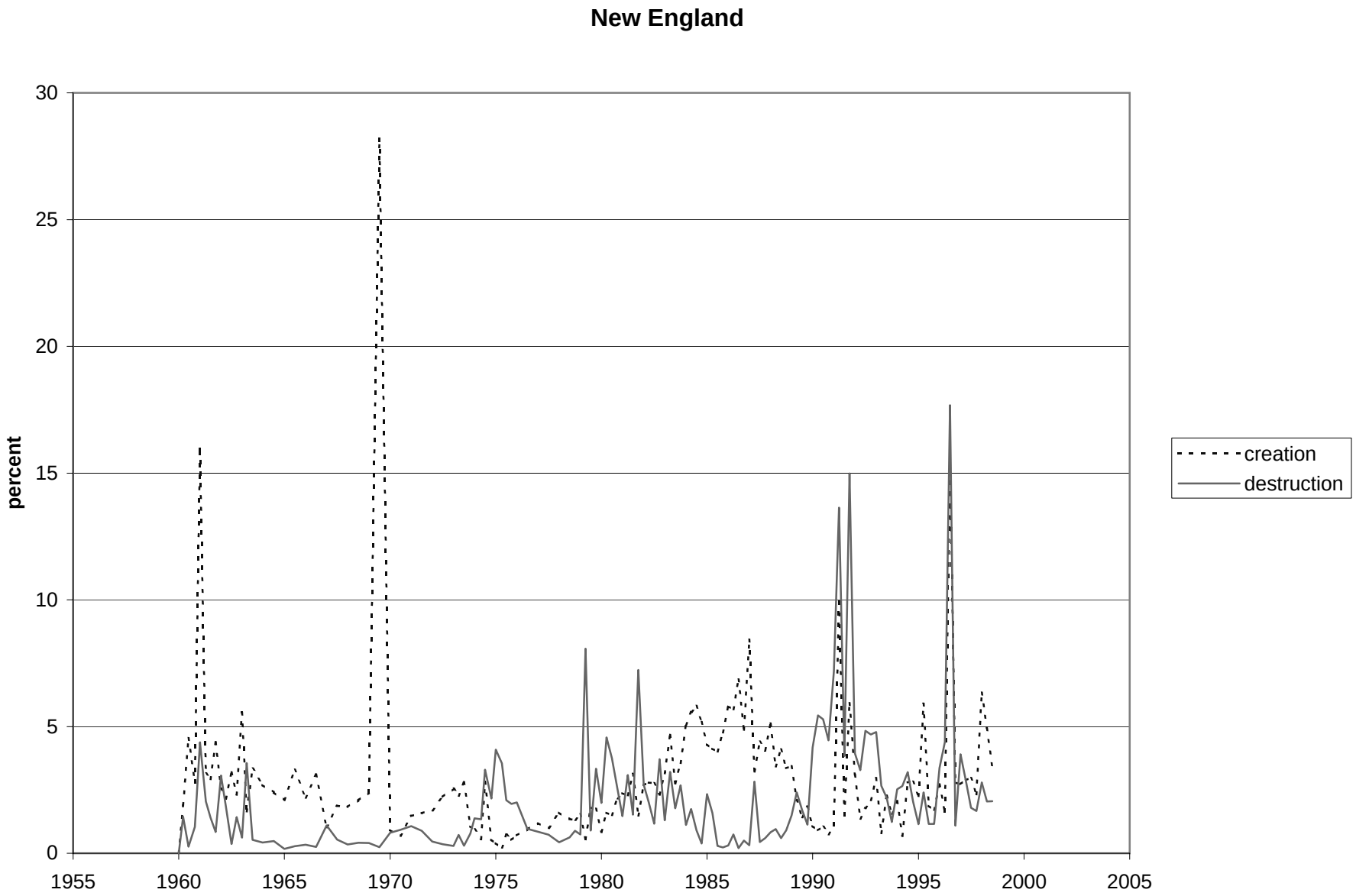
Figure 13


New England
percent
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1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
creation
destruction

Figure 12

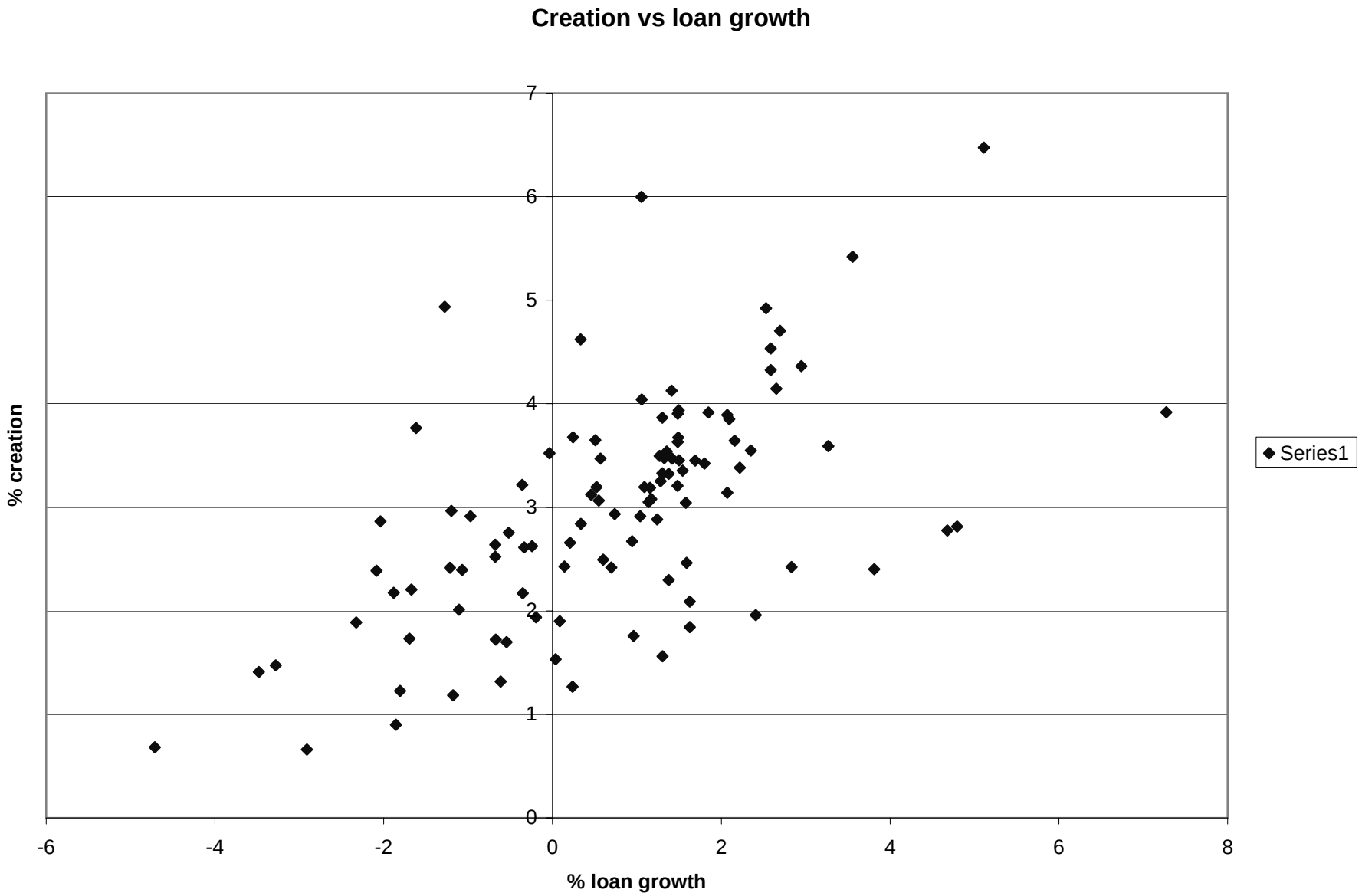
Creation vs loan growth
% creation
% loan growth
Series1
0
1
2
3
4
5
6
7
-6
-4
-2
0
2
4
6
8

