Lending Practices, Capital Adequacy Ratios, and Risk Exposures of Banks to Systemically Important Real Sectors

By

TYLER MARTINS

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I. Introduction

The Global Financial Crisis of 2008/2009 has demonstrated that there is still a need for a stronger understanding of areas in risk management and regulation, and the banking system. Of specific concern to regulators is the origination and identification of systemic risk. Systemic risk played a critical role in the most recent financial crisis with banks such as Lehman Brothers and AIG having increasingly riskier exposures to the American subprime mortgage market. This combined with their size and interconnectedness with the US economy made them a source of systemic risk leading to the crisis in 2008. It is because of the events that occurred in 2008/2009, and other crises before them that an accurate identification of systemic risk is essential to the success of the global macroeconomy.

To date, systemic risk is believed to originate in the financial sector. However, beyond that there are some considerable disagreements as to where and how systemic risk arises. While each school has their strengths in identifying and explaining systemic risk, it is clear that these models failed to identify the impending failures the US financial system would eventually see. Thus, systemic risk continues to pose a challenge to economists and regulators alike.

Crean and Milne (2017) dispute the popular belief that systemic risk originates in the financial sector, and points to a specific group of real sectors as the culprit. The argument is that while the crises are often realized in the financial sector, it is the financial sector's exposure to these real sectors that are ultimately the cause of such crises. Crean and Milne (2017) present data on the past two financial crises (the Financial Crisis of 2008/2009 and the Dot Com Bubble of 2000/2001) and show that a significant portion of the realized losses were due to exposures to a select group of real sectors. While these real sectors often differed across crises, they all shared

the same set of characteristics. Thus, these real sectors are to be considered Systemically Important Real Sectors ("SIRS").

With the consensus that systemic risk arises in the financial sector, there has been minimal emphasis on SIRS in modern statistical risk models. However, these particular sectors were referenced in the late nineteenth century and early twentieth century. Bagehot (1873) argued the importance of the performance of large real sectors and their effect on other sectors, "No single large industry can be depressed without injury to other industries…" "The most common, and by far the most important, case where the depression in one trade causes the depression in all others, is that of depressed agriculture." O.M.W. Sprague (1910) also points to industries such as agriculture, mining, and steel, and their importance to the setting of crises. However, there has been very little reference of Bagehot and Sprague since the early twentieth century. A description of how these types of industries meet the SIRS characteristics will be discussed in a later section and can also be found in Fortowsky (2015).

While there are still many difficulties with identifying and estimating systemic risk, regulators have taken action to ensure banks are solvent in the event of a crisis. In particular, over the past 30 years the Basel Committee on Banking Supervision (BCBS) have introduced updated capital frameworks aimed at maintaining strong capital adequacy ratios, the ratio of capital reserves to risk-weighted assets. As argued in Crean and Milne (2017) and reiterated in the paper, these ratios have several flaws in preparing banks for impending crises. These flaws, and how SIRS can be incorporated into these Basel Accords, are discussed in a later section.

The purpose of this paper is to demonstrate the benefits of a SIRS analysis in identifying systemic risk and ensuring banks hold enough capital reserves earlier to protect themselves against financial instability. While it would be ideal to conduct a SIRS analysis to illustrate these benefits,

due to data availability, this is not possible. Therefore, the rest of this paper is organized as follows: in Section II, the SIRS model will be introduced, examples of SIRS will be presented, the SIRS analysis will be described, and the flaws of the Basel Accords and how the SIRS capital regime can supplement them will be discussed. Section III will demonstrate the importance of the consideration of SIRS by using data from the Texas banking environment in the 1980s. Section IV will then examine the current Alberta economy to draw comparisons to the past Texas economy, and the lessons that can be gathered. Finally, Section V will present concluding remarks.

II. Systemically Important Real Sectors

As previously described, during the period of 1995 to 2009, there were two major recessions; the Dot-Com Bubble and the Global Financial Crises. Losses experienced during this fifteen-year period were heavily concentrated on these two recessions. Crean and Milne (2017) show that for both recessionary periods, a small group of real sectors contributed to the lion's share of the loan losses. These sectors were: Media, Automotive, Real Estate, and Chemicals. However, it is shown that none of the subsectors were consistent in contributing to major losses in both periods. For example, the Telecom subsector of Media contributed to 43.9% of loans losses during the period of 2000 to 2002, but contributed to a mere 3.0% of total losses during the period of 2008 to 2009. Meanwhile, Printing and Publishing (another subsector of Media) saw the reverse; during the period of 2000 to 2002, they contributed 0% of losses but 23.8% during the period of 2008/2009. While the share are losses are smaller for the other sectors, the behaviour they exhibit across recessions is similar. It is clear that while the sectors and sub-sectors change between

recessions, there is something else driving this behaviour. Thus, Crean and Milne (2017) model these sectors to better understand their dynamics[1].

A Model of Systemically Important Real Sectors

A SIRS firm will share a common set of characteristics with other SIRS firms. These are: i) high asset to revenue levels, meaning that they tend to have high upfront costs in order to generate revenue. ii) The firms will have high financial leverage since they must have high levels of capital prior to earning any revenue. iii) They will exhibit low marginal costs, since they majority of their costs are fixed and upfront. iv) They exist in a very competitive industry meaning that they have little market power. v) Due to the high levels of competition and upfront costs, there is uncertainty in future cash flows. It is when these five factors are combined that a potential SIRS emerges, which provides some possible dangerous scenarios.

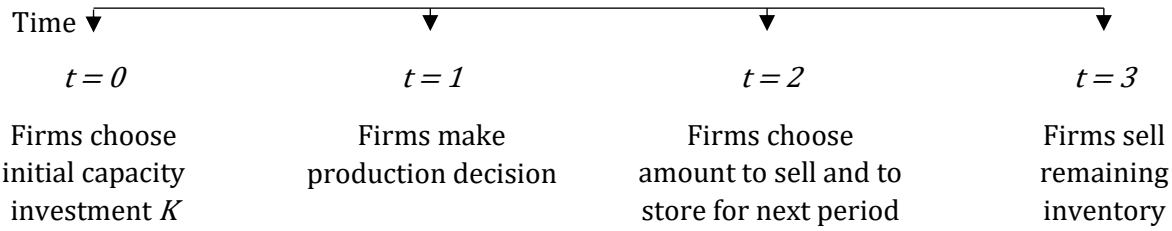
These dangerous scenarios arise due to the uncertainty in future cash flows. In its simplest form, if a SIRS firm is uncertain about their future cash flows, they will purchase the necessary level of capital in order to maximize their future expected profit. In order to make these purchases, they must borrow from the bank. However, if the firm is overoptimistic in their expectations and overextend themselves, they may not receive the revenue they had anticipated and therefore, may not be able to repay their loans. It is because of this that Crean and Milne (2017) argue that systemic risk emerges. This will be modelled in further detail to better explain the nature of the SIRS industry.

[1] It should be noted that Crean and Milne (2017) refers to two papers which this section will rely on. They are: *The Foundations of Systemic Risk* (2017) and *The Anatomy of Systemic Risk (2017).*

The SIRS model has 4 periods, *0, 1, 2*, and *3*. At time $t = 0$, the firm chooses their initial level of capacity, K_j to invest in (the model can be adapted to allow for existing capacity, however for simplicity it is assumed away) with aggregate investment being K, being the sum of the individual firms' investments. The initial capacity will represent the upfront fixed costs required to generate revenue. For example, automotive industry's initial capacity might involve the number of plants to build rather than the number vehicles to produce. As previously stated, firms will choose the level of initial capacity to maximize their expected future return.

In period $t = 1$, firms choose output q_j before realizing the state of demand, with Q being the total production in the industry. Therefore, the firm's production decision is based on the expected demand curve in period $t = 2$ and $t = 3$ and is chosen to maximize total discounted profits. In period $t = 2$ the state of demand is realized and the firm can choose to sell their product, or store and sell in $t = 3$, uncertain for the state of demand in $t = 3$. In period $t = 3$, the firm sells the remainder of their production (again assuming that existing capacity does not exist). The firm will also choose the amount to sell and the amount to store so as to maximize the total discounted profits. Finally, revenue is realized in periods $t = 2$ and $t = 3$. This model can be illustrated by Figure 1

Figure 1

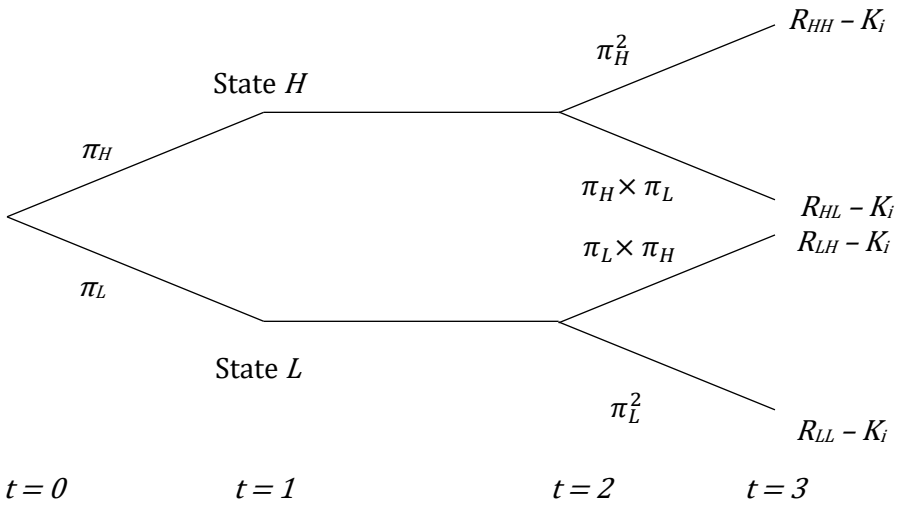


In this model, there is uncertainty in future demand. Therefore, investors in firms will speculate over the expected future demand. Due to this speculation, investors (who are assumed

to be risk neutral) can diverge in expectations. An optimistic investor will expect demand to be high and therefore will choose higher levels of initial capacity and production so as to maximize their returns. In turn, a pessimistic investor will expect demand to be lower and therefore choose lower levels of initial capacity and production. Should an investor be overly-optimistic, they will choose a level of initial capacity that is too high relative to the future demand and potentially experience losses.

The future demand can be considered to take one of two states: a high state H, or a low state L where the probability of each state occurring in each period is π_H and $\pi_L = 1 - \pi_H$, respectively. To allow for divergent expectations, these probabilities will vary for each investor. At the end of period $t = 3$, the investor realizes their gross return R and net return $R - K_i$, for each respective state. In the four – period model, $R_{HH} > R_{HL} > R_{LH} > R_{LL}$. Figure 1 can be appended as follows:

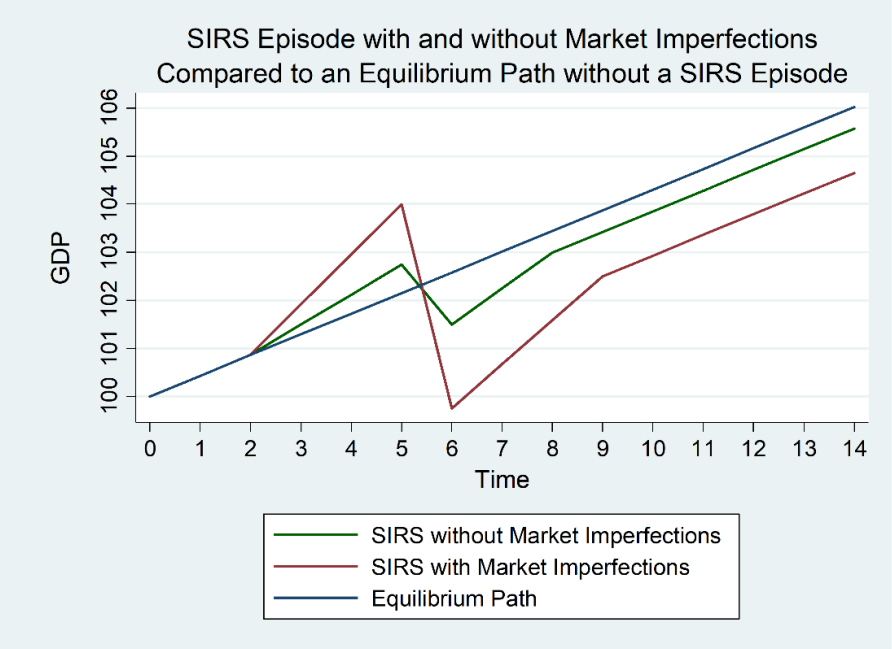
Figure 2



Where K_i is the initial investment in period $t = 0$ for each firm i. This model can be updated to include prior capacity, updating information, multiple production dates, and additions to capacity. However, for the purpose of this paper, a simple model will suffice to illustrate the nature of this industry.

This model provides a good starting point for how a SIRS behaves over time and can provide a better explanation for a SIRS "episode" and how it develops. When investors diverge in expectations from differences in interpreting economic data, it is possible for them to become overly optimistic. This over-confidence will lead to them to increase their level of investment to a level higher than what would be profit-maximizing according to the true future demand curve. However, these investors don't realize the level of risk they are exposing themselves to and so a SIRS bubble emerges, producing systemic risk. This can be shown in Figure 3 adapted from Figure 1 in Crean and Milne (2017).

Figure 3



In year 2, investment in capacity over its efficient amount begins, causing a SIRS episode. It is here that systemic risk first emerges. This is shown by the green line between years 2 and 5. In year 5, investors realize the level of over-investment and risk-taking and prices begin to drop. Demand for the SIRS product drops until storage becomes optimal, capital expenditure decreases due to excess capacity, and output is reduced to use up the excess storage. The decrease in demand and output decreases the firm's bank credit, thus their loans. Because the bank credit that was inefficiently used in years 2 to 5 is now no longer available, the SIRS cannot achieve the same level of GDP prior to year 2.