Figure 11

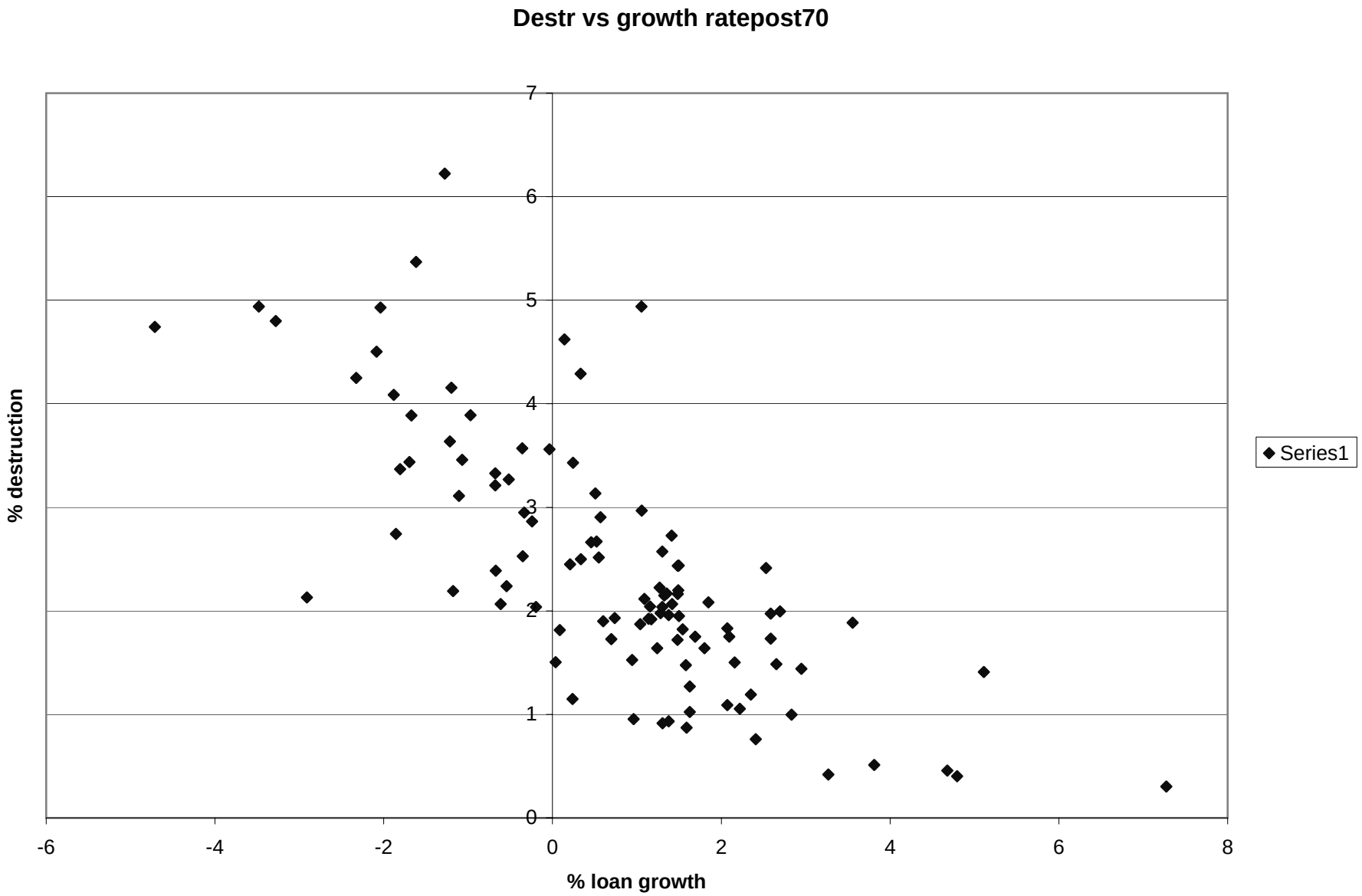
Destr vs growth ratepost70
% destruction
% loan growth
Series1
0
1
2
3
4
5
6
7
-6
-4
-2
0
2
4
6
8

Figure 10

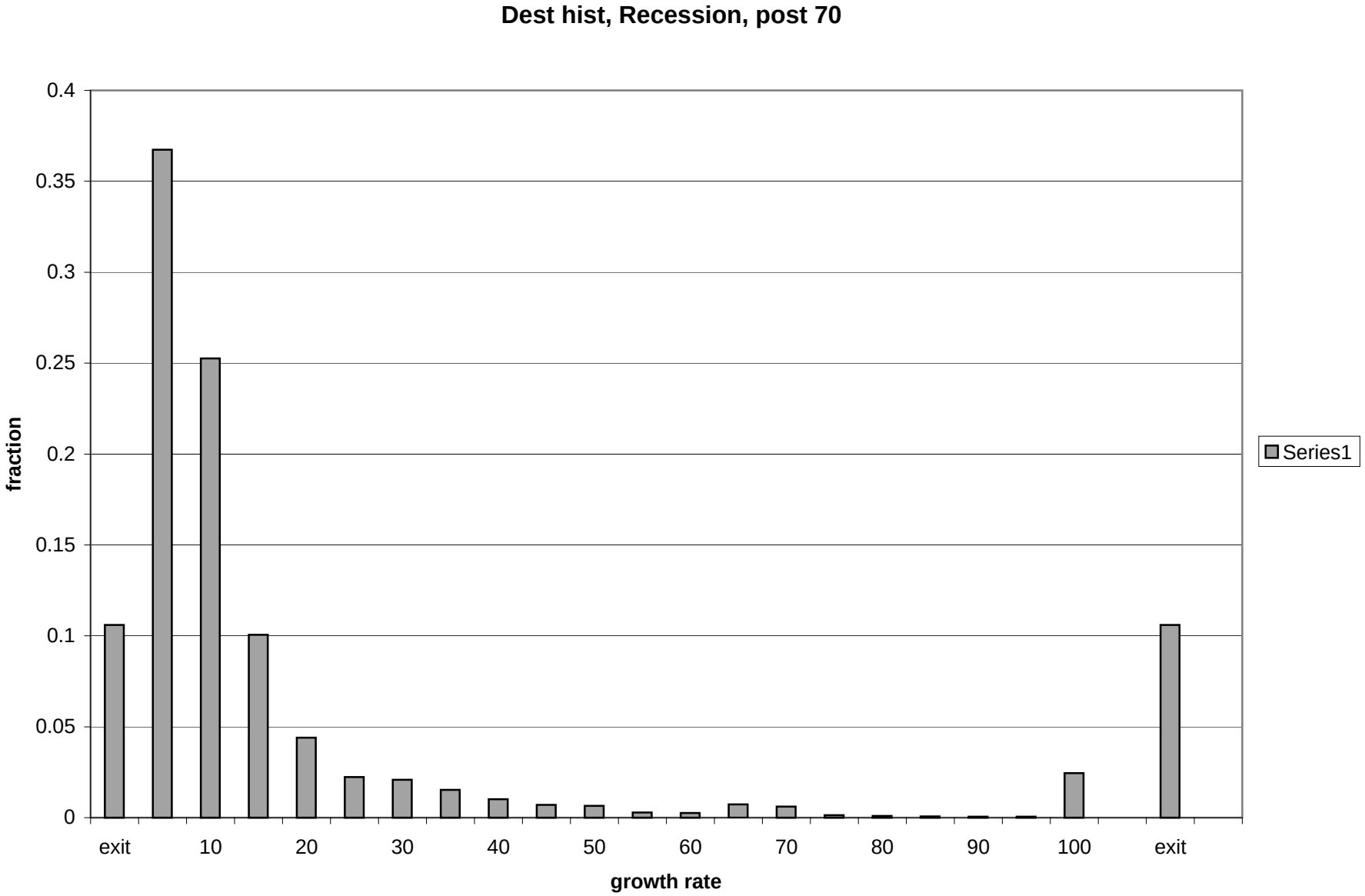
Dest hist, Recession, post 70
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
fraction
exit
10
20
30
40
50
60
70
80
90
100
exit
growth rate
Series1

Figure 9

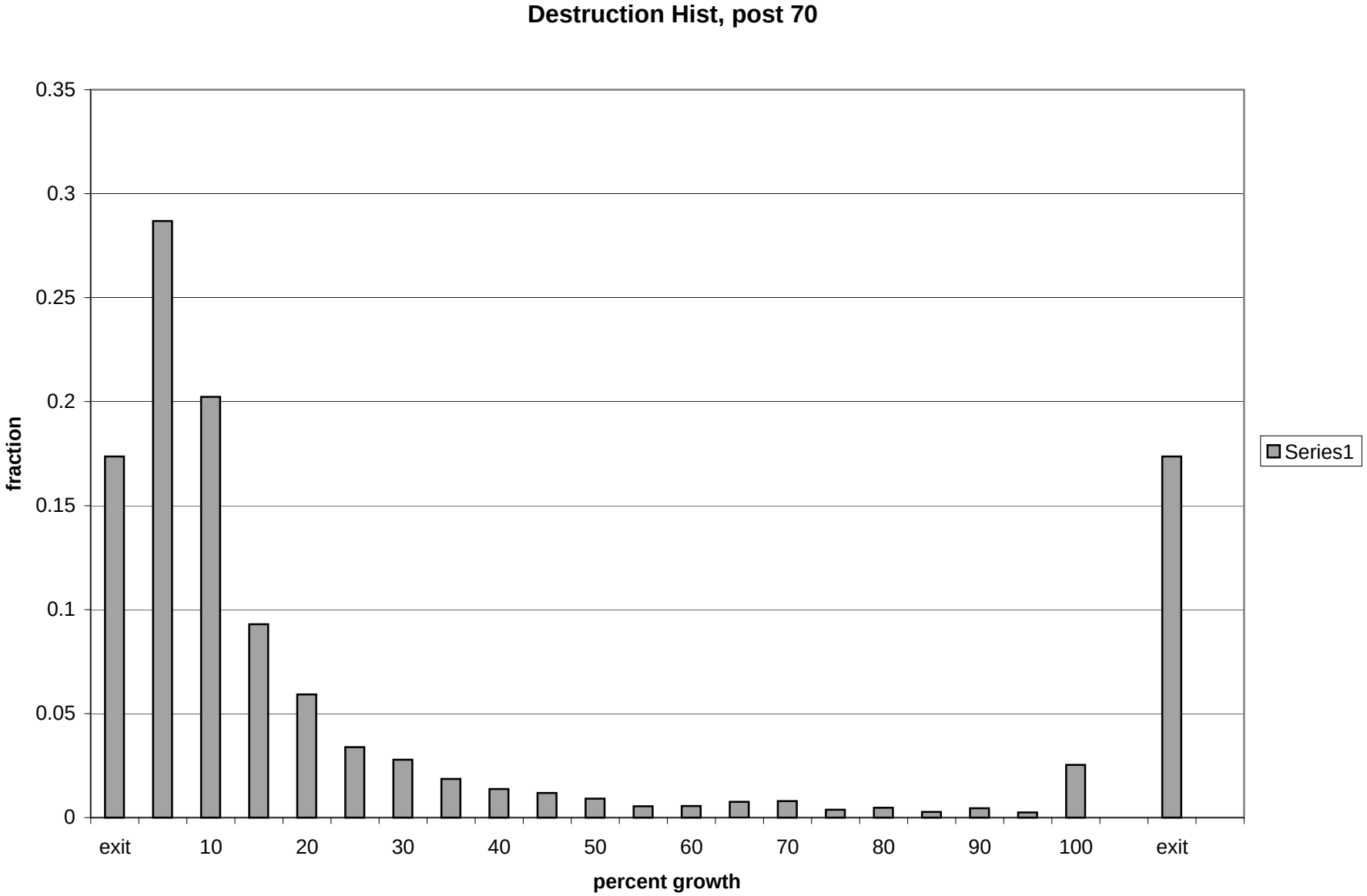
Destruction Hist, post 70
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
fraction
exit
10
20
30
40
50
60
70
80
90
100
exit
percent growth
Series1