If prices drop below their marginal costs, the firm will shut down production altogether, and use their available cash to meet their debt obligations. If the firm is unable to meet these obligations, they will default and the bank will take losses on these defaults. Smart depositors will quickly identify the banks with heavy SIRS exposures and will withdraw their funds to deposit them with banks with little SIRS exposure. This will lead to a run on weak banks and a "flight to quality" that is often observed in a crisis.

The red line in Figure 3 shows what the effect of market imperfections would have on a SIRS episode. Market imperfections will exaggerate this effect, both during a boom and bust phase. Excess capacity will be even greater during a boom. Market failures will lead to mispricing of credit, which will in turn lead to excess borrowing and even higher investment in initial capital than the SIRS episode without market imperfections. The fall in GDP will be greater as the market failures and increased excess capacity is realized, and the distance between current GDP and its equilibrium path will also be greater as there will be even less capital available to SIRS firms. Crean and Milne (2017) show that this model is able to replicate many characteristics of a financial crisis, identify costs to banks, and reconcile the different approaches to explaining systemic risk.

Examples of Systemically Important Real Sectors

Having derived the SIRS model, it would now be useful to provide some examples of SIRS. The examples that will be examined will be: Oil and Real Estate.

Oil

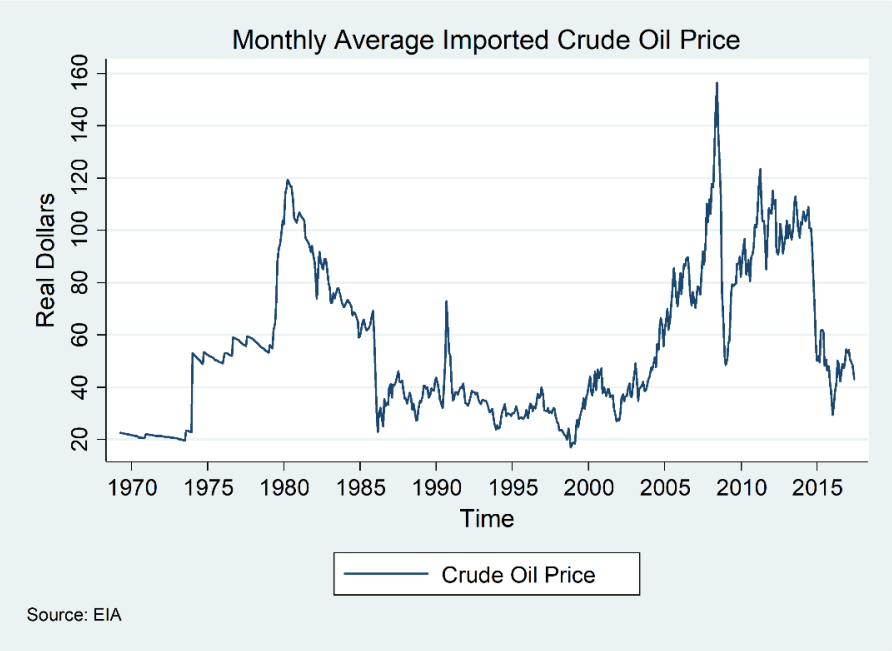
The oil sector is a clear example of a SIRS. A quick analysis of the oil sands in Western Canada will show that this sector does indeed meet the SIRS characteristics. As of 2015, a hypothetical steam-assisted gravity drainage (SAGD) project would cost C$58.65/bbl and C$70.18 for a surface mining and extraction project[2]. Of the SAGD costs, Fixed Capital (initial and sustaining) account for 39% of the total costs while Operating Working Capital accounts for less than 1%. Similarly, Fixed Capital for a surface mining and extraction project accounts for 45.8% of total costs while Operating Working Capital also accounts for a mere 1%[3]. It is clear that this meets the first two characteristics. From 2015 to 2035, total initial and sustaining capital required for all projects is expected to be C$329 billion, exceeding the C$270 billion cited by Fortowsky (2015) by almost C$60 billion[4]. With such a large upfront investment, it is likely that firms will be borrowing from banks.

[2] (Millington & Murillo, 2015)

[3] (Millington & Murillo, 2015)

[4] (Millington & Murillo, 2015)

Figure 4



It is also clear that the volatility of oil prices would lead to uncertain future revenues. As can be seen in Figure 4, oil prices have seen some devastatingly large price drops over the past 40 years[5]. In particular, the price drop in 1985 had some severe effects on the Texas economy. This will be examined further in a later section. Based on its cost structure and its price volatility, the oil sector proves to be a clear case of a SIRS.

Real Estate

Real estate provides a special case in which it can be considered both a SIRS and a SIRS Dependent Industry (hereafter referred to as a "SIRD"). A SIRD industry has a similar structure to the SIRS industry in that they both have a normal and SIRS-shock demand curve. A SIRD does not necessarily have to fit the characteristics of a SIRS rather the performance of this industry must depend on the performance of the SIRS industry to have such a title. During a period where the

[5] Figure 4 depicts the real oil price. As will be seen later in this paper, nominal oil prices are also used. Real levels are used here to illustrate the volatility of oil prices, with emphasis on the magnitude of 1980s oil bubble.

SIRS has high demand, the demand for the SIRD will be normal. However, the SIRD will experience a negative demand shock whenever the SIRS experiences a low demand state. For example, if a large share of homeowners are employed in the oil sector, and the oil sector experiences a low demand state resulting in increased unemployment, then it is likely that house prices would drop in the next period as people moving to find new employment. It is also worth noting that people do tend to want to hold onto their homes as long as possible during periods of economic uncertainty, resulting in perceived stability. Of course, this is not always the case, as seen in the US subprime mortgage crisis of 2008/2009.

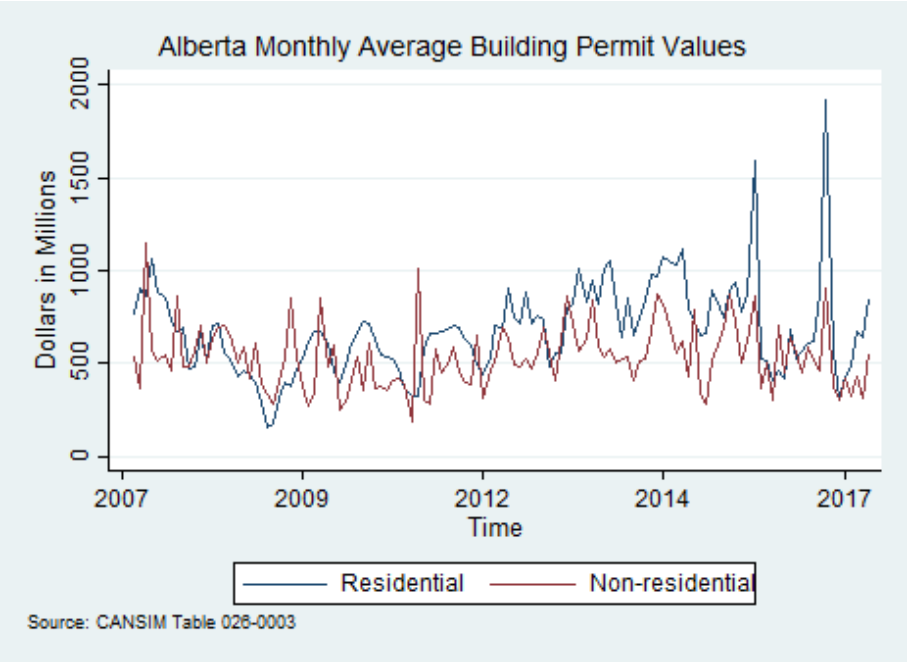
Real estate can also be shown to meet the SIRS characteristics. Upfront investment in construction real estate requires a 0% down payment for residential space and a 25% down payment for nonresidential space, with the remaining being borrowed from a bank or mortgage company[6]. Nonresidential real estate such as Commercial or Industrial tends to be riskier by nature and so requires a larger up-front investment. Most of this upfront cost is applied to fixed costs such as land and equipment. Marginal costs are also fairly low, being employee wages, materials, and maintenance of equipment. Finally, revenue in construction real estate can be derived from the value of the property upon completion. This can prove to be fairly uncertain. Figure 5 illustrates this level of uncertainty using the value of residential and non-residential building permits in Alberta. The value of building permits is often used as an economic indicator to determine the health of the real estate market in the particular region, thus providing a good measure for the predictability of future revenues[7]. Both residential and non-residential building permit values appear to be quite sporadic, suggesting future revenues are uncertain. This is especially evident in

[6] (Canadian Mortgage and Housing Corporation, 2017)

[7] (Martins & Mc Donald-Guimond, 2017)

regions where a commodity industry such as oil is a major economic driver. Large levels of uncertainty in these industries translate to uncertainty in future real estate prices as is common with SIRDs.

Figure 5



The SIRS Analysis

This section will outline the procedure Crean and Milne (2017) describe to conducting a SIRS analysis. The purpose of a SIRS analysis when applied to a single bank is to identify the potential losses on their SIRS exposures in a worst-case scenario. These estimates will in turn determine the amount of capital reserves the bank should hold. Regulators can then use these estimates to estimate systemic risk. The SIRS analysis is made up of three steps: a sectoral analysis, producing expected cash flows, and estimating the SIRS capital regime. Within these steps, an estimate of systemic risk will be produced. It is also important to note that the SIRS analysis will not forecast likely outcomes. It should only be used to ensure that banks remain profitable in times of economic and financial distress.

Step 1: Sectoral Analysis

To begin the SIRS analysis, the bank should conduct a sectoral analysis. The bank should begin by identifying the potential SIRS the bank is exposed to. Filtering for the set of SIRS characteristics can be used to accomplish this. Potential SIRDs will likely need to be examined on a geographic region based on the location of the potential SIRS, in order to identify the regions that generate the most risk.

Having identified the potential SIRS, standard industrial analysis can be conducted on each sector to determine the likely impact on pricing from a severe but plausible recession. To do this, the industry cost curve must first be estimated, this can be done by sorting each firm's marginal cost, with the lowest marginal cost firms located at the origin, and their output along the horizontal axis. This produces the industry supply curve. One can then forecast a demand curve from a plausible worst-case recession to determine the prevailing price during this period. Having determined the price during this recession, all firms to the right of the industry output (ie. whose marginal cost is higher than the current price) are now identified. These firms have the potential to generate losses for the bank in the worst-case recession. Banks now have prices and quantities for the potential SIRS during a plausible worst-case recession

Step 2: Produce Expected Cash Flows

The next step within this SIRS analysis is to prepare expected forecasts of the cash flows of each borrower previously identified, along with a downside projection. This downside projection will be based on the pricing determined from the previous step as well. These projections will show which firms will default on their loans in the case of this plausible recession. To estimate the losses in the plausible worst-case recession generated from each of the borrowers, a "gone concern analysis" should be conducted. This is the procedure where a firm assumed to soon be discontinued, is evaluated so as to estimate the amount of debt that can be repaid based on the firm's market value or liquidation value of tangible assets.

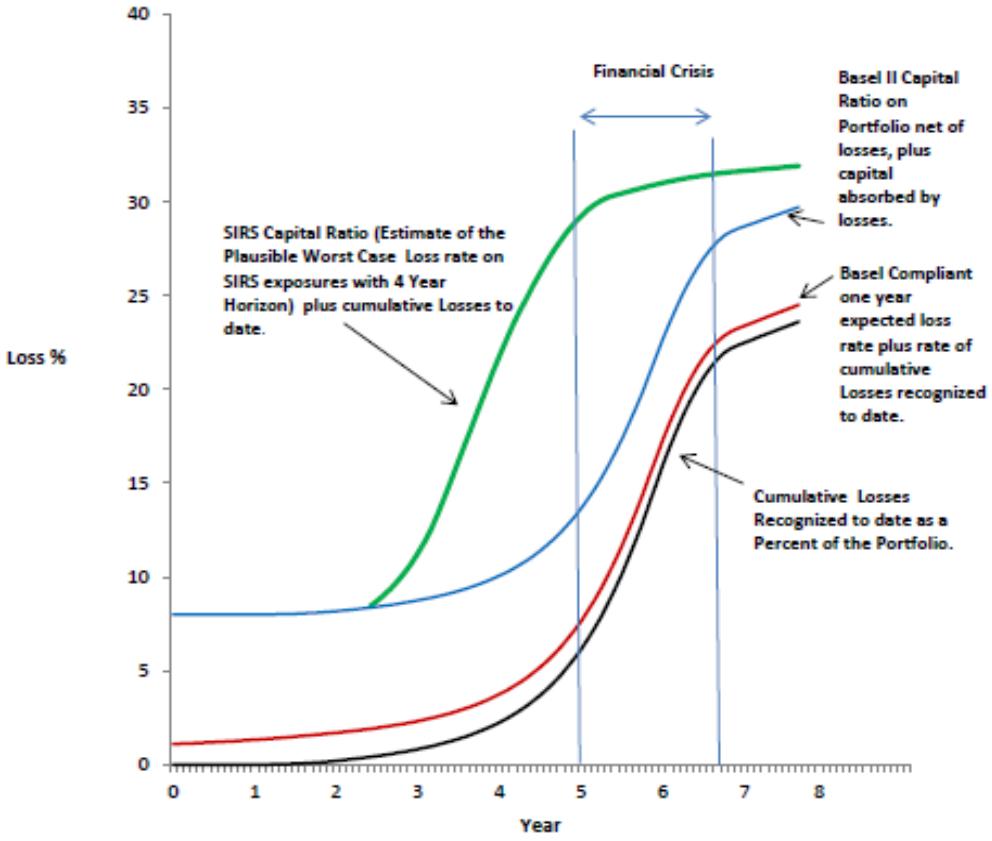
Step 3: Estimate the SIRS Capital Regime

The worst-case losses estimated from this set of borrowers can now be used to determine the amount of capital reserve that the bank should hold in its portfolio. This is also the minimum the amount of capital that should be held. However, if this required capital is less than the required capital under the current Basel standard, then the bank should defer to the Basel standard for setting the level of capital reserves. Finally, it is sufficient to use the current Basel standard for borrowers that are deemed to not meet the SIRS characteristics.