Figure 8

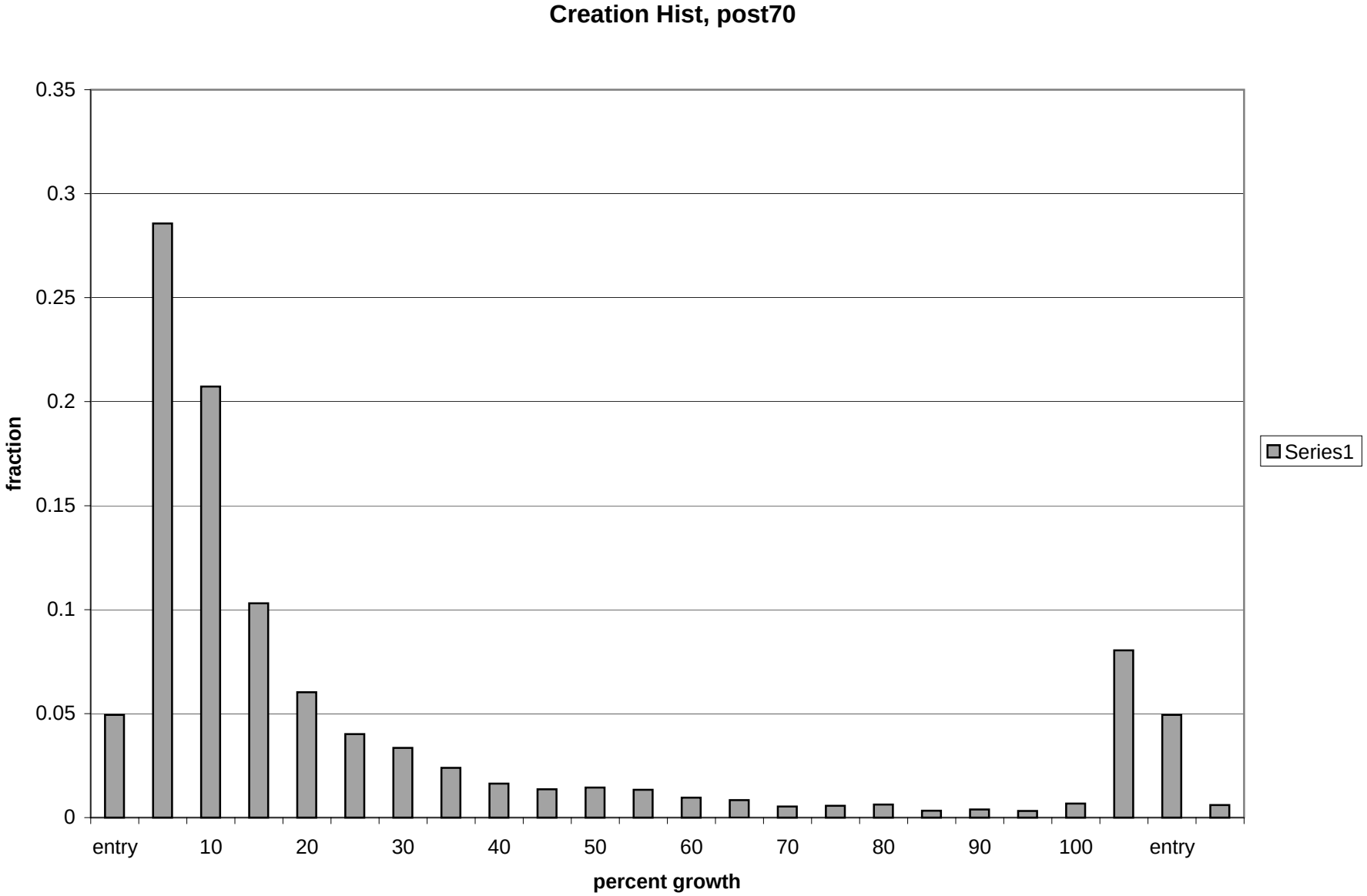
Creation Hist, post70
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
fraction
entry
10
20
30
40
50
60
70
80
90
100
entry
percent growth
Series1

Figure 7

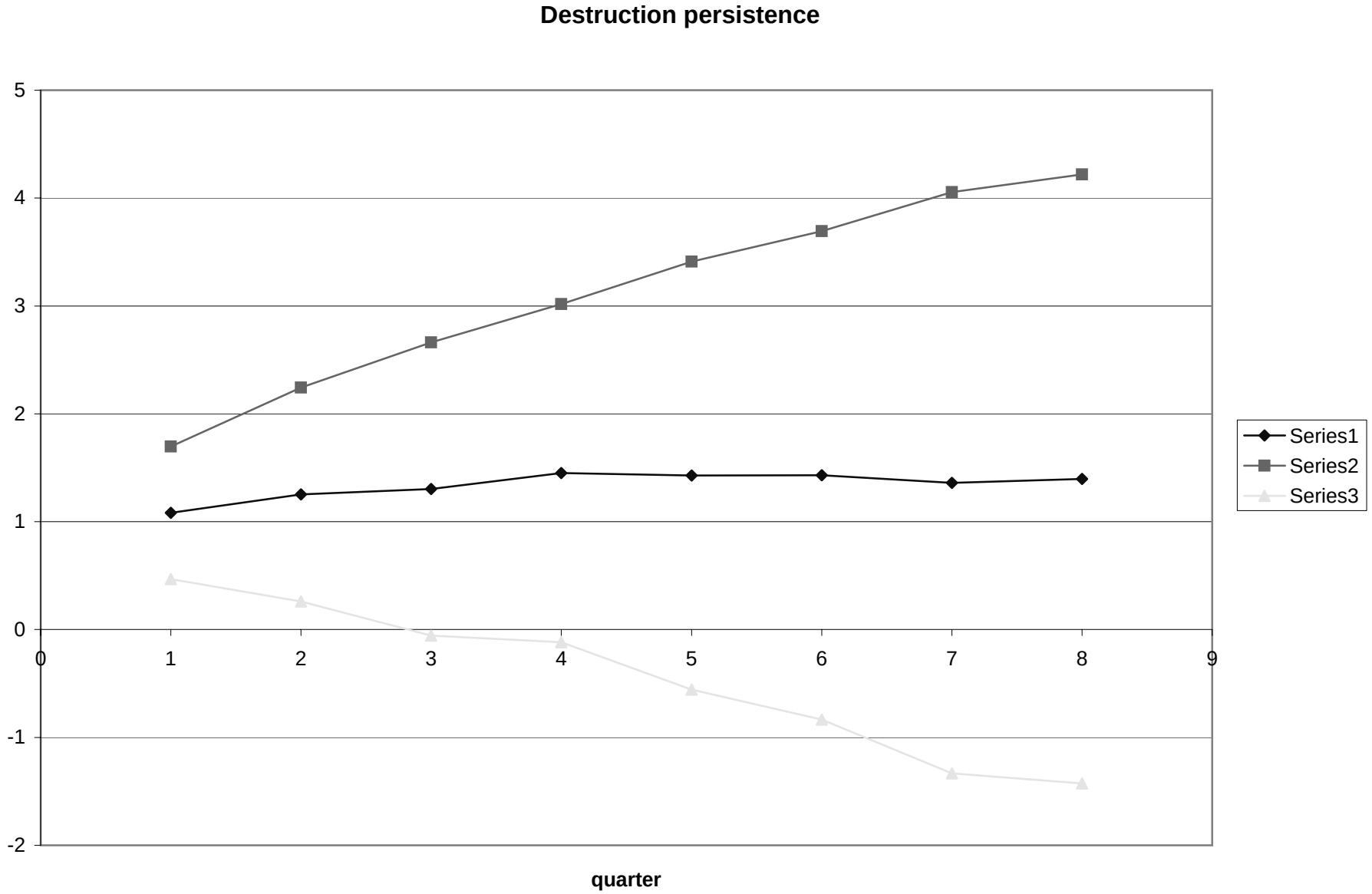
Destruction persistence
5
4
3
2
1
0
-1
-2
0
1
2
3
4
5
6
7
8
9
quarter
Series1
Series2
Series3

Figure 6

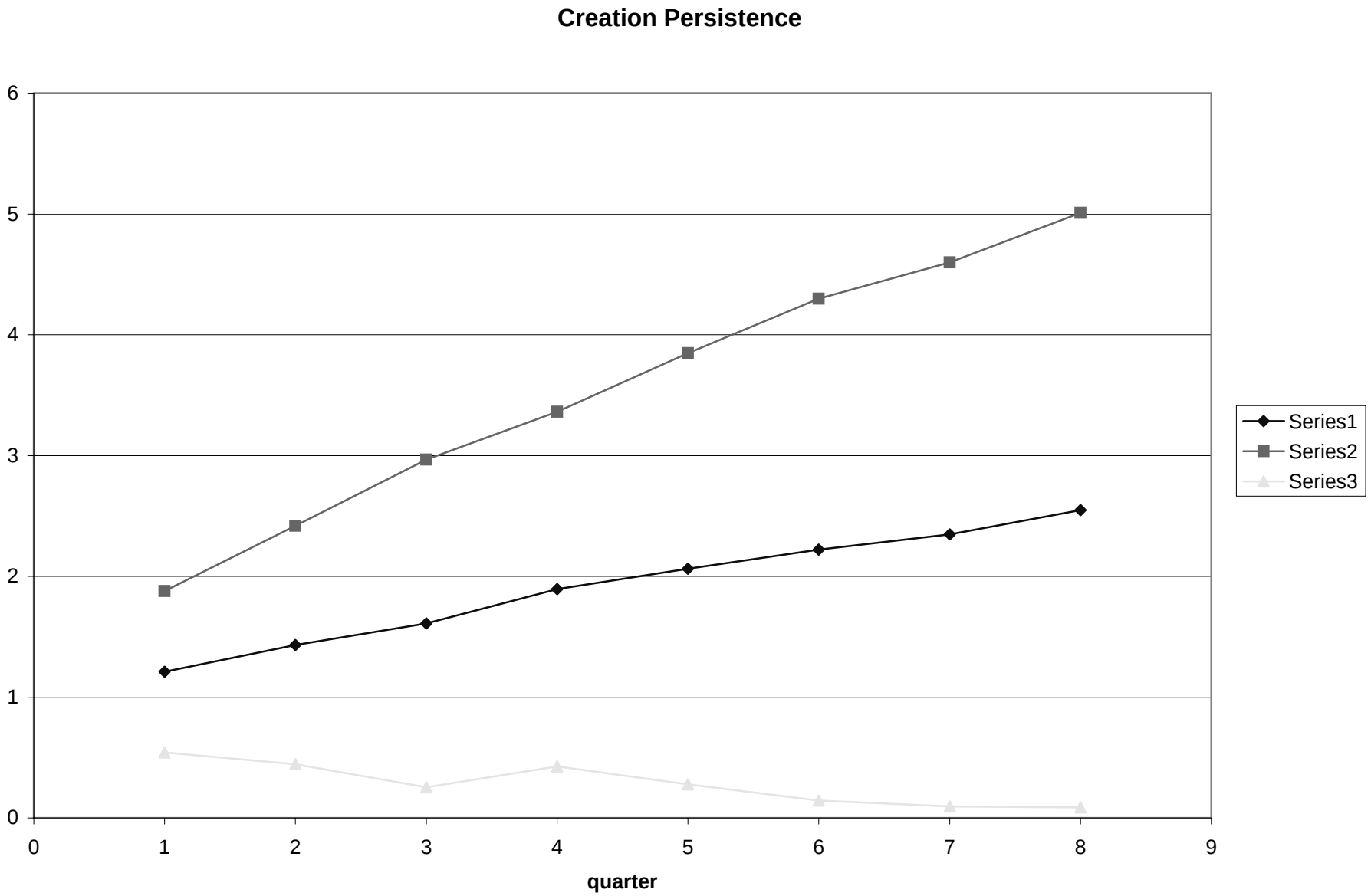
Creation Persistence
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
quarter
Series1
Series2
Series3