The SIRS analysis is beneficial in that it provides an early recognition of emerging risk. As such, capital reserves in the bank are built up much earlier as well, protecting the bank from the impending crisis. This is because the SIRS analysis will consider a three- to four-year time horizon rather than the current one-year expected default ratio that the Basel Accords currently use. Looking out only one year is too far into the SIRS expansion that banks will not be able to accumulate enough capital in time. The flaws of the Basel standards will be explored further next. The benefits of the SIRS capital regime can be shown graphically in the following figure.

Figure 6

SIRS Capital Regime Compared to Basel Capital Regime



Source: (Crean & Milne, The Foundations of Systemic Risk, 2017)

As can be seen in this figure, capital under the SIRS regime begins to accumulate far earlier than the Basel standard and almost immediately following the SIRS expansion seen in Figure 3. When the financial crisis does occur, the increase in the loss percentage is significantly lower than the that of the Basel standard's. It can also be seen that under the Basel standard, capital does not begin to accumulate until year 4, at which point the bank is unable to acquire enough to absorb the losses.

To summarize, a SIRS analysis can provide numerous benefits to the bank conducting it. As previously indicated, it can better identify emerging systemic risk. It provides board members

with a better view of their current risk position, likely providing incentive to restructure their position and thus adjust their SIRS exposures to appropriately meet their risk appetite. The SIRS analysis is also simple enough that it can be done on a regular basis, thus improving the bank's awareness of their risk exposures. And finally, when applied to all banks, allows for a more stable banking system.

SIRS Analysis and Basel III

It is now worth discussing how the SIRS analysis can supplement Basel III. In order to do so, the flaws and objections of Basel III must first be addressed. In light of the most recent financial crisis, the capital ratios under Basel III are being raised so to provide better financial stability to banks, especially those considered to be systemically important[8]. This increase will strengthen banks' loss-absorption capabilities, providing depositors with assurance that their funds will remain safe with their bank, and will ensure that enough capital is held to increase the rate of recovery following a crisis. However, there have been a number of objections made as it pertains to capital adequacy. These objections include inefficiencies in use of resources, calculation of risk weights and barriers to entry problems, among others.

Crean and Milne (2017) address three major objections regarding the Basel III capital ratios. Firstly, these capital ratios, which are being raised even more so for the Systemically Important Financial Institutions (SIFIs), are not able to separate the banks that partake in the riskier ventures, and thus generate systemic risk, from those that cannot. While applying a blanket policy to all banks will ensure that the high risk-exposed banks will maintain the desired capital reserves, those banks with better risk management practices will be forced to carry significantly more capital

[8] (Basel Committee on Banking Supervision, 2010)

reserves than necessary, and therefore prove to be an inefficient use of funds. This argument also leads to possible barriers to entry. As will be later shown, young banks tend to partake in more aggressive risk management practices to stimulate their growth during the phase of their life cycle where they are most financial fragile. An increase in capital reserves will therefore prevent some of these banks from entering the market and thus decrease competition (this will clearly be more significant in the US, where the banking sector is much more competitive)[9]. In addition, well established banks that have better lending practices will see a hindering in their growth, again due to the inefficient use of resources.

Secondly, after a financial crisis, banks that experienced heavy losses reduce their lending, which in turn reduces the credit available to firms and consumers, and thus, reducing the overall rate of recovery. Higher capital ratios are argued to reduce the heavy losses and therefore ensure banks' continued lending after the crisis. However, the flaw with this argument is that banks are only required to hold the minimum capital ratio. Should a financial crisis occur that erodes their equity, banks are still obliged to maintain these ratios. As a result, decreasing lending provides an easy means to avoid a capital ratio breach. Crean and Milne (2017) do suggest that a cushion above these ratios, which can absorb these losses and still maintain the minimum ratio, could support continued lending.

Finally, the third objection lies in the calculation of risk weights. These calculations are flawed for two major reasons. First, the risk weights are based on accounting standards, which don't take into consideration worst-case losses on SIRS exposures[10]. Instead, these risk weights

[9] (Perez, 2014)

[10] (Crean & Milne, The Foundations of Systemic Risk, 2017)

are based on fair value reporting, and require realized losses to be reported. This results in an underestimation of risk weights. For example, during a SIRS expansion, when systemic risk is emerging, firms are performing quite well and are unlikely to report significant losses. The second flaw lies in the fact that risk weights also rely on credit rating agencies, which have proven to fail as evident by their inaccurate ratings during the subprime mortgage crisis. While this flaw is less likely to be avoided, it is important to be aware that it exists.

The SIRS capital regime addresses these objections. A SIRS capital regime does not apply a blanket policy across all banks, but rather ensures capital is placed on the loans that are deemed to be systemically important. This allows for a more efficient use of resources. The SIRS capital regime also accounts for worst-case losses, rather than realized, or "expected" losses, thus more accurately estimating the risks the banks are exposed to. Finally, and probably most importantly, the SIRS capital regime provides a much earlier recognition of systemic risk than Basel III. As previously stated, the SIRS analysis builds up capital three to four years in advance, whereas the Basel III capital ratio only considers the one-year default ratio. Capital has been built up much earlier, allowing for much better loss absorption capabilities.

III. Texas Banking Problems

To better illustrate the benefits of a SIRS analysis, a historical crisis in which a SIRS played a major role will now be discussed. During the 1980s, the United States experienced a series of severe banking crises. Texas in particular suffered the most from these crises. Therefore, this section will study the Texas economy and banking environment to illustrate the effect an unstable SIRS can have on a region's economy. Using banking data from the Federal Deposit Insurance Corporation (FDIC) and the Federal Reserve Bank of St. Louis (FRED), this section will describe

the history of the Texas economy, as it relates to the sectors that contributed to the economic instability, and the Texas banking environment and its role in magnifying the effect of the crisis.

The Texas economy and the Southwest region in general, can attribute the many problems they faced to three major sectors: Energy, Real Estate, and Agriculture[11]. This paper will examine the energy and real estate markets, having already shown that they were in fact SIRS (or SIRDs), and the problems they caused. It would be ideal to conduct a SIRS analysis, as described in the previous section. However, the data required to conduct such an analysis would require a significant amount of data that either isn't readily available or wasn't gathered at the time, keeping mind that Basel I wasn't even introduced until 1988[12].

History of the Texas Economy

The Texas banking sector experienced the worst of the crisis of any state in the Southwest. As can be seen in Table 1, between years 1980 and 1990, 765 Texas banks either failed or assistance had been provided by FDIC in merging with another institution. 1988 and 1989 proved to be especially devastating years for Texas banks, accounting for 42% and 51.7% of US failed banks and $143 billion in assets in the two years alone. As Table 1 shows, total assets of failed banks during these two years were significantly greater than the other years, accounting for approximately 80% of the total assets of failed banked over the ten-year period. Another important detail as shown in the below table is the timing of when the Texas banks began to fail. As will be shown later in this section, this coincides with the point at which oil prices peaked and then began to drop. As previously indicated the oil and real estate sectors played very important roles in the

[11] (Hanc, 1997)

[12] (Basel Committee on Banking Supervision, 2016)

Texas banking crisis. Therefore, these two sectors will be discussed first, before examining the banking environment during this time period.

Table 1

Bank Failures

Year	*U.S Total*	*U.S. Fail*	*U.S. Assist*	*TX Total*	*TX Fail*	*TX Assist*	*Total Assets **	*TX Fail %*
1980	22	10	12	0	0	0	0	0.0%
1981	38	9	29	1	0	1	5,925	0.0%
1982	117	33	84	16	6	10	1,571,553	18.2%
1983	98	49	49	4	3	1	1,626,170	6.1%
1984	103	82	21	8	7	1	649,245	8.5%
1985	180	139	41	17	13	4	1,992,319	9.4%
1986	203	161	42	31	28	3	5,017,139	17.4%
1987	262	217	45	68	54	14	6,345,306	24.9%
1988	470	232	238	256	120	136	86,100,000	51.7%
1989	534	531	3	224	223	1	57,000,000	42.0%
1990	381	380	1	140	140	0	17,900,000	36.8%
Total	2,408	1,843	565	765	594	171	178,207,657	-

*Total Assets in thousands of dollars
Source: FDIC

The Texas Oil Sector

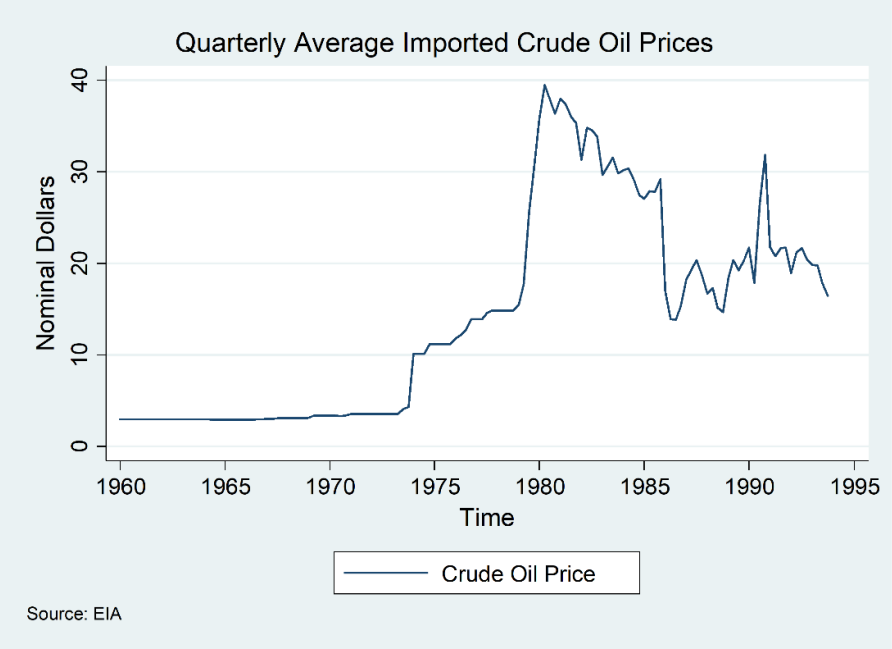
The oil sector in Texas was the cornerstone of its economy and also the main cause of the banking crisis they experienced[13]. Prior to 1974, the price of oil was steady, hovering around $3 per barrel, as seen in Figure 7. However, due to international economic and political events involving the Organization of Petroleum Exporting Countries (OPEC), by January 1974, oil prices had risen to approximately $10 per barrel and would continue to rise over the next six years[14]. This boom phase had significant effects on the Texas economy. Texas GDP growth rates significantly

[13] (Hanc, 1997)

[14] (Hervey, 1994)

exceeded US GDP growth rates, coinciding with the boom phase of the Texas oil sector, as seen in the oil prices. However, the GDP growth rate of Texas is also shown to be significantly lower than the US standard at approximately the same time oil price are shown to drop precipitously. Finally, A study conducted by the Federal Reserve Bank in Dallas states that Texas nonagricultural employment follows oil price movement with a short lag[15]. Figure 7, Figure 8, and Figure 9 present these findings.