Figure 5

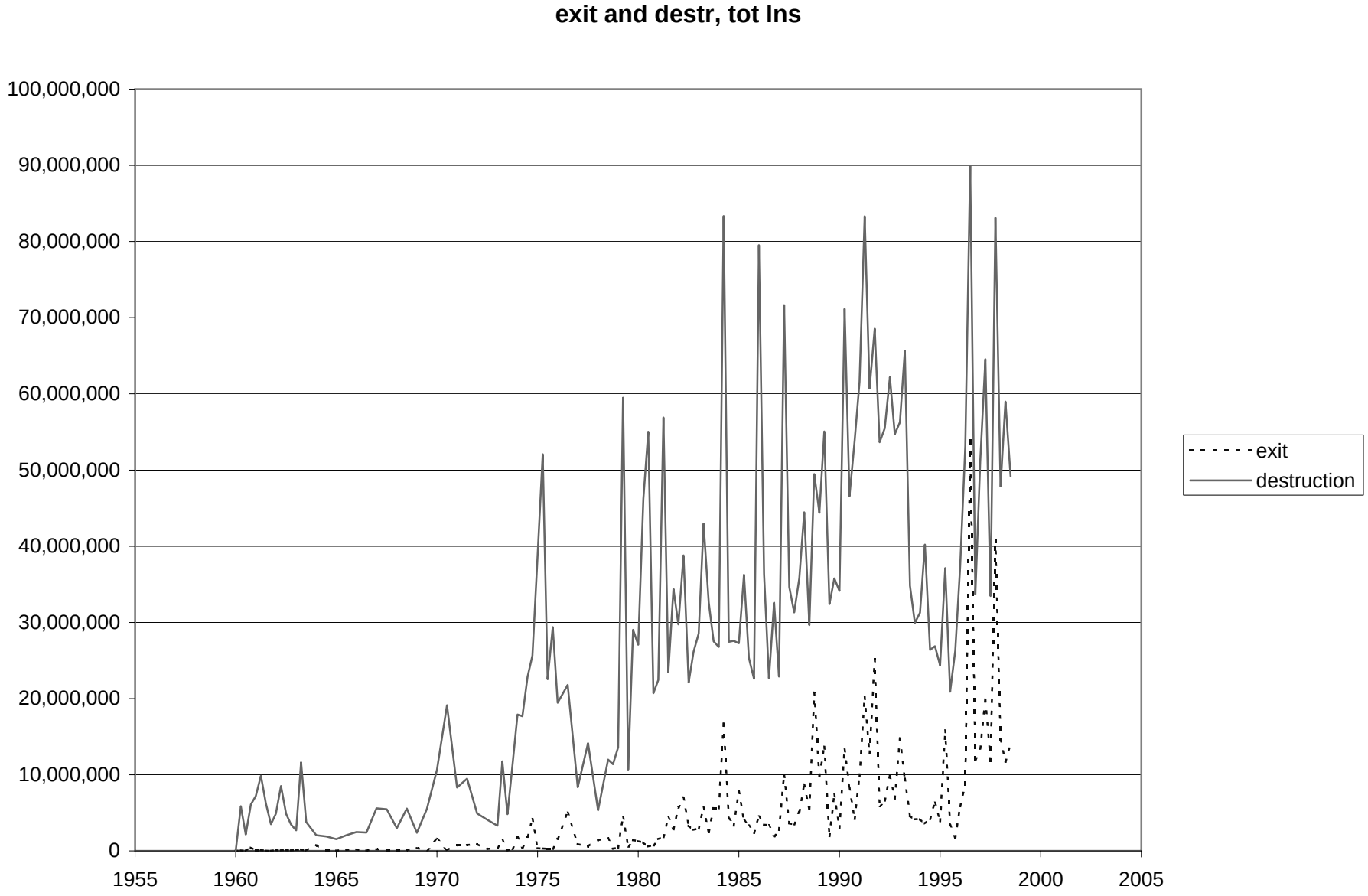
exit and destr, tot lns
100,000,000
90,000,000
80,000,000
70,000,000
60,000,000
50,000,000
40,000,000
30,000,000
20,000,000
10,000,000
0
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
exit
destruction

Figure 4

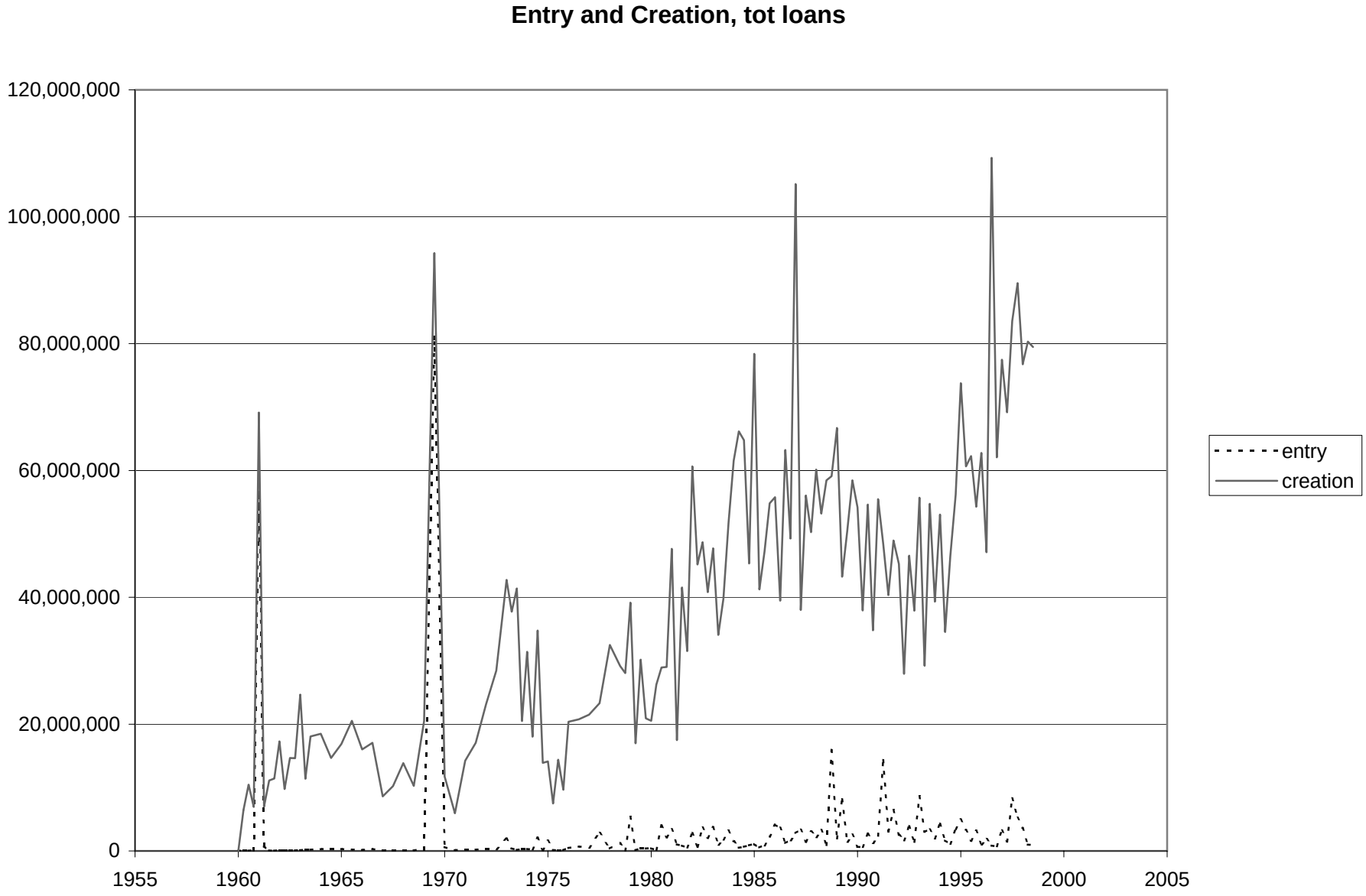
Entry and Creation, tot loans
120,000,000
100,000,000
80,000,000
60,000,000
40,000,000
20,000,000
0
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
entry
creation

Figure 3

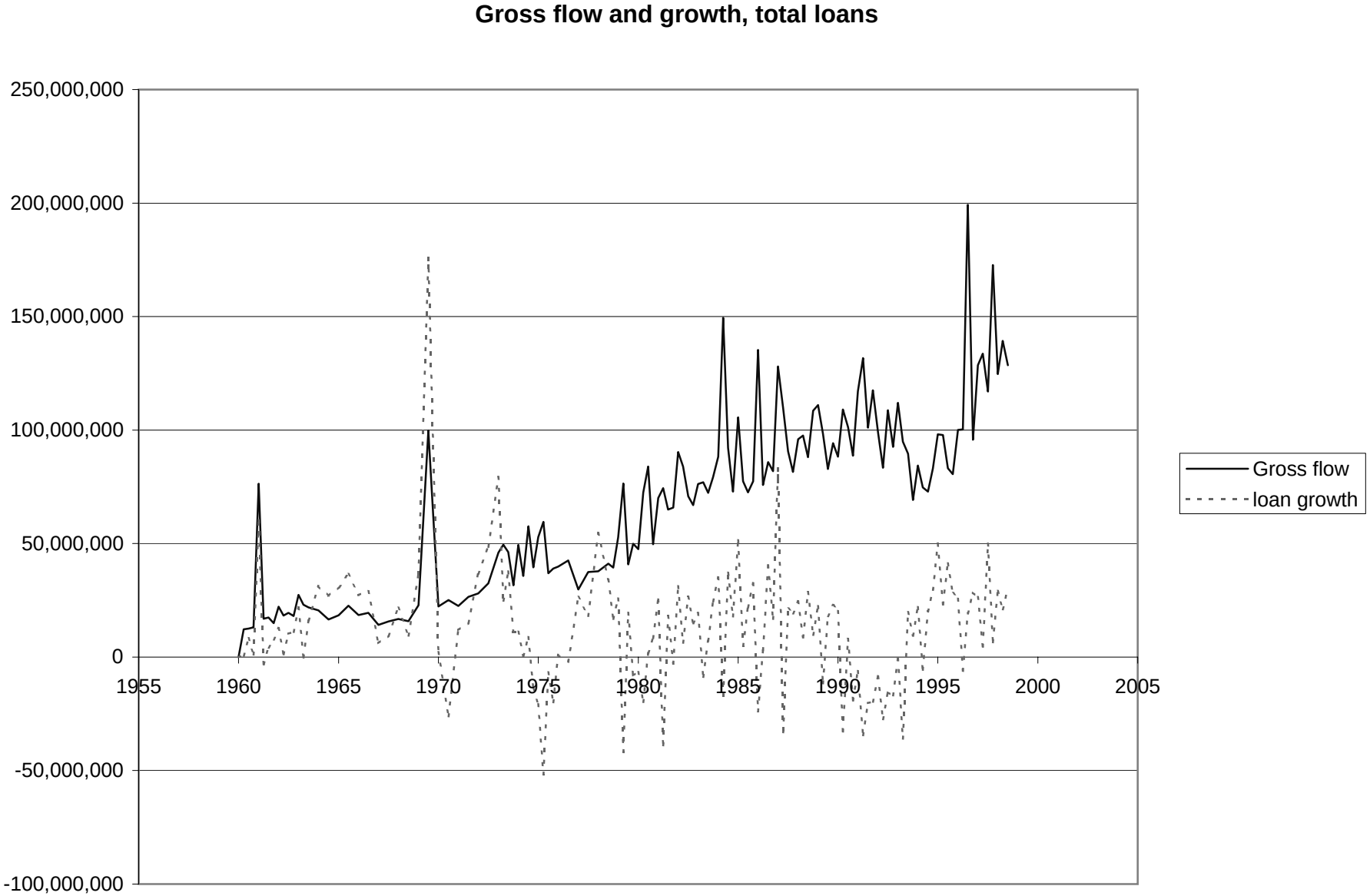
Gross flow and growth, total loans
250,000,000
200,000,000
150,000,000
100,000,000
50,000,000
0
-50,000,000
-100,000,000
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Gross flow
loan growth