Figure 7



[15] (O'Keefe, 1990)

Figure 8

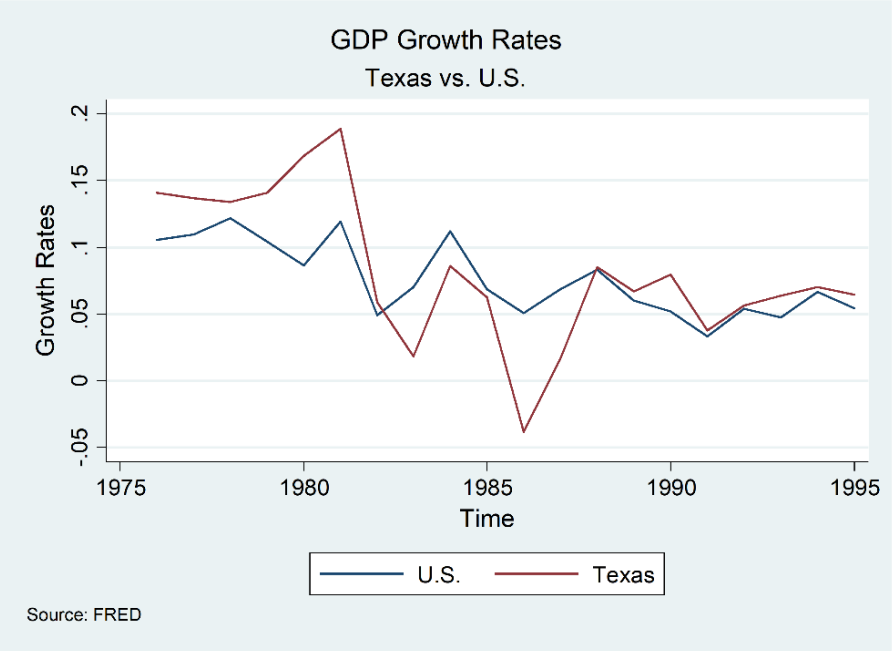
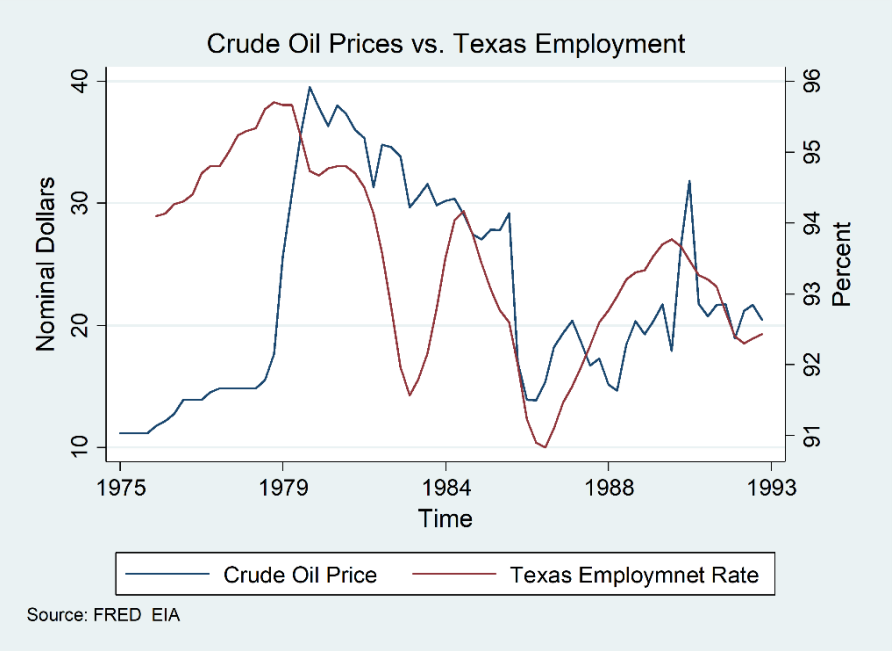


Figure 9



During the 1960s, oil prices were very low and stable. As a result, oil fields in the US could not profitably extract oil, as it was often quite deep and difficult to pump and so required the use of enhanced recovery techniques. OPEC countries however had oil wells that were quite shallow and could therefore profitably pump at the prevailing market prices[16]. With the political and international events leading to an increase in oil prices, production in the United States began to rapidly escalate. However, this rapid increase led to speculation over future oil prices and thus increased investment in production. This is not unlike the beginning of a SIRS expansion where these investors were overly optimistic in the future demand. By 1981, oil prices had peaked and begun to decline.

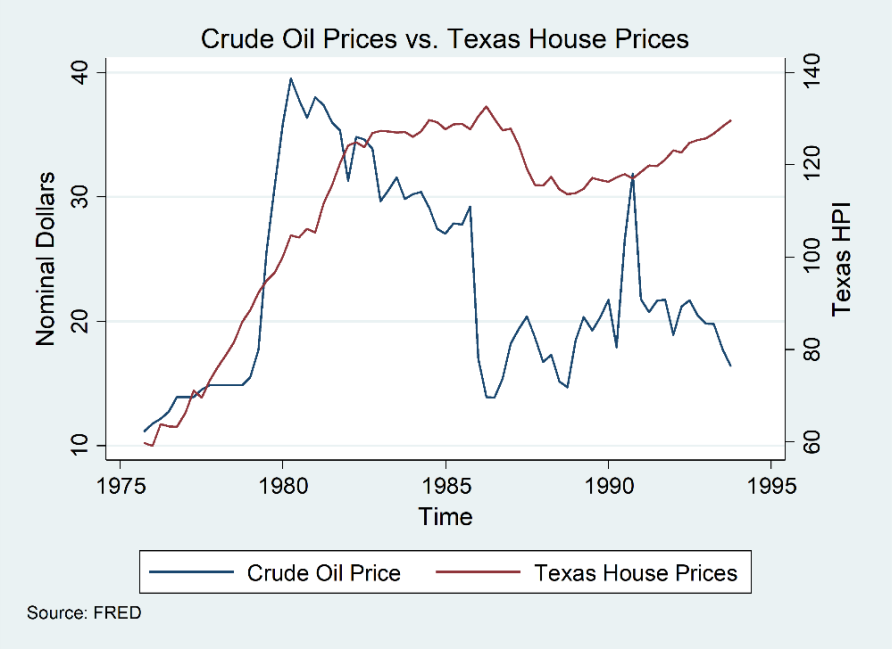
As the SIRS model would predict, this decline in oil prices started to cause problems for the Texas banks' energy loans which in turn led to the increase in bank failures as seen in Table 1[17]. These problems were then compounded by the increased emphasis on ensuring that banks maintain or increase their market share in energy loans, as there was still speculative behavior in future oil prices. This included lowering lending standards to attract new business[18]. This behavior is a classic example of the SIRS episode with market imperfections seen in Figure 3. Prior to oil prices plummeting in 1986, many banks would also speculate that the current eroded oil prices were temporary[19]. Although, oil was the foundation for the Texas economy as well as the main cause for their banking crisis, Texas banks amplified this crisis through riskier lending practices to this sector.

[16] (Hanc, 1997)
[17] (O'Keefe, 1990)
[18] (O'Keefe, 1990)
[19] (Hanc, 1997)

The Texas Real Estate Sector

The boom of the oil sector led to a healthy Texas economy, which included a healthy real estate market. However, as oil prices began to erode, real estate markets did see a drop but remained fairly steady as consumers held their property with the expectation that oil prices would rebound. This can be seen in Figure 10 which depicts oil prices and Texas house prices. While there does appear to be some level correlation between the two, the robustness of the Texas house prices does seem to be consistent with the current understanding of residential real estate. This provided lenders who had deteriorating energy loans with new investment opportunities. Banks therefore increased their lending to the booming real estate market as a means to recover from the energy losses.

Figure 10



This again proved to be unwise, as a SIRS analysis would indicate that the real estate market in Texas is a potential SIRDs that derived its health from the performance of the energy market. Although residential real estate tends to be quite resilient, the same cannot be said for

commercial real estate, as it is much more sensitive to the current levels of employment, and therefore sensitive to current oil prices. This can be further supported by Table 2 which shows the office vacancy rates for rented and owned properties of two Texas metropolitan areas relative to the national standard, along with prevailing oil price at the time. This table shows that although banks were increasing their lending to the real estate market, office vacancy rates were actually increasing, further compounding the banks' risk exposures to commercial real estate. The table also shows that the increase in vacancy rates coincided with the decline in oil prices, providing further evidence of a SIRS-SIRD relationship.

Table 2

HISTORIC VACANCY RATES

Year	*Oil Price*	*U.S. Rent*	*Dallas Rent*	*Houston Rent*	*U.S. Own*	*Dallas Own*	*Houston Own*
1981	$36.7	5%	5.4%	6.4%	1.4%	2.2%	2.2%
1982	33.6	5.3	4.7	7.6	1.5	1.4	4.1
1983	30.4	5.7	9.0	13.9	1.5	2.0	3.4
1984	29.3	5.9	7.7	15.4	1.7	2.2	5.4
1985	28.0	6.5	13.9	18.1	1.7	1.6	3.6
1986	15.0	7.3	17.2	18.0	1.6	2.1	3.7
1987	19.2	7.7	16.2	18.3	1.7	3.7	3.4
1988	16.0	7.7	17.9	14.4	1.6	3.9	2.3
1989	19.6	7.4	14.6	12.5	1.8	4.1	2.4
1990	24.5	7.2	12.3	9.6	1.7	2.1	2.1

Source: (Petersen, Phillips, & Yucel, 1994), indirect source from U.S. Bureau of the Census

Even with the increasing vacancy rates, commercial real estate loans increased from 1981 to 1983. This was due to a number of reasons including the increase in the number of newly chartered banks increasing the competition for commercial real estate loans, questionable

underwriting processes and loosened lending standards, and inadequate feasibility studies which failed to consider other activity in progress (ie. falling oil prices)[20].

The Texas Banking Environment

Having reviewed the history of the Texas economy and the events that lead the banking crisis, it is would now be worth examining the Texas banking environment in further detail to better understand the actions banks took that lead to their failure. To do this, quarterly individual bank data was gathered for every FDIC insured bank in the United States from 1984 to 1994 from the FDIC database. While there are some limitations in the time frame of this dataset, the performance on banks' real estate loans peaked around 1984 to 1986, and so within the parameters of the dataset being used. There is also minimal data on loans to the oil sector, as such the banks' business in real estate loans will be used instead.

The following figures not only show how unstable Texas real estate loans were, relative to the United States as a whole, but they also show what type of these real estate loans were most unstable. Commercial and Industrial (C&I) and Construction and Development (C&D) real estate loans contributed a large share to this instability. This intuitively makes sense. With the increasing office vacancy rates, C&I loans would eventually have to fall. Table 2 shows that office vacancy rates peaked around 1987 to 1988, which is the same time period that the commercial real estate loans peaked. Construction and Development is known to contribute excess risk due to its dependence on future real estate demand, and therefore there exists uncertainty in future revenues. The Texas C&D loans being drastically higher than their US counterparts also supports the already well-known boom and bust phase that took place in the construction sector as well.

[20] (Hanc, 1997)

Texas bank asset growth rates also followed oil prices with a short lag. Texas banks' asset growth rates outpaced the US average from 1977 to 1984, and was then significantly lower than the national average, especially during 1987 and 1988. For example, in the 1981, Texas banks' asset growth rates reached a high of 20.5% compared to 8.6% for all other U.S. banks. However in 1988, Texas banks' asset growth rates reached a low of approximately -10%, compared to the 5% of the other U.S. banks. Much of this growth in Texas banks between 1977 and 1980 can be attributed to the expansion of existing banks. Growth after 1980 was then aided by a large increase in newly chartered banks, as Figure 17 will show[21].

It is also interesting to note that residential real estate loans in Texas made up almost 10% less of total assets than the US. This again coincides with the common belief of the resilience of residential real estate and that people tend to hold onto their homes during a market decline and speculate a rebound. It is also clear from Figure 11 that Texas real estate loans were significantly more volatile than the US standard between 1984 and 1994. As seen from figures 3.8, 3.9, and 3.10, Commercial and Construction real estate loans accounted for a significantly higher percentage of Texas banks' assets than they did for the US.

[21] (O'Keefe, 1990)