Figure 2

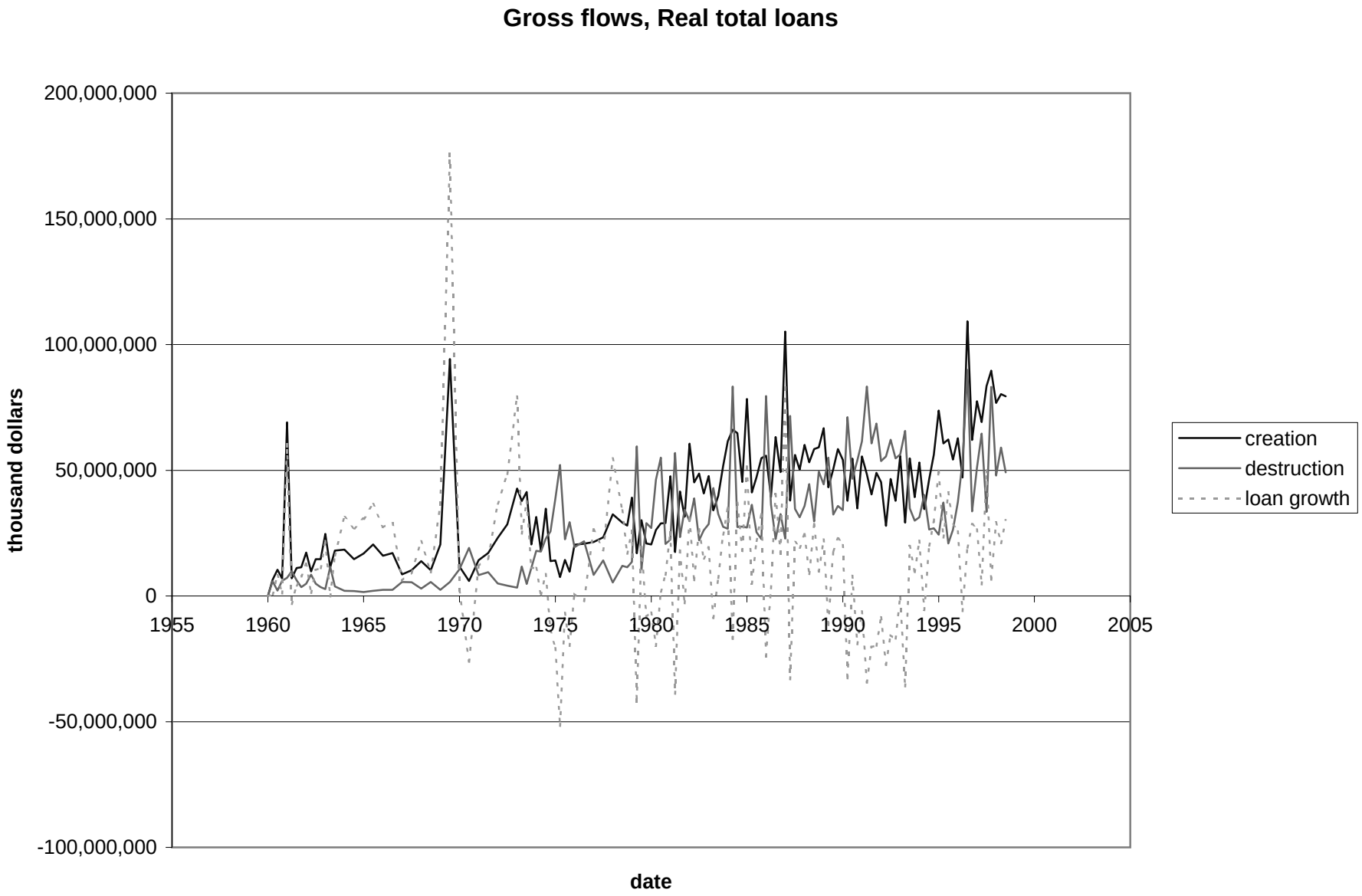
Gross flows, Real total loans
200,000,000
150,000,000
100,000,000
50,000,000
0
-50,000,000
-100,000,000
thousand dollars
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
date
creation
destruction
loan growth

Figure 1