Figure 11

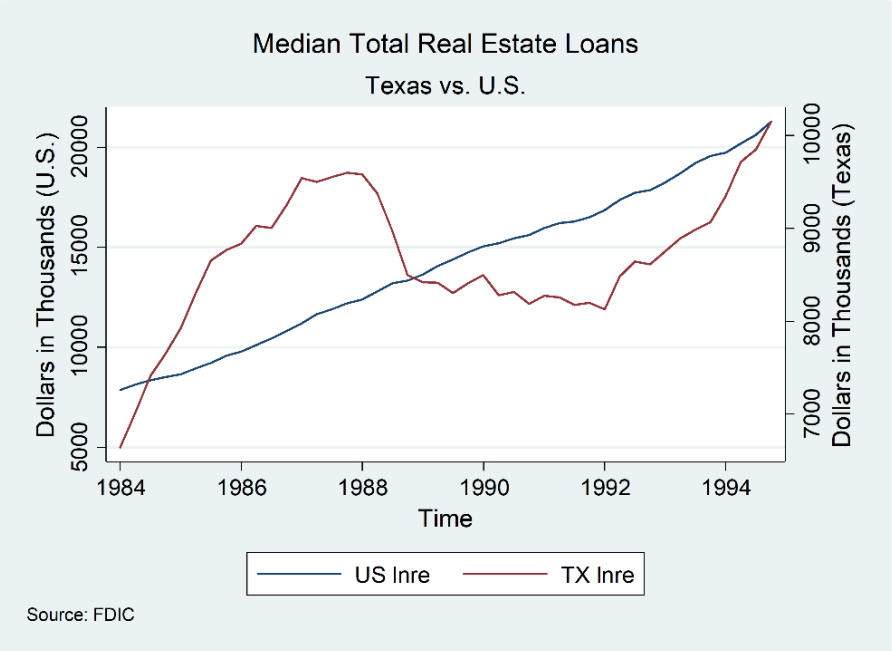


Figure 12

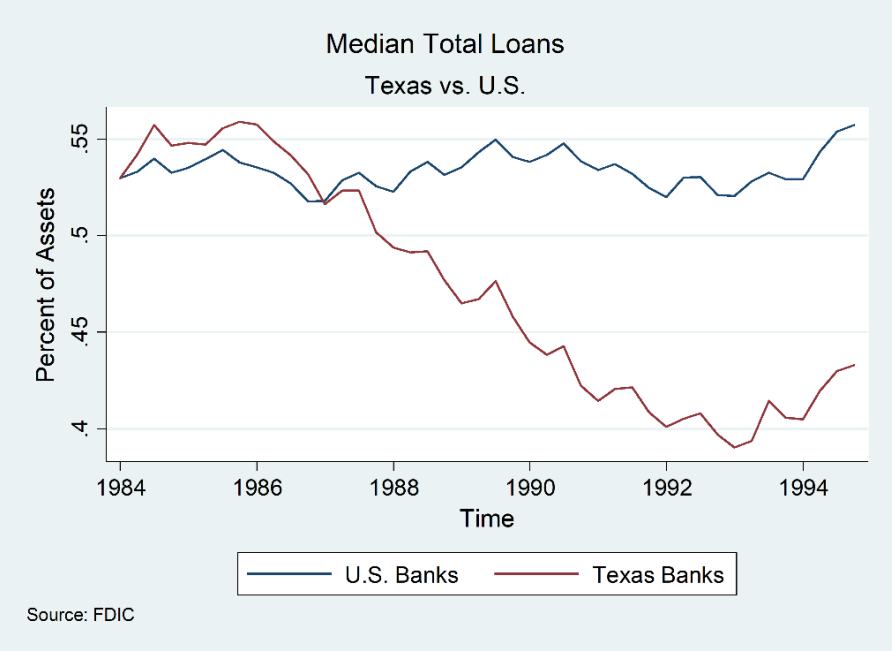


Figure 13

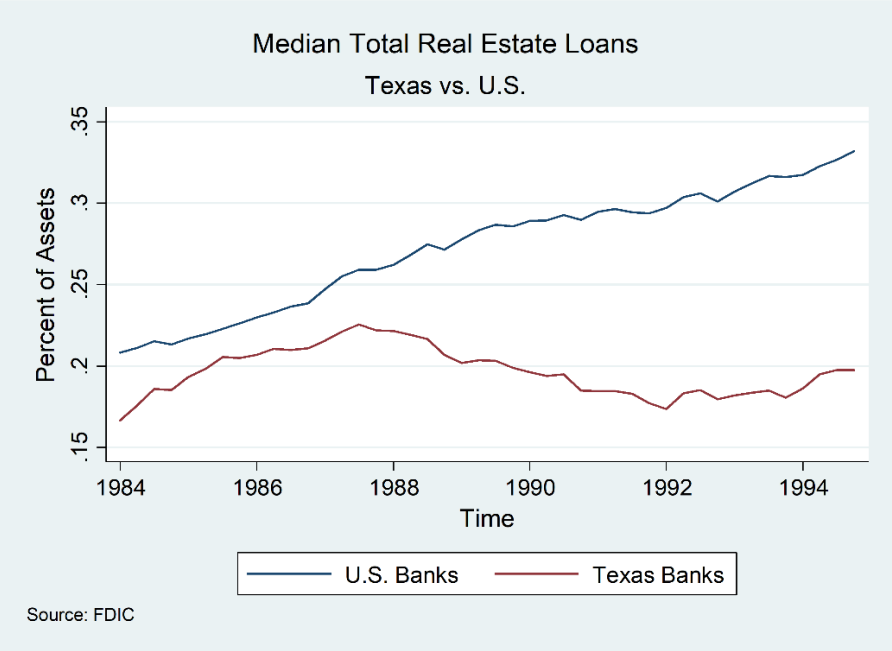


Figure 14

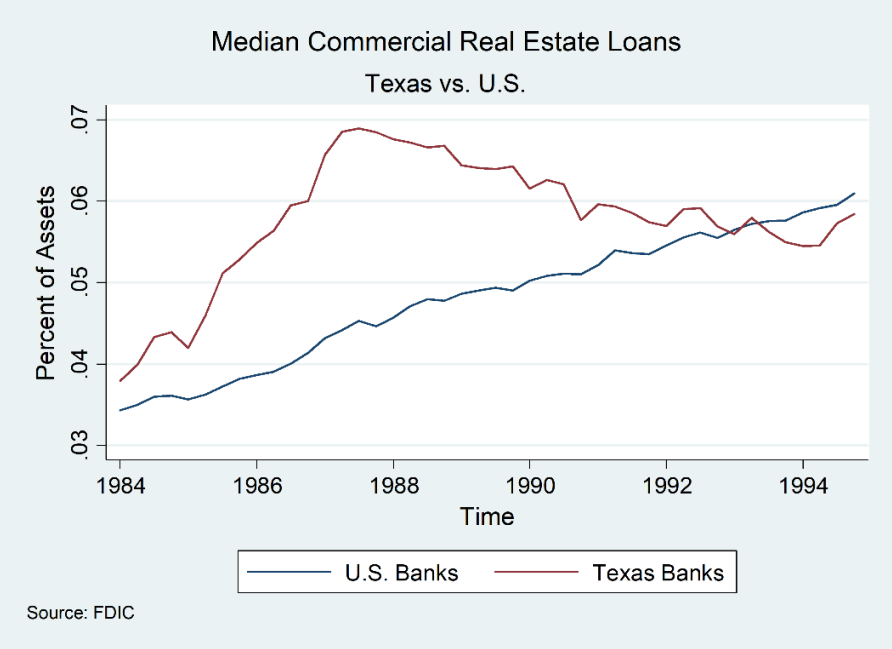


Figure 15

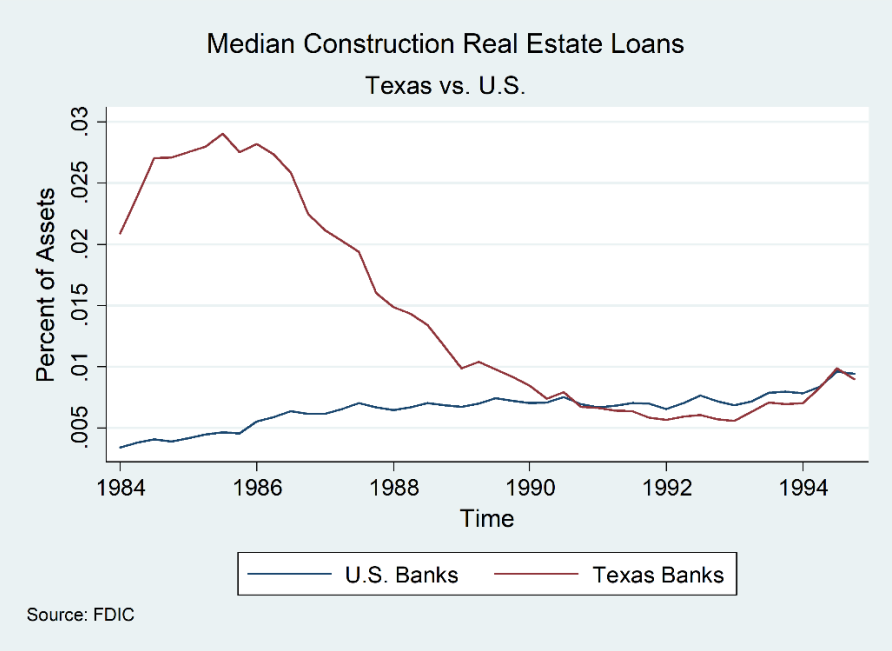
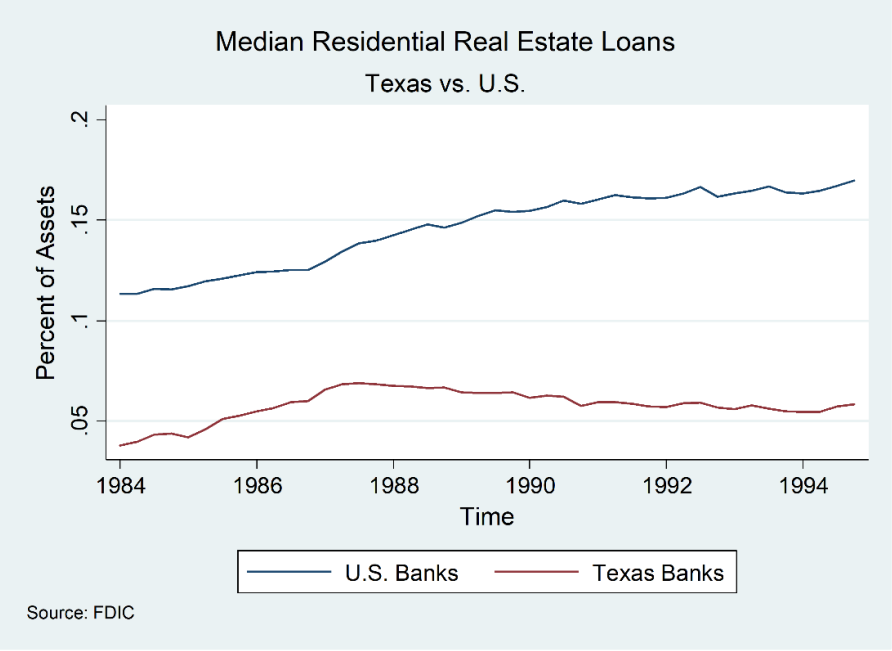


Figure 16



Although the data was unavailable, nonperforming assets and net charge-offs on loans and leases of Texas banks between 1984 and 1992, were significantly higher than the U.S. standard[22]. Nonperforming assets of Texas banks increased from 1.75% of total assets in 1982 to 6.58% in 1987. Among failed Texas banks, nonperforming assets were extremely high, averaging approximately 10.4% of failed-bank assets[23]. Median net charge-offs on loans and leases of all Southwest banks reached a high of .75% of total assets, roughly double the U.S. for the same year at approximately .375% of total assets[24].

The FDIC reviewed trends in the portfolio composition of banks within four major metropolitan areas in Texas to gain insight into the behaviour of the failed Texas banks. Although each area had unique features, they all had very similar overall behaviour. The majority of the banks studied appeared to react quickly to oil price movements[25]. For example, the increase in oil prices between 1973 and 1981 was accompanied by increases in concentrations in C&I loans (including loans to oil and gas producers). The majority of banks studied also appeared to react slowly to changes in commercial real estate[26]. As the previous figures and tables show, office vacancy rates began rising by 1981 however concentrations in C&D loans grew until they reached a peak in 1986, long after the decline of the commercial real estate market. Finally, the FDIC shows that with the exception of the Austin area, healthy banks had, on average, lower concentrations of construction and land development loans on the sample period. The healthy banks followed similar trends in construction loan concentration as the failed banks, however these concentrations were much lower. Healthy banks also had much fewer nonperforming real estate

[22] (Hanc, 1997)
[23] (O'Keefe, 1990)
[24] (Hanc, 1997)
[25] (O'Keefe, 1990)
[26] (O'Keefe, 1990)

assets (again, with the exception of Austin). The differences in commercial real estate loans were also significant, as it became a crucial factor to the banks' survival during the real estate boom[27]. It should also be noted that a possible reason why Austin exhibited atypical behaviour is because it is the state's capital. Federal and state government, accounting for 30% of the city's jobs may have contributed to stabilizing the area's economy during this period[28].

Two factors played significant roles in making Texas banks behave so aggressively during the booming phase. First, the oil boom created a surge of newly chartered banks, putting competitive pressures on the established banks to maintain their market share. These newly chartered banks were also much more likely to take on riskier loans than the more established banks[29]. Second, the Garn-St. Germain Depository Institution Act of 1982 broadened the lending abilities of Savings and Loan Institutions (S&Ls), further increasing the level of competition[30].

With the surge of newly chartered (i.e.. "de novo") banks increasing competition in the Texas banking sector, it would be worth studying how the new banks behaved relative to the more established banks. Thus, similar figure presented comparing Texas and the United States can be used to compare these two groups of banks. Comparing de novo banks to established banks, Gunther (1990) estimates approximately 39% of de novo banks failed compared to only 21% of established banks[31]. What is also interesting to note is that even though the trend in the loans of both groups of banks were similar, new banks saw a significant increase in unearned income by 1988 while the mature banks continued to see a downward trend in theirs. This suggest that young

[27] (O'Keefe, 1990)
[28] (O'Keefe, 1990)
[29] (Hanc, 1997)
[30] (Hanc, 1997)
[31] (Yom, 2005) - Gunther (1990) is an archive article in the Dallas Fed, as such Yom (2005) is used instead. Gunther (1990) tracks the failure rates during the period 1986 to 1989 of banks that had been established between 1980 and 1985. Accordingly, new banks in his study were ten years old and younger.

banks were making riskier loans across each type. Gunther (1990) reaches a similar conclusion, finding that new banks with capital levels and risk similar to established banks did not fail at significantly higher rates than mature banks.

Figure 17

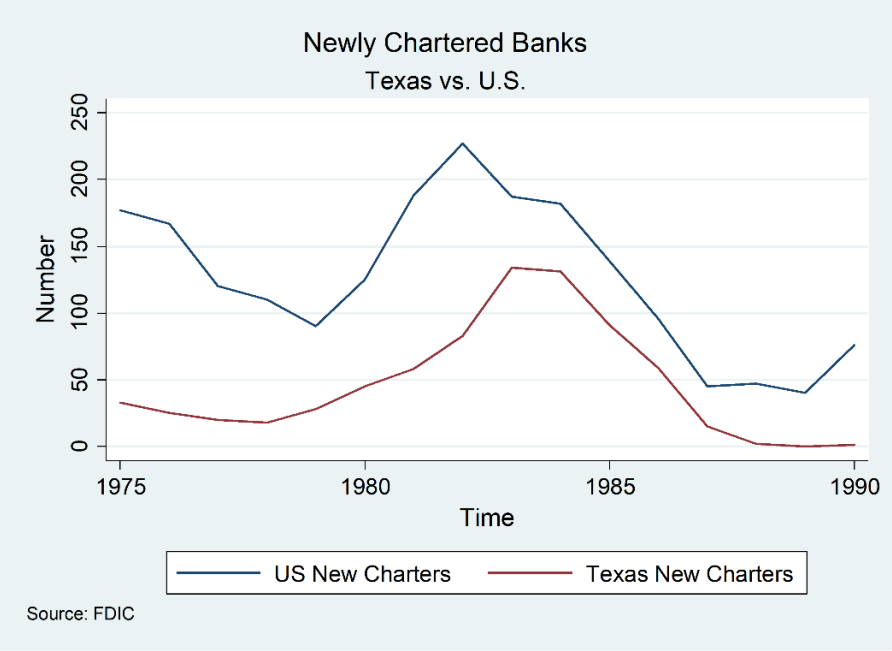


Figure 18

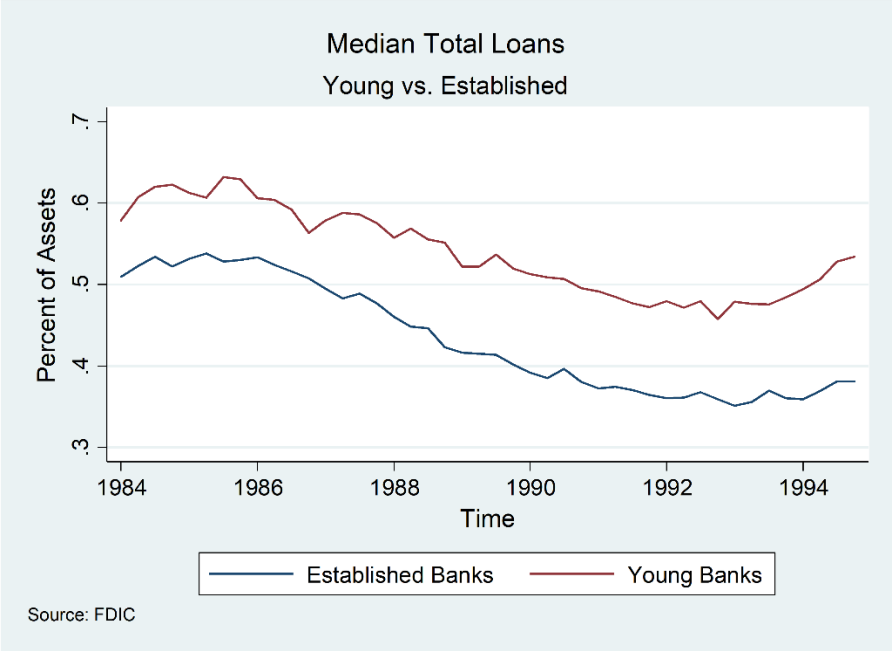


Figure 19

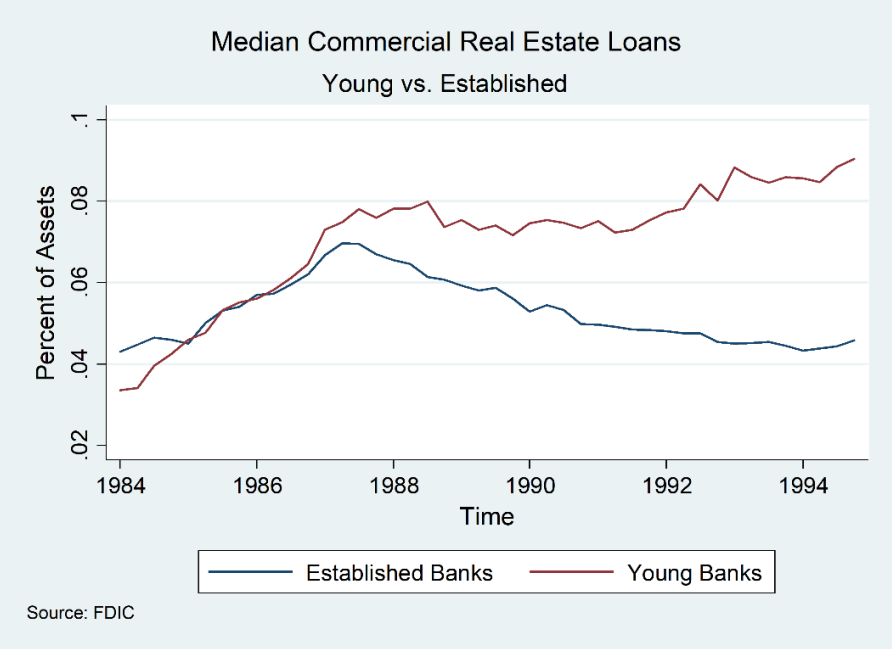


Figure 20

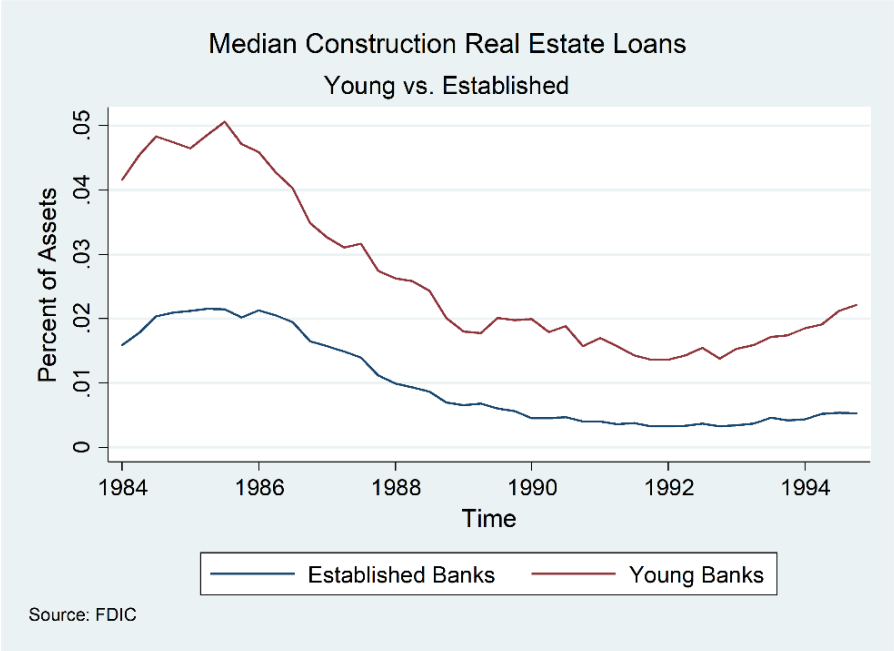


Figure 21

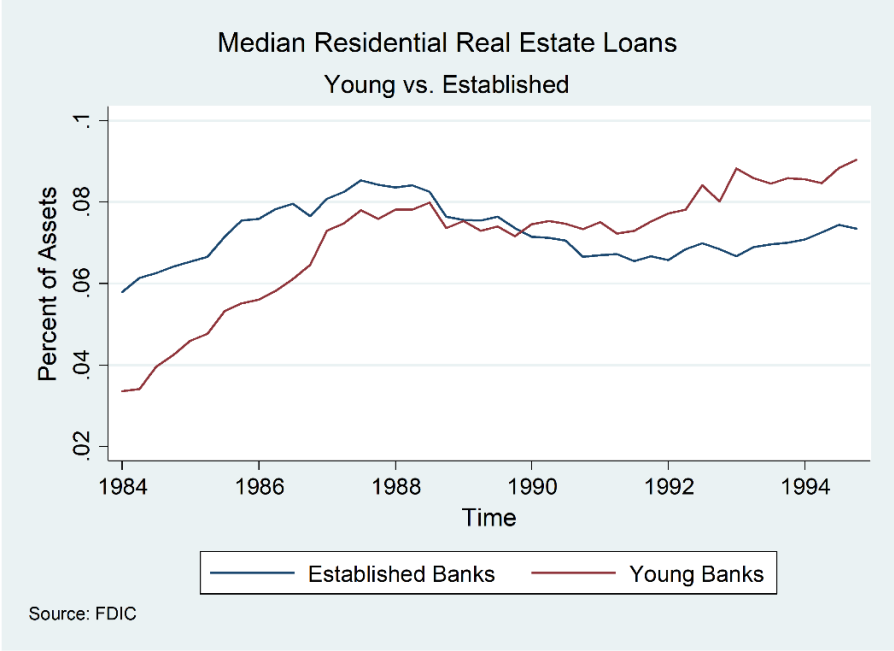
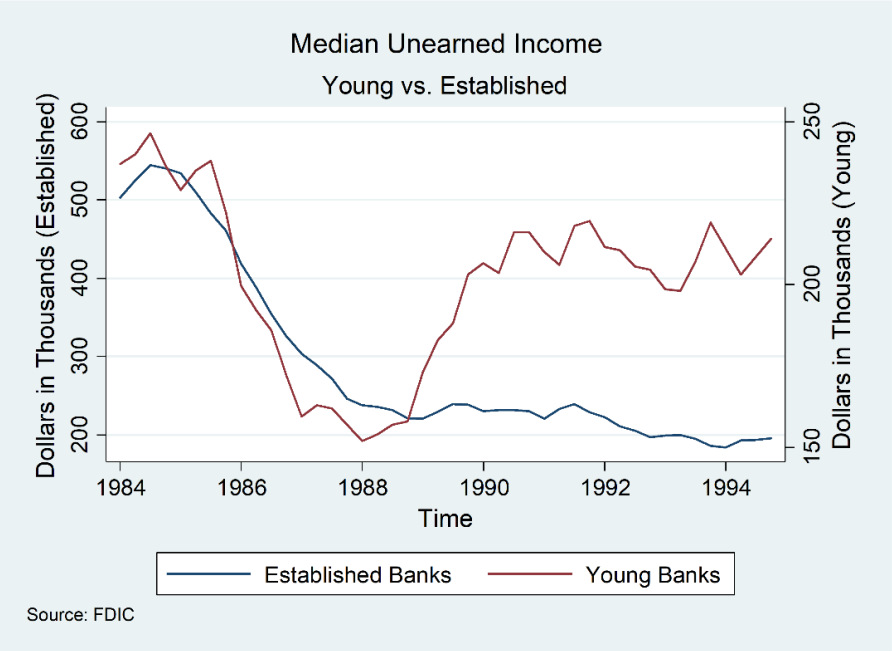


Figure 22



The FDIC studied de novo banks' vulnerability to real estate crises for the period of 1995 to 2003. While this period is not the period studied in this paper, the results the FDIC present can still be applied. It is well known that young banks are more financially fragile. As a result, they concentrate more heavily on risky assets than established banks do. For example, the FDIC finds that the Real Estate Stress Test (REST) rating of young banks were worse than established banks for their sample period[32]. Table 3 present the median REST ratings for young and established banks between the years 1986 and 1992. The table shows that young banks consistently underperform compared to their mature counterparts, each quarter being statistically significant at the 1% level. Furthermore, Figures 3.17 and 3.18 show the percentages of young and established

[32] The real estate stress test was developed on the basis of the New England real estate crisis in the 1990s, and information from a bank's balance sheet and income statement are used to rate the institution. The REST ratings are directly comparable to CAMELS ratings; a REST rating of 1 indicates least vulnerable to a real estate crisis, and a rating of 5 indicates most vulnerable. The REST model is part of the FDIC's offsite monitoring system and is used to help identify and monitor the institutions that are most vulnerable to a real estate crisis.

banks with poor REST ratings over time. These figures show the extent to which young banks are more vulnerable to the stress of a real estate crisis than their established counterparts.

Table 3

Comparison of Median REST Ratings for Young and Established Institutions

Date	*Young Banks*		*Established Banks*	
	Number	*Rating*	*Number*	*Rating*
1986Q1	84	4.11	5465	2.62
1986Q2	169	3.95	5386	2.58
1986Q3	267	3.96	5369	2.59
1986Q4	346	3.79	5219	2.54
1987Q1	410	3.66	5137	2.47
1987Q2	473	3.57	5037	2.41
1987Q3	527	3.45	4978	2.38
1987Q4	569	3.38	4898	2.37
1988Q1	607	3.35	4833	2.33
1988Q2	638	3.25	4732	2.32
1988Q3	676	3.16	4636	2.34
1988Q4	708	3.16	4503	2.32
1989Q1	732	3.12	4431	2.33
1989Q2	766	3.12	4389	2.33
1989Q3	798	3.16	4302	2.38
1989Q4	837	3.30	4235	2.40
1990Q1	860	3.20	4163	2.41
1990Q2	894	3.37	4079	2.43
1990Q3	922	3.31	4009	2.45
1990Q4	960	3.32	3953	2.42
1991Q1	990	3.23	3899	2.42
1991Q2	1019	3.24	3829	2.40
1991Q3	1041	3.10	3759	2.37
1991Q4	1048	2.97	4781	2.32
1992Q1	1008	2.86	4702	2.24
1992Q2	977	2.81	4676	2.22
1992Q3	938	2.82	4652	2.20
1992Q4	916	2.70	4567	2.13

Source: (Yom, 2005)
Based on Kendall's rank correlation test

Figure 23

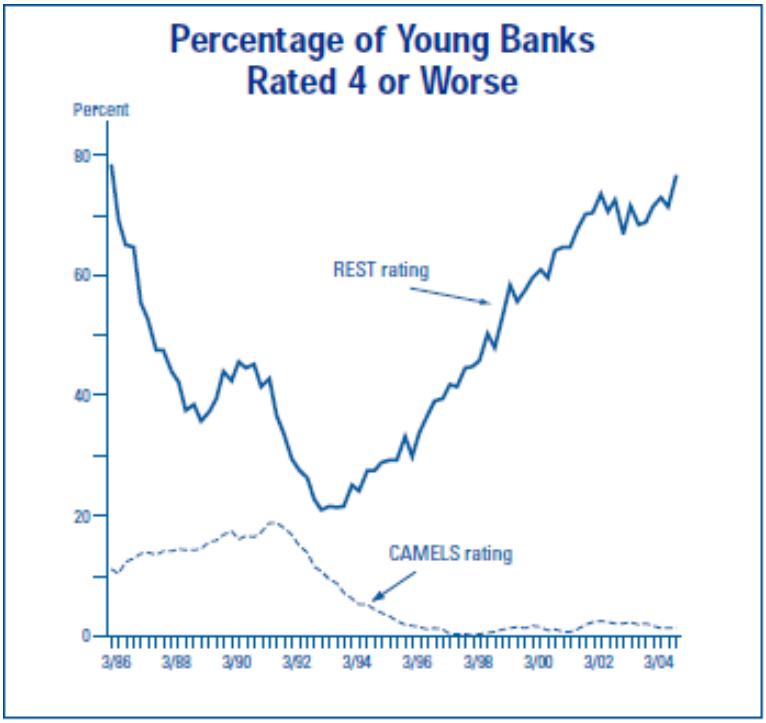
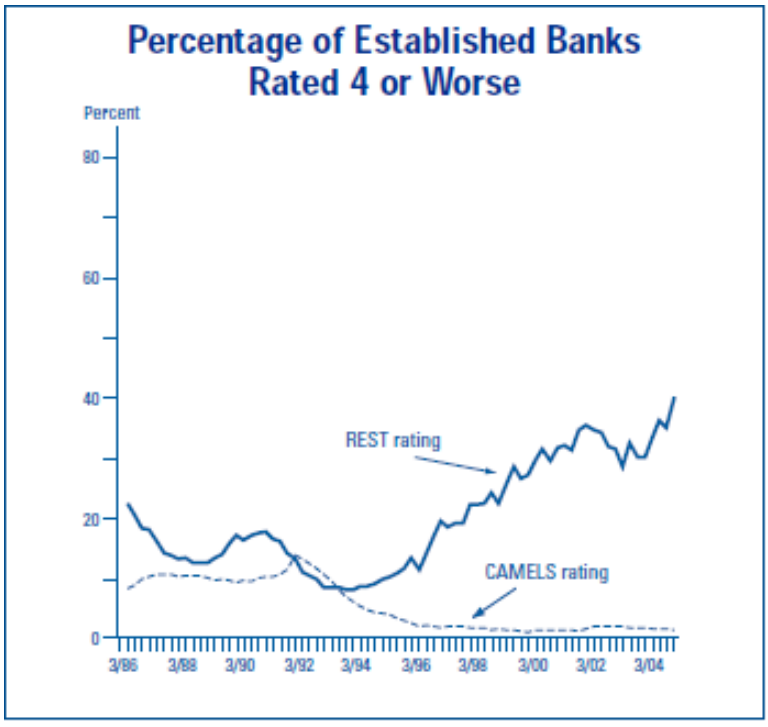


Figure 24



The reason young banks underperformed compared to the mature counterparts lies in their types of real estate lending. The FDIC gathered data on young and established banks and showed that young banks tended to have more C&I, C&D, and nonresidential real estate loans – the three types generally considered to be risky. Table 4 shows that as of December 2004, young banks' median ratio of C&I loans to assets were roughly double that of the established banks. The same trend is seen in C&D loans and nonresidential loans as well. However, 1 – 4 family loans made up a smaller share of total assets for young banks than for established banks. This table also shows that the median asset growth rates for young banks were almost four times the median asset growth rate of established banks. The FDIC conclude that the poor REST ratings are due to the higher concentrations in C&D, C&I, and nonresidential real estate loans.

Table 4

Comparison of Median Ratios between Young and Established Institutions

(as of December 31, 2004)

Variable	***Young***	***Established***
C&I	11.85	6.59
Agriculture	0.00	0.14
C&D	8.58	3.93
Multifamily	1.04	0.75
Nonfarm nonresidential	21.14	13.12
1 - 4 Family	15.77	20.47
Noncore Liabilities	24.72	17.33
Asset Growth	22.23	4.90
Equity Growth	-3.50	0.68
No. of Observations	905	2002

Source: (Yom, 2005)
Loan ratios are expressed as a percentage of assets. The growth measures are one-year change (in percent) in assets and equity.
*** Indicates statistical significance at the 1% level

The FDIC proceeds to explain why young banks tend to engage in riskier lending activities and concludes on two possible explanations: geography and aggressive risk management practices.

New banks tend to emerge in rapidly growing regions where the demand for riskier loans such as commercial and industrial and construction and development tends to be greater. New banks are also quite fragile and therefore more susceptible to failure compared to the more mature banks. As a result, these younger banks must take on riskier loans as a means of gaining business. These new banks also face an adverse selection problem since the pool of customers they are most likely to lend to would have poor credit and riskier ventures. Another reason that young banks would be attracted to riskier assets is the immediate income that would be generated. For example, commercial real estate loans have large up-front fees[33]. These explanations do seem to fit with the story of the Texas banking environment. As the previous figures show, young banks tend to have a higher proportion of risky loans to their assets including commercial and construction real estate loans, while having a lower proportion of residential real estate loans to their assets.

This section demonstrates the effect a SIRS and a SIRD industry had on the Texas economy. Banks unaware of the risks these sectors presented, compounded the problems they faced by enabling these oil and real estate bubbles to grow, seeking short-term profit from the booming sectors. The booming oil and real estate construction sector helped create an overly optimistic mindset amongst bankers, intensifying the competition for these two sectors and leading bankers to loosening their lending standards. One could argue, that the Basel Accords could have mitigated some of these problems. While it is true, that the increased regulation would likely have monitored banks' lending practices and decrease the overall number of bank failures, it still would not have been able to identify the emerging risks the oil and real estate sectors were presenting. As discussed in the previous section, a capital ratio that only considers the default probability one

[33] (Yom, 2005)

year in advance, would not be able to ensure that enough capital was being accumulated during the SIRS expansionary periods.

IV. Comparing Alberta and Texas

The lessons taken from Texas during the 1980s can be applied to the current state of the Alberta economy, since both regions are heavily dependent on the oil sector. Therefore, this section will examine the current state of the oil and real estate sectors and show the similarities between the two regions. However, it should also be noted that Canadian banking data is not as easily accessible as American banking data is. For this reason, the lending practices of Canadian banks to the oil and real estate sectors in Alberta will be quite limited. Instead, economic outlooks from regulators and banks will be used to review the recent history of the Alberta economy, as it pertains to oil and real estate, including summary tables and figures where applicable.

Alberta Oil Sands

The crude oil industry is vital to the success of the Canadian energy industry, and will continue to be for the foreseeable future. With oil prices dropping from $100 per barrel in early 2014 to a recent low of $30 per barrel by early 2016, this has had some significant effects on the Canadian economy, with Alberta receiving the worst. Over the past 10 years, the oil and gas industry in Alberta has had an average 25% share in total GDP in the province, as shown in Table 5. As a result of such a high share on GDP, other sectors are affected by it as well. This in turn translates into a higher than 25% share of GDP that the oil and gas sector has as a direct, indirect, or induced influence on. For example, a decline in oil production has a direct impact on its contribution to overall GDP and an indirect impact on GDP through companies that service the oil industry. Individuals that are employed in these sectors will also be affected through possible

layoffs and decreased income, having an induced impact on total GDP. Figure 25 illustrates this by showing the correlation between Calgary's employment and oil prices over the past 15 years. It is clear from this figure that Calgary (arguably the most dependent metropolitan region) is heavily dependent on the oil sands.

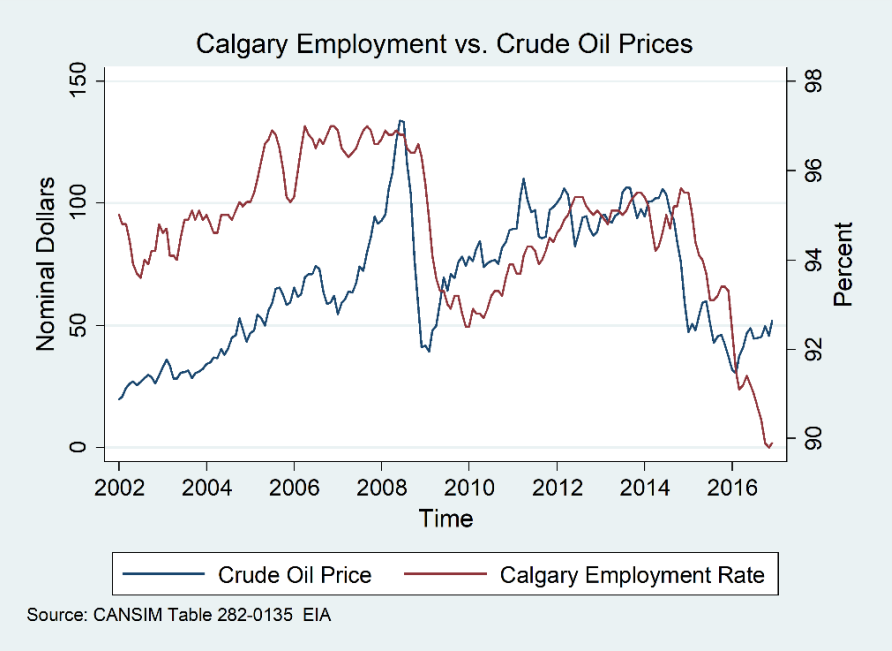
Table 5

Alberta Total and Oil and Gas GDP, in millions of dollars

YEAR	*TOTAL GDP*	*OIL AND GAS*	*SHARE OF TOTAL GDP*
2006	245,421	62,279	25.38%
2007	250,488	63,071	25.18%
2008	253,756	60,432	23.81%
2009	240,215	60,075	25.01%
2010	252,494	62,206	24.64%
2011	269,508	65,544	24.32%
2012	280,280	66,364	23.68%
2013	296,432	69,799	23.55%
2014	311,083	75,141	24.15%
2015	299,603	78,428	26.18%
2016	288,113	78,934	27.40%

Source: CANSIM Table 379-0030

Figure 25

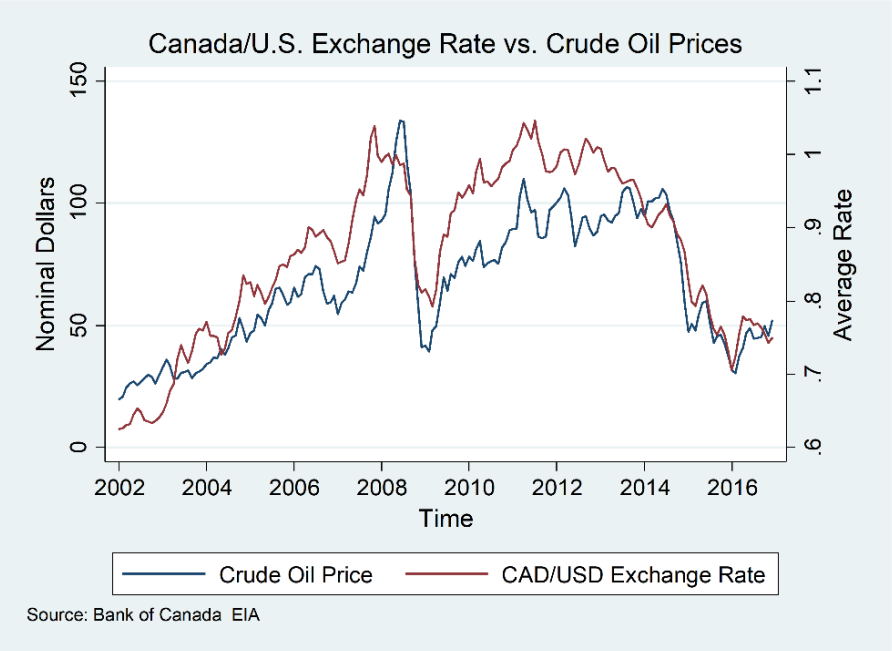


The decline in oil prices has also had significant effects on Canada as a nation. With the most recent major drop in oil prices has been an equally significant decline in the Canadian dollar (see Figure 26), and thus stimulating the debate for the level of correlation between the two. The Canadian dollar is often considered to be a petrocurrency in that due to the share of oil exports to total exports being large enough, the dollar will follow the movements of oil prices[34]. While Figure 26 shows that there is a correlation between oil prices and the Canadian dollar, what is more important to take from this is that an industry such as oil and gas, which has already been determined to be a classic example of a SIRS, has such a commanding effect on the entire Canadian economy. For this reason alone, Canadian regulators and banks should dedicate special attention to SIRS as outline in Crean and Milne (2017). While there is still debate as to whether or not the

[34] (Millington & Murillo, 2015)

Canadian dollar is in fact a petrocurrency, as long as the dollar continues to behave as it has, a SIRS analysis would prove to be a strong asset to Canadian banks.

Figure 26



The Canadian Energy Research Institute (CERI) conducted a study to determine the impact on the Canadian economy from low crude oil prices. To do so, they considered two possible short-term scenarios, spanning 7 years, starting in 2015: a Reference case, where the oil prices are forecasted to grow from current levels to $73 per barrel (in 2014 dollars) and a Low case, where the oil prices are only forecasted to reach $51 per barrel[35]. Economic impacts from low crude oil prices are then compared to those from the Reference Case. These results are organized for Canada and Alberta here.

[35] (Millington, 2016)

Under the Reference Case, Total Canadian GDP is project to be $830 billion, and direct, indirect, and induced employment is projected to be 4.1 million. Of these projections, Alberta accounts for approximately 88% and 81% respectively. Under the Low Case, the economic impacts amount to less than the reference case. Total Canadian GDP is projected to be $627 billion with employment estimated to be 3.3 million. In this case, Alberta accounts for approximately 81% and 70% of the total impact. These results, which are summarized in Table 6, are consistent with the common belief that a drop in oil prices would have a negative impact on the Canadian economy, and as can be seen from the following table, the majority of the impact is experienced by Alberta.

Table 6

Low Oil Prices Impact

2015 - 2021	***GDP****				***EMPLOYMENT****			
	Ref.	*Low*	*Low vs. Ref.*	*% Change*	*Ref.*	*Low*	*Low vs. Ref.*	*% Change*
Alberta	$735,791	$510,916	$(224,876)	-30.6%	3,329	2,315	$(1,014)	-30.5%
Canada	$830,336	$626,887	$(203,449)	-24.5%	4,109	3,298	$(811)	-19.7%
Alberta Share	88.6%	81.5%	-	-	81.0%	70.2%	-	-

Source: CERI
*GDP in millions CAD$
**Employment in thousands of persons

With Alberta accounting for significant shares of the impact in each case, it should also be noted that the oil sector alone accounts for almost 40% of the share of provincial GDP[36]. Thus, using the study conducted by CERI, it is clear that not only is Alberta heavily dependent on its oil sector, a common belief among economists, but should there be a severe but plausible downturn in this sector, Alberta would experience the most of this economic downturn, as has historically

[36] (Millington, 2016)

occurred. To shed light on the effects that a depressed oil sector can have on other sectors and the province's economy in general, Alberta real estate will be examined next.

Alberta Real Estate

As is the case with Texas, Alberta's real estate market is also heavily dependent on it's oil sector. Since oil prices have proven to be fairly volatile, it is likely that house prices in metropolitan regions such as Calgary and Edmonton would not only follow the oil price trend, but also tend to be more volatile than the national house price index, which is less exposed to the oil sector. This can be seen in Figure 27 and 4.4, which show Calgary house price movements with oil prices, and Calgary house price volatility compared to that of Canada's. It should also be noted that while Calgary house prices do appear to be more volatile relative to Canada's, they also appear to be fairly robust, with the only significant drop being during 2008 and 2009. In comparison to the most recent major oil price drop, house prices in Calgary saw minimal change.

Figure 27

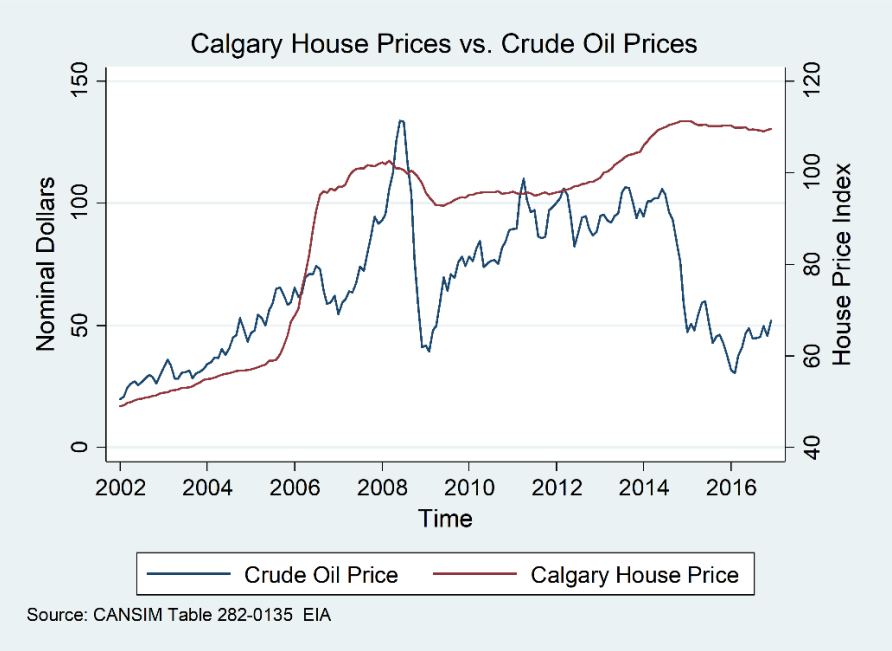
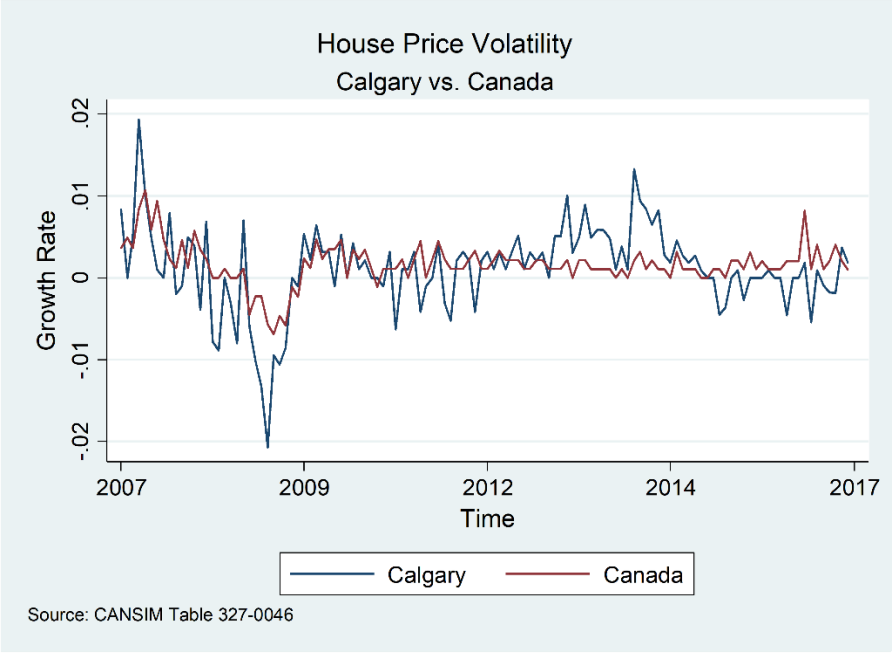


Figure 28



Although Calgary house prices have not seen much change when oil prices dropped, total housing starts did see a significant drop, as seen in Table 7. Due to the drop in employment and slower population growth, housing demand decreased, thus decreasing the pace of new home construction[37]. In addition to the drop in housing starts, the Canadian Mortgage Housing Corporation (CMHC) also reported that residential real estate sales also decreased during this period[38]. While the lack of change in Calgary house prices during market downturn does seem to contradict economic theory, even for a market where prices tend to lag in practice, there are possible explanations for this behaviour. One reason for this is that many homeowners may be waiting for market conditions to improve before listing their house for sale. This tends to be a common explanation for house prices, however the prices would be expected to exhibit some

[37] (Canadian Mortgage and Housing Corporation, 2016)

[38] (Canadian Mortgage and Housing Corporation, 2016)

change, even minor (for example, house prices dropped following a significant drop in oil prices in 2008) within a few years, as has historically been the case. This of course does not appear to have happened. Another possible explanation is the size of the itinerant workforce in Alberta, especially in the construction and oil and gas sectors. In 2013, the itinerant workforce was estimated to be more the 150,000 people – more than double what it was a decade earlier. Of those people, 70,000 to 80,000 are estimated to be involved in the oil and gas or related sectors. However, following the oil drop, approximately 56,000 workers appear to have left Alberta[39]. This resulted in a spike in rental vacancy rates from 1.5% in 2014 to over 5% in 2015 to a 25-year high of 8% in 2016[40]. While there is still speculation as to whether or not house prices will change to reflect the current economic environment in this region, it is clear that there are other areas of the residential real estate market that have been affected.

[39] (Fletcher, 2016)

[40] (Canadian Mortgage and Housing Corporation, 2016)

Table 7

Total Alberta Housing Starts

Quarter	*Housing starts*	*% Change*	*Quarter*	*Housing starts*	*% Change*
2007Q1	10495	-	2012Q2	9436	46%
2007Q2	13228	26%	2012Q3	8952	-5%
2007Q3	14157	7%	2012Q4	8524	-5%
2007Q4	10456	-26%	2013Q1	6989	-18%
2008Q1	9119	-13%	2013Q2	10435	49%
2008Q2	7796	-15%	2013Q3	8868	-15%
2008Q3	7038	-10%	2013Q4	9719	10%
2008Q4	5211	-26%	2014Q1	8152	-16%
2009Q1	2614	-50%	2014Q2	11231	38%
2009Q2	4270	63%	2014Q3	11692	4%
2009Q3	6202	45%	2014Q4	9515	-19%
2009Q4	7212	16%	2015Q1	10183	7%
2010Q1	5651	-22%	2015Q2	9302	-9%
2010Q2	8238	46%	2015Q3	9403	1%
2010Q3	7437	-10%	2015Q4	8394	-11%
2010Q4	5762	-23%	2016Q1	4925	-41%
2011Q1	4211	-27%	2016Q2	6410	30%
2011Q2	6281	49%	2016Q3	6611	3%
2011Q3	7589	21%	2016Q4	6587	0%
2011Q4	7623	0%	2017Q1	5800	-12%
2012Q1	6484	-15%	2017Q2	8157	41%

Source: CANSIM Table 027-008

In addition to the change in residential real estate, commercial real estate (CRE) has seen significant impacts as of late. Since 2014, 11,500 jobs were lost in Calgary alone, bringing the unemployment rate to 10.1%[41]. Three areas of the commercial real estate market have been affected significantly in Calgary and Edmonton: Office, Industrial, and Retail. Last year the

[41] (TD Economics, 2017)

Calgary office segment saw a vacancy rate of 23.8%, while Edmonton saw a vacancy rate of 17.8%[42]. Vacancy rates are expected to be as high as 33% in Calgary by 2018. Apart from the Office segment, Calgary and Edmonton have differed in the Industrial and Retail segments. Calgary's retail market has proven to be fairly strong due to the equally strong house prices, while Edmonton's retail market is expected to see an increase in vacancy rates. These differences are intuitive given that the two cities differ in the makeup of their economies. Table 8 illustrates these findings.

Table 8

Vacancy Rates Outlook

Year	*Office*			*Industrial*			*Retail*		
	Can.	*Cal.*	*Edm.*	*Can.*	*Cal.*	*Edm.*	*Can.*	*Cal.*	*Edm.*
2016	12.9%	23.8%	17.8%	4.1%	7.5%	5.3%	5.0%	3.6%	4.2%
2017F*	15.1%	27.9%	17.9%	5.1%	7.7%	4.9%	4.5%	5.4%	6.0%
2018F	17.2%	33.0%	21.0%	5.2%	6.1%	4.6%	4.0%	4.6%	6.8%
Avg. 2005 to 2015	9.0%	8.3%	8.8%	4.4%	3.1%	2.6%	4.8%	3.4%	4.1%

*F represents forecasted rates
Source: (TD Economics, 2017)

It should also be noted that the Office and Industrial segments report Calgary having higher vacancy rates for years 2016, 2017F and 2018F than Canada, but has lower average vacancy rates for the ten years prior. This may suggest that during periods where the Alberta oil sector is strong, the Calgary CRE market tends to outperform the nation. This behaviour is consistent with what has been seen in Texas during the 1980s, as well as the Calgary house prices during this period.

[42] (TD Economics, 2017)

As is the case with the Texas economy in the 1980s, one would expect to see an increase in loan losses to Alberta lenders. In particular, in May of 2016 Alberta government-owned lender ATB Financial reported a net income of $108 million, a drop from the $329 million the year before. The reason for this being the increase in loan loss provisions from $73 million to $338 million[43]. These figures are consistent with that of both the Royal Bank and CIBC, saying that these provisions were related to the struggling oil and gas sector in Alberta. In addition, Moody's Investor Services indicates that ATB's loan book is increasing the risk to Alberta's credit rating[44]. In late 2015, when oil prices and employment were continuing to fall, ATB in fact increased its loans to small and medium-sized business by almost 30%. While access to credit is good for business, it also increases the risk the province faces during this economic downturn. Over the past decade, ATB has also worked more aggressively to gain market share. Between 2007 and 2015, ATB's loan book more than doubled, with $37 billion in loans outstanding and $30 billion in deposits, and the province extending their credit line by $1.5 billion[45]. ATB has made it clear that they intend to have the energy sector as the foundation of their business. ATB is also not geographically diversified thus attracting the attention of Moody's and the risk they are taking on[46]. ATB Financial not only provides a glimpse into the effect that the energy sector has on the financial sector in Alberta, but also provides an opportunity to study the potential consequences a financial institution may face, should they be over-exposed to a SIRS and not have an adequate capital regime.

[43] (The Canadian Press, 2016)
[44] (Johnson, 2016)
[45] (Johnson, 2016)
[46] (Johnson, 2016)

This section has shown that both Alberta and Texas are heavily dependent on its oil sector, and the impact that can cascade from this sector into other sectors. The Alberta oil sector is currently recovering from it largest price-drop since the recession and so consequently are many of its other sectors that exist to service this sector, including real estate. While there may not have been any financial crisis caused due to overinvestment in this industry, it is important to learn from previous errors to ensure a similar crisis is averted.

V. Concluding Remarks

The purpose of this paper is to illustrate the need and benefits of a SIRS analysis in current risk management practices. The Global Financial Crisis showed that there are still many areas that can be improved on, including the capital adequacy ratio. While there is still much speculation on the origin of systemic risk, the most recent crisis showed that the means of measuring this risk could not predict the events that would occur. Crean and Milne (2017) attempt to change the focus of the origin of systemic risk from the financial sector to the real sector, showing a small group of real sectors that shared similar characteristics contributed to the majority of the loans losses during these recent crises.

This paper continues their work by showing the effect that a Systemically Important Real Sector such as oil can have on a region's economy. The Texas oil sector in the late-1970s to mid-1980s provides a classic example of the SIRS episode. The Texas economy was heavily dependent on its oil sector, and many other sectors existed to service it. This is not unlike the current Alberta economy. However, Texas banks lacked some significant risk management regulations, as they heavily exposed themselves to the oil sector, speculating prices to continue to rise, or rebound when it was clear they would continue to fall. Banks would then increase their exposure to this

failing sector, by shifting their lending from the failing energy sector, to the booming real estate sector, unaware of the relationship between the two.

Crean and Milne (2017) develop the SIRS model and SIRS analysis as a means to identify these emerging sectors. This SIRS analysis identifies these emerging sectors much earlier than current methods and ensures banks acquire capital much earlier in advance. It does so by considering the possible effects from the worst-case scenarios in these industries. With methods proving to be inadequate in accurately identifying the generation of systemic risk, this analysis provides and sound and reasonable solution. For this reason, those with the data and resources available would find it valuable to conduct such a study on a historical crisis before another one occurs.

